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Warranty Handling For Products Sold Through Dealerships

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Abstract

This thesis is made on behalf of Wärtsilä Marine Power's Customer Assistance Warranty Services, with the purpose of producing a warranty management process that can be implemented when handling customer complaints for products sold through dealerships. As a model, the warranty process between manufacturers and dealerships within the automotive industry has been benchmarked and utilized.

The thesis is covering theory of warranty terms and conditions, liabilities and exclusions of liability, both within Wärtsilä's current warranty process and within that of the automotive industry.

The methodology of gathering needful information to produce a process for Wärtsilä was actualized as a literature study of the warranty management process between vehicle manufacturers and dealerships, as well as an interview with a dealership within the automotive industry. The analysed procedures are visually presented in the form of flow charts.

The results consist of a new warranty process for Wärtsilä Marine Power, together with arguments for and against the suggested procedures. In addition, the results cover the critical functions and features of a warranty software that should be developed as a support to enhance the suggested warranty process.

Language: English
Key Words: warranty, warranty management, customer complaint, dealership

EXAMENSARBETE

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Titel: Garantihantering för produkter sålda genom återförsäljare

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Abstrakt

Det här examensarbetet har gjorts för Wärtsilä Marine Power, Customer Assistance Warranty Services, med syftet att producera en garantihanteringsprocess som kan användas för att ta hand om reklamationer från återförsäljare av Wärtsiläs produkter. Garantihanteringsprocessen inom bilindustrin, mellan fordonstillverkare och återförsäljare, har använts som modell.

Teorin i examensarbetet täcker garantiprocessens villkor, skyldigheter och situationer som medför ansvarsfrihet, både inom Wärtsiläs nuvarande process samt inom den analyserade processen hos bilindustrin.

Metoderna som använts för att producera ett resultat bestod av en litteraturstudie av bilindustrins garantihanteringsprocess mellan fordonstillverkare och återförsäljare, samt en intervju med en återförsäljare inom bilindustrin. Processerna som undersökts är visuellt presenterade i form av flödesdiagram.

Resultatet består av en ny garantihanteringsprocess som Wärtsilä Marine Power kan använda i samarbete med återförsäljare, samt argument för och mot den föreslagna processen. Därutöver innehåller resultatet även en sammanställning av nödvändiga funktioner hos en programvara som kunde utvecklas inom Wärtsilä för att understöda och förstärka garantihanteringsprocessen.

Språk: engelska
Nyckelord: garanti, garantihantering, reklamation, återförsäljare

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1 Introduction

With a huge product portfolio comes the responsibility of handling a great amount of product warranty. As of 2021, Wärtsilä acts as the seller of all their products, and therefore all customer complaints are handled by Wärtsilä´s own warranty departments. The warranty process is extensive and well-developed, as well as subject to continuous improvement.

If Wärtsilä would sell their products through dealerships, the warranty process would be a lot different from what it is now. This thesis is made on behalf of the warranty department of Wärtsilä Marine Power, named Customer Assistance Warranty Services (CAWS), in order to analyse a possible warranty process for products sold through dealerships.

This chapter presents Wärtsilä as a company, as well as the department of CAWS. After the company has been introduced, and the reader has an understanding of the organization, the background, purpose, scope and delimitation is explained. This chapter also includes the disposition of the thesis.

1.1 Wärtsilä

Wärtsilä's history dates back to 1834, when Gustaf Löfström was given the permission to build a sawmill next to the Värtsilä rapids in the municipality of Tohmajärvi, Finland. Two years later, the sawmill was passed into the ownership of Nils Ludvig Arppe. As Arppe saw the benefits of focusing on the railway industry, an ironworks was built alongside the sawmill in 1851. Half a century later, in the year of 1898, the sawmill and the ironworks were given the name *Wärtsilä Aktiebolag.* In 1907, the company name was changed to *Ab Wärtsilä Oy*. (Tervetuloa Värtsilään!, 2021)

Since that time, Wärtsilä has shifted focus to products for the marine and energy markets, including power generating machinery, vessel positioning solutions, emissions control systems, gas handling, electrical and automation systems and much more. Today Wärtsilä has a leading position globally in smart technologies and complete lifecycle solutions, both for the marine and the energy markets. In 2020, Wärtsilä had a revenue of EUR 4.6 billion and a workforce of 18,000 employees. The company is operating in more than 200 locations worldwide, in over 70 countries. (Wärtsilä, 2021a)

1.1.1 Wärtsilä Marine

Wärtsilä Marine is leading the marine technology worldwide and provides products and solutions for marine installations such as cruise ships, ferries, fishing vessels and naval ships. The products and solutions offered by Wärtsilä Marine are efficient, reliable, flexible and environmentally sustainable. By using high levels of digitalisation and connectivity, Wärtsilä Marine is leading the industry towards a smarter marine ecosystem. (Wärtsilä, 2021c)

The product portfolio mainly consists of diesel and dual-fuel engines (Figure 1), as well as power systems, propulsors, electrical packages, automation systems, ship design and a variety of environmental products such as NOx reducers, SOx scrubbers and VOC recovery systems. Alongside the physical products Wärtsilä Marine also provides related services such as repair, upgrades and maintenance. The customers of Wärtsilä Marine are shipyards and shipowners. (Wikipedia, 2021)

Figure 1. The world's most efficient 4-stroke diesel engine, the Wärtsilä 31DF (Wärtsilä, 2021c)

1.1.2 Wärtsilä Energy

Today Wärtsilä Energy is leading the transition towards a future of 100 % renewable energy. Through technology and innovation Wärtsilä Energy is helping customers decarbonise their installations, as well as increase the efficiency, performance, and reliability, in order to build a future where homes and businesses are powered in a sustainable way. At the same time as the products are developed, Wärtsilä Energy is also preparing for the future fuels that will let us take the last step to reaching a completely renewable energy process.

The product portfolio covers power plants, energy storage systems, hybrid solutions and optimisation technology. By 2021, a total power plant capacity of 74 GW, together with more than 80 energy storage systems, has been delivered to 180 countries around the world. (Wärtsilä, 2021b)

1.1.3 Customer Assistance Warranty Services

Wärtsilä Marine is divided into Marine Power, Marine Systems and Voyage. Part of Marine Power is CAWS, the warranty department that is managing the contractual warranty for delivery projects. CAWS has an overall responsibility to plan strategies and actions within the warranty process, as well as assess the risks on a yearly basis. Review and reporting of the warranty process is performed each month. CAWS is also working closely together with other departments such as Technical Services and Field Services, in order to provide the best possible assistance for Wärtsilä's customers. A strict way of working as well as a good cooperation on all levels within the department is key to the efficient performance.

CAWS is also working to ensure a systematic problem-solving process which ensures a prompt resolution of technical problems that appear during the warranty period. Product performance feedback is also gathered to improve Wärtsilä's production process.

As Wärtsilä also sells products made by vendors, another core activity of CAWS is to reclaim vendors for problems arising with their products, in order to ensure that the vendors are also performing well and that Wärtsilä's warranty costs are minimized.

1.2 Background

Since Wärtsilä's products and solutions are sold directly to the customers, the customer complaints are taken care of by Wärtsilä's own warranty departments. The warranty handling process involves investigating the cause of the issue, providing technical advice, shipping spare parts, arranging service attendance and more. This is an extensive procedure that at times can be time-consuming.

Wärtsilä does however have the possibility to start selling some of the products through dealerships in the future. The dealerships will in turn sell the products to their customers, the end users.

The background of this thesis was the need to develop a warranty process for products sold through dealerships.

1.3 Purpose

The purpose of this thesis was to investigate how warranty is handled by organizations that sell their products through dealerships, and by doing so, to analyse an alternative warranty procedure for Wärtsilä, which could be implemented in a future when the company's products are sold by dealers.

The purpose was also to provide a ground for how the warranty procedure could be implemented in practice, and what it would require from the management of CAWS. Furthermore, the purpose of the thesis was to provide a guideline for how the high-level system architecture could look in a warranty software to be used by Wärtsilä.

1.4 Scope

The scope of the thesis is built up by the following questions:

- What would the contractual warranty process look like?
- What are the arguments for and against the suggested warranty process?
- What high-level system architecture should be used to develop a warranty software that supports and speeds up the warranty process?

1.5 Delimitation

As the thesis is made on behalf of CAWS, Wärtsilä Marine Power, it is not covering the warranty handling procedure of Wärtsilä Energy. The current way of working within CAWS is presented with main focus on the warranty expert's role, acting as the customer's contact person within Wärtsilä and validating the warranty complaints. The cost of implementing a new warranty procedure is not calculated in this thesis, and the process of choosing a dealership and providing sufficient training to perform repair work on Wärtsilä's equipment is not analysed, as the scope is limited to the process of handling reported warranty issues.

1.6 Disposition

The first chapter of the thesis introduces the subject. It also discusses Wärtsilä as a company, including a presentation of CAWS, the department for which the thesis is made. The background, purpose, scope and delimitation is also explained.

The second chapter brings up the relevant theory for the thesis, including the definition of warranty, the current warranty handling procedure within CAWS and the needed information to plan the implementation of a procedure for handling warranty of products sold through dealerships.

The third chapter describes the empirical method that has been used together with the theory to produce a result.

The fourth chapter presents the result, answering to the questions brought up as the scope of the thesis.

The fifth chapter gives a final discussion of the result and gives a conclusion of the thesis. Challenges and further development possibilities of the thesis are also brought up.

2 Theory

This chapter presents the relevant theory for the thesis, gathered through literature study. Initially, warranty will be defined. This is followed by a description of the current warranty management process of CAWS. Afterwards, the theory of handling warranty for products sold through dealerships is presented.

2.1 Warranty defined

Warranty is defined as a promise given by the manufacturer that a remedy is available if the product fails to meet certain characteristics such as condition, quality, or quantity. Hence, the warranty is a measure of the manufacturer's confidence in its products. The process of handling warranty is a part of the manufacturer's customer service and describes how the warranty is administered to. In contract law, a warranty is a legal stipulation which the warrantor must strictly comply with. (Legal Information Institute, 2021)

2.1.1 The difference between warranty and guarantee

Guarantee and warranty are often used synonymously, but the words have different meanings. A guarantee is a promise given by the manufacturer or seller, assuring that the product will meet certain standards, and work as intended. If the product does not meet the specifications, it will be repaired or replaced. Guarantees do not cost anything for the customer.

A warranty is a form of guarantee given by the seller, assuring that a remedy is available if the product fails to meet determined specifications. A warranty does however only cover the product within certain conditions, and the conditions where the seller is not liable are also stated. The buyer does not pay separately for the warranty, but the price of the product covers the price of the warranty as well. (Kenton, Warranty, 2021)

2.1.2 Expressed and implied warranty

Warranty is divided into two main categories, expressed and implied warranty. An expressed warranty, also known as express warranty, is based on an expressed guarantee that the product will perform according to predetermined specifications. If the product is defective or does not perform as it should, it will be repaired or replaced by the seller. This

kind of warranty can be given to the buyer in written or verbal form, and it is limited within a set timeframe. For example, car dealers tend to express warranty terms that are limited by mileage or length of ownership. (Liberto, 2021)

An implied warranty assumes that a product is fit for its intended purpose and will meet reasonable expectations of the buyer. The implied warranty does not have to be communicated from the seller in any form to be valid. As a practical example, if a sandwich is bought at a café and turns out to be covered with mold, it shall be replaced by the seller. It is reasonable to expect that a sandwich at a café would not be covered with mold. (Kenton, Implied Warranty, 2020)

2.1.3 Limiting conditions

Often warranties have conditions that limit the manufacturer's obligation to rectify an issue. Products are usually covered by warranty only for a limited time after the date of purchase, and only if the problems result from defective parts, inappropriate materials, or bad workmanship. Sellers usually offer extended warranty, at an extra cost for the buyer, which provides additional repairs and maintenance. The extended warranty can have other limitations than the standard warranty, but similarly, it has terms and conditions that must not be breached by the customer if the product is to be covered. (Kenton, Warranty, 2021)

2.1.4 Grounds on which warranty can be denied

A manufacturer or seller can deny warranty coverage in certain conditions. Different companies can have different warranty terms, but there are usually some common conditions applicable to most warranty contracts.

If a product has been modified or altered by the customer, the warranty will usually not be honored. Nonstandard parts or unqualified maintenance is likely to alter the performance, functionality, and reliability of a product.

Although a product has suffered from malfunction within the warranty coverage timeframe, the buyer needs to prove that the product failed during normal course of operation. Misuse of the product will usually void the warranty.

Warranty is often only valid if the buyer has followed certain specifications regarding storage and maintenance. If a product has been stored in an extreme environment, or if it has not been taken care of according to recommendations, warranty might not apply.

Sometimes warranty is only valid if the buyer can return the damaged part back to the manufacturer or seller. (Kenton, Warranty, 2021)

2.2 Warranty terms and conditions of CAWS, Wärtsilä

In the *General Terms and Conditions of Contract* that are given by Wärtsilä Marine, the liability and exclusions of liability of the warranty provided to the customer are described in detail. In chapter *2.2.1 Liability* and *2.2.2. Exclusions of liability* these are summarized to give an understanding of the warranty which CAWS is responsible to act in accordance with.

2.2.1 Liability

Wärtsilä warrants that during a predetermined amount of time, known as the warranty period, the equipment will be free of defects, and will perform according to the agreed specifications. If the customer discovers defects in the material or workmanship during this time, which is a breach of warranty, Wärtsilä will repair or replace the malfunctioning materials. For the remedy to be available, the customer must give Wärtsilä a written notice within a set time limit after the defect has been discovered. The customer must also take appropriate steps to diminish damage and to prevent the issue from becoming more serious. If repairing or replacing the defect material requires special knowledge, Wärtsilä is obliged to do the needful work. Other components that need to be removed in order to reach the defect material shall be removed by the customer. If parts are needed back for investigation by Wärtsilä, the customer must return these. Wärtsilä will bear the cost of transporting parts to and from the global distribution center. Needful service attendance onboard the customer's vessel will be covered by Wärtsilä's warranty as long as it takes place during normal working hours. (Wärtsilä Marine, 2018)

2.2.2 Exclusions of liability

Wärtsilä is not obliged to provide spare parts or arrange service attendance under warranty if the reported defects are caused by normal wear-and-tear, use of materials that are

neither supplied or approved by Wärtsilä, use or maintenance of the equipment that is not in accordance with Wärtsilä's manuals or instructions, negligence on the part of the customer, improper installations carried out by the customer or non-compatible combination with other equipment or software that are not supplied by Wärtsilä. Furthermore, Wärtsilä is not liable for indirect losses that are caused by the defect, such as commercial losses, interruption of business resulting in profit losses, costs for clean-up of pollution, docking costs, towage costs or costs due to damage to the vessel. These exclusions do however not apply if the indirect losses were caused due to misconduct or negligence on the part of Wärtsilä. In Wärtsilä's general terms and conditions it also stated to what amount Wärtsilä's maximum liability reaches. (Wärtsilä Marine, 2018)

2.3 Warranty management process of CAWS, Wärtsilä

The warranty process within Wärtsilä Marine Power, managed by CAWS, describes the implemented steps that are fulfilled to plan for, execute and close a successful warranty period. (Högkull, Warranty Management Process, 2021)

As Wärtsilä offers a high volume of complex products, which will be used in harsh environments, there will be failures from time to time. The important task that is under the responsibility of CAWS, is to take care of the company's customers and provide quick and accurate support. Any product failure will likely displease or frustrate the customer, but CAWS is working to minimize the dissatisfaction as efficiently as possible, in a cost-effective way.

2.3.1 Plan warranty

Internal information.

2.3.2 Execute warranty

Internal information.

2.3.3 Close warranty

Internal information.

2.3.4 Warranty claim handling

Internal information.

Figure 2. The process of handling a warranty claim within CAWS (internal information)

2.4 Warranty terms and conditions within the automotive industry

To identify a warranty process that could be used within Wärtsilä when selling products through dealerships, a warranty process from a similar industry has been analyzed. The requirements of the industry that was analyzed was a scope of products with similar function, use and lifespan. Additionally, the products must be sold through dealerships. An industry that fulfils these requirements is the automotive industry, manufacturing motor vehicles.

2.4.1 An overview of the vehicle's warranty coverage

Within the automotive industry, the customer only interacts with the dealer. If the manufacturer should be contacted, this is done by the dealer.

After the car manufacturer has built the vehicle, it is sold to the dealer. The dealer then sells the vehicle to the customer, the end-user. Upon the purchase, the customer is informed about the warranty coverage by the dealer. It is however the car manufacturer that decides what is covered by warranty and what is not, and the manufacturer is also responsible for and supervises the execution of the warranty. Factory warranties, or manufacturer warranties, are typically standard for all the manufacturer's models and cover defects originating from factory workmanship and material defects. The recommendations given by the manufacturer, on how the vehicle should be maintained, are usually strict. This is an important way for the manufacturer of protecting itself from damages it should not have to cover. Routine maintenance is often not covered by factory warranty but should be paid for by the customer. (Fracchia, 2021)

The responsibility of the dealership is to make the needful repairs as described by the manufacturer and invoice the repair costs to the manufacturer. If the dealer does not follow the manufacturer's requirements on how to execute the repair work, the manufacturer's warranty will not cover the costs. The rules and procedures set forth by the manufacturer are intended to keep the dealer from invoicing repairs that should not be covered by warranty, and to make sure the dealer does not invoice repairs that have not been done at all. The dealerships are paid well for the performed warranty work, but only one time per issue. If the vehicle is taken back to the dealership for the same problem again, the dealer will have to cover the costs. For this reason, it is important that the dealer

has experienced technicians and mechanics that get the work done right the first time. (Reynolds, 2021)

2.4.2 Extended warranties and service contracts

In addition to the standard warranty, the manufacturer often offers extended warranties, and the dealership offers service contracts, to their respective customers. Unlike the standard warranty, that is included in the price of the vehicle, the extended warranty or service contract needs to be additionally paid for. The service contracts can for instance extend the length of the standard warranty and cover the cost of additional services and repairs, and they can be bought anytime, not only in combination with the purchase of the vehicle. The extended warranty offered by the manufacturer covers the same parts and issues as the standard warranty, but with an extended time limit. Service contracts that are offered by dealerships sometimes duplicate the coverage of the manufacturer's standard warranty, making it necessary for the customer to do research on what is already covered. Service contracts and extended warranties, like the standard warranty, are limited. Issues caused by normal wear-and-tear are often not covered, and the contracts are only active for a certain amount of time or mileage. The manufacturer has no role in covering costs of repairs under the service contract. Warranties provided by the manufacturer often allows the customer to have the warranty work done in several different locations, while smaller dealerships may need to restrict the repair locations for work to be done under service contracts. The manufacturer's recommendations for maintenance are to be followed for both the service contract and extended warranty to cover repair costs. (Federal Trade Commission, 2021)

Another type of warranty within the automotive industry is the certified pre-owned (CPO) warranty. The CPO warranty is provided by the manufacturer after a slightly used vehicle has been taken in for a thorough check of performance and condition, and then sold again. This type of warranty is provided to ensure the customer that the used vehicle is still in good order. The CPO warranties differ between manufacturers, but they usually only apply to vehicles that are a couple years old and have a low mileage. The CPO warranty is, like the standard warranty, included in the price of the vehicle. (Fracchia, 2021)

2.4.3 When can the manufacturer or dealer void the vehicle's warranty?

To keep the vehicle's warranty in effect, the customer does not have to come back to the same dealership with every issue. Not even major repairs and modifications such as body work and upgrade of electronics automatically allows the manufacturer, or dealer, to void the vehicle's entire warranty coverage, just because it has been done by someone else. The customer is even allowed to use aftermarket parts, made by another company than the car manufacturer, and recycled parts, removed from another car for resale, without making the entire warranty contract void. However, if these parts should damage other parts in the vehicle, those will not be covered by warranty anymore. The modified or replaced parts themselves are not covered by the warranty contract either.

Before voiding the warranty of a component due to the installing of an aftermarket or recycled part, the manufacturer or dealer must prove that the damage is a result of improper repairs, maintenance, or upgrades. Similarly, the manufacturer or dealer can't deny warranty repairs on a vehicle's engine just because the customer has changed the oil themself, it must be proven that the wrong type of oil was used, or that the amount was incorrect. For this reason, it is important that the customer keeps all service records for the vehicle, no matter where or by whom the service has been done. If there is no proof that the customer has maintained the vehicle according to recommendations by the manufacturer, the warranty might be denied. (North Carolina Consumers Council, 2021)

2.4.4 The manufacturer's warranty affects the customer base

As the coverage of the warranty often reflects the manufacturer's product confidence, many customers consider the warranty terms before choosing a supplier. The warranty reputation of the manufacturer, built up by customers' experiences when they have needed repairs or replacements, gives a good indication of how well the manufacturer lives up to the established terms. The manufacturer's customer support within the warranty department will improve the reputation of the company if it meets the customer's needs quickly and completely, and succeeds to inform the customer about warranty coverage, processes, and rectifications of reported issues. In the same way, unsuccessful customer support will also impair the reputation of the manufacturer. The lead time of the warranty process is another important indicator of the warranty department's performance, showing how quick the process is. Lengthy approval processes on the manufacturer's side

leads to delays at the dealership or repair facility. Also, the number of dealerships or repair facilities across the world indicates how quick and smooth the warranty process will be. (Fracchia, 2021)

2.5 Warranty management process within the automotive industry

The Center for Automotive Research (CAR) published a report in 2005 named *The Warranty Process Flow Within the Automotive Industry: An Investigation of Automotive Warranty Processes and Issues*, based on interviews with professionals from thought leaders within the automotive industry. The interviewees consisted of three car manufacturers, four component suppliers, and one dealership. The report presents the complex flow of warranty data from the dealership to the manufacturer, and further to the supplier of individual components, resulting in remediation of the reported warranty issue. This chapter brings up the identified process.

2.5.1 Warranty process within the dealership

After the customer has discovered a failure in the purchased equipment, this is reported to the dealer. The dealer records the customer's complaint, identifies which part is causing the failure and analyses the cause of the defect. A technician is often assigned for this task, and it is one of the most critical steps of the warranty process since it should give an understanding of the required solution, but the complexity of the equipment and its functions creates significant challenges for the dealer. Due to the complexity of the equipment, the investigation process varies from dealer to dealer. Moreover, the dealer has to determine the failure within a certain time limit, given by the manufacturer, after the issue has been reported by the customer. When a decision has been made on how to proceed, the vehicle is handed over from the technician to an appropriate mechanic. The experience of the technician and the mechanic is of great significance to reduce the lead time at this stage.

The mechanic must follow manuals and bulletins provided by the manufacturer, not to void the warranty coverage. The mechanic must also match the cause of the failure, and the repair work to be done, to a specific warranty repair code, predetermined by the manufacturer. The repair time allowed varies from code to code, and some codes are more likely to be accepted by the manufacturer without further investigation. As the true cause

of the failure might be difficult to fully determine, the technician or mechanic will sometimes have to make a guess, which will create potential for an even more time-consuming warranty process between the dealer and the manufacturer.

The dealer will then create a claim report and send it to the manufacturer, often through CRM software. Manufacturers require different reporting methods, in order to understand the situation and be able to make the correct decision. The quality and structure of the reporting software that is being used can have a great impact on the identification of the failure, making the process more efficient, or more difficult. Figure 3 shows the warranty process within the dealership, starting from the reported customer complaint and ending with a claim report issued to the manufacturer, as well as a completed repair work.

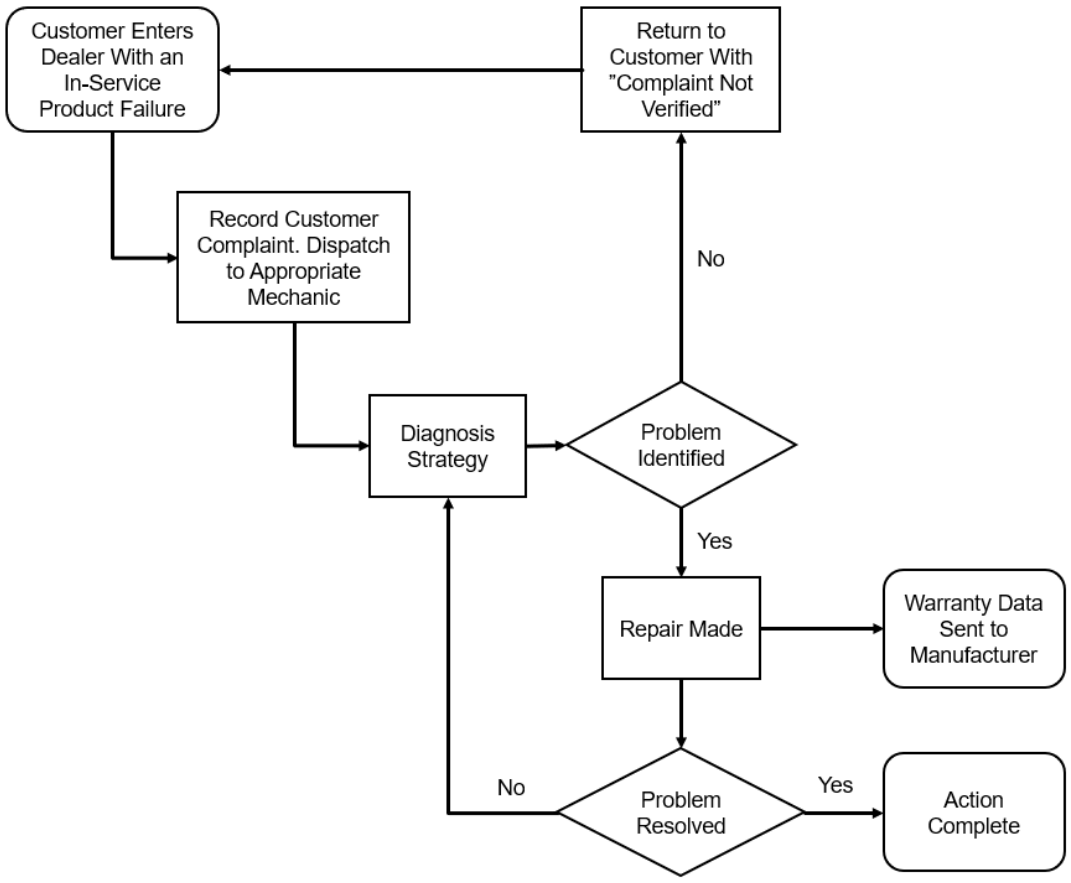

Figure 3. The warranty process within the dealership (Center for Automotive Research, 2005)

2.5.2 Warranty process within the manufacturer

The manufacturer's warranty department will analyze the claim report issued by the dealer. The purpose of the analysis is to monitor the work that has been done at the dealership. By reviewing how the repair work has been done and how long it has taken, the manufacturer determines if the dealer has followed the standards that have been set to ensure warranty coverage. If the repair has not been done within the set time limit, the reason behind this needs to be carefully explained by the dealer. It is also analyzed how frequently the certain repair has been done at the dealership, also in relation to the frequency at other dealerships. The claim process is enhanced by the use of warranty software, but a substantial amount of work is still required by the manufacturer's warranty department, in form of email exchange and telephone conversations, to clarify questions arising during the review. Moreover, it is important to get this process put in action as soon as possible, since the mechanic that performed the repair will be able to remember and describe the repair work more accurately, the sooner he or she is contacted. At this stage, the warranty department has the responsibility of identifying potential problems that may void the warranty between the manufacturer and the dealer.

The manufacturer will then enter all relevant data into a warranty database, which is also accessed by other departments within the company, such as product engineering, design engineering, legal and assembly. The distribution and flow of data is visually presented in Figure 4. The registered warranty data is critical for the continuous development and improvement of the company's product portfolio. The database is often a combination of third-party software and internally developed functions, and it is important for the manufacturer to determine what data will be available for which departments, as these have different needs of accessible functions. The information will also to a certain extent be transferred to the component supplier if the damaged part is not produced by the manufacturer itself. When the manufacturer provides the supplier with warranty data, the quality of the information affects the speed and accuracy of the review done by the supplier. Apart from information of the defect itself, the manufacturer should provide the date of manufacture, or months in service, when reporting to the supplier.

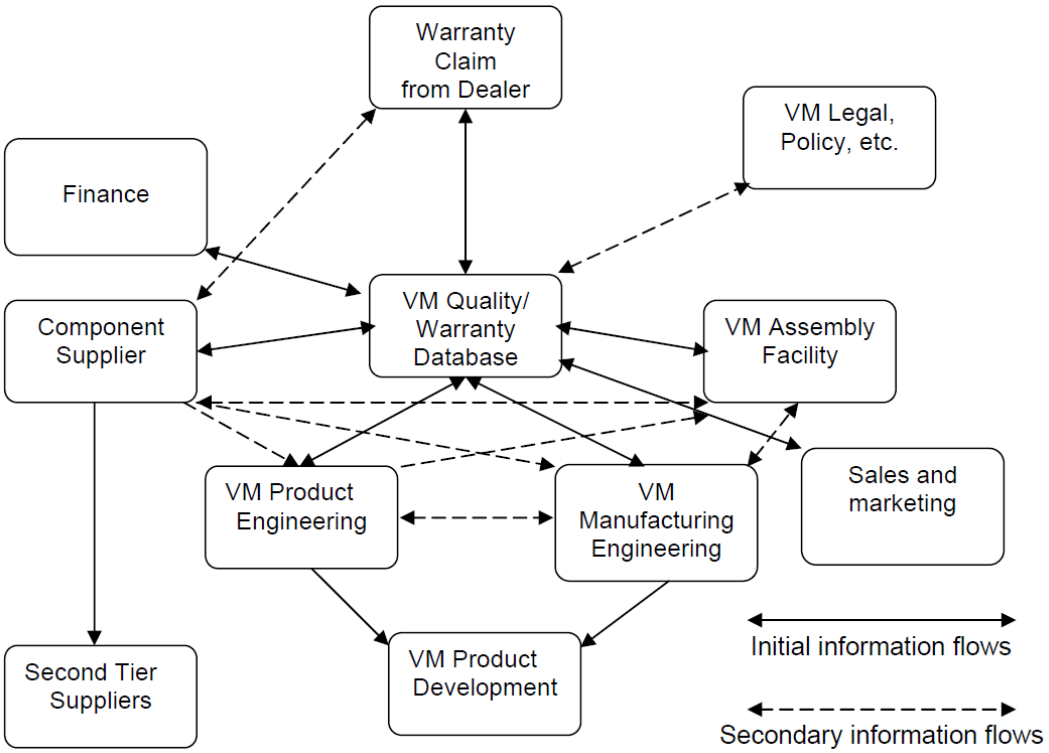

Figure 4. Warranty data flow within the vehicle manufacturer (VM) (Center for Automotive Research, 2005)

For the supplier of the component, it is many times required to analyze the component itself to find a root cause, not just the data provided by the dealership or manufacturer. Most of the components are however often disposed of at the dealership, making a root cause analysis impossible. For this reason, it should be established in the warranty agreement between the manufacturer and dealership that certain parts need to be stored for a fixed time, to keep the warranty coverage valid. Depending on the agreement between the manufacturer and the supplier, the parts are either analyzed at the manufacturer's or directly sent to the supplier. If the part is sent to the supplier, it will often be received by the quality department for data review, and then given to a cross-functional team that will identify the cause. The team may for instance consist of representatives from manufacturing, product engineering and materials specialists.

In the end of the process, the dealership will be compensated by the manufacturer for the repair work performed, if it is determined to be under warranty coverage. Actions will be taken to ensure a permanent correction is implemented already in the product development stage, if it is cost effective. If the damaged component is not produced by the

manufacturer, but by another supplier, the manufacturer will be compensated by the supplier depending on the results of the root cause analysis.

2.5.3 An initial challenge within the warranty process

As equipment and components are getting more complex, and increasingly electrical, the repair work done by the dealers requires skilled mechanics with great product knowledge. The mechanics do not only need to know how the engine works, but also how the systems around it operate. For the warranty process to be efficient, an experienced mechanic is therefore critical. This is not only in regard to a fast and accurate cooperation between the dealer and the manufacturer, but also to the satisfaction of the customer. This challenge calls for actions by the manufacturer to ensure that the dealer is provided with sufficient guidance.

2.6 High-level system architecture for warranty software tools

Today there are many software tools available on the market, created for companies to handle warranty claims more easily. The system architecture enables the software tools to cover the entire process from receiving a customer complaint to following up the results of a rectified issue. The architecture of the tools is developed to automate and speed up the user's warranty process, and thereby lower warranty costs. In addition to speeding up the process, which will improve customer satisfaction, the software tools should also prevent fraud and assure future quality improvement. It is still important to remember that the warranty process cannot be completely automated, since human communication plays a big role in building trust, and thereby long-term relationships, between seller and buyer. Often the issues reported by the customer are not possible to directly match to a determined warranty code either, but require clarification, expertise based on experience, and logical thinking.

There are several common features all efficient warranty software tools should provide. Products and equipment under warranty should be traceable, by using barcodes or material numbers, to monitor at which stage along the supply chain they are. With product traceability it is also easier for the user to recall parts that have been found out to be at risk of failure. Warranty claims should be processed in an accurate and efficient way and part inventory should be automatically updated to maintain a sufficient stock of replacement

parts that are commonly claimed. As there is a huge amount of data entered into warranty databases, the warranty software should also provide settlement management, meaning that warranty documentation is organized and thereby easily found by the different departments. The warranty software should enable the manufacturer of the sold equipment to stay in contact with the supplier, or OEM (original equipment manufacturer). The communication between the manufacturer and supplier is important to find root causes and improve future product quality. The warranty software tools should also aid in organizing the collection of defective parts that are returned for root cause analysis and keeping them separate from the rest of the inventory. Finally, an efficient warranty software tool should support the warranty department in detecting and preventing fraud. Within the warranty process, fraud might appear as attempts to claim parts that are no longer under warranty coverage, that have been damaged due to inappropriate use, or that are not damaged at all. (Wood, 2020)

3 Empirical method

This chapter presents the empirical method that was used, together with the theoretical information, to produce a result to the thesis. The empirical method took shape as an interview with a dealership within the automotive industry, to get the additional information of the warranty process which was not found from the literature study. The identity of the interviewed company is not made available in this thesis, and the gathered answers are presented in a way that will not enable identification of any related manufacturers. As manufacturers and dealers handle warranty claims in different ways, this empirical method is not intended to provide a general procedure of handling warranty claims. Instead, it is aspired that the information gathered during the interview will bring forth one possible path for Wärtsilä to follow, as both the company that was interviewed, and the manufacturers they are working together with, are leaders within their industry. The interviewee showed a strong knowledge of the warranty procedure, as well as a willingness to bring up challenges within the process, which is hoped to give Wärtsilä an understanding of how important it is to face these challenges when implementing a warranty procedure for products sold through dealerships. The interview questions that were asked are presented in chapter *3.3 Interview questions*.

3.1 Procedures discussed during the interview

The first topic discussed during the interview was how the dealership gets the needful expertise to perform repair work on equipment that is new on the market. When the manufacturers develop new engines, systems and parts that require a considerable amount of fresh knowledge, online lectures are arranged by the manufacturer to educate the dealership's mechanics and technicians. By attending these lectures, the dealership's staff gain a solid insight into the maintenance and repair procedures that will be needed throughout the lifespan of the new equipment. If the new parts do not differ much from parts that are already on the market, and already sold through the dealership, the additional knowledge that is required might be given by the manufacturer's service engineers upon request by the dealership.

The second topic of the interview was how the dealership proceeds if they get a customer complaint they do not know how to rectify. As a great amount of the equipment on today's

automotive market is getting increasingly electrical, the issues are often not visible to the naked eye but need to be inspected through diagnostic tests with computers. If the technician or mechanic do not know how to settle the problem reported by the customer, they fill in a report template that has been given by the manufacturer in an early stage of the cooperation between the companies. The report needs to contain all available information of the problem, as well as the dealer's own suspicions on what might be the cause. The technician or mechanic at the dealership should also try to match the issue with the warranty code that shows the greatest similarity. If the issue is urgent, the dealership may call the manufacturer after sending the completed report. The call will not go to the manufacturer's warranty department, but to the manufacturers own service engineers. The report template to be filled in and sent to the manufacturer for assistance is used in roughly 10 % of the repair cases at the interviewed dealership, but with new equipment the number consequently increases. During the interview it was mentioned that a couple of times every year the manufacturer's own service engineers need to visit the dealership, as there sometimes appear issues that are new for the manufacturer as well and cannot be clarified through e-mail correspondence or phone calls.

As the vehicle manufacturer do not produce all the sold equipment itself, some claimed issues require contacting the manufacturer's supplier. This is however always done by the manufacturer, and no communication should go directly between the dealership and the manufacturer's supplier. The reason behind this is that the manufacturer should be fully aware of all the issues that are appearing, and how they are rectified.

The following topic of the interview was the compensation provided by the manufacturer. The compensation, as well as the criteria for receiving the compensation, varies widely between manufacturers. If the dealership performs repair work that requires replacement of parts, they will use parts from their own stock and later send a claim report to the manufacturer. The claim reports are sent through the manufacturers' own warranty software tools, which the dealership has access to. If the claim is accepted to be covered by warranty, the manufacturer will either pay for the parts used or send new parts free of charge. Larger manufacturers often prefer an invoice for the used parts, while smaller manufacturers tend to send replacement parts under warranty coverage. If the issue on the car that is brought to the dealership do not require any change of parts, but is rectified through modification in software for instance, the dealership will send an invoice to the

manufacturer for the hours spent on the job. The computer that is connected to the car or the equipment while doing the upgrades or modifications automatically registers the time spent on doing the needful work.

The final topic of the interview was how the dealership proves to the manufacturer that the repair work has indeed taken place. This is an important part of the warranty process, as valid proof of the repair work significantly supports and accelerates the decision-making step within the manufacturer's warranty department. If the repair work requires replacement of parts, the manufacturer demands pictures of the damaged part, both before and after it has been dismantled. A picture of a damaged part lying on a worktable is not enough since this can be from any vehicle. If no pictures are provided by the dealership, they will not be compensated by the manufacturer for the work that has taken place. If the reported issue is a noise, that cannot be seen, a video is required where the noise is heard, and the vehicle is visible. For all issues, a copy of the service book is needed to confirm that all the needed maintenance has been done according to the manufacturer's recommendations. Stamps in the service book are required to indicate when the scheduled maintenance as well as the repair work has taken place, and signed reports describing the performed work for which the dealership claims compensation are needed from the mechanic or technician. If the repair work does not require any parts to be replaced but is solely done through adjustments using a computer connected to the equipment, the electronic logbook from the computer is required together with the claim report that is sent to the manufacturer. The logbook gives the vehicle identification number (VIN) as well as all the performed actions, and how much time has been spent on each step.

In Figure 5 the cooperation between the dealership and the manufacturer is visually presented, starting with the release of new equipment, and ending with a closed warranty claim related to the new equipment. The flow chart is produced in accordance with the procedures discussed during the interview.

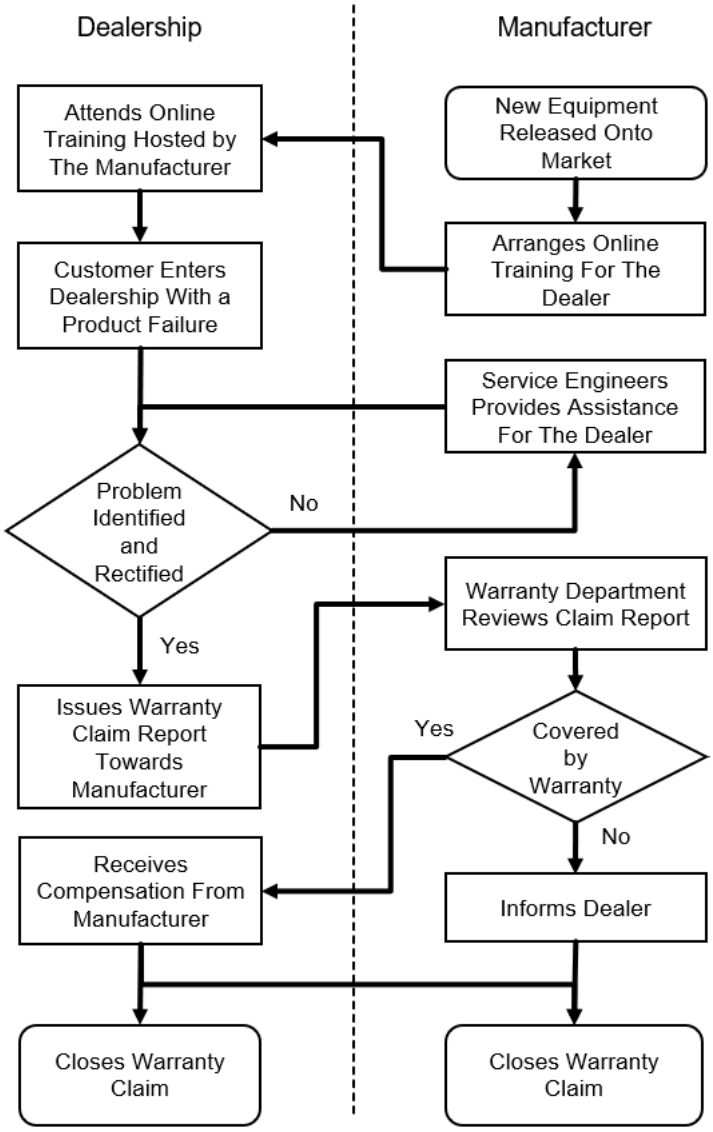

Figure 5. The workflow between dealership and manufacturer for handling repair work on equipment covered by warranty

3.2 Challenges underlined by the interviewee

During the interview several challenges that are present throughout the warranty process between the dealer and the manufacturer were brought up.

Sometimes new complex equipment is released onto the market before the manufacturer arranges an online lecture for the dealership's mechanics and technicians on how to maintain and repair it. If a customer returns a vehicle to the dealership, with an issue related to this new equipment, a challenge arises that demands for excessive investigation and communication together with the manufacturer before the dealer is able to do the

needful repair work and settle the issue. This consequently impairs the lead time, which affects the satisfaction of the customer and thereby the reputation of the dealership and vehicle manufacturer.

The time limit for issuing a warranty claim towards the manufacturer varies, but at the interviewed dealership it is often 30 days after the customer has brought the vehicle to the dealership for the first time. During this time the needful repair work also needs to be done. Depending on the workload at the dealership, the experience of the mechanics and technicians, and the information provided by the customer, this time limit can sometimes be challenging. Sometimes needful documents such as service books are missing, which demands for additional waiting time that the dealer cannot affect.

All the issues that are worked on at the dealership need to be matched to an existing warranty code for the warranty coverage to be valid. The warranty code indicates the affected equipment and the type of issue, as well as a time limit for the repair work to be done in order for the warranty claim to be valid. Often the time limits are not very generous, which creates an additional challenge for the dealership. Although intended to shorten the lead time, a narrow time window might put pressure on the dealership that leads to mistakes or premature decisions.

As earlier mentioned, there are situations where recordings of sounds are required by the manufacturer for the warranty coverage to be valid. It can be difficult to record a noise, as it often is partly overridden by other sounds in the vicinity, or sometimes not heard at all. This leads to difficulties getting the warranty claim report accepted.

The final challenge that was brought up during the interview was that it is hard for the dealership to get compensated for the hours that the mechanic or technician spend on doing own research, to find a way to proceed with the reported issue. As mentioned, the computer that is connected to the equipment while doing the needful work counts the working time that is used, but this is only the time that is spent on actively doing the adjustments that will rectify the issue. The time that is spent to figure out where to begin is, depending on the manufacturer, difficult to get compensated for. It can be more time-consuming to find a way forward than doing the actual work, and the fact that it is not compensated for is dissatisfactory for the dealership.

3.3 Interview questions

The procedures and challenges presented above are based on the answers to the following nine interview questions:

1. How do you get the expertise that is needed to perform repair work on equipment that is new on the market?

2. How do you proceed if you do not know how to rectify an issue?

3. How often do you need to be involved with the manufacturer before being able to settle a problem? This question is asked to get an understanding of how frequent the correspondence between the manufacturer and the dealer usually is.

4. How do you get compensated by the manufacturer if you need to replace parts?

5. How do you get compensated by the manufacturer if you do not need to replace any parts (for instance, if the repair work only requires adjustments in software)?

6. How do you prove to the manufacturer that the repair work has indeed taken place? This question is asked to get an understanding of how Wärtsilä could ensure that repair work reported by its dealers has indeed taken place.

7. Are you ever in direct contact with the manufacturer's suppliers or do the communication always go through the manufacturer?

8. What warranty software do you use towards the manufacturer?

9. What are, in your opinion, the biggest challenges within the warranty process?

3.4 Discussion of the empirical method

Although a lot of information was gathered through the literature study, the interview allowed me to put the final pieces into place to create a plan for Wärtsilä. By discussing the warranty procedure with someone who is working as a part of it on a daily basis and has a

deep understanding for both the procedures and the challenges, it makes it possible to grasp the theory and understand how it works out in reality.

The interview was initiated by calling the Chief Operating Officer of one of the dealership's business units, who directed me to the contact person of the department for warranty works. The interview was arranged as a Microsoft Teams meeting, where the questions presented in chapter *3.3 Interview questions* were discussed.

4 Results

This chapter presents the results, and thereby answers the questions brought up as the scope of the thesis.

First, a warranty process that Wärtsilä could implement for handling warranty claims for products sold through dealerships is presented. The warranty process is produced as a combination of the current process within Wärtsilä and the warranty process within the automotive industry, to keep the needful procedures that are already implemented, and to utilize the advantageous features discovered through the literature study and the empirical method. Consequently, the arguments for and against the suggested process are brought up.

Thereafter, the high-level system architecture for supporting the suggested warranty process is presented. The architecture is planned to give Wärtsilä reliable guidelines for creating a warranty software that will support and enhance the warranty process.

4.1 Warranty process

The following warranty process, which is illustrated in Figure 6, is a possible path for Wärtsilä to follow when handling warranty issues together with the dealership that sells Wärtsilä's products. The focus, and the biggest changes from the current warranty process, lies on the responsibility of the warranty expert (WE) and the product warranty expert (PWE). The current function of the WE as an intermediary between the PWE and the customer for giving technical advice is removed, as direct communication between the PWE and the customer (dealership) will speed up the process. The responsibility of the WE is put on questions regarding the warranty claim report, that is issued by the dealership after the repair work has taken place and the issue is rectified. The dealership will thereby have a separate contact person for technical questions and a separate contact person for questions regarding warranty coverage and compensation. The responsibility of the WE is to review the claim report and decide whether the repair work shall be covered or not, to answer contractual questions, and to issue purchase orders (PO) or trigger delivery of spare parts under warranty coverage.

The warranty process starts when a customer enters the dealership with a product failure. If the customer is able to provide enough information of the issue, or if the issue is clearly noticeable, a responsible technician or mechanic at the dealership will start the process of identifying the problem and the solution. If the dealer is not able to identify the issue, there is contact information to a PWE within Wärtsilä that is able to provide assistance. The PWE will, with or without help from Wärtsilä's Technical Services (TS), advise the dealer how to proceed. As in the current warranty process, the PWE will also trigger corrective actions if needful, or contact Wärtsilä's supplier if the equipment is not produced by Wärtsilä. In rare cases where the dealer is not able to rectify the issue although Wärtsilä has provided guidance, the PWE will inform Wärtsilä's Field Services (FS) that a service engineer (SE) is required to visit the dealership. In the current warranty process within CAWS, it is the WE that requests an engineer, but by having the PWE ask for engineers the needful technical information is ensured to be provided already from the start, as the PWE (together with TS) has a wide technical knowledge. In the current way of working, there is sometimes a need for additional mail correspondence between FS and the PWE, through the WE.

Upon confirmation by FS that an SE is available to visit the dealership, the PWE informs the WE who is responsible for the dealership in question. The WE triggers an internal PO for the costs of booking an engineer, which will later be invoiced to the dealership if the repair work is not considered to be covered by warranty.

When the problem has been rectified by the dealer, with or without help from Wärtsilä's PWE and FS, a warranty claim report is issued towards Wärtsilä. The claim report is to be issued through Wärtsilä's own warranty software, where the dealership is provided with a clear template, ensuring that all relevant information is filled in. Within Wärtsilä, a responsible WE will pick up the claim report and review the validity, in order to decide if it should be covered by warranty or not. If there are any questions regarding the content of the report, the WE will contact the dealer.

The following content shall be available in the claim report issued by the dealer:

- End customer ID
- Dealership ID
- Warranty claim number

- The date when the issue has been discovered and reported
- Warranty code defining type of failure and equipment
- Material and/or serial number of the affected parts
- Description of the issue
- Description of the performed repair work
- Timeline of the performed repair work
- Parts, working hours and other costs to be compensated for
- Pictures and/or videos of the issue

If all the above-mentioned content is available and the claimed repair work is covered by warranty, Wärtsilä's WE will trigger a PO or delivery of parts to be sent to the dealership. Should the repair work not be covered by warranty, the WE will inform all stakeholders. Finally, the WE will close the claim from the dealership in Wärtsilä's warranty software.

Through this process, the responsibility of the PWE has changed from supporting the customer through the WE to supporting the customer (dealership) directly. The PWE is taking care of technical questions, while the WE is taking care of contractual questions. The WE is no longer focusing on what the issue might be, but instead on whether the dealership shall be compensated. The responsibility of the WE is now to keep track of open warranty claims, follow up the costs that have been allocated on each dealership and customer, issue purchase orders and arrange shipments of parts.

What is not a part of the warranty process, but still a critical factor in order to sell products through dealerships, is that the dealers get the needful training or instructions to perform repair work on Wärtsilä's equipment. The training is to be arranged before the dealers start selling the equipment, and the quality of the training will have a direct impact on the quality of the repair work performed by the dealers.

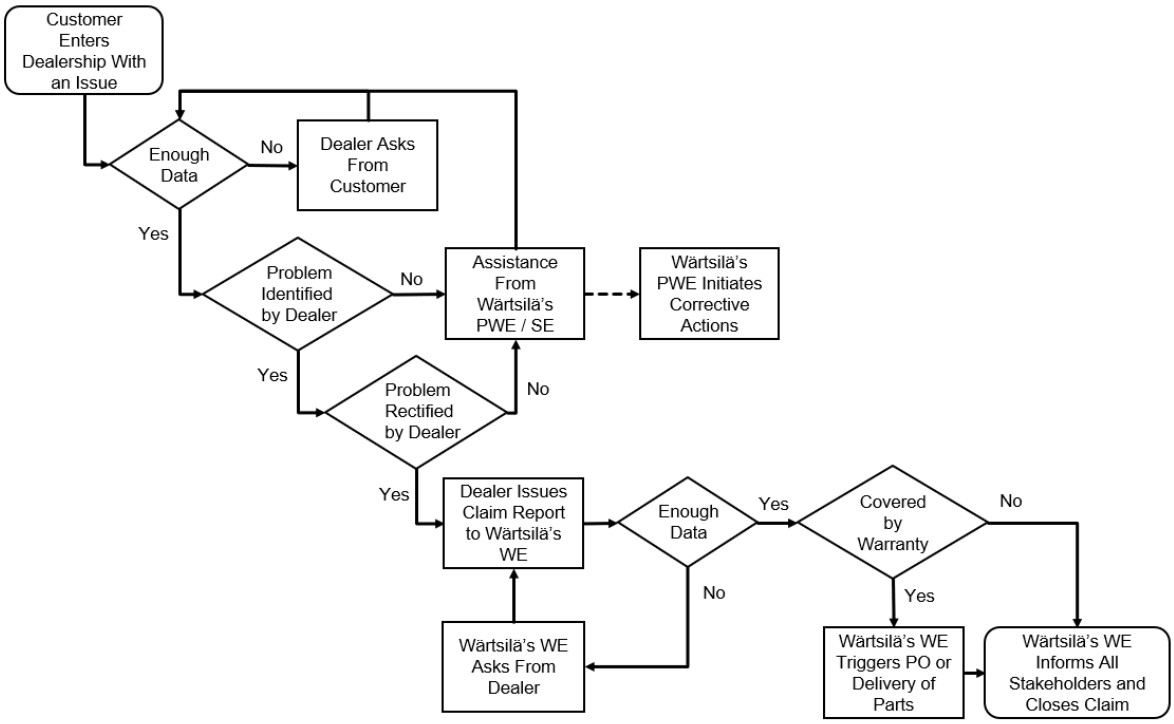

Figure 6. Future warranty process for products sold through dealerships

4.1.1 Arguments for and against the suggested warranty process

By implementing the suggested warranty process, Wärtsilä's CAWS would benefit from advantages such as an improved lead time and a clear partition of responsibility:

- If the PWE would be in direct contact with the dealership, there would be one less link in the chain of communication. As the dealership has received training by Wärtsilä on how to perform repair work, the technicians and mechanics have an extensive knowledge in the functions of the equipment and are therefore able to communicate directly to the PWE, instead of sending mails through the WE. In the current way of working, all the customer's questions as well as the PWE's advice go through the WE, which is adding additional lead time to the process.

- By implementing the suggested process, the technical questions would always be directed to someone with the needful knowledge. In the current way of working, the technical questions are directed to the WE, who might not have the same technical expertise as the PWE. It is then on the WE's responsibility to decide if he or she can handle the issue independently or ask for assistance from the PWE who has in-depth knowledge.

- If the PWE would be requesting service engineers, the needful procedures to be performed at the dealership would be directly communicated between the PWE and the SE, instead of going through the WE. Since service engineers would only be requested in rare cases where the professionals at the dealership are not able to rectify the issues on their own, the job to be performed by the SE would be technically complex and call for communication between experts of the related equipment. The WE would then be taking care of the financial part, issuing the PO for the attendance, and deciding whether the issue is covered by warranty or not.

- Finally, the WE and PWE would have clear areas of responsibility. There would be no uncertainties where the WE's responsibility ends and the responsibility of the PWE starts. In a company of Wärtsilä's size, strict guidelines are needful to keep the employees aligned on the correct procedures. The WE would be the one with expertise in general terms and conditions of the warranty contract, while the PWE would be the one with expertise in how Wärtsilä's equipment works.

There are however some disadvantages of the suggested warranty process:

- The number of contact persons that the customer (dealership) can choose from when reaching out to Wärtsilä for assistance would increase significantly. In the current process, the WE is the customer's only contact person for all warranty related matters. In the suggested warranty process, the dealership would have separate contact persons for different kind of equipment as well as a separate contact person for questions regarding the terms of the warranty contract.

- Implementing a new warranty process puts changes to the way of working. With a large number of employees within CAWS, there would be a need for extensive training. Training is time-demanding and thereby costly.

With good instructions for the dealership, as well as for the employees of CAWS, the suggested warranty process would be a possible choice for Wärtsilä. As it is not optimal to have the same employees working in several different ways, it would be recommended to have a separate team of warranty experts working with the dealerships. This is because the suggested way of working clearly differs from how it is done when taking care of claims

from shipyards and shipowners. In the same way, it would also be good to have separate product warranty experts taking care of the questions raised by the dealerships.

4.2 High-level system architecture

There is a large number of warranty software programs on the market, developed to support companies in handling customer complaints. However, many vehicle manufacturers develop their own warranty software, to match the exact need of functions that the high-level system architecture is calling for. It would be a good option for Wärtsilä to develop an own warranty software, as this means Wärtsilä would not have to pay license fees to any software administrator. In addition, as all companies handle their customer complaints in different ways, it would be hard to find a software on the market that is already a perfect fit for Wärtsilä. This would result in the need to purchase, or develop, add-ons for the software.

If it is determined that Wärtsilä's Customer Assistance Warranty Services shall develop an own warranty software, at least the following features and functions should be included in the high-level system architecture, to support the suggested warranty procedure for handling warranty for products sold through dealerships:

- Contact information for both warranty experts and product warranty experts, depending on the nature of the question and the geographical area
- A report template for the dealership to fill in, with mandatory fields that must be filled in to proceed. This would eliminate Wärtsilä's issue of receiving incomplete claim reports
- Instructions or examples on how to fill in the report, in form of suggestions or drop-down lists
- A list of warranty codes for matching equipment, issues, and repair work that has been performed
- The software should support uploading of attachments, such as data logs, together with the claim report

- The software should support uploading of images
- The software should support uploading of videos
- The software should trigger notifications for the warranty expert when a claim report has been submitted by the dealership
- A register of material numbers and spare part numbers available for ordering
- The possibility to order spare parts from Wärtsilä's distribution center
- The possibility to issue purchase orders towards the customer, for covering costs of performed repair work
- The possibility to issue internal purchase orders for the booking of service engineers
- The possibility to follow up costs that have been allocated on different dealerships
- The possibility to follow up how much reservations are still available to allocate on each dealership
- The possibility to follow up lead-time of each warranty claim from the date it was issued by the dealership, along with the possibility to follow up average lead-time of a chosen category of warranty claims
- Spare parts' inventory to be updated based on orders made through the software
- The software should trigger notifications if replaced spare parts are needed back for root cause analysis
- Documents such as claim reports, purchase orders and delivery confirmations should be organized and easily accessible for users that need to access them

It is important to note that the above points are considered to be the most critical, but the need of additional functions or features should be followed up during the development and implementation process of the software. Although it will be time-consuming and costly to develop an entire warranty software, it will be profitable in the long run, as the continuous costs are heavily reduced by not paying monthly license fees for the large number of users to an external software administrator.

5 Discussion

The results of this thesis met the purpose, as a possible warranty procedure for handling warranty issues through dealerships was formed. Furthermore, the results provided a guideline for how the high-level system architecture would look in a warranty software that meets the needs of the presented warranty procedure.

In my opinion, the most significant change from the current warranty procedure within CAWS was that technical communication should go directly between the dealership and the product warranty expert. This is how it often is done within the automotive industry, and this would improve the lead time from a reported customer complaint to a final rectification of the issue. This process is however only meant to be implemented for handling warranty for products sold through dealerships, as the technicians and mechanics working at the dealership would already have an extensive knowledge of the equipment, and thereby be able to directly communicate with Wärtsilä's product warranty experts.

The results of my thesis could be used as a base for the management of CAWS when implementing a new warranty procedure, with further investigation possibilities such as costs. The results could be used by Wärtsilä's software developers when producing a warranty software, with further investigation possibilities such as low-level system architecture.

The biggest challenges of this thesis were to choose an industry that had a warranty process that could match the possible process within CAWS, and to limit the existing information about warranty procedures, to only cover significant aspects.

The reliability of this thesis is strengthened by the fact that the utilized procedures that are presented as the warranty management process of the automotive industry were the procedures that the chosen sources had in common. Exceptional procedures were not used in this thesis. Thereby, if someone else would do a literature study of the warranty management process within the automotive industry, the procedures that I have presented would be found. What strengthens the theory of the warranty terms and procedures within CAWS, Wärtsilä, is that I have been working in the position of a warranty expert for nine months at the time of writing. Thereby, I have a hands-on knowledge of the current procedures and challenges, and I also understand what would be possible to implement in

order to cut down on the lead-time. The empirical method was performed as an interview with a company that has a significant share of the Finnish market of car dealers. The questions that the interview consisted of were open and did not lead the interviewee in a pre-determined direction, which strengthens the reliability. The interviewee was also very co-operational and wanted me to understand the daily challenges, and as it was an anonymous interview, the interviewee could be more open.

To end this thesis, I would like to thank everyone involved.

I would like to thank Robert Högkull from Wärtsilä who gave me the idea of this thesis, as well as a clear and meaningful target to aim for. Thanks to our discussions regarding the history and future of warranty handling within Wärtsilä, the whole thesis process has felt important to me. The topic was also interesting to me as I am working in the position of a warranty expert within CAWS, and thereby might be involved in a future process of handling warranty claim reports issued by dealerships.

I would like to thank Roger Nylund from Novia University of Applied Sciences, who has acted as my supervisor and supported me through the whole process of producing this thesis. The excellent constructive feedback I have received from him throughout the process has had significant impact on my motivation and eagerness to go on with my work.

I would like to thank the interviewee for providing me with significant and in-depth knowledge of the warranty process within a dealership. The interviewee showed a great willingness to help me with my work, and our discussions let me tie up all the loose ends from the literature study.

Finally, I would like to thank all my colleagues in Wärtsilä who have given their opinions on my thesis and who keep me driven in my daily work.

6 References

Center for Automotive Research. (2005, August). *The Warranty Process Flow Within the Automotive Industry: An Investigation of Automotive Warranty Processes and Issues.* Retrieved from Center for Automotive Research: http://www.cargroup.org/wp-content/uploads/2017/02/The-Warranty-Process-Flow-within-The-Automotive-Industry.pdf

Federal Trade Commission. (2021, May). *Auto Warranties and Service Contracts*. Retrieved from Consumer Information: https://www.consumer.ftc.gov/articles/auto-warranties-and-service-contracts

Fracchia, A. (2021, July 20). *Everything You Should Know About Factory Car Warranties*. Retrieved from The Drive: https://www.thedrive.com/car-warranty/29411/factory-warranty-guide

Högkull, R. (2016, January 4). *Warranty Management RACI*. Retrieved from Wärtsilä Compass: Wärtsilä internal document.

Högkull, R. (2020, December 29). *Handle Warranty Claims (ZW).* Retrieved from Wärtsilä Compass: Wärtsilä internal document

Högkull, R. (2021, November 5). *Warranty Management Process.* Retrieved from Wärtsilä Compass: Wärtsilä internal document

Kenton, W. (2020, June 3). *Implied Warranty*. Retrieved from Investopedia: https://www.investopedia.com/terms/i/implied-warranty.asp

Kenton, W. (2021, April 23). *Warranty*. Retrieved from Investopedia: https://www.investopedia.com/terms/w/warranty.asp

Legal Information Institute. (2021, August). *Warranty*. Retrieved from LII: https://www.law.cornell.edu/wex/warranty

Liberto, D. (2021, June 2). *Express Warranty*. Retrieved from Investopedia: https://www.investopedia.com/terms/e/express-warranty.asp

North Carolina Consumers Council. (2021, July 29). *When Can Your Car Dealer Void Your Vehicle's Warranty or Deny Auto Warranty Service Claims?* Retrieved from North Carolina Consumers Council: https://www.ncconsumer.org/news-articles-eg/making-the-most-of-your-auto-warranty.html

Reynolds, J. (2021, August 4). *Understanding Your Vehicle's Factory Warranty*. Retrieved from CarProUSA: https://www.carprousa.com/blog/the-factory-warranty-repair-process-at-car-dealerships

Tervetuloa Värtsilään! (2021). *Wärtsilä yhtiö*. Retrieved from Tervetuloa Värtsilään!: https://vartsila.fi/vartsila/?page_id=97

Wärtsilä. (2021a). *About Wärtsilä*. Retrieved from Wärtsilä: https://www.wartsila.com/about

Wärtsilä. (2021b). *Leading the energy transition*. Retrieved from Wärtsilä: https://www.wartsila.com/energy

Wärtsilä. (2021c). *Marine*. Retrieved from Wärtsilä: https://www.wartsila.com/marine

Wärtsilä Marine. (2018). *GENERAL TERMS AND CONDITIONS OF CONTRACT.* Retrieved from Wärtsilä internal document

Wikipedia. (2021, October 29). *Wärtsilä*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/W%C3%A4rtsil%C3%A4

Wood, L. (2020, May 6). *Warranty Management Software.* Retrieved from SoftwareConnect: https://softwareconnect.com/warranty-management/