T.C. DOĞUŞ UNIVERSITY
INSTITUTE OF SCIENCE AND TECHNOLOGY
ENGINEERING AND TECHNOLOGY MANAGEMENT

A STUDY ABOUT PROCESS IMPROVEMENT WITH SIX SIGMA METHODOLOGY IN CUSTOMER SUPPORT DEPARTMENT

MASTER'S THESIS

MURAT CAN ATALAY

201399003

THESIS ADVISOR: PROF. DR. MESUT KUMRU

ISTANBUL OCAK 2017

T.C. DOĞUŞ UNIVERSITY
INSTITUTE OF SCIENCE AND TECHNOLOGY
ENGINEERING AND TECHNOLOGY MANAGEMENT

A STUDY ABOUT PROCESS IMPROVEMENT WITH SIX SIGMA METHODOLOGY IN CUSTOMER SUPPORT DEPARTMENT

MASTER'S THESIS

MURAT CAN ATALAY

201399003

THESIS ADVISOR

PROF. DR. MESUT KUMRU

COMMITTEE MEMBERS

PROF. DR. MESUT KUMRU

PROF.DR. ÖZALP VAYVAY

YRD. DOÇ. DR. PERAL TOKTAŞ PALUT

ISTANBUL OCAK 2017

TEZ BİLDİRİMİ

Tez içindeki bütün bilgilerin etik davranış ve akademik kurallar çerçevesinde elde edilerek sunulduğunu, ayrıca tez yazım kurallarına uygun olarak hazırlanan bu çalışmada orijinal olmayan her türlü kaynağa eksiksiz atıf yapıldığını beyan ederim.

Murat Can Atalay

CONTENTS

PAGE NO

PREFACE

First of all, I would like to express my gratitude to my advisor Prof. Dr. Mesut KUMRU who consider my wishes while helping me to choose the thesis topic. He always set an example of excellence as a researcher, role model, instructor, and mentor. Also, I would like to thank Res. Asst. Aydın TANRIVERDİ for his valuable support to me.

I would also like to thank my manager dear Volkan KUŞ for giving me a chance to design a Six Sigma Project. Furthermore, I like to thank my Six Sigma Black Belt Ali Osman AYDIN and my Project team. Finally, I would like to present my eternal gratitude my mother Muazzez ATALAY and my girlfriend Ece YUNGUL for their valuable support.

ISTANBUL, JAN 2017 **MURAT CAN ATALAY**

ÖZET

Bilişim ve teknolojinin çok hızlı ve sürekli olarak gelişmesi sebebi ile kurum ve kuruluşlar, iç ve dış etkenlere bağlı olarak ciddi bir değişim baskısı altındadır. Bu baskı iki tip değişim sürecini ortaya çıkarmıştır. Birincisi bu değişim baskısını spontane şekilde yaşayan kurumlardır. İkincisi ise, değişimi planlı ve programlı bir şekilde gerçekleştirenlerdir. Bu değişimi yönetebilen şirketler istikrarlı bir şekilde büyümektedir ve olası kriz durumları ile kolaylıkla başa çıkabilmektedir. Bu da iş süreçlerinde en etkili yolu izlemeleri ve süreçlerini mükemmele yaklaştırmaya çalışmaları ile olmaktadır. Bütün iş süreçlerinde mükemmeli hedefleyen şirketler yoğunluklu olarak 6Sigma metodolojisini kullanmaktadır. Çıkış noktası üretimde mükemmellik olan 6sigma, günümüzde hem üretim süreçlerinde hem de hizmet süreçlerinde aktif şekilde kullanılmaktadır. Altı Sigma'nın odak noktası, müşteridir. Bu noktasında ilerlerken 6 Sigma projeleri, müşteriye değer katarak, kalite ve verimi artırarak ve israfları minimuma indirerek, müşteri memnuniyetini ve kârı artırmayı, zaman kayıplarını azaltmayı hedefler. Bu sebeple müşteriyi odak noktasına oturtmuş olan kurum ve kuruluşlar için 6 Sigma paha biçilemez bir değerdir.

Ülkemizde önde gelen en büyük 100 şirketinin tamamına yakını 6 Sigma faaliyetlerini aktif bir şekilde yürütmektedir ve çeşitli başarı öykülerine imza atmışlardır.

Bu çalışma ile Altı Sigma metodunun ideolojisi, tarihsel süreçleri ve evrimi incelenerek, Altı Sigma aletlerine ve kullanım alanlarına yer verilmiştir. Ardından ülkemizin iş makinaları sektöründe önde gelen bir firmasında yapılan Altı Sigma uygulamasına yer verilmiştir. Bu kuruluş aynı zamanda Türkiye'de Altı Sigma kültürünü kendi ve holding grup şirketleri arasında yaymış bir firmadır.

Bu Altı Sigma Projesi, Garanti Hizmet sonucu oluşan hurda parçaların kayıtsız stoklanması sonucunda ortaya çıkan parça kayıplarının ve finansal tehditlerin önüne geçmek için yapılmıştır. Garanti hizmeti sonrası, yenisi ile değiştirilen parçaların müşteriden teslim alınarak, imha edilmesine kadar giden süreçte yaşanan sorunların çözümü için Altı Sigma projesi başlatılmıştır. Proje ile hurda parçaların piyasaya düşmesinin engellenmesi, suiistimallerin önlenmesi ve bütün bu parçaların lojistik hareketlerinin kayıt altına alınarak denetlenebilir hale getirilebilmesi hedeflenmiştir. Projemin tamamlanması sonucunda, Uzman Yeşil Kuşak Sertifikası almaya hak kazandım.

ABSTRACT

Today, institutions and organizations are under a serious change pressure due to the rapid and continuous development of information and technology depending on internal and external factors. This pressure reveals two types of exchange processes. The first one is the institutions that encounter with this change pressure spontaneously and the second one is that actualize the change in a planned and organized way. If the companies would manage this change, they can consistently expand their company. Also, they would easily overcome potential crisis situations. This solution can come true with the monitoring and processing the business processes. The companies that target excellence in business processes use Six Sigma methodology intensively. Output point of the Six Sigma is the excellence in production and today Six Sigma is used in both production and service processes actively. The focal point of Six Sigma is the customer. At this point, Six Sigma projects aim to increase customer satisfaction and profit and decrease time loss by increasing quality, efficiency. Therefore, for the institutions and organizations that focused on customer, Six Sigma methodology is an invaluable asset.

Nearly all of the top 100 largest companies in Turkey are actively carrying out Six Sigma activities and have made various success stories.

This study examines the ideology, historical processes, and development of the Six Sigma methodology, including Six Sigma tools and their areas of use. Also, an application of Six Sigma methodology from a leading construction machinery organization is examined. This organization is a rare company that spreads Six Sigma methodology among its own and group companies in Turkey.

This Six Sigma Project is designed to avoid machinery piece losses and prevent financial threats arising from unregistered stockpiles of scrap parts resulting from Warranty Service. Six Sigma Project is started to solve the problems experienced in the process that begins with receiving scrap parts from the customer until disposing of that parts after the Warranty Service. It was aimed to prevent the entering of scrap pieces to the market and to record, control the logistic movements of all of these parts. As a result of completing this project, I am honored by Expert Green Belt certificate.

FIGURES

TABLES

ABBREVIATIONS

CPK: Process Capability
DMADV: Define-Measure-Analyze-Design-Verify
DMAIC: Define-Measure-Analyze-Improve-Control
DPMO: Defective Per Million Opportunities
DFSS: Define-Identify-Design-Optimize-Verify
KPI: Key Performance Indicators
SPC: Statistical Process Control
SIPOC: Suppliers-Inputs-Process-Outputs-Customer
SIB: Send It Back
SL: Sigma Level
QFD: Quality Function Deployment
TC: Technical communications engineer
TEI: Tusas Engine Industry
TQM: Total Quality Managment
VOC: Voice of Customer

1. INTRODUCTION

In today's global markets it is increasingly important that companies work smarter rather than harder in order to stay competitive. Current level of technology enables wide range of data to be collected and analyzed efficiently to gain better knowledge of an organization's operations and to recognize potential areas for improvements.

This thesis focuses on improving business processes using six sigma methodology. We selected the Six Sigma methodology because Six Sigma is both a methodology and a philosophy that improves quality by analysing data to implement controls and to find the root cause of the quality problems.

The paper is divided into two main parts. The first part examines literature review, the ideology, historical processes, and development of the Six Sigma methodology, including Six Sigma tools and their areas of use. Second part focuses an application of Six Sigma methodology from a leading construction machinery organization is examined. This organization is a rare company that spreads Six Sigma methodology among its own and group companies in Turkey.

2. LITERATURE REVIEW

Six Sigma is a kind of customer-focused methodology. This strategy can drive a surprising change in a business and enhance the customers' satisfaction.

The widespread process improvement methodology of Six Sigma was introduced by Bill Smith at Motorola in the 1980s. After Motorola, Six Sigma methodology spreads between lots of big and important companies. According to previous literature review about Six Sigma on the Google Academics. Six Sigma project and article increase day by day. If we investigate Six Sigma project results which are published in big companies, lots of big and global firms save their cost and gain big earnings with their results of Six Sigma studies and projects. For example, according to wikipedia.org, we can create a table as "Table 2.1". These firms gain the millions of dollar in a few years with their Six Sigma projects.

Table 2.1 Example of Company Earnings with Six Sigma Project (Wikipedia.org)

Company Earnings (US $)		
Motorola	2,2 Billion	2,6 year
ABB	900 Million	1 year
Allied Signal	1,2 Billion	2 year
GE	2,2 Billion	4 year
Nokia	300 Million	2 year
Sony	100 Million	1 year

For Six Sigma literature research, In 2012, Thomas J. Zugelder, (The Ohio State University) and Qun Zhang and his friends (University of Southern Queensland) have academic research about Six Sigma Literature. According to Zugelder, at the end of the 90s, the number of article about Six Sigma seriously rises. In "Figure 2.1" is showed rise of Six Sigma articles according to Google Search (Thomas J. Zugelder, 2012)

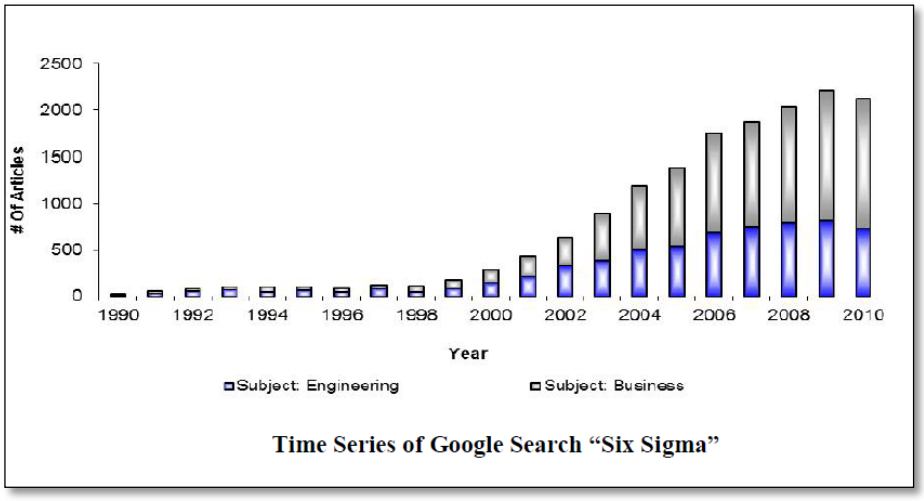


Figure 2.1 Time Series of Google Search "Six Sigma"(Thomas J. Zugelder, 2012)

In addition to this results, Qun Zhang, and his friends handled the subject from the other side and they classified the Six Sigma article and projects. According to their research, out of total 116 Lean Six Sigma relevant found research publications, there was 66 (53%) papers were case study based while 50 (47) % papers were theory based. "Figure 2.2."Shows the focus area of implementation of Six Sigma mainly has been Process improvement (ijcrb.webs.com)

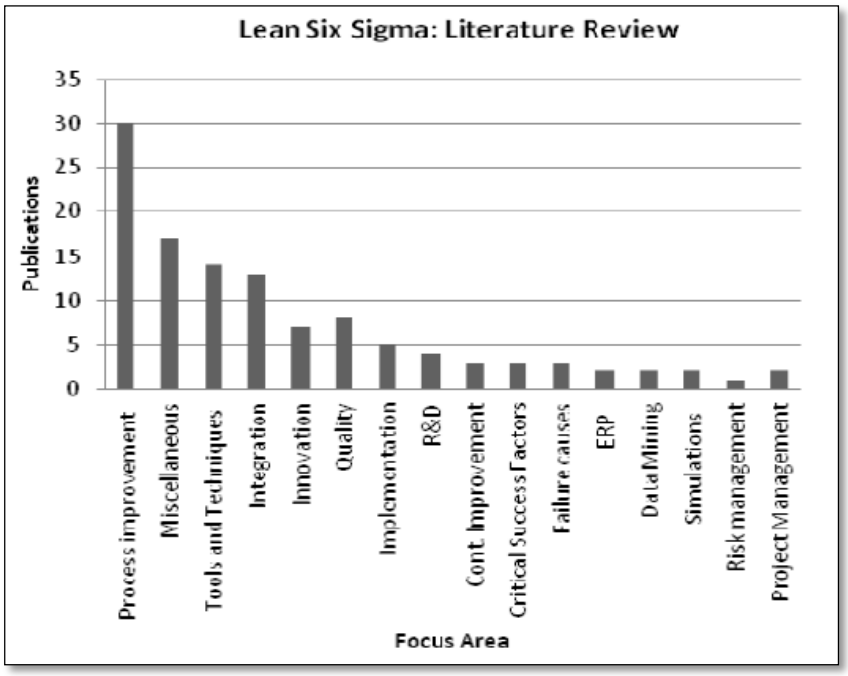


Figure 2.2 Focus areas of Six Sigma publications (Qun Zhang, 2012) (ijcrb.webs.com)

Also, their second analysis showed that Six Sigma research differs from developed countries and developing countries.

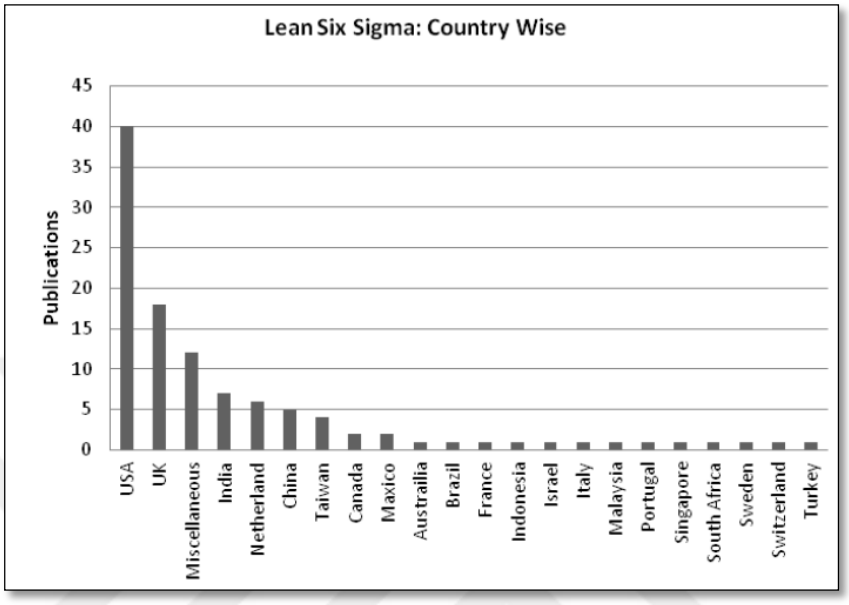


Figure 2.3 Country distribution of Six Sigma publications (Qun Zhang, 2012)

"Figure 2.3" is about Six Sigma Topics. The usage area of the Six Sigma is generally in manufacturing in Turkey. But Six Sigma use in many business sectors in the world, "Figure 2.4" shows the usage Industry distribution of Six Sigma.

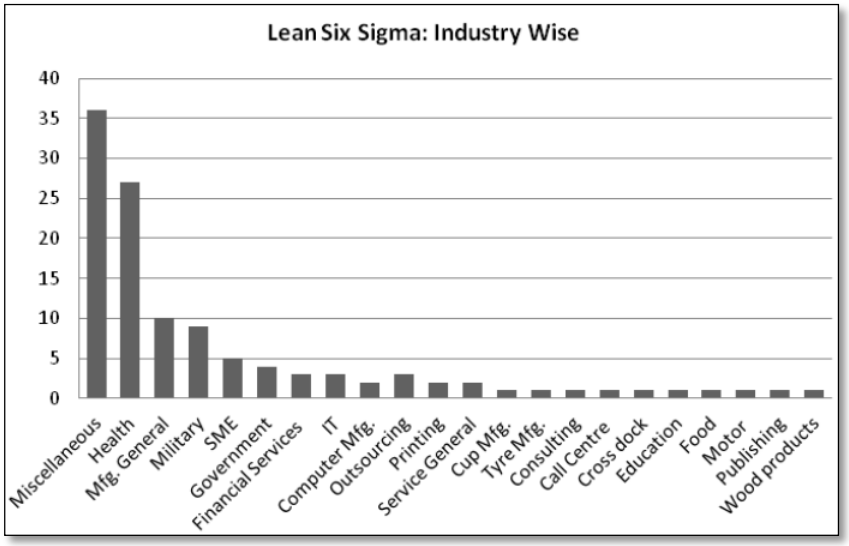


Figure 2.4 Usage Industry distribution of Six Sigma (Qun Zhang, 2012)

Table1.2 Country Focus Industry and Focus Area (Muhammad Irfan 2012)

Country	Focus Industry	Focus Area
USA	E transition, tools, integration, simulation, Quality, Services, Critical Success Factors, Process Improvement, Web Technology, Innovation, Product Life cycle, Emotional Intelligence	Computer Manufacturing, Manufacturing, Service, Information Technology, Health, Financial Services
UK	Process Improvement, Risk Management, Integration, Innovation, R&D, Continuous Improvement	Health, Manufacturing
India	ERP, BPO, Quality	Manufacturing, Outsourcing, Health
Netherland	Quality	Health
China	Integration	-
Taiwan	Data Mining, Project Management, TRIZ Methodology, Process Improvement	Financial Services, Food, Printing, Motor
Canada	Integration	
Mexico	Tools, Process Improvement	Health
Australia	Marketing	Outsourcing
Brazil	Implementation	
Indonesia	Process Improvement	Telecommunication
Israel	Failure Causes	-
Italy	Critical Success Factors	
Malaysia	Critical Success Factors	Electronic Industry
Singapore	Integration	
South Africa	Process Improvement	Education
Turkey	Data Mining	Manufacturing
Japan	Quality	-

In “Table 2.2” Country Focus Industry and Focus Area is showed (Muhammad Irfan 2012) According to “Table 2.2”, as we mentioned, Six Sigma project is generally used in the manufacturing sector in Turkey. This is a bias that must be broken today.

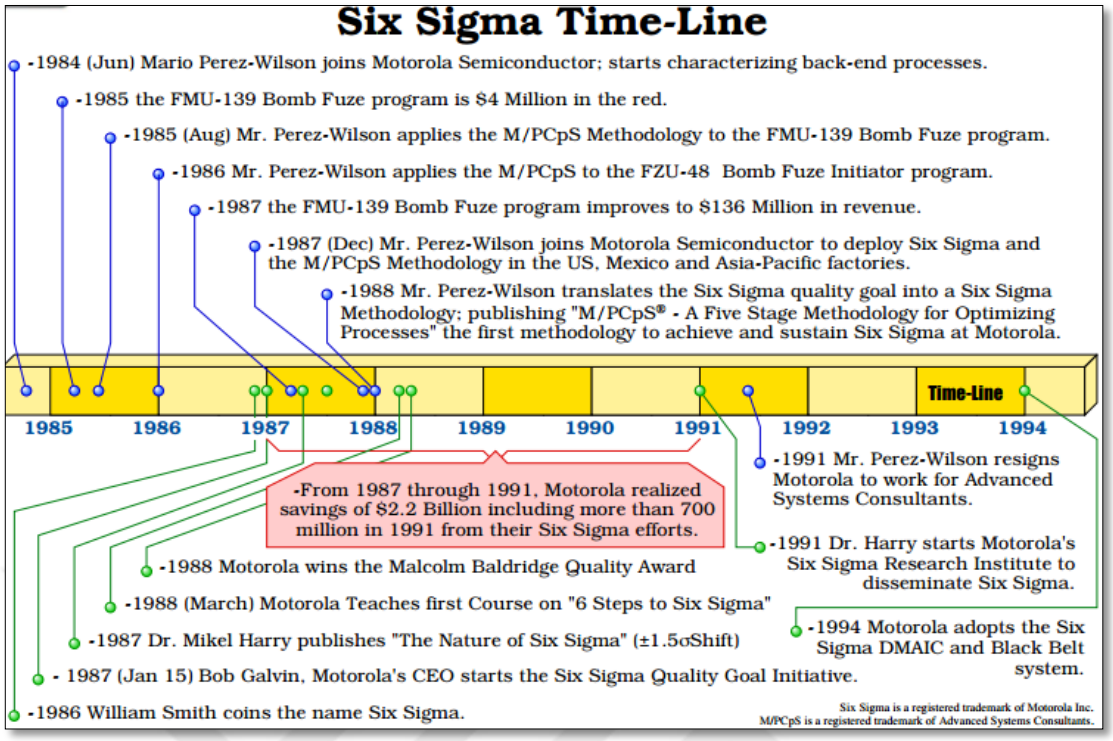


Figure 2.5 Six Sigma Time-Line (Advanced Systems Consultants, 2009)

After the widespread of using Six Sigma methods, countless projects has been made in various business sectors. Depending on this spread, the number of academic articles increased in the 90s Six Sigma was only a tool for increasing quality, then it is started to use every process.

Hahn and his friends (1999) mentioned in their articles and books that, using Six Sigma tools provided an advantage in every business sector. These tools provided career development, especially for the statisticians.

Deshpande and his friends (1999) proved that using Six Sigma methods in processes increased the number of the error, improved customer satisfaction and increased market share and employee well-being with their project in chemical industry.

Blakeslee (1999) made a statement in an article, using Six Sigma methodology provided superiority on competitors. He demonstrated this idea with a comparison between two baggage handling processes.

Chen and his friends (1999) used Six Sigma methodology in casting industry to improved product and design quality.

Nevalainen and his friends (2000) used Six Sigma methodology in a pathology laboratory to improve their laboratory performance.

Pande and his Friends (2000) created a road map for many companies to improved Six Sigma in all industry.

De Mast (2000) adapted new statistical methods to Six Sigma ideology and he showed the benefits of these statistical methods.

Wyper and Harrison (2000) used Six Sigma methodology in Human Resource Department for true wage policy, true employment, time management and workload. In result of the project, personal cost %34 reduced and they save 250.000Pound from general expenses.

Calcutt (2001) mentioned Six Sigma achievements of big companies in his article such as; Motorola, Signal (Honeywell), ABB, Black&Decker Bombardier, Allied, General Electric. And with his article, he guided the other companies about how they should apply Six Sigma in their businesses.

Hoerl (2001) explained Six Sigma roles such as Master black belt, black belt, green belt and he improve this role.

Neuscheler and Norris (2001) explained five important points to gain financial success on Six Sigma projects.

Gross (2001) explained why all employee should be a participation in the Six Sigma project and he demonstrated the importance of this participation in his article.

Chowdhury (2001) explained 5 steps of Six Sigma and he defended that all steps should be simple and every employee should understand this methodology

Baczewski (2005) compared in his article; Six Sigma, ISO, Benchmarking, Lean Management. Then he showed advantages and disadvantages of these ideologies

Banuelos and his friends (2005) completed a Six Sigma project in the manufacturing sector, they show step by step their project phases and at the end of the project their cost save 50K euro.

Fort Wayne Municipality in India (2005) used Six Sigma in 2005 to improve their municipal service and to reduce the waiting time. This project has selected a successful study in India.

D'Angelo and friends (2007) applied the Six Sigma methodology to improve after sales service sector. Their main target was zero error in the service.

Janet Jacobsen (2011) presented a Six Sigma project in Ford Motor Company. Ford's consumer-driven Six Sigma strategy involved regular analysis of scorecard metrics to detect performance trends. During a routine metrics review, officials at the organization's Saarlouis, Germany, plant discovered an escalation in basecoat paint consumption. Not only was the upsurge driving production costs higher, but it also pointed toward increased solvent consumption, which in turn led to higher levels of volatile organic compound emissions. An At the end of the project the team exceeded all project goals and they published a exceeded chard. The results of project is showed in "Table 2.3"

Table 3.3 Results of Janet Jacobsen project (Ford Motor Company,2012)

Goal	Target	Result
Reduce costs	$1.5 million annually	$2 million annually
Improve customer satisfaction	127.000 ppm reduction	129.000 ppm reduction
Reduce environmental impact	Lower VOCs by 50.000 kg annually	VOCs reduced 70.000 kg annually

The project earned finalist honors, and team members had the opportunity to present their project at the 2011 World Conference on Quality and Improvement.

Like these examples, a lot of Six Sigma project leader and academicians contribute Six Sigma project spreads. Every after year, the number of Six Sigma project rises very fast, because of today all big companies like Ford, Caterpillar, and other firms, have a Six Sigma department and educate many Green Belts, Black Belts or Master Black Belts. Today, these firms have countless Six Sigma project. In our Country, Turk Firms especially which have foreign partners, use Six Sigma tools and apply their processes.

Borusan was a good example for the spread of Six Sigma culture in Turkey. In 1994, Borusan first met Six Sigma methodology by the agency of Caterpillar. With the decision of Ahmet Kocabıyık who is the Chairman of Borusan, Six Sigma culture spread in Borusan. First projects raised in Borusan Makina ve Güç Sistemleri then, other Borusan group companies

started to use 6 sigma methodology. Today more than 550 projects had already finished in Borusan and these projects provide over 55 Million saving.

According to Agah Uğur who is the CEO of Borusan, the company growth by %36 and the profit increased by %60 after Borusan met the 6Sigma Culture. These in formations was located on Borusan website.

As a conclusion, Six Sigma methodology and tools not only used manufacturing sector but also used very sector. It is enough having a problematic process and an enthusiastic project team for starting a Six Sigma project.

2.1. Six Sigma Concept

Six Sigma is a successful methodology for seeking continuous improvement in consumer loyalty and benefit. It is a management philosophy endeavoring to improve viability and proficiency. Additionally, Six Sigma is an exceedingly trained process that helps us focus on creating and conveying close impeccable items and services. The focal thought behind Six Sigma is that on the off chance that you can gauge what number of " defects" you have in a procedure, you can efficiently make sense of how to dispense with them and get as near " zero defects " as could be allowed.

2.2. Features of Six Sigma

Six Sigma's point is to dispose of waste and inefficiency, in this manner expanding consumer loyalty by delivering what the customer is expecting. Six Sigma follows a structured methodology and has defined roles for the participants. Six Sigma is an information-driven procedure and requires accurate data collection for the processes being analyzed. Six Sigma is about putting comes about on Financial Statements. It is shown normal distribution of Six Sigma “Figure 2.6”

Six Sigma is a business-driven, multi-dimensional organized approach for enhancing forms, bringing down deformities, lessening process changeability, decreasing expenses, and expanding consumer loyalty, expanded benefits, and improving processes.

The word Sigma is a factual term that measures how far a given procedure goes amiss from flawlessness. It is shown sigma levels in “Figure 2.7”

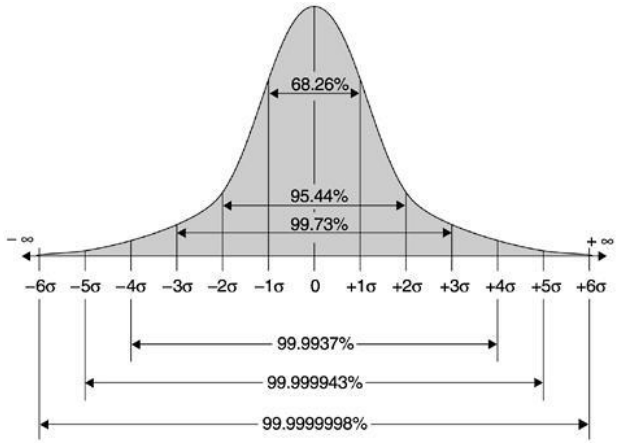


Figure1.6 6 Sigma Normal Distribution (media.licdn.com)

Sigma Level	Defects (Per Million)
2 Sigma	308,507
3 Sigma	66,807
4 Sigma	6,210
5 Sigma	233
6 Sigma	3.4

Figure1.7 Sigma Levels

2.3. Concepts of Six Sigma

Critical to Quality: Ascribes most vital to the client.

Variation: What the customer feels and sees.

Process Capability: What your procedure can convey.

Defect: Neglecting to convey what the client needs.

Design for Six Sigma: Outlining to address client issues and Process ability.

Stable Operations: Guaranteeing steady, unsurprising procedures to enhance what the client sees and feels.

Figure1.8 Concepts of Six Sigma

2.4. Role of Six Sigma

2.4.1. Sponsor

Is usually a high-level or senior business leader or executive who sponsors the Six Sigma engagement. Responsible for articulating the problem statement, defining the team's objectives and validating the business case in the project charter. Sponsors are the liaison between the team and senior management and thus responsible for securing subject matter experts and non-Six Sigma resources critical to the success of the project. Is looked to for decisions at critical times at the project. The sponsor's approval is required at DMAIC tollgates.

2.4.2. Champion

Middle or senior executive who sponsor and promote continuous improvement initiatives throughout their organization. Secures training and mentorship for Black Belt candidates and makes sure that resources are available for projects. Resolves any cross-functional team issues that may occur. Trained in the basics of Six Sigma. Sometimes filled by former Black Belts or Master Black Belts. Occasionally the Champion may also Sponsor projects or programs.

2.4.3. Master Black Belt

100% allocated professional with tremendous experience as a Black Belt leading teams and completing projects. A true expert in Six Sigma methodology and tools. Six Sigma Master Black Belts often mentor aspiring black belts and consult and remove obstacles from Black Belt teams. Has a responsibility to champions for keeping a portfolio of initiatives on track. Certifications offered from ASQ, Villanova, and IASSC.

2.4.4. Black Belt

100% allocated professional trained in DMAIC and other problem-solving methodologies. Has project management, statistical and process analysis skill sets. Trained in both the science of and soft skills needed in bringing about change. Responsibilities often include training green belts and other black belt candidates, and leading Six Sigma projects. Black Belts may also serve as internal consultants helping multiple teams at once. Job duties sometimes include training other employees in tools, techniques, and processes.

2.4.5. Process Owner

Professional, often a senior business leader, responsible for the business process that is the target of a Six Sigma project. Sometimes the process owner may be the sponsor of the initiative.

2.4.6. Expert Green Belt

A professional with introductory Six Sigma training partially allocated to an initiative. Maybe a team member on a Black Belt project or lead a smaller project.

2.4.7. Green Belt

Member of the team working directly with the Expert Green Belt.

“Figure 1,9” shows the relation between role of Six Sigma

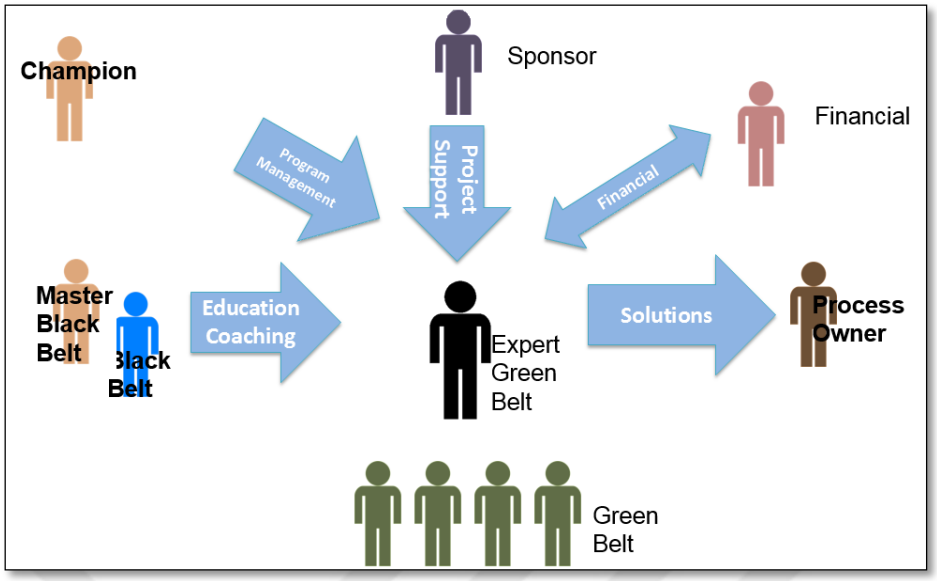


Figure 2.9 Relation Between Role of Six Sigma (Borusan Six Sigma Guide)

2.5. Methodology

Six Sigma has two key methodologies;

2.5.1. DMAIC Methodology

DMAIC: It alludes to an information-drove quality procedure for enhancing processes. This approach is utilized to enhance a current business prepare. This methodology consists of the following five steps. 1-Define > 2-Measure > 3-Analyze > 4-Improve > 5-Control

Define: Define the issue or venture objective that should be tended to.

Measure: Measure the issue and process from which it was delivered.

Analyze: Analyze information and procedure to decide underlying driver of imperfections and openings.

Improve: Improve the procedure by discovering answers for settle, decrease, and anticipate future issues.

Control: Implement, control, and manage the change

DMAIC five step is shown in “Figure 2.10”

2.5.2. DMADV Methodology

DMADV: It alludes to an information-drove quality technique for outlining items and procedures. This strategy is utilized to make new item plans or process outlines in a manner that it brings about a more unsurprising, develop and deformity free performance. Solutions to keep the procedure on the new course. This technique comprises of five stages:

1-Define > 2-Measure > 3-Analyze > 4-Design > 5-Verify

Define: Define the Problem or Project Goal that should be tended to.

Measure: Measure and decide clients' needs and details.

Analyze: Analyze the process to meet the customer needs.

Design: Design a procedure that will address clients' issues.

Verify: Verify the outline execution and capacity to address client issues.

DMADV five phase is shown in “Figure 2.11”

2.5.3. DFSS Methodology

DFSS is a separate and emerging discipline related to Six Sigma quality processes. This is a systematic methodology utilizing tools, training, and measurements to enable us to design products and processes that meet customer expectations and can be produced at Six Sigma Quality levels. This methodology can have the following five steps.

1-Define > 2-Identify > 3-Design > 4-Optimize > 5-Verify

Define: Define what the clients need, or what they don't need.

Identify: Identify the client and the venture.

Design: Design a procedure that addresses clients' issues.

Optimize: Determine prepare ability and upgrade the outline.

Verify: Test, confirm, and approve the plan.

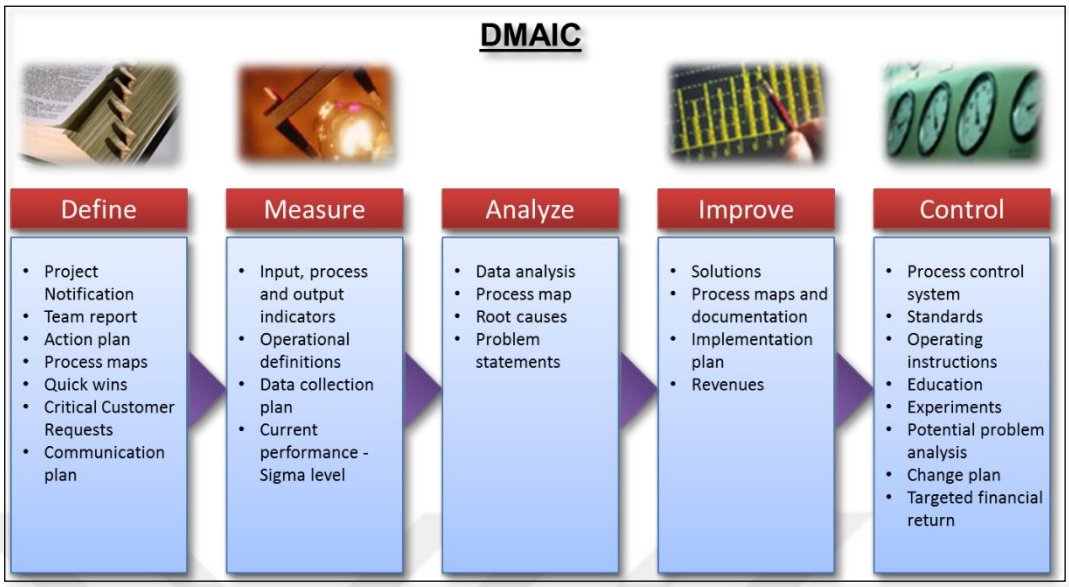


Figure 2.10. DMAIC five phase (Borusan Six Sigma Guide)

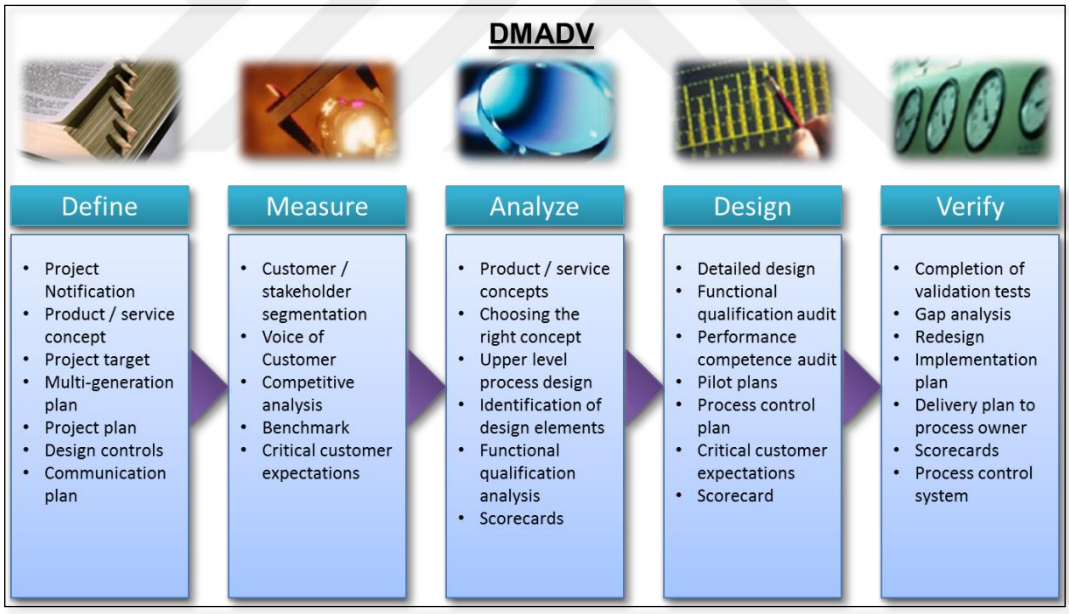


Figure 2.11. DMADV five phase (Borusan Six Sigma Guide)

2.6. The Development of Six Sigma Concept

The foundations of Six Sigma as an estimation standard can be followed back to Carl Friedrich Gauss (1777-1855) who presented the idea of the typical bend. Six Sigma as an estimation standard in item variety can be followed back to the 1920's when Walter Shewhart

demonstrated that three sigma from the mean is the point where a procedure requires redress. Numerous estimation models (Cpk, Zero Defects, and so on.) later went ahead of the scene, however, credit for begetting the expression "Six Sigma" goes to a Motorola design named Bill Smith. (By chance, "Six Sigma" is a governmentally enlisted trademark of Motorola).

In the early and mid-1980s with Chairman Bob Galvin in charge, Motorola engineers chose that the customary quality levels — measuring absconds in a large number of changes – didn't give enough granularity. Rather, they needed to gauge the imperfections per million open doors. Motorola built up this new standard and made the system and required social change connected with it. Six Sigma helped Motorola acknowledge effective main concern brings about their association – truth be told, they recorded more than $16 Billion in reserve funds therefore of our Six Sigma endeavors.

From that point forward, a huge number of organizations around the globe have embraced Six Sigma as a method for working together. This is an immediate aftereffect of a hefty portion of America's pioneers transparently applauding the advantages of Six Sigma. Pioneers, for example, Larry Bossidy of Allied Signal (now Honeywell), and Jack Welch of General Electric Company. Talk has it that Larry and Jack were playing golf one day and Jack wager Larry that he could execute Six Sigma quicker and with more noteworthy outcomes at GE than Larry did at Allied Signal. The outcomes represent themselves.

Six Sigma has advanced after some time. It's more than only a quality framework like TQM or ISO. It's a method for working together. As Geoff Tennant depicts in his book Six Sigma: SPC and TQM in Manufacturing and Services: "Six Sigma is numerous things, and it would maybe be less demanding to run down every one of the things that Six Sigma quality is most certainly not. Six Sigma can be viewed as: a dream, a logic, an image, a metric, an objective, a procedure, a philosophy." We couldn't concur more.

Most of World's leading brands using 6 sigma in your business; this brands such as; Motorola, Caterpillar, 3M, IBM, Volkswagen, Nokia, P&G, John Deere, Ford, Honda, Hitachi, , Jaguar Dupont, Dow Chemical, LG, Johnson & Johnson, Pfizer, Raytheon, , Sun Microsystems, Delphi Bombardier, Rexam, , Cisco, Alcan, Toshiba, General Electric, Allied Signal, Lockheed Martin, , Texas Instruments, General Electric, BMW, Merck Bristol-Myers, , Xerox, HP, Lexmark, Intel, NCR, Oracle, ABB, Squibb , HTC,Apple Computer, Alstom, York International, Autoliv, , Volvo, Boing, Whirlpool Black&Decker, Perkins,

Chevron, SonyEricson, Mercedes-Benz Coca-Cola, Pepsi-Co, McDonald's, Kellogg, Colgate-Palmolive, Merck Wyeth, Lill, Schering-Plough, Bausch&Lomb, Baxter International, Samsung, GlaxoSmithKline, BP, Shell.

Some example from Turkey Bands; Borusan Grubu, Koç Grubu, Bosch-Profilo, Aselsan, Arçelik, TEBA, TEI (Tusas Motor Sanayi A.S.), , Eczacıbası-Vitra, Kordsa, Klimasan, , BOS (Birlesik Oksijen Sanayi), Ford Türkiye, Petrol Ofisi, , Shell, Kalekim, Çimtas.

2.7. Phase of Six Sigma

There are five main steps in the implementation of Six Sigma to improve the outputs. "Figure 2.12" shows a partial listing of tools often found to be useful in a given stage of a project. There is considerable overlap in practice.

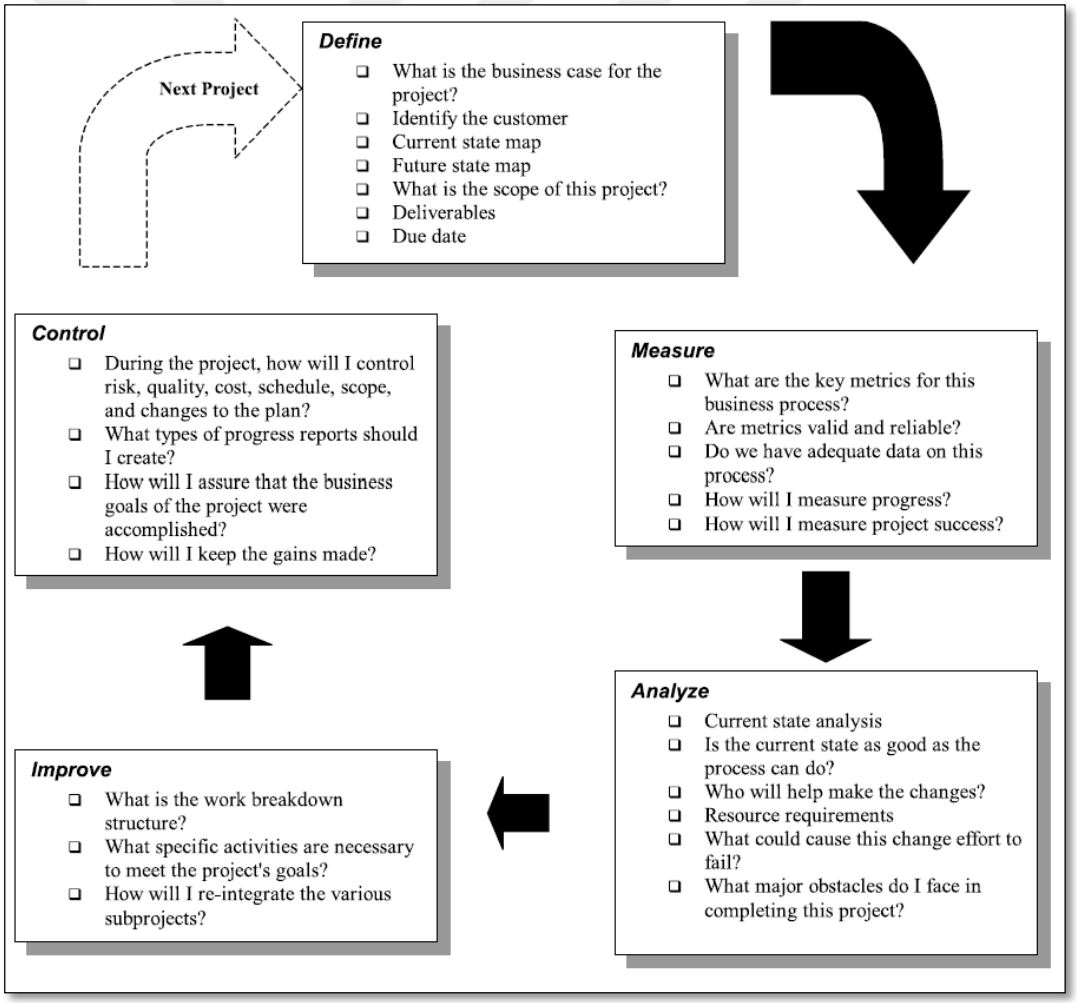


Figure 2.12. Relation of DMAIC'S five phase (The six sigma handbook- Tomas Pyzdek page: 239)

2.7.1. Define Phase

Define the goals of the improvement activity. The most important goals are obtained from customers. In this phase, the project team defines the scope of project, project goals, inputs, and outputs of the study. Then a project timeline and the chart are submitted. The aims should be realistic and measurable. In this phase mainly tree point should be careful, this points;

- The selected project should be convenient to the facilities.
- The project should be tangible return and improve the quality or productivity.
- The problems should be well defined.

At the top level, the goals will be the strategic objectives of the organization, such as a higher ROI or greater customer loyalty, greater employee satisfaction or increased market share.

At the operations level, an objective may be to build the throughput of a generation division. At the project level, objectives may be to decrease the imperfection level and increment throughput for a specific procedure. Get objectives from direct correspondence with clients, shareholders, and workers. Picking the right team members can be a difficult decision, especially if a project involves a large number of departments. Every project has customers. The customer is the beneficiary of the item or administration of the procedure, focused for development. Every customer has one or multiple needs from their supplier.

At the conclusion of the design phase, you should know who the end-user or the customer is, prerequisites or their resistance issues. The project team should also have a clear understanding of goals in addition to this, the scope of the project should including budget, deadlines and time constraints. The tools used in the identification phase are as follows;

- Matrix diagram
- Process map
- SIPOC diagram
- Nominal group technique
- Relationship diagram
- Product analysis
- Voice of the customer

2.7.2. Measure Phase

During the Measure Phase, the current performance of the current business process is measured. There are three essential parts of measure phase. Data collection should be prepared to collect the data. What type of data we need to be collect should include in measurement plan. The reason to collect data is to identify areas where current processes need to be improved. The project team should collect data from three main origin: input, process, and output.

Output: Measurements made on the printout (eg: customer complaints) give faster results and have long-term effects (eg: customer satisfaction).

Process: The traceability which is most helpful in determining the process problems of the Six Sigma tool is the step which is much more.

Input: Six Sigma tools need to measure on the inputs since a problem in the inputs will be reflected in the output of the process.

At this stage, with the collected data, the current sigma level can calculate. It gives an approximate number of defects. Sigma level can calculate DPMO formula (Defective Per Million Opportunities)

Table 2.4 Formula of DPMO

$$DPMO = \frac{\text{Number of defects}}{\text{Number of Units x Number of opportunities}} \times 1{,}000{,}000$$

Instruments used in the measurement phase;

- Troll diagram
- Pareto scheme
- Descriptive statistics
- Z tests
- Signal sigma

2.7.3. Analyze Phase

In the Analyze Phase, measurement data's is examined to understand the main problem of the project subject. Basic problem-solving techniques are used in this stage. To find the root causes shows us which problem and rootcauses should be carried to improvement phase.

Analyze tools should be; Correlation, T-test, Chi-square test, F-test, Hypothesis tests, Confidence intervals, Analysis of variance (ANOVA), Histogram, Fishbone diagram.

We consider five specific types of analyses that help to promote the goals of the project. These are source, process, data, resource, and communication analysis. Now we will see them in detail.

2.7.4. Improve Phase

In the improve phase, improvement activities and changes are determined to create new project process maps in addition to this statistical methods should be used to validate the improvement. The measures which are used for overcoming the root causes of the problem are tried and put into practice. As a result of these applications, good satisfaction, better programming, better equipment should be planed. Identify high gain alternatives:

- Create criteria to assess competitor change arrangements.
- Think efficiently and comprehensively.
- Organize and assess the competitor arrangements against the arrangement assessment criteria.
- Direct a possibility appraisal for the most noteworthy esteem arrangements.
- Create preparatory arrangement courses of events and money saving advantage examination to help in suggestion presentation and future execution arranging.

However, we may need to utilize extra devices too These Tools used in this phase;

- Creativity
- Data collecting
- Flow diagrams
- Experimental design
- Hypothesis testing

2.7.5. Control Phase

At the control phase, implemented the improvement plan, obtained results are evaluated. If these results are desired results, the new process is spread. In control phase, control the future state procedure to guarantee that any deviations from the objective are remedied before they result in imperfections. Implement control systems such as statistical process control, production boards, visual workplaces, and continuously monitor the process. This procedure is rehashed until the sought quality level is acquired.

Quality Control, A definitive reason in control is the general confirmation that an elevated requirement of value is met. Client's desires rely on upon this, so control is characteristically connected with quality. Since the motivation behind Six Sigma is to enhance the general procedure by lessening absconds, quality control is the basic strategy for keeping the entire procedure on track; for empowering us to spot inconvenience and settle it; and for judging how successfully the venture was executed and actualized. Quality is at the heart of Six Sigma rationality. Diminishing imperfections has an inseparable tie to taking a stab at flawlessness.

Standardization, Standardization or institutionalization empowers procedures to go as easily as would be prudent. In an assembling domain, the estimation of institutionalization has been demonstrated again and again.

Control Methods and Alternatives, The advancement of another procedure of any change to a current procedure requires the improvement of techniques to control work process. At the point when a procedure can't be overseen in a typical way, we have to concoct choices, shy of compelling consistency to the institutionalized strategy.

Tools used in control phase;

- Control chart
- Flow diagram
- Data collecting
- Quality control
- Standardization

2.8. Technical Tools

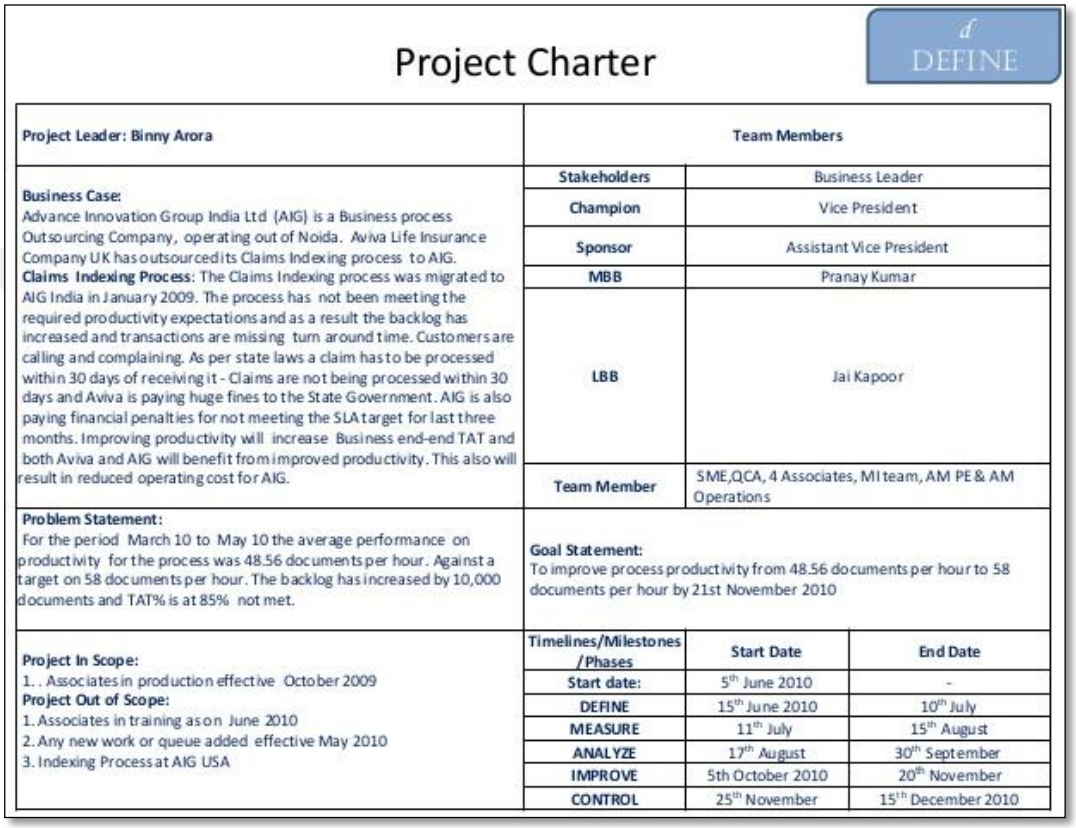
Six Sigma tools commonly used in each phase of a project. On “Table 2.5” is shown tool lists of the Six Sigma

Table 2.5 Candidate Six Sigma Tools (The six sigma handbook- Tomas Pyzdek page: 240)

Project Phase	Candidate Six Sigma Tools
Define	☐ Project charter ☐ VOC tools (surveys, focus groups, letters, comment cards) ☐ Process map ☐ QFD, SIPOC ☐ Benchmarking
Measure	☐ Measurement systems analysis ☐ Exploratory data analysis ☐ Descriptive statistics ☐ Data mining ☐ Run charts ☐ Pareto analysis
Analyze	☐ Cause-and-effect diagrams ☐ Tree diagrams ☐ Brainstorming ☐ Process behavior charts (SPC) ☐ Process maps ☐ Design of experiments ☐ Enumerative statistics (hypothesis tests) ☐ Inferential statistics (Xs and Ys) ☐ FMEA ☐ Simulation
Improve	☐ Force field diagrams ☐ 7M tools ☐ Project planning and management tools ☐ Prototype and pilot studies
Control	☐ SPC ☐ FMEA ☐ ISO 900× ☐ Change budgets, bid models, cost estimating models ☐ Reporting system

2.8.1. Six Sigma Project Charter

The project charter is the first step in the Six Sigma Project. It is created in the Define of DMAIC and the project charter can represent the deciding moment an accomplished Six Sigma project. It can make it by specifying essential assets and limits that will, in turn, ensure success. In "Figure 2.13" is shown an example of Six Sigma project charter



Project Charter

DEFINE

Project Leader: Binny Arora		**Team Members**	
Business Case: Advance Innovation Group India Ltd (AIG) is a Business process Outsourcing Company, operating out of Noida. Aviva Life Insurance Company UK has outsourced its Claims Indexing process to AIG. **Claims Indexing Process**: The Claims Indexing process was migrated to AIG India in January 2009. The process has not been meeting the required productivity expectations and as a result the backlog has increased and transactions are missing turn around time. Customers are calling and complaining. As per state laws a claim has to be processed within 30 days of receiving it - Claims are not being processed within 30 days and Aviva is paying huge fines to the State Government. AIG is also paying financial penalties for not meeting the SLA target for last three months. Improving productivity will increase Business end-end TAT and both Aviva and AIG will benefit from improved productivity. This also will result in reduced operating cost for AIG.	**Stakeholders**	Business Leader	
	Champion	Vice President	
	Sponsor	Assistant Vice President	
	MBB	Pranay Kumar	
	LBB	Jai Kapoor	
	Team Member	SME,QCA, 4 Associates, MI team, AM PE & AM Operations	
Problem Statement: For the period March 10 to May 10 the average performance on productivity for the process was 48.56 documents per hour. Against a target on 58 documents per hour. The backlog has increased by 10,000 documents and TAT% is at 85% not met.	**Goal Statement:** To improve process productivity from 48.56 documents per hour to 58 documents per hour by 21st November 2010		
Project In Scope: 1.. Associates in production effective October 2009 **Project Out of Scope:** 1. Associates in training as on June 2010 2. Any new work or queue added effective May 2010 3. Indexing Process at AIG USA	**Timelines/Milestones /Phases**	**Start Date**	**End Date**
	Start date:	5th June 2010	-
	DEFINE	15th June 2010	10th July
	MEASURE	11th July	15th August
	ANALYZE	17th August	30th September
	IMPROVE	5th October 2010	20th November
	CONTROL	25th November	15th December 2010

Figure 2.13. Example of Six Sigma Project Charter (SlideShare.com)

2.8.2. Voice of the Customer (VOC)

The "voice of the customer" is a process used to capture the requirements/feedback from the customer (internal or external) to provide the customers with the best in class service/product quality. This procedure is about being proactive and continually inventive to catch the changing prerequisites of the clients with time.

The "voice of the customer" is the term used to describe the stated and unstated needs or requirements of the customer.

The voice of the customer can be captured in a variety of ways: Interviews or direct discussion, focus groups, surveys, observation, warranty data, customer specifications, complaint logs, field reports, etc. “Figure 2.14” shows the interaction of VOC

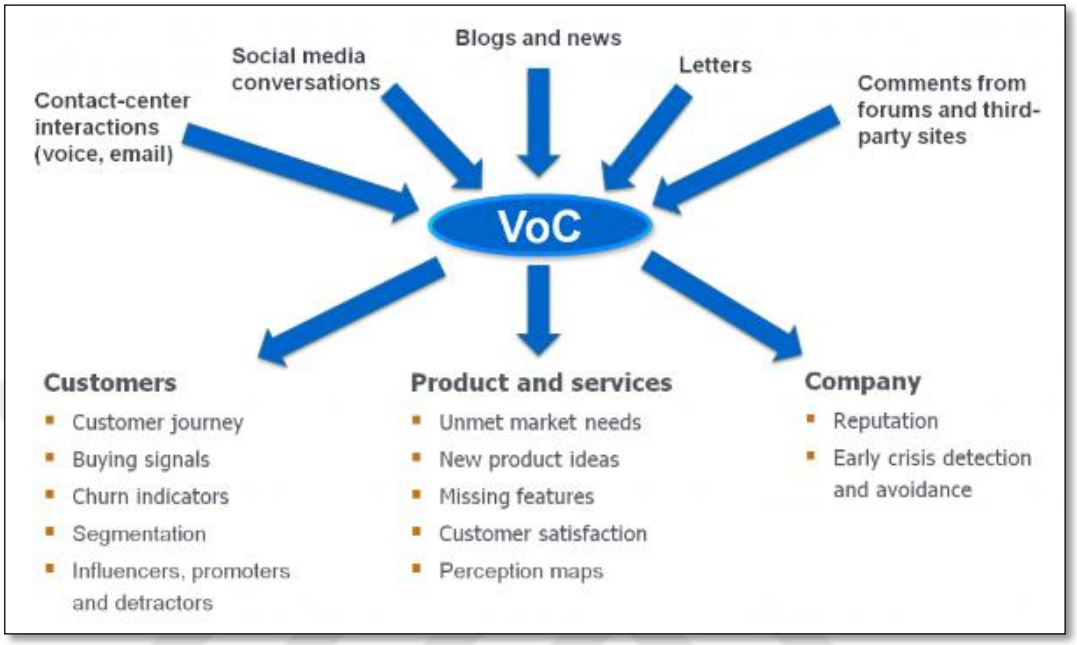


Figure 2.14. Voice of Customer (VOC) Interaction chart
(Analyzing the Voice of the Customer at the Sentiment Analysis Symposium-April/2014)

2.8.3. Quality Function Deployment (QFD)

Quality function deployment (QFD) is a method to help transform customer needs (the voice of the customer [VOC]) into engineering characteristics (and appropriate test methods) for a product or service. It helps create operational definitions of the requirements, which may be vague when first expressed. It prioritizes each product or service characteristic while simultaneously setting development targets for the product or service. As described by Yoji Akao, who originally developed QFD in Japan in 1966, it is a "method to transform qualitative user demands into quantitative parameters, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process.", The author combined his work in quality assurance and quality control points with function deployment used in value engineering.

QFD is applied in a wide variety of services, consumer products, military needs, and emerging technology products. The technique is also included in the new ISO 9000:2000

standard which focuses on customer satisfaction. An example of Quality House is shown in "Figure 2.15"

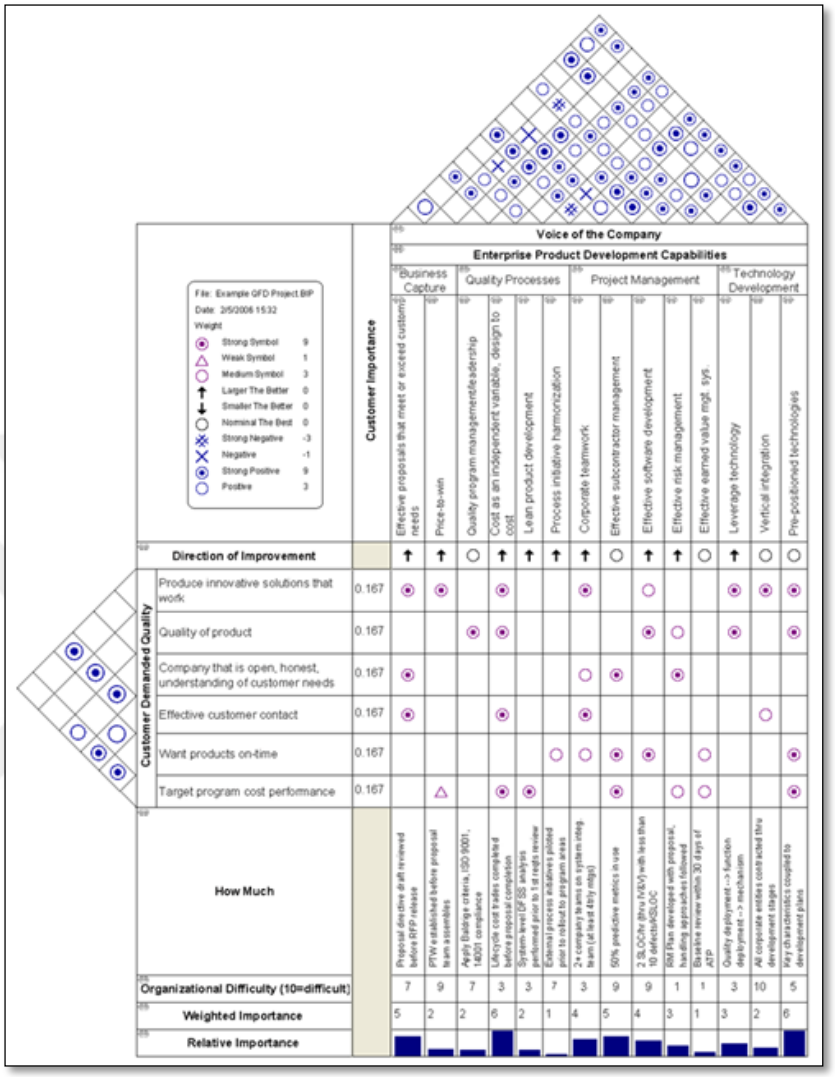


Figure 2.15. Quality House Example (House of Quality Matrix Software Example -conceptdraw.com)

2.8.4. SIPOC

In process improvement, a SIPOC (sometimes COPIS) is a tool that summarizes the inputs and outputs of one or more processes in table form.

The SIPOC is frequently introduced at the beginning of process change endeavors, for example, Kaizen occasions or amid the "define" phase of the DMAIC process. It has three ordinary users relying upon the group of project members:

- To give individuals who are new to a procedure an abnormal state outline

- To individuals in define another procedure.
- To reacquaint individuals whose recognition with a procedure has blurred or turned out to be outdated because of process changes.

A few parts of the SIPOC that may not be promptly evident are:

- The center is around catching the arrangement of sources of info and yields as opposed to the individual strides simultaneously.
- Inputs and outputs might be materials, administrations, or data.
- Suppliers and clients might be inner or outer to the association that plays out the procedure.

In “Table 2.6” is shown an example SIPOC for automobile repair.

Table 2.6 an example SIPOC for automobile repair

Example SIPOC: Automobile repair

Supplier	Input	Process	Output	Customer
• Vehicle owner • Customer service representative • Facility manager • Parts window	• Repair inquiry • Vehicle for repair • Permission to proceed with individual recommendations • Open bay • Parts for approved repairs • Observations	• Schedule visit • Diagnose problem • Prepare work order • Source parts • Perform repairs • Notify that service is complete	• Appointment date and time • Repair recommendations and cost estimates • Work order • Parts for approved repairs • Telephone/e-mail/text message notification • Repaired vehicle	• Vehicle owner • Mechanic • Customer service representative

2.8.5. Benchmarking

Benchmarking is use to comparison, to determinate the goal and sampling with other companies. The destinations of benchmarking are to figure out what and where enhancements are called for, to investigate how different associations accomplish their elite levels, and to utilize this data to enhance execution. Robert Camp wrote one of the earliest books on benchmarking in 1989.

2.8.6. Pareto Analysis

Pareto investigation is a formal procedure valuable where numerous conceivable strategies are going after consideration. Basically, the issue solver gauges the advantage conveyed by every activity, then chooses some of the best activities that convey an aggregate advantage sensibly near the maximal conceivable one.

This system distinguishes the top bit of causes that should be tended to determine the greater part of issues. Management consultant Joseph M. Juran suggested the principle and named it after Italian economist Vilfredo Pareto, who noted the 80/20 connection while at the University of Lausanne in 1896, as published in his first paper, "Cours d'économie politique".

While it is regular to allude to pareto as "80/20" manage, under the supposition that, in all circumstances, 20% of causes decide 80% of issues, this proportion is simply an advantageous dependable guideline and is not nor should it be viewed as the unchanging law of nature.

The use of the Pareto investigation in risk administration permits the administration to concentrate on those dangers that have the most effect on the venture. “Figure 2.16” is shown an example of Pareto Analysis.

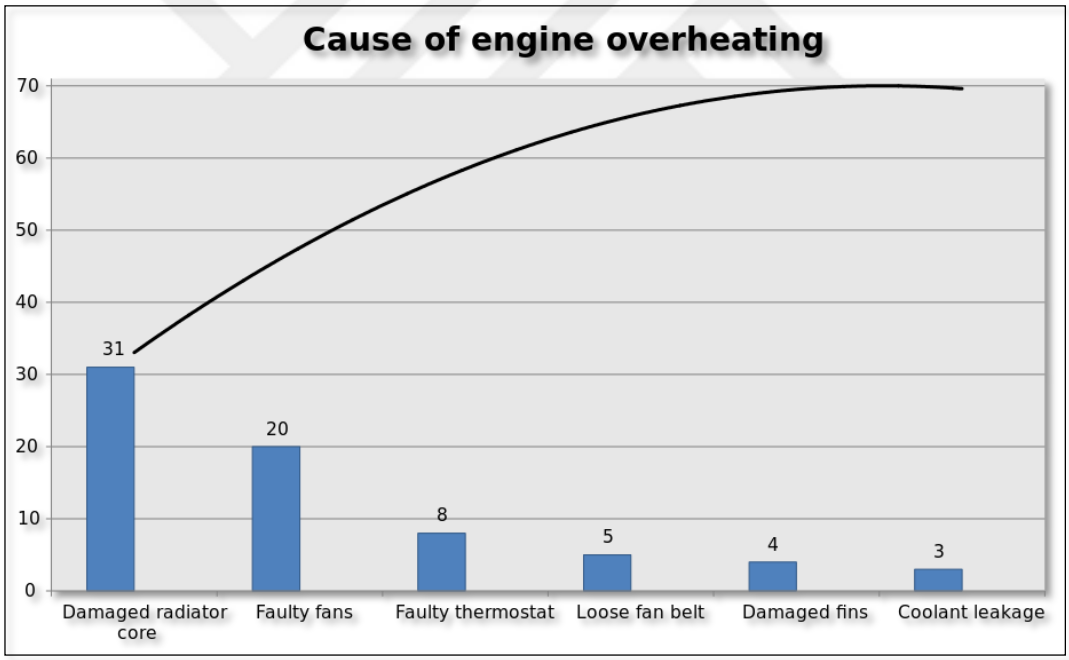


Figure 2.16 An Example of Pareto analyses

2.8.7. The Cause and Effect (Ishikawa Diagram or Fishbone) Diagram

Ishikawa diagrams (also called fishbone diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa) are causal diagrams created by Kaoru Ishikawa (1968) that show

the causes of a specific event. Basic employments of the Ishikawa graph are item outline and quality deformity counteractive action to recognize potential variables creating a general impact. Every cause or explanation behind defect is a wellspring of variety. Causes are typically gathered into significant classes to recognize these wellsprings of variety. The classifications regularly incorporate;

- People: Anyone required with the procedure
- Methods: How the procedure is performed and the particular necessities for doing it, for example, strategies, methods, guidelines, directions and laws
- Machines: Any equipment, tools, computers, etc. required to accomplish the job
- Materials: Raw materials, pens, paper, parts etc. on used to create the last item
- Measurements: Data generated from the process that are used to evaluate its quality
- Environment: The conditions, for example, area, time, temperature, and culture in which the procedure works.

In "Figure 2.17" is shown an example of Fish Bone

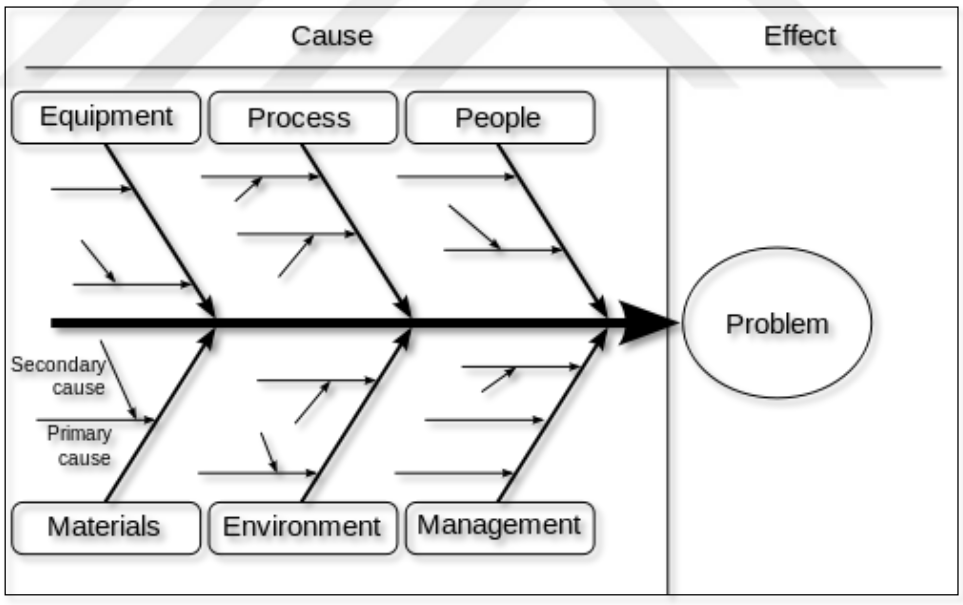


Figure 2.17 an Example of Fish Bone (timvandevall.com 2013 Dutch Renaissance Press LLC)

2.8.8. Brainstorming

Brainstorming is a gathering inventiveness strategy by which endeavors are made to discover a determination for a particular issue by social event a rundown of thoughts suddenly

contributed by its individuals. The term was advanced by Alex Faickney Osborn in the 1953 book Applied Imagination.

2.8.9. The Process Map

During the Define stage, the venture group makes the first of a few procedure maps. A procedure guide is a photo of the present strides in the process focused on development. A procedure outline five noteworthy classifications of work from the distinguishing proof of the providers of the procedure, the sources of info the providers give, the name of the procedure, the yield of the procedure, and the clients of the procedure. Each of these means is compressed as SIPOC to show the means to the group that must be directed to finish a procedure delineate. In addition, The first structured method for documenting process flow, the flow process chart, was introduced by Frank Gilbreth to members of ASME in 1921 as the presentation “Process Charts—First Steps in Finding the One Best Way”

3. IMPROVEMENT OF SCRAP PARTS TRACKING AND DESTRUCTION PROCESS FOR WARRANTY SERVICE

The “Dealer A” which provides sales and services in the area of the machinery and power systems since 1994 in Turkey.

According to the company regulation, it is forbidden to publish the company name in studies that contain internal data. For this reason, the company name could not be used in this thesis study. The data which is in this study have been revised for this reason. Therefore we used “Dealer-A” nickname for this company.

This Six Sigma project was developed for Warranty Department to improve scrap parts tracking for destruction and aims to prevent certain deficiencies at the warranty process.

The warranty process starts with the customer failure notification. Then service team do trouble shooting and prepares the part list. After warranty confirmation, the machine is repaired.

At the end of the warranty processes, the scrap parts are taken from the customer, and the new parts are installed on the machine. The scrap parts should be returned the dealer’s warranty warehouse. Scrap parts are very important for the “Dealer-A” because these scrap parts should not be repaired and not be launched to the market. The dealer does service claims for these part to the manufacturer, using a claim administration system on SAP. All of the scrap parts lists, failure analysis, and work order numbers are added on claiming system. After doing warranty claim to the manufacturer, the cost of scrap parts which are replaced by new parts is paid by the manufacturer. According to the dealer contract the dealer have to destroy the scrap parts. The scrap parts should be stored for 2 months. The manufacturer company sometimes recalls some parts in this two months to investigate the failure. If the dealer couldn’t send the parts back, the manufacturer doesn’t pay the warranty claim payment.

The warranty process is one of the important processes for the dealer because this process both related to the customer, the dealer, and the manufacturer. This coordination should be perfect because this is directly related to the customer satisfaction, cost of warranty and dealer prestige. This is a DMAIC project so that we follows DMAIC five steps; Define > Measure > Analyze > Improve > Control

3.1 Define Phase

In the define phase; the project team, project charter, business cases, opportunity statement and the project plan published. Then, we started to create process maps with the project team. After creation of macro process map, we created micro process map and swimming line process map.

3.1.1. Project charter

The project charter consists of six titles; business cases, opportunity statement, goal statement, project scope, project plan, and project team. “Table 3.3” shows The Project charter this project.

3.1.1.1 Business Cases

The “Dealer-A” has 4 District Office (Ankara-İzmir-Gebze-Adana), 5 Branch Office (Trabzon-Antalya-Trakya-Bursa-Diyarbakır) ve 1 Special Project Area (3rd Airport in Istanbul). Totally, “Dealer-A” has 10 location and one Head Office. Also, “Dealer-A” has ten warranty engineer. At the head office, warranty and technical communication department provide management and coordination to 10 location. All warranty Engineers' KPI, warranty budget, and efficiency is calculated and is managed by head office. The head office has 2 Technical communications engineer (TC) and a warranty analyzer.

Scrap parts tracking and destruction process is an important process for warranty team. Because these scrap parts should be follow up from the “Dealer-A” and should not be repaired and should not launch on the market. The dealer does service claims for these part to the manufacturer, using a claim management system on SAP. All scrap parts lists, related failure stories, and the work order numbers are added to this claim system. After doing warranty claim to the manufacturer, the cost of scrap parts which are replaced by new parts is paid by the manufacturer. According to the dealer contract the dealer have to destroy the scrap parts. The scrap parts should storage only 2 months. The manufacturer company sometimes recall some parts in this two months to investigate the failure. If the dealer couldn’t send the parts to back, the manufacturer didn’t pay the warranty claim payment.

The “Dealer-A” have no standard follow-up procedure for scrap parts. The current situation is caused complicated workload for warranty engineers. In addition to this, take a risk for audit processes. Because in current situation warranty engineer is responsible for warranty confirmation and scrap parts. Sometimes, the scrap parts send destruction process

prematurely, so that if the manufacturer company wants to the dealer to send these parts back the dealer wouldn't send back the scrap parts. In this case, the manufacturer takes back the payment of warranty claim. These issues cause financial losses.

3.1.1.2. Opportunity Statement

Creating a standard and follow the able process for scrap parts tracking and destruction process, avoid to losing the parts, labor cost, and financial losses.

The manufacturer firm back the payment because of missing to send the part back;

- At 2014: $40.000
- At 2015: $45.000
- At 2016 3quarter: $35.000

With the new follow-up and control system we reduce these cost. Reducing time releases warranty engineer to do another task. Increase customer, audit department and employee satisfaction.

3.1.1.3 Goal Statement

- Y: Excellence of improvement of scrap parts tracking and destruction process for warranty
- X1: Personnel resource optimization
- X2: Evaluation of electronic record facility (provision of SAP integration)
- X3: Improvement of storage conditions
- X4: Improvement in referral processes to manufacturer's warehouses with DHL

3.1.1.4. Project Scope

- Inside: Machine all regions and branches
- Excluded: Power Systems

3.1.1.5. Project Plan

The project plane is shown in the “Table 3.1”.

Table 3.1 Project Plan Table

PHASE	Start	Finish	Time(day)
Define	25.07.2016	18.08.2016	24
Measure	18.08.2016	10.09.2016	23
Analyse	10.09.2016	30.09.2016	20
Improve	30.09.2016	30.10.2016	30
Control	30.10.2016	19.11.2016	20

3.1.1.6. Project Team

The project team members is shown in “Table 3.2”

Table 3.2 Project Team Table

Adnan K.	Sponsor
Aybars A.	Process Owner
Özgür A.	Master Black Belt
Ali A.	Black Belt
Sina S.	Financial representative
Murat Can Atalay	Expert Green Belt
Gamze K.	Green Belt
Demet E.	Green Belt
Pelin A.	Green Belt
Ali Y.	Green Belt
Ferhat V.	Green Belt
Ayfer Ş.	Green Belt
Yavuz K.	Green Belt

Table 3.3 Project charter of the project

Improvement of Scrap Parts Tracking and Destruction Process for Warranty

Business Casse

The Dealer-A has 4 District Office (Ankara-İzmir-Gebze-Adana), 5 Branch Office (Trabzon-Antalya-Trakya-Bursa-Diyarbakır) ve 1 Special Project (3rd Airport in Istanbul) totally have 10 location. Also the dealer have a warranty engineer at all locations, totally 10 warranty engineer. The head office warranty and technical communication department provides management and coordination to these 10 location. All KPI's, warranty budget, warranty excellence programs efficiency is calculate by this department. The head office have 2 Technical communications engineer (TC) and a warranty analyzer.
Scrap parts tracking and destruction process is an important process for warranty team. Because these scrap parts should be chased from the firm and should not be repaired and should not launch to the market. The dealer claim this part to manufacturer on a system adding parts list, warranty issue and all the detail about the failure. All scraped parts' price which changed from the warranty processes take from the producing company and also according to the dealer contract our firma have to destroy the scraped parts. The scraped parts should storage 2 months. The manufacturer company sometimes recall this parts in this two months to investigate the failure. If the dealer couldn't send the part back, the manufacturer didn't pay the warranty claim.
The dealer have no standard follow-up procedure, this situation cause heavy and complicated workload to warranty engineer. In addition to this, take risk for audit processes. Because, in current situation warranty engineer is responsible from warranty confirmation and scrap parts.
Sometimes, these scrap parts send destruction process prematurely, so that if the manufacturer company wants to send these part back form the dealer, the dealer wouldn't sent beck the scrap parts. In this case, the manufacturer take back the payment the warrant claim. These issue cause financial losses.

Opportunity Statement

Creating a standard and followable process for scrap parts tracking and destruction process, avoid to losing the parts, labor cost and financial losses.
The manufacturer firm back the payment because of missing to send the part back;
At 2014: $40.000
At 2015: $45.000
At 2016 3quarter: $35.000
With the process new follow-up and control system we reduce these cost.
Reducing time releases warranty engineer to do other task.
Increase customer, audit department and employee satisfaction.

Goal Statement

Y: Excellence of improvement of scrap parts tracking and destruction process for warranty
X1: Personnel resource optimization
X2: Evaluation of electronic record facility (provision of SAP integration)
X3: Improvement of storage conditions
X4: Improvement in referral processes to manufacturer's warehouses with DHL

Project Scope

Inside: Machine all regions and branches
Excluded: Power Systems

Project Plan

	Proje Fazı	Start	Finish	Time(day)
Define	[D] Tanımlama	25.07.2016	18.08.2016	24
Measure	[M] Ölçüm	18.08.2016	10.09.2016	23
Analyze	[A] Analiz	10.09.2016	30.09.2016	20
Improve	[I] Geliştime	30.09.2016	30.10.2016	30
Control	[C] Kontrol	30.10.2016	19.11.2016	20

Project Team

Adnan K.	Sponsor
Aybars A.	Process Owner
Özgür A.	Master Black Belt
Ali O.	Green Belt
Sina S.	Financial representative
Murat Can Atalay	Expert Green Belt
Gamze K.	Green Belt
Demet E.	Green Belt
Pelin A.	Green Belt
Ali Y.	Green Belt
Ferhat V.	Green Belt
Ayfer Ş.	Green Belt
Yavuz K.	Green Belt

3.1.2. Process Maps

The most important step is the creation of the process maps because it shows that how to moving on the project and it also show the project team where is the main problem.

3.1.2.1 Macro Process Map

The main process map type is macro process map. It shows the main steps of the process. Then, If is needed, the macro process maps transformed micro process map. “Figure 3.1” shows the macro process map of this project.

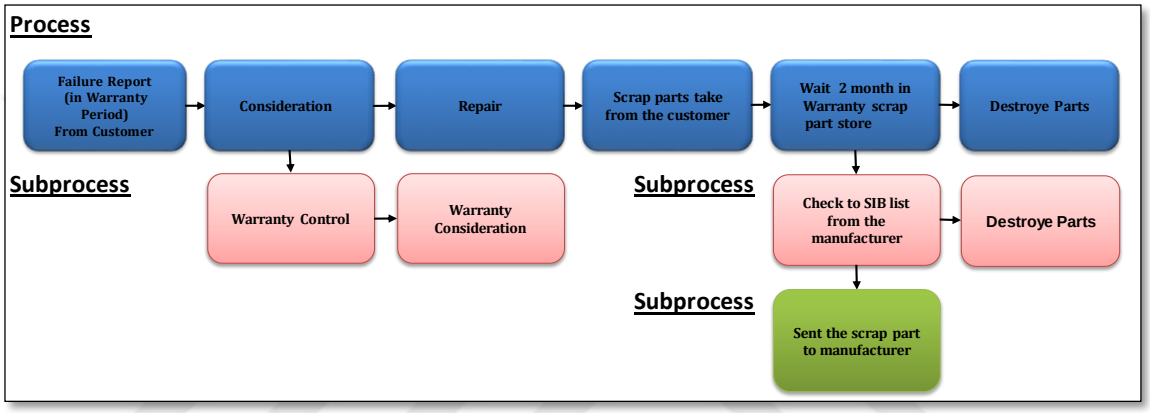


Figure 3.1 Macro Process Map of the project

The process starts with customer service request. The customer calls the service department to report their machines failure. If the machine in warranty periods, warranty engineer checks the machines information and sends the service team to the customer. Generally, a few customer get their machine directly to the service area. This is very costly and difficult process. Because the heavy duty machines hardly transport from one place to another.

After the customer service request, the engineer sends the service team to customer area. The technicians control the machine and define the problem. Technicians decide that is it necessary to take the machine to the service area or they decide can this problem repair on the field. Generally, simple failures can repair in the customer field. If it is not possible to repair on the customer field, the machine is transported he dealer service area. Then, the technicians listed the required part list and start repair process, by the way, the warranty engineer open a warranty work order on SAP system. After the problem solved, the scrap parts are taken from customer machine and deliver to warrant engineer. These scrap parts

also very important because our firm has to destroy scrap parts according to the dealer contract. Using or repairing these parts strictly prohibited by the manufacturer firm.

All the failure have to report to the manufacturer with claims. The manufacturer sometimes calls these parts back, and they publish a list which is call “Send It Back (SIB List)”. The engineer has to check the SIB List, before destruction. If the parts are included in SIB list, the parts are should send to the manufacturer with DHL firm. If the parts are not included in SIB list in two months, these parts have to be destroyed.

3.1.2.2 Micro Process Map

Micro process map helps the project team to see the most detailed steps. The expert green belt should take all the information about the process and should apply to process map. In addition to this, the team can decide to non-value and value process in that map. At multiple unitary structures, after the creation of micro process map, this map can test at all location. “Figure2.2” shows micro process map of the current process.

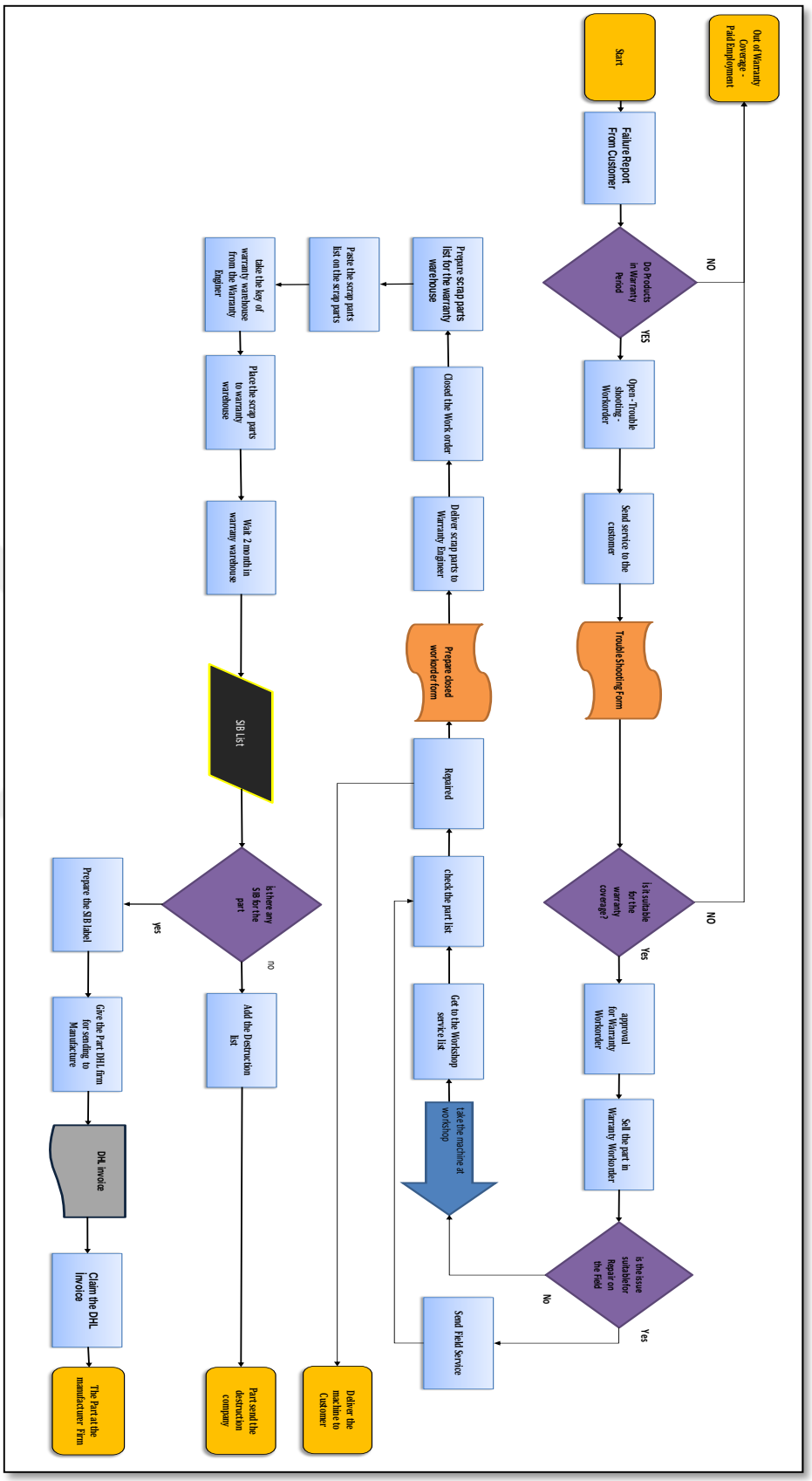


Figure2.2 Micro Process Map of Current Process

3.1.3. Unitary of the Process

The Project team wrote all operations step by step. Then all warranty engineers evaluated and compared their process steps to other location. At micro process flow diagram, all the step determined, controlled and checked. We have 29 step in our processes. These steps help the project about create “Swimlane Map”. “Table 3.4 “shows unitary of the process in regional based.

The list of all process in the micro process map;

1. Service request from the customer. (start the process)
2. Check - Is product in warranty period?
3. Create a work order (trouble shooting work order)
4. Send service to the customer.
5. Prepare trouble shooting form.
6. Check –Is the failure suitable for the warranty coverage?
7. Approval for warranty work order
8. Sell the parts in warranty work order.
9. Check - Is the problem suitable for repair on the field?
10. Send field service.
11. Get to the workshop service list.
12. Take the machine at the workshop.
13. Check the part list.
14. Repaired.
15. Prepare closed work order form.
16. Deliver scrap parts to warranty engineer.
17. Closed the work order.
18. Prepare scrap parts list for the warranty warehouse
19. Paste the scrap parts list on the scrap parts
20. Take the key of warranty warehouse from the warranty engineer
21. Place the scrap parts to warranty warehouse
22. Wait two month in warranty warehouse
23. Check -Is there any sib for the part?
24. Add the parts destruction list
25. Part send the destruction company
26. Prepare the SIB label.
27. Give the part DHL firm for sending to manufacture.
28. Claim the DHL invoice.
29. Warranty warehouse -recording system.

Table 3.4 Unitary of the Process (regional)

No	1	2	3	4	5
	ÇAYIROVA	ANKARA	İZMİR	ADANA	3rd Airport
1	Process Begins	Process Begins	Process Begins	Process Begins	Process Begins
2	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
3	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.- SMCS
4	Field Eng.	Field Eng.	Field Eng.	Field Eng.	Dış Servis- Atölye
5	Technician	Technician	Technician	Technician	Technician
6	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
7	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
8	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.- SMCS
9	Technician	Technician	Technician + Field Eng.	Technician + Field Eng.	Technician
10	Field Eng.	Field Eng.	Field Eng.	Field Eng.	Field Eng.
11	Workshop Eng.	Workshop Eng.	Workshop Eng.	Workshop Eng.	Formen
12	Logistics Firm	Logistics Firm	Logistics Firm	Logistics Firm	Logistics Firm
13	Technician	Technician	Technician	Technician	Technician
14	Technician	Technician	Technician	Technician	Technician
15	Warranty Eng.	N / A	Warranty Eng.	Warranty Eng.	Warranty Eng.
16	Technician	Technician	Technician	Technician	Technician
17	SMCS	SMCS	Warranty Eng.	Warranty Eng.	SMCS
18	N / A	Warranty Eng.	Warranty Eng. + Technician	Warranty Eng. + Technician	N / A
19	N / A	Warranty Eng.	Warranty Eng. + Technician	Warranty Eng. + Technician	N / A
20	Fielder	Technician	Warranty Eng. + Technician	Warranty Eng. + Technician	Technician
21	Fielder	Technician	Warranty Eng. + Technician	Warranty Eng. + Technician	Technician
22	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
23	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
24	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
25	Fielder	Warranty Eng.	Fielder	Fielder	Fielder
26	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
27	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
28	N / A	N / A	N / A	N / A	N / A
29	N / A	Excel	N / A	N / A	N / A
No	**6**	**7**	**8**	**9**	**10**
	BURSA	TRAKYA	TRABZON	ANTALYA	DİYARBAKIR
1	Process Begins	Process Begins	Process Begins	Process Begins	Process Begins
2	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
3	SMCS	SMCS	Warranty Eng.	Warranty Eng.	SMCS
4	Field Eng.	Field Eng.	Field Eng.	Field Eng.	Field Eng.
5	Technician	Technician	Technician	Technician	Technician
6	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
7	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
8	SMCS	SMCS	Warranty Eng.	Warranty Eng.	SMCS
9	Field Eng.	Field Eng.	Technician	Technician	Field Eng.
10	Field Eng.	Field Eng.	Field Eng.	Field Eng.	Field Eng.
11	Workshop Eng. +	Workshop Eng.+ (	Workshop Eng.	Workshop Eng.	Workshop Eng. +Warranty Eng
12	Customer	Customer	Logistics Firm	Logistics Firm	Customer
13	Technician	Technician	Technician	Technician	Technician
14	Technician	Technician	Technician	Technician	Technician
15	SMCS	SMCS	Warranty Eng.	Warranty Eng.	SMCS
16	Technician	Technician	Technician	Technician	Technician
17	SMCS	SMCS	SMCS	SMCS	SMCS
18	N / A	N / A	N / A	Warranty Eng.	N / A
19	N / A	N / A	N / A	Warranty Eng.	N / A
20	Fielder/Formen	Fielder/Formen	Fielder	Formen	Fielder/Formen
21	Fielder/Formen	Fielder/Formen	Fielder	Formen	Fielder/Formen
22	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
23	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
24	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
25	Fielder/Formen	Fielder/Formen	Fielder	Formen	Fielder/Formen
26	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
27	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.	Warranty Eng.
28	N / A	N / A	N / A	Warranty Eng.	N / A
29	N / A	N / A	Botebook	Excel	N / A

3.1.4. Swimlane Map

With the swimlane map, the project team see the main characters in this process and we can easily focus of the workload of this characters. “Figure 3.3” shows the swimlane map of the project

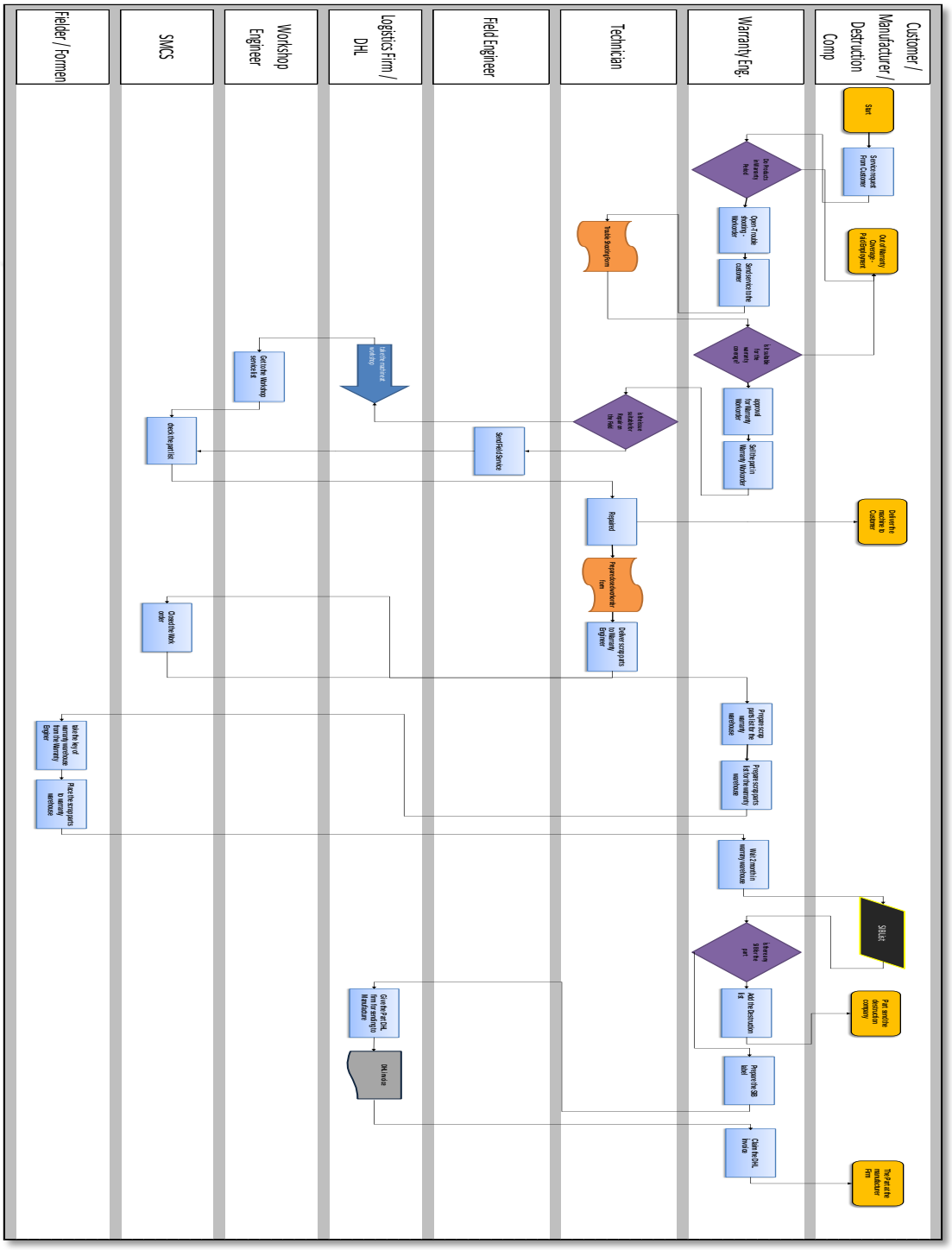


Figure 3.3 Swimlane Map of the project

3.1.5. SIPOC

At the final of the define phases, our project team used SIPOC diagram for this project. SIPOC helps us to see who is our supplier and customer, what is our inputs and outputs and what the main step of our process is.

This process starts with the service request from the customer and finishes the disposal process. Our main suppliers, for the project, are customers and warranty engineer. In that case, customer and warranty engineer provide inputs. Our inputs are scrap parts, work order of scrap part, work order date of scrap part and warehouse area. Processes are service request from customer, warranty consideration, repair process, deliver scrap parts to warranty engineer, disposal process. Our outputs are scrap parts, disposal process photograph, send it back (SIB) list. Finally, customers are audit department, manufacturer firm, Destruction Company. "Table 3.3" shows SIPOC of the project.

Table 3.3 SIPOC of the project

Start				Finish
Scrap				Disposal process
(S) Supplier	**(I) Inputs**	**(P) Process**	**(O) Outputs**	**(C) Customer**
Customer Warranty Engineer	Scrap Parts (Part Out) Workorder of scrap part Workorder date of scrap part Warehouse	Failure Report From Customer Warranty Consideration Repair Process Deliver scrap parts to Warranty Engineer Disposal process	Scrap parts Disposal process photograph CAT Send It Back List	Audit Department Manufacturer Destruction Company

SIPOC diagram does the groundwork for finding the indicators.

2.2. Measure Phase

In this phase, the project team collects the dates which are related the project. Firstly our team defines the indicators which can be collectible to see the current situation. "Table 3.4" shows the input indicators, process indicators and output indicators of the project.

Table 3.4 Indicators of the Project

Start				Finish
Service request				Disposal process
(S) Supplier	**(I) Inputs**	**(P) Process**	**(O) Outputs**	**(C) Customer**
Customer Warranty Engineer	Scrap Parts (Part Out) Workorder of scrap part Workorder date of scrap part Warehouse	Service request from Customer Warranty Consideration Repair Process Deliver scrap parts to Warranty Engineer Disposal process	Scrap parts Disposal process photograph CAT Send It Back List	Audit Department Manufacturer Destruction Company

Input Indicators	Process Indicators	Output Indicators
Number of Warrant Workorder	Number of Valid Warranty Request	Number of Workorder destroyed
Number of Part In Warrant Workorder	Entry-exit Dates of scraps parts in War. Ware.	Number of War. WO which send to Manufacturer
Number of Scrap Parts In Warrant Warehouse	Number of WorkOrder in Disposal list	Number of missing part list
Number of Scrap Workorder In Warrant Warehouse	Entry-exit War. WO list at War. Ware.	Dollar of Withdrawn Money
	Number of War. WO in SIB list	

The project team defined the input, process, and the output indicators. Input indicators are the number of warrant work order, the number of part in warranty work order, the number of scrap parts in warrant warehouse, the number of scrap work order in warrant warehouse. Process indicators are the number of valid warranty request, entry-exit dates of scrap parts in warranty warehouse, the number of work order in disposal list, entry-exit warranty, work order list at warranty warehouse, the number of war. Which in the SIB list. Output indicators are the number of work order destroyed, the number of warranty work order, which send to the manufacturer, the number of missing part list, dollar of withdrawn money.

After defining the indicator, the team can easily drown process overview table. “Table 3.7” shows the customer requests, and “Table 3.8” shows measurement decisions.

Table 3.7 Customer Requests table

Customer	Customer Requests
Audit Department	Warranty engineer should not be authorized person for the Warranty Warehouse
Audit Department	The scrap parts or warranty work order should be seen or to be reportable at "T" time in the process
Audit Department	Any withdrawn money
Manufacturer	All the SIB parts must sent the manufacturer
Destruction Company	Easy and fast delivery

Table 3.8 Measurement decision table

What can be measured?	Why? For what?
Number of Warranty work order	To see the volume of Warranty Job
Number of Warranty work order in SIB list	To see the volume of Send it back workload
Number of War. WO which send to Manufacturer	To compare with the SIB list, and to see the efficiency of SIB performance
Number of Work order destroyed	To compare with Number of Warranty work order and to see the efficiency for Disposal process
Number of missing part list	To see weakness in internal control system
Number of Claim Withdrawn Money	To see Withdrawn Money

According to audit department at the beginning of 2016, a report published to warranty team. This report contains 2014-2015 and 2016 throughputs about the warranty warehouse in the regions. “Table 3.9” shows measurement results.

Table 3.9 Measure Results Table of the Project

	First Six Month of 2016										
What can be measured?	ÇAYIROVA	ANKARA	İZMİR	ADANA	3rd Airport	BURSA	TRAKYA	TRABZON	ANTALYA	DİYARBAKIR	Total
Number of Warranty work order	533	913	985	803	1026	473	329	284	250	395	5991
Number of Workorder have Warehouse registration	490	820	910	701	944	423	299	255	219	349	5410
Number of missing part list (workorder)	43	93	75	102	82	50	30	29	31	46	581
Percentage of loss Part	8%	10%	8%	13%	8%	11%	9%	10%	12%	12%	10%
Percentage of True registration	92%	90%	92%	87%	92%	89%	91%	90%	88%	88%	90%
Sigma Level	2,9	2,8	2,9	2,6	2,9	2,7	2,8	2,8	2,7	2,7	2,8
Number of Warranty work order in SIB list	21	3	17	20	46	2	2	11	2	2	126
Number of War. WO which NOT send to Manufacturer	9	0	3	2	3	0	0	2	0	0	19
Number of Claim Withdrawn Money	5	0	0	2	2	0	0	0	0	0	9
Percentage of True registration	57%	100%	82%	90%	93%	100%	100%	82%	100%	100%	85%
Sigma Level of SIB sending	1,7	6	2,4	2,8	3	6	6	2,4	6	6	2,5

According to measurement results, we determine the sigma levels of the current situation to compare the result of Six Sigma project. Current status sigma levels about 2.8 for warehouse recording system and 2.5 for success of sending the requesting part to manufacturer. "Table 3.10" shows current sigma level of the process.

Table 3.10 Sigma level of the current situation

	Totally
Warehouse recording success	90%
Sigma Level	2,8
Sending the required parts to Manufacturer	85%
Sigma Level	2,5

Sigma levels are determined according to the sigma level table which is in the appendix. (Appx-1)

3.3 Analysis Phase

At analysis phase, dates are used and analyze, which is collected in measurement phase. According to collected data, Number of SIB required work order, don't send work order and the number of claims withdrawn money show relations.

If we apply the Pareto analysis Number of War. Work order does not send to Manufacturer and Number of Claim is withdrawn money, the relation between to parameters easily shown. In first two quarter, 20.000 euro withdrawn for this reason.

Apart from these, "Number of missing park work order" and "Number of work order have warehouse registration" didn't collect because of the lock of a recording system. It shows, in the current state, a warehouse recording system should be created definitely.

To understand the importance of these data, audit data has been examined. According to examination. Having no data about warranty warehouse registration entrance and exiting is

shown as a very high-risk factor in the executive report. Financial loss, weakness in the internal control system, difficulty in following steps and risks of abuse has defined as risk consequences. To see the root causes, we use fishbone diagrams. Mainly we need to find the solution for two problem, one of them financial loss and the other weakness in internal control system. Therefore we create two fish bone for separate root causes. "Figure 3.4" shows the Fish Bone diagram of why we have financial loss?

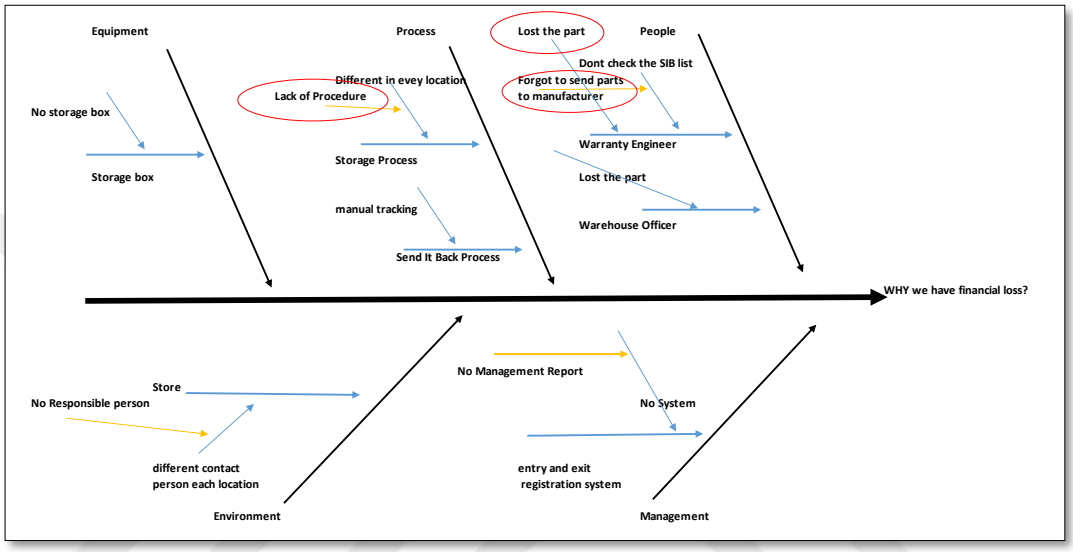


Figure 3.4 Why we have financial loss? (Fish Bone)

According to fish bone diagram the main reasons of financial loss are losing the parts and forgetting to send part to manufacturer. "Figure 3.5" Shows the Fish Bone diagram of what is the root cause of weakness in internal control system?

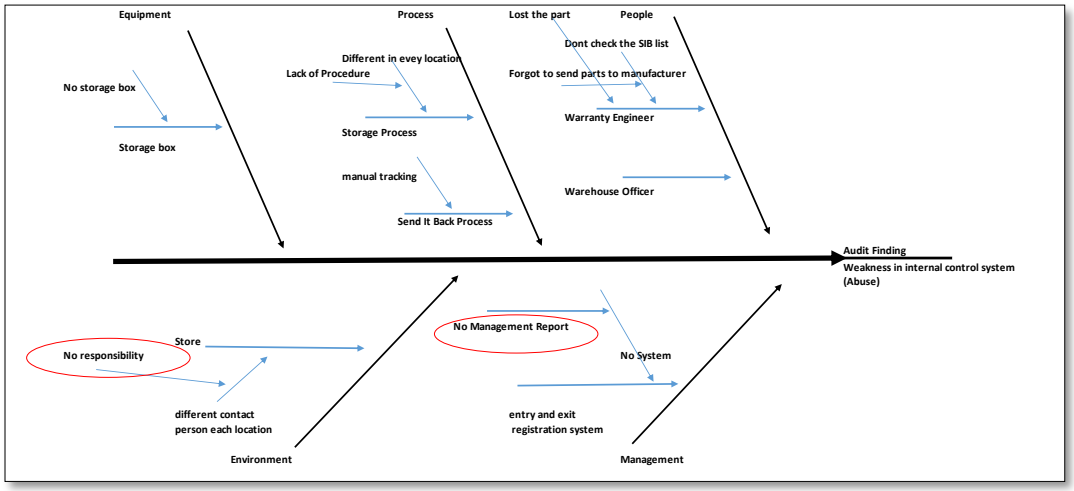


Figure 3.5 What is the root cause of weakness in internal control system? (Fish Bone)

According to diagram having no management report and having no person to check the warranty warehouse should be root causes of this problem.

But after creating the fish bone diagram, we need to take a step further this problem. So that we use why-because analysis for our two problems.

To solve the financial loss problem, we cope with abuse, early distraction and we should check SIB list more frequently. For weakness in an internal control system, we should create a stock tracking system for the scrap parts.

Scrap parts are very different from the other parts in the warehouse, because they have no original package and barcode so it is hard to integrate the standard stock system and also scrap parts should be correlated with the warranty work order, because when the manufacturer firm wanted these part back, they only send us the warranty work order number. For all these reasons, a new tracking system should be created for scrap parts and it is correlated with warranty work order numbers. "Figure 3.6" shows problem statement chart.

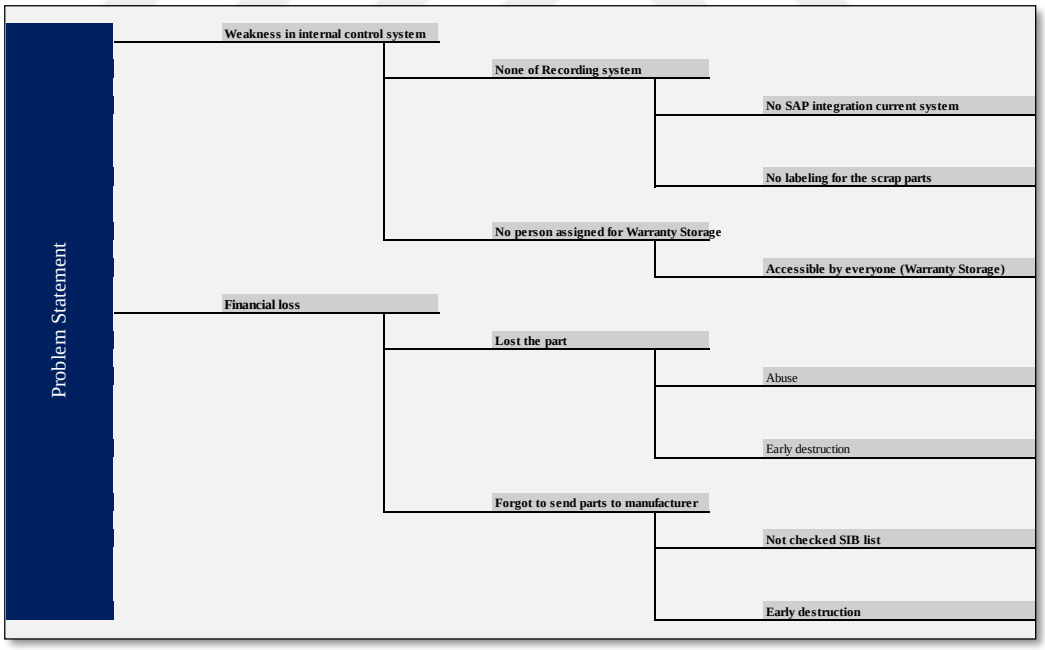


Figure 3.6 Problem Statement Chart

3.4. Improve and Control Phase

For evaluation of root causes, the project team chose to brainstorm, all team members share their interpretation and opinions. 12 idea was tendered from members “Table 3.12” shows brainstorming results and “Table 3.13” shows the classification of brainstorming results

A: Financial Loss - B: Weakness in Internal Control System

Table 3.11 Brainstorming results

	Financial Loss(A) / Weakness in Internal Control System(B)	**relation**
1	Creating a new warehouse tracking system for scrap parts.	**B**
2	Warranty Engineer shouldn’t be responsible from the warranty scrap parts	**B**
3	A person should responsible form warranty warehouse like parts warehouse	**B**
4	Workorder number should attached the scrap parts.	**A,B**
5	The parts should be storage for the workorder number	**B**
6	Creating a user-friendly SIB list	**A,B**
7	Warranty engineer shouldn’t join the warehouse procedure	**B**
8	Should create an barcode system for scrap pats for entrance and existence in warehouse	**A,B**
9	The warehouse register system should be integrated with the barcode system	**A,B**
10	Pre-destruction procedure should be apply for huge and valuable scrap parts	**B**
11	Request an evidence from destruction firm	**B**
12	SIB transporting invoice should be chased by the tracking system	**A**

These 12 ideas were grouped, according to their main segmentations and solution types.

Table 3.12 Classification of brainstorming results

1	Creating a new warehouse tracking system for scrap parts.	**Creating an new storage system with barcode**	**A,B**
	Workorder number should attached the scrap parts.		
	The parts should be storage for the workorder number		
	Creating a user-friendly SIB list		
	Should create an barcode system for scrap pats for entrance and existence in warehouse		
	The warehouse register system should be integrated with the barcode system		
	SIB transporting invoice should be chased by the tracking system		
2	Warranty Engineer shouldn’t be responsible from the warranty scrap parts	**Assigned a new employee for the scrap part storage**	**B**
	A person should responsible form warranty warehouse like parts warehouse		
	Warranty engineer shouldn’t join the warehouse procedure		
3	Pre-destruction procedure should be apply for huge and valuable scrap parts	**PARKING AREA (Out of Scope)**	**B**
	Request an evidence from destruction firm		

As a conclusion, main two solutions find. One of them creating a new storage system with barcode and the other is that to assign a new employee for the warranty parts storage.

For new barcode system, discussed with two firms which are sell barcode systems. End of the discussions, a draft label was created. This label includes

Work order number, claim number, label number, who create the label, part number, label date, and parts list. “Figure 3.7” is the view of new scrap parts label.

Figure 3.7 View of New Scrap Parts Label

This label will be integrated with the scrap parts warehouse system, and we can create a tracking report in every time from SAP system. “Table 3.13” shows new scrap parts warehouse entrance- existence report.

Table 3.13 View of new scrap parts warehouse entrance- existence report

Label information						Entrance İnformation			Existence information		
Store	Label No	Label Date	Workorder	Warranty Engineer name	Number of Part list	warehouseman	Storage Time	Number of Part	Existence date	Number of Part	Note
Adana	1220160001	25.12.2016	AD11500001	Volkan A	5	Ahmet A	25.12.2016	5	01.01.2017	5	SIB-CAT
Ankara	1220160002	25.12.2016	AN11500123	Kaan B	1	Cengiz B	25.12.2016	1	01.01.2017	1	

For this solution, we define tree KPI. “Table 3.14” Shows New KPI list for new Processes.

Table 3.14 KPI lists for this project

KPI no	Key Performance Indicators
1	Warranty workorder number vs. Workorder number of entrance in warehouse (%100 compliance)
2	Send it back all SIB part (%100 compliance)
3	Claim all transportation cost (%100 compliance)

At the end of the Improvement & Control phase, an Implementation Plan created “Table 3.15” shows improvement & control implementation plan.

Table 3.15 Improvement & Control Implementation Plan

No	Required Construction	Responsible	Date	Status
1	Buying Label/Sticker Device	Purchasing dept.	Jan 2017	Started
2	Assignment of warehouse worker	Service Manager	Dec 2016	Started
3	Creating System report for Warranty warehouse tracking	IT	Jan 2017	Started
4	KPI tracking and calculation	KPI Controller	Dec 2016	Started

3.5. Conclusion

In this thesis, I employed the Six Sigma practices in a warranty department as a case study to discuss the problems and prospects of Six Sigma in modern industries. This includes identifying problems and their root causes to determine where focus should be placed. Further it was aimed at establishing a definition of scrap parts delivery performance and metrics for how this could be measured.

3.5.1 Conclusion of Project

As a conclusion of this Six Sigma study, the last month of 2016 and the first month of 2017 data was started the calculating for to see the efficiency of this project. Automatic warehouse register system has not started yet, but now manual register system and new process map applied for Dec.2016 and Jan2017. New duties and responsibilities signed new personals. Warranty warehouse registration assigned parts warehouse and today, warranty engineers don’t handle scrap parts storage. This system gains the engineer extra one hour in a day, totally 10 warranty engineer gains 200 working hour in a month. An engineer cost for one hour in the company is $20. This is equal to $4000 for a month for 10 engineers.

As result of calculation of the project, at the end of 2017, It is expected 2400 work hour save and depends on this $48000 cost save from engineers. The engineers can be directed more value-added jobs. They can take on new valuable responsibility.

With this project, it is detected that the scrap revenue has been added in overheads statements, but this revenue should be in warranty budget so that, In 2017 about $10.200 will be located in warranty income.

Also, when we don't send the required parts to the manufacturer in 3 quarter of 2016 $36.000 money was withdrawn. In 2015 this cost is $45.000 and in 2014 this cost is $40.000. With this project, all SIB required parts send in Dec2016 and in future our target is all required parts must send to manufacturer. (In SIB list parts) so that, this loss in 2017 will be zero dollars because this subject is directly related to warehouse registration efficiency and success. "Table 3.16" shows the financial result of the project.

Table 3.16 Financial Results of the project

Goal	Current	Result in Month	Results in Year
Cost Save for 10 War. Engineer	0	$ 4.000	$ 48.000
Time Save for 10 War. Engineer	0	200 hour	2400 hour
Scrap revenue in warranty budged for all regions	0	$ 850	$ 10.200
Warehouse recording success	90%	97%	100%
SIB process success	85%	100%	100%
Reducing Withdrawn Money claim	-$ 36.000	0	0

Also, with this Six Sigma project and with new registration system the efficiency of warehouse registration system increase from %90 to %97 and in this case, all SIB parts send to manufacturer. This SIB efficiency increased %85 to %100. "Table 3.17" shows efficiency and tracking results of the project in Dec2016-Jan2017. All required parts send the manufacturer in this two validation month. The detailed table is in the appendix. (Appx -2)

Table 3.17 Efficiency and tracing results of the project (Dec2016-Jan2017)

Dec 2016 + Jan 2017											
What can be measured?	ÇAYIROVA	ANKARA	İZMİR	ADANA	3rd Airport	BURSA	TRAKYA	TRABZON	ANTALYA	DİYARBAKIR	Total
Number of Warranty work order	150	160	221	163	91	112	89	56	72	82	1196
Number of Workorder have Warehouse registration	144	154	216	158	88	109	85	55	69	79	1157
Number of missing part list (workorder)	6	6	5	5	3	3	4	1	3	3	39
Percentage of loss Part	4%	4%	2%	3%	3%	3%	4%	2%	4%	4%	3%
Percentage of True registration	96%	96%	98%	97%	97%	97%	96%	98%	96%	96%	97%
Sigma Level	3,3	3,3	3,7	3,5	3,5	3,5	3,3	3,6	3,3	3,3	3,5
Number of Warranty work order in SIB list	2	1	3	3	4	1	1	1	1	1	18
Number of War. WO which NOT send to Manufacturer	0	0	0	0	0	0	0	0	0	0	0
Number of Claim Withdrawn Money	0	0	0	0	0	0	0	0	0	0	0
Percentage of True registration	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sigma Level of SIB sending	6	6	6	6	6	6	6	6	6	6	6

As quick win, at the beginning of the project ıt is noticed that SIB parts' transportation cost have not been claimed the manufacturer. According to dealer agreement, if the manufacturer would require parts from the dealer, the manufacturer must responsible for the transportation costs. So that, the project team contacted the manufacturer firm to take the transportation

cost of 2016 SIB parts. As a conclusion of this contact, this project have totally $68.000 transportation cost taken from the manufacturer.

With the quick wins this project, the 68.000 dollar transportation cost invoiced to the manufacturer in 2016. “Table 3.18” shows Transportation cost claims numbers and payments.

Table 3.18 Transportation cost claims

Claim Number	Paid
TR25162	$ 16.801
TR251611	$ 15.807
TR24666	$ 4.010
TR24562	$ 4.010
TR24303	$ 4.020
HV24507	$ 2.417
HV23293	$ 7.887
HV23294	$ 13.206
Total	$ 68.158

The detail of the claim payment is shown at appendices (Appx-3). For 2017 Plan, the project saves 48.000 labor dollar cost and it prevents average 40.000 dollars withdrawn money. Also, it takes 10.400 dollar scrap parts revenue. This calculation is done according to 2014-2015-2016 years' data. The project team predicts 10400 dollar scrap parts revenue in warranty bugged. Scrap parts revenue was calculated at the contracted firm table rates and annual scrap parts weights. Before this project, scrap pars revenue had not been added in warranty budged. We notice this problem with this project.

“Table 3.19” shows the payment for scrap parts and “Table 3.20” shows Regional distribution of scrap parts in our firm. (2014-2015-2016)

Table 3.19 Waste Scope and Pricing Table Screen Shot

- AnelDoğa imha edilecek garanti parçaları için Firma’ya aşağıdaki gibi ödeme yapacaktır.

Hurda Malzeme Adı	Atık Kodu	Fiyat (TL/Kg)*
Garanti Aksam Parça	16 01 22	0,21
Yağ Filtresi (kullanılmamış)	16 01 22	0,07

[1]KDV oranı hurda malzemelerde KDV Kanunu 17/4-G maddesi gereğince %0’dır.

Table 3.20 Regional Distribution of Scrap Parts (KG) (2014-2015-2016)

Annual Scrapped Part (KG)	ÇAYIROVA	ANKARA	İZMİR	ADANA	3rd Airport	BURSA	TRAKYA	TRABZON	ANTALYA	DİYARBAKIR	Total (KG)	Scrapped Part Revenue
2014	13.385	22.928	24.736	20.165	25.766	11.878	8.262	7.132	6.278	9.920	152.464	32.017 TL
2015	15.043	25.769	27.801	22.664	28.958	13.350	9.286	8.016	7.056	11.148	171.105	35.932 TL
2016	17.082	29.260	31.567	25.735	32.881	15.159	10.544	9.102	8.012	12.659	194.016	40.743 TL

Table 3.21 Summary Results Table of the Project

Revenue List	2016	2017
Cost save from Labor		$ 48.000
Scrap Revenue		$ 10.200
Reducing Withdrawn Money		$ 40.000
Quick Win (transportaion invoices)	$ 68.000	
Total	$ 68.000	$ 98.200

In addition to financial results, the process flow chart is changed and is developed. Scrap parts storage process was created and this process was assigned general parts warehouse. In 2017, warehousemen will be responsible for scrap parts instead of warranty engineers. New process diagrams and flow charts are added the appendix (Appx 4-5)

Table 3.22 Comparison of Results Table of the Project

Annual scrap tonnage	Before the Project	After The the Project
Percentage of loss Part	10%	**3%**
Percentage of True registration	90%	**97%**
Sigma Level	2,8	**3,5**
Percentage of True registration	85%	**100%**
Sigma Level of SIB sending	2,5	**6**

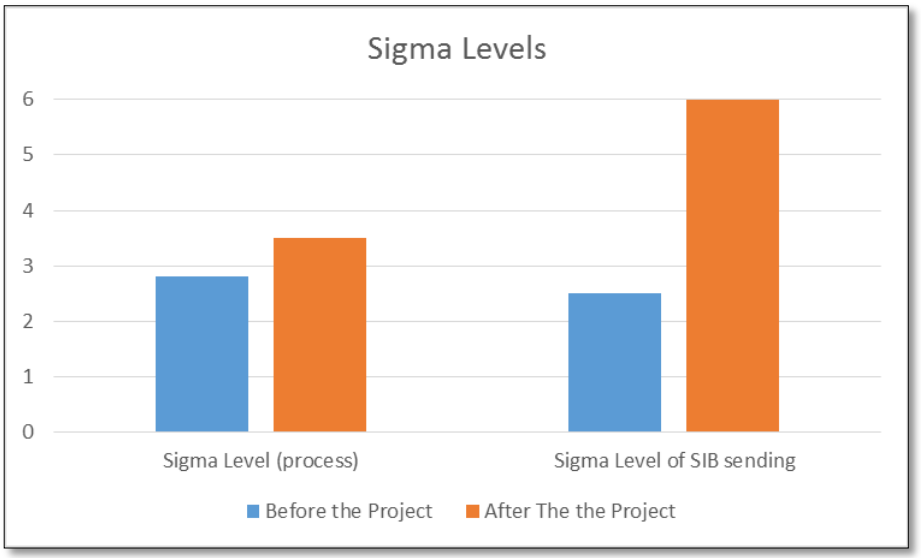


Figure3.8 Comparison of Sigma Level

3.5.2 Recommendations and Further Discussions

When we started the literature research, we saw the most of engineering and technology management articles and master thesis about Six Sigma methodology and six sigma studies. In this thesis we have presented several new ideas that have been tested on a limited scale. Implemented six sigma methodologies could bring multiple important values to the test performance. Using six sigma revealed that adding one more process. Cost reductions, improvements in efficiency, reduction in lead time, and higher quality of the product being delivered ultimately benefit consumers and shareholders. Improvements in the processes benefit both managers and employees. Six Sigma project is generally used in the manufacturing sector in Turkey. However, when analyzed globally, Six Sigma has been mostly used in process improvement. Six Sigma can be taught as a course in engineering faculty or master programs. Because, all new graduated engineers should have knowledge about six sigma and ıts tools.

Positive aspects;

- 6 Sigma is a valuable methodology for engineering and technology management and reengineering.
- It provides a performance goal for everyone and increases the value that given to customer.
- It creates a constant success.

Negative aspects;

- Six sigma culture is not common enough in Turkey
- It is necessary to observe for long time periods in order to obtain full results.
- Every member of the team must be enthusiastic and responsible.
- Six sigma-trained members are needed for the Project team.
- Six Sigma Trainings are long and costly.

In this thesis we analyzed the warranty scrap part store efficiency, at the end of the six sigma project we improved the efficiency and we created a tracking system for warranty store. For further research will be analyzed the entrance and existence time period of scraps and weight of scrap parts. These analyzes will show us, the economical destruction periods of scraps. Another further research topic can be about reusing scraps, for this research can be work with manufacturer and I can calculate possible income.

BIBLIOGRAPHY

Adams, Cary W.; Gupta, Praveen; Wilson, Charles E. (2003). Six Sigma Deployment

Baczweski, R. A., 2005, "Four Methods for Improving Performance: A Comperison", Healthcare Financal Management

Banuelas, R., Antony, J., Brace, M., 2005, "An Application of Six Sigma to Reduce Waste", Quality and Reability Engineering International

Borusan - Six Sigma Expert Green Belt Training Documents (May 2016)

Breyfogle, F. W., Cupello, J. M., Meadows, B., 2001, "Managing Six Sigma: A Practical Guide to Understanding", Assessing and Implementing the Strategy That Yields Bottom-Line Success

Calcutt, R., 2001, "Why is Six Sigma Successful?", Journal of Applied Statistics

Chan, K. K., Spedding, T. A., 2001, "On-line Optimization of Quality in a Manufacturing System", International Journal of Production Research

Chen, Y. T., Ali, O. G., 1999, "Design Quality and Robustness with Neural Networks", IEEE Transactions on Neural Networks

Chonghun, H., Young-Hak, L., 2002, "Intelligent Integrated Plant Operation System for Six Sigma", Annual Reviews in Control

Chowdury, S., 2001, The Power of Six Sigma, Subir Chowdhury, Chicago

De Mast, J., Schippers, W. A. J., Does, R. J. M. M., Van Den Heuvel, E. R., 2000, "Steps and Strategies in Process Improvement", Quality and Reliability Engineering International

Deshpande, P. B., Makker, S. L., Goldstein, M., 1999, "Boost Compotitiveness via Six Sigma", Chemicial Engineering Progress

Gijo, E.V., Rao, T. S., 2005, "Six Sigma Implementation-Hurdles and more Hurdles", Total Quality Management

Goh, T. N., 2001, "A Pragmatic Approach to Experimentel Design in Industry", Journal of Applied Static

Gross, J. M., 2001, “A Road Map to Six Sigma Quality”, Quality Progress

Hahn, G. J, Hill, R. W., Zinkgraf, S. A., 1999, “The Impact of Six Sigma Improvement –A Glimpse Into the Future of Statistics”, American Statistician

Hoerl, R. W., 2001, “Six Sigma Black Belts:What do they need to know?”, Journal of Quality Technology

Linderman, K., Schroeder, R.G., Zaheer, S., Choo, A.S., 2003, “Six Sigma: a goal-theoretic perspective”, Journal of Operations Management

Neuscheler-Fritsch, D., Norris, R., 2001, “Capturing Financial Benefits From Six Sigma”, Quality Progress

Nevalainen, D., Berte, L., Kraft, C., Leigh, E., Picaso, L., Morgan, T., 2000, “Evaluating Laboratory Performance on Quality Indicators with the Six Sigma Scale”, Archives of Pathology&Laboratory Medicine

Pearson, T. A., 2001, “Measure of Six Sigma Success”, Quality Progress

Ruffa, Stephen A. (2008). Going Lean: How the Best Companies Apply Lean Manufacturing Principles to Shatter Uncertainty, Drive Innovation, and Maximize Profits

Pyzdek, Thomas & Paul A. Keller (2009). The Six Sigma Handbook, Third Edition

Taylor, Gerald (2008). Lean Six Sigma Service Excellence: A Guide to Green Belt Certification and Bottom Line Improvement

Wyper, B., Harrison, A., 2000, “Deployment of Six Sigma Methodology in Human Resource Function: a case study”, Total Quality Management

https://de.slideshare.net (December 2016)

https://en.wikipedia.org/wiki/Six_Sigma (November 2016)

https://isoconsultantpune.com (December 2016)

https://www.academia.edu (November 2016)

https://www.isixsigma.com/ (November 2016)

http://www.tutorialspoint.com/six_sigma/ (October 2016)

APPENDIX-1

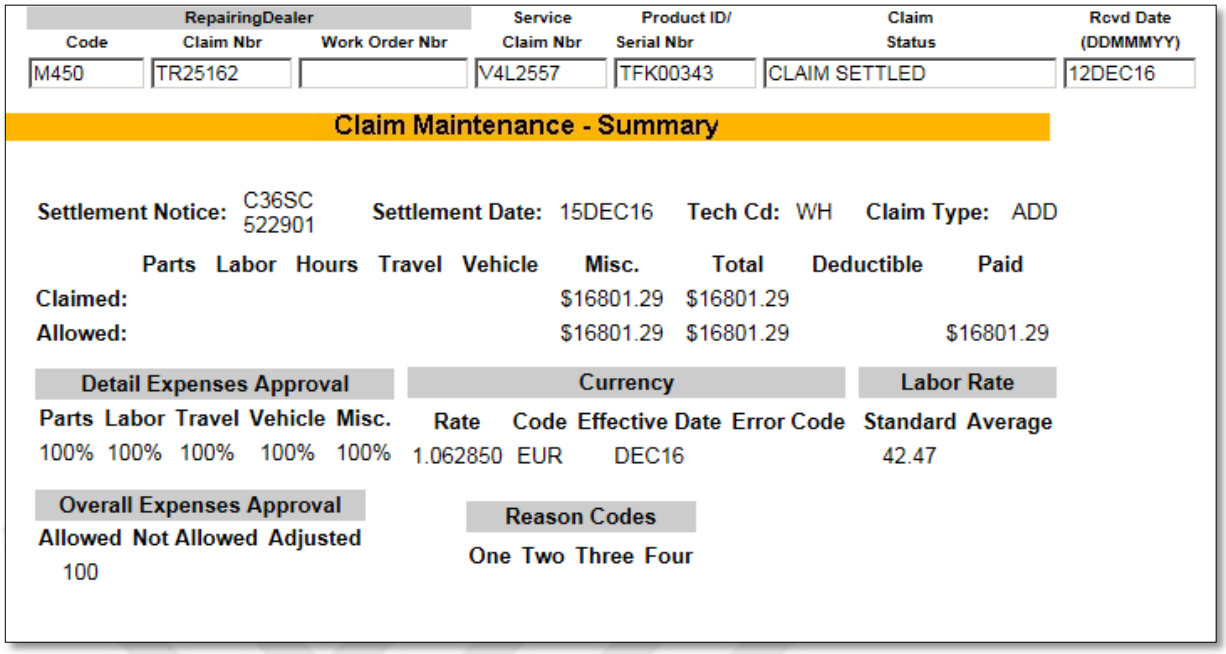
Appx-1 Six Sigma Calculation Table

DPMO	Sigma Short Term (Z_{ST})	Sigma Long Term (Z_{LT})	Yield	Cpk
2	6.00	4.50	99.999660	2.00
5	5.90	4.40	99.999540	1.97
9	5.80	4.30	99.999150	1.93
13	5.70	4.20	99.998700	1.90
21	5.60	4.10	99.997900	1.87
32	5.50	4.00	99.996800	1.83
48	5.40	3.90	99.995000	1.80
72	5.40	3.90	99.993000	1.77
108	5.20	3.70	99.989000	1.73
159	5.10	3.60	99.984000	1.70
233	5.00	3.50	99.980000	1.67
337	4.90	3.40	99.970000	1.63
483	4.80	3.30	99.950000	1.60
687	4.70	3.20	99.930000	1.57
968	4.60	3.10	99.900000	1.53
1,350	4.50	3.00	99.870000	1.50
1,866	4.40	2.90	99.810000	1.47
2,555	4.30	2.80	99.740000	1.43
3,467	4.20	2.70	99.650000	1.40
4.661	4.10	2.60	99.500000	1.37
6,210	4.00	2.50	99.400000	1.33
8,198	3.90	2.40	99.200000	1.30
10,724	3.80	2.30	98.900000	1.27
13,903	3.70	2.20	98.600000	1.23
17,864	3.60	2.10	98.200000	1.20
22,750	3.50	2.00	97.700000	1.17
28,716	3.40	1.90	97.100000	1.13
35,930	3.30	1.80	96.400000	1.10
44,565	3.20	1.70	95.500000	1.07
54,799	3.10	1.60	94.500000	1.03
66,807	3.00	1.50	93.300000	1.00
80,757	2.90	1.40	91.900000	0.97
96,801	2.80	1.30	90.300000	0.93
115,070	2.70	1.20	88.500000	0.90
135,666	2.60	1.10	86.400000	0.87
158,655	2.50	1.00	84.100000	0.83
184,060	2.40	0.90	81.600000	0.80
211,855	2.30	0.80	78.800000	0.77
241,964	2.20	0.70	75.800000	0.73
274,253	2.10	0.60	72.600000	0.70
308,538	2.00	0.50	69.100000	0.67
344,578	1.90	0.40	65.500000	0.63
382,089	1.80	0.30	61.800000	0.60
420,740	1.70	0.20	57.900000	0.57
460,172	1.60	0.10	54.000000	0.53
500,000	1.50	0.00	50.000000	0.50
539,828	1.40	-0.10	46.000000	0.47
579,260	1.30	-0.20	42.100000	0.43
617,911	1.20	-0.30	38.200000	0.40
655,422	1.10	-0.40	34.500000	0.37
691,462	1.00	-0.50	30.900000	0.33
725,747	0.90	-0.60	27.400000	0.30
758,036	0.80	-0.70	24.200000	0.27
788,145	0.70	-0.80	21.200000	0.23
815,940	0.60	-0.90	18.400000	0.20
841,345	0.50	-1.00	15.900000	0.17
864,334	0.40	-1.10	13.600000	0.13
884,930	0.30	-1.20	11.500000	0.10
903,199	0.20	-1.30	9.700000	0.07
919,243	0.10	-1.40	8.100000	0.03
933,193	0.00	-1.50	6.700000	0.00

Appx-2 results of new registration system for December 2016 and January 2017

	Number of Warranty work order		
	December	Jan 2017	Total
ADANA	126	37	163
ANKARA	110	50	160
ANTALYA	44	28	72
BURSA	91	21	112
DIYARBAKIR	62	20	82
3.AIR PORT.	61	30	91
ÇAYIROVA	106	44	150
IZMIR	177	44	221
TRAKYA	79	10	89
TRABZON	45	11	56
TOTAL	901	295	1196
	Number of Workorder have Warehouse registration		
	December	Jan 2017	Total
ADANA	121	37	158
ANKARA	105	49	154
ANTALYA	41	28	69
BURSA	88	21	109
DIYARBAKIR	59	20	79
3.AIR PORT.	58	30	88
ÇAYIROVA	101	43	144
IZMIR	172	44	216
TRAKYA	75	10	85
TRABZON	44	11	55
TOTAL	864	293	1157

Appx-3 Transportation cost claims payment



RepairingDealer Code	Claim Nbr	Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	TR25162		V4L2557	TFK00343	CLAIM SETTLED	12DEC16

Claim Maintenance - Summary

Settlement Notice: C36SC 522901 **Settlement Date:** 15DEC16 **Tech Cd:** WH **Claim Type:** ADD

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$16801.29	$16801.29		
Allowed:						$16801.29	$16801.29		$16801.29

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.062850	EUR	DEC16	

Labor Rate

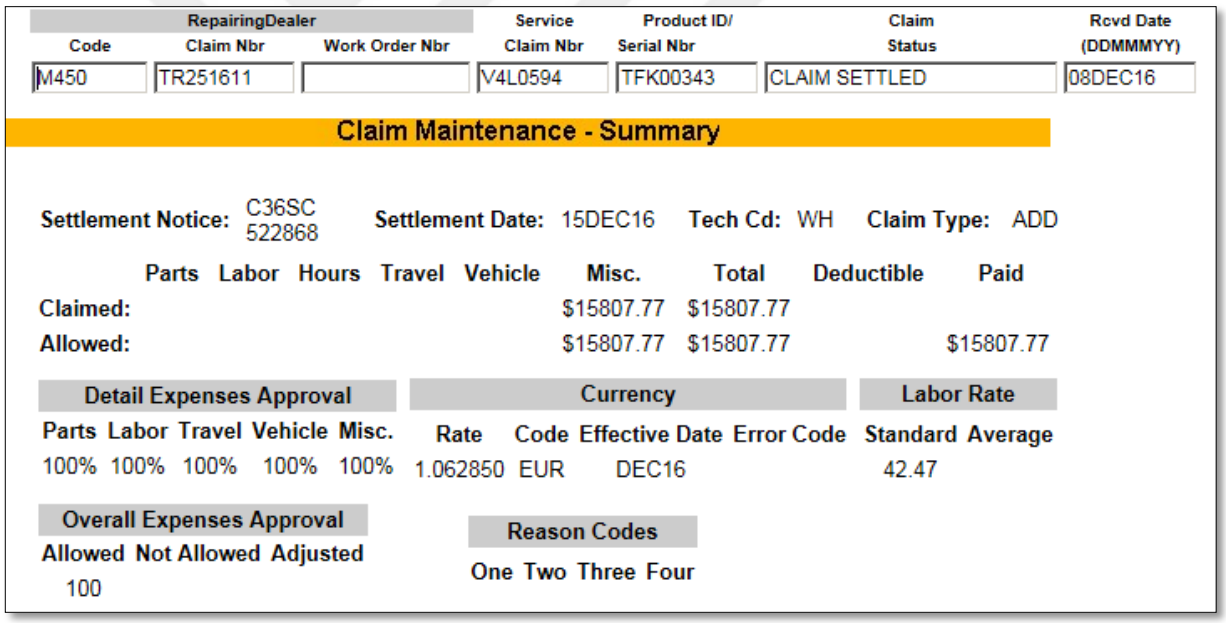
Standard	Average
42.47	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One Two Three Four



RepairingDealer Code	Claim Nbr	Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	TR251611		V4L0594	TFK00343	CLAIM SETTLED	08DEC16

Claim Maintenance - Summary

Settlement Notice: C36SC 522868 **Settlement Date:** 15DEC16 **Tech Cd:** WH **Claim Type:** ADD

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$15807.77	$15807.77		
Allowed:						$15807.77	$15807.77		$15807.77

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.062850	EUR	DEC16	

Labor Rate

Standard	Average
42.47	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One Two Three Four

RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	TR24666		V4H3348	TFK00347	CLAIM SETTLED	18OCT16

Claim Maintenance - Summary

Settlement Notice: C36SC 494590 **Settlement Date:** 19OCT16 **Tech Cd:** XE **Claim Type:**

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$4010.49	$4010.49		
Allowed:						$4010.49	$4010.49		$4010.49

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.117750	EUR	OCT16	

Labor Rate

Standard	Average
44.67	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One	Two	Three	Four

RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	TR24562	TR1124302	V4H3335	TFK00355	CLAIM SETTLED	18OCT16

Claim Maintenance - Summary

Settlement Notice: C36SC 502020 **Settlement Date:** 04NOV16 **Tech Cd:** WH **Claim Type:** ADD

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$4010.49	$4010.49		
Allowed:						$4010.49	$4010.49		$4010.49

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.117750	EUR	OCT16	

Labor Rate

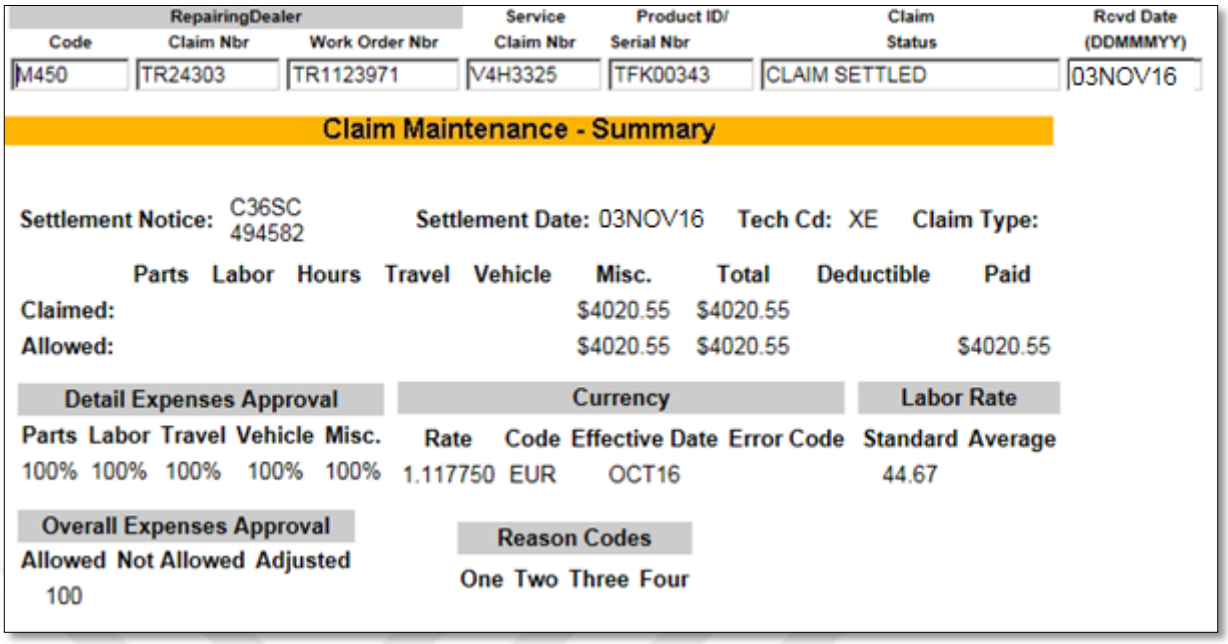
Standard	Average
44.67	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One	Two	Three	Four



RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	TR24303	TR1123971	V4H3325	TFK00343	CLAIM SETTLED	03NOV16

Claim Maintenance - Summary

Settlement Notice: C36SC 494582 **Settlement Date:** 03NOV16 **Tech Cd:** XE **Claim Type:**

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$4020.55	$4020.55		
Allowed:						$4020.55	$4020.55		$4020.55

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.117750	EUR	OCT16	

Labor Rate

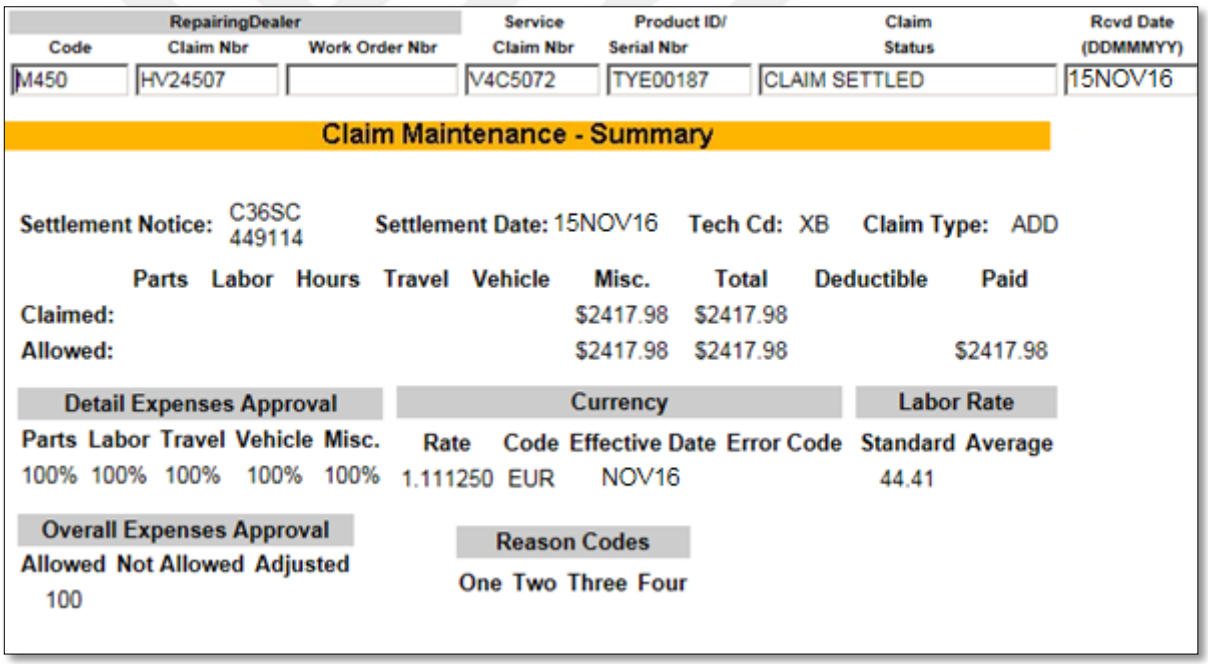
Standard	Average
44.67	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One	Two	Three	Four



RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	HV24507		V4C5072	TYE00187	CLAIM SETTLED	15NOV16

Claim Maintenance - Summary

Settlement Notice: C36SC 449114 **Settlement Date:** 15NOV16 **Tech Cd:** XB **Claim Type:** ADD

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$2417.98	$2417.98		
Allowed:						$2417.98	$2417.98		$2417.98

Detail Expenses Approval

Parts	Labor	Travel	Vehicle	Misc.
100%	100%	100%	100%	100%

Currency

Rate	Code	Effective Date	Error Code
1.111250	EUR	NOV16	

Labor Rate

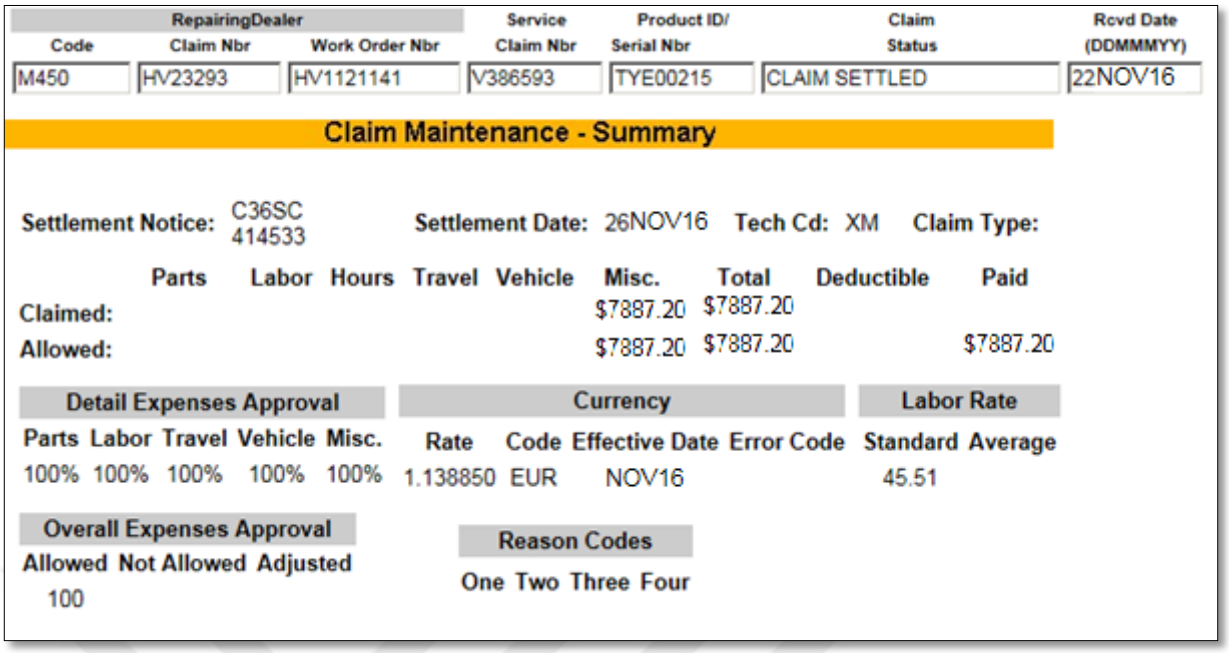
Standard	Average
44.41	

Overall Expenses Approval

Allowed	Not Allowed	Adjusted
100		

Reason Codes

One	Two	Three	Four



RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	HV23293	HV1121141	V386593	TYE00215	CLAIM SETTLED	22NOV16

Claim Maintenance - Summary

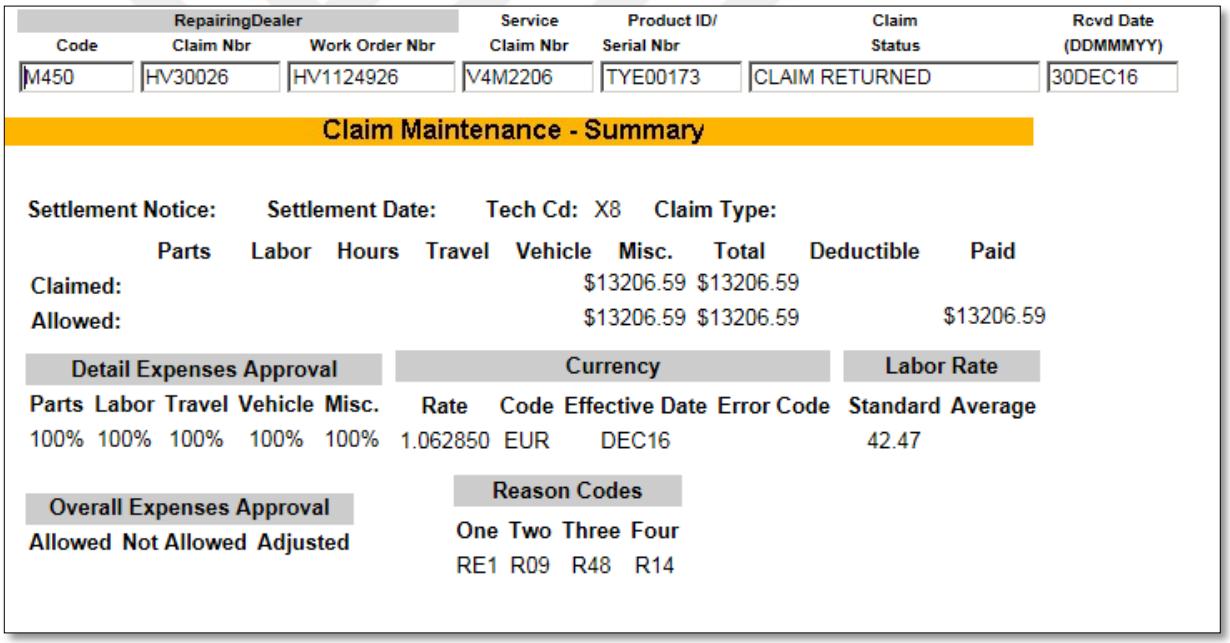
Settlement Notice: C36SC 414533 Settlement Date: 26NOV16 Tech Cd: XM Claim Type:

	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$7887.20	$7887.20		
Allowed:						$7887.20	$7887.20		$7887.20

Detail Expenses Approval					Currency				Labor Rate	
Parts	Labor	Travel	Vehicle	Misc.	Rate	Code	Effective Date	Error Code	Standard	Average
100%	100%	100%	100%	100%	1.138850	EUR	NOV16		45.51	

Overall Expenses Approval		
Allowed	Not Allowed	Adjusted
100		

Reason Codes			
One	Two	Three	Four



RepairingDealer Code	RepairingDealer Claim Nbr	RepairingDealer Work Order Nbr	Service Claim Nbr	Product ID/ Serial Nbr	Claim Status	Rcvd Date (DDMMMYY)
M450	HV30026	HV1124926	V4M2206	TYE00173	CLAIM RETURNED	30DEC16

Claim Maintenance - Summary

Settlement Notice: Settlement Date: Tech Cd: X8 Claim Type:

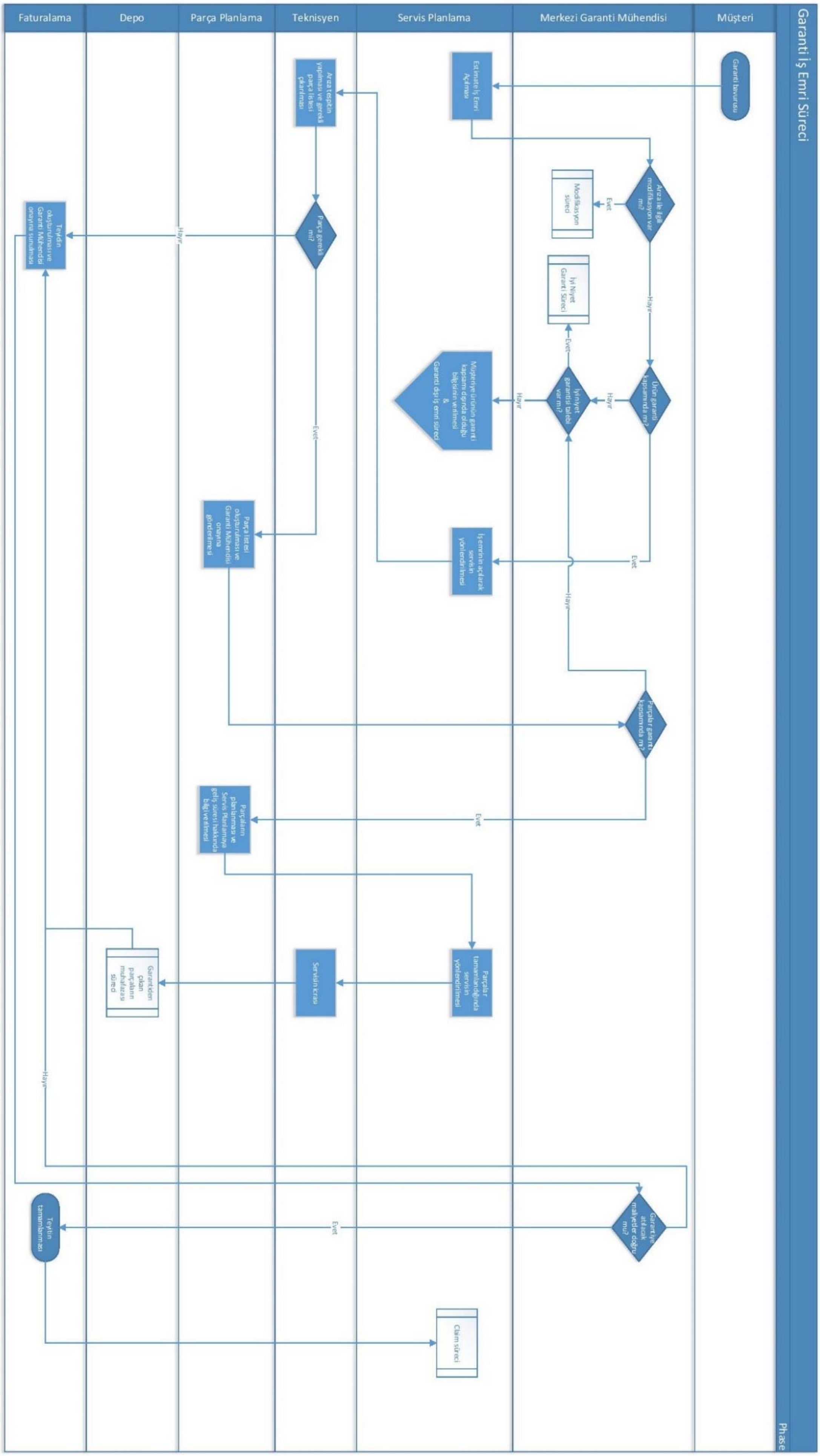
	Parts	Labor	Hours	Travel	Vehicle	Misc.	Total	Deductible	Paid
Claimed:						$13206.59	$13206.59		
Allowed:						$13206.59	$13206.59		$13206.59

Detail Expenses Approval					Currency				Labor Rate	
Parts	Labor	Travel	Vehicle	Misc.	Rate	Code	Effective Date	Error Code	Standard	Average
100%	100%	100%	100%	100%	1.062850	EUR	DEC16		42.47	

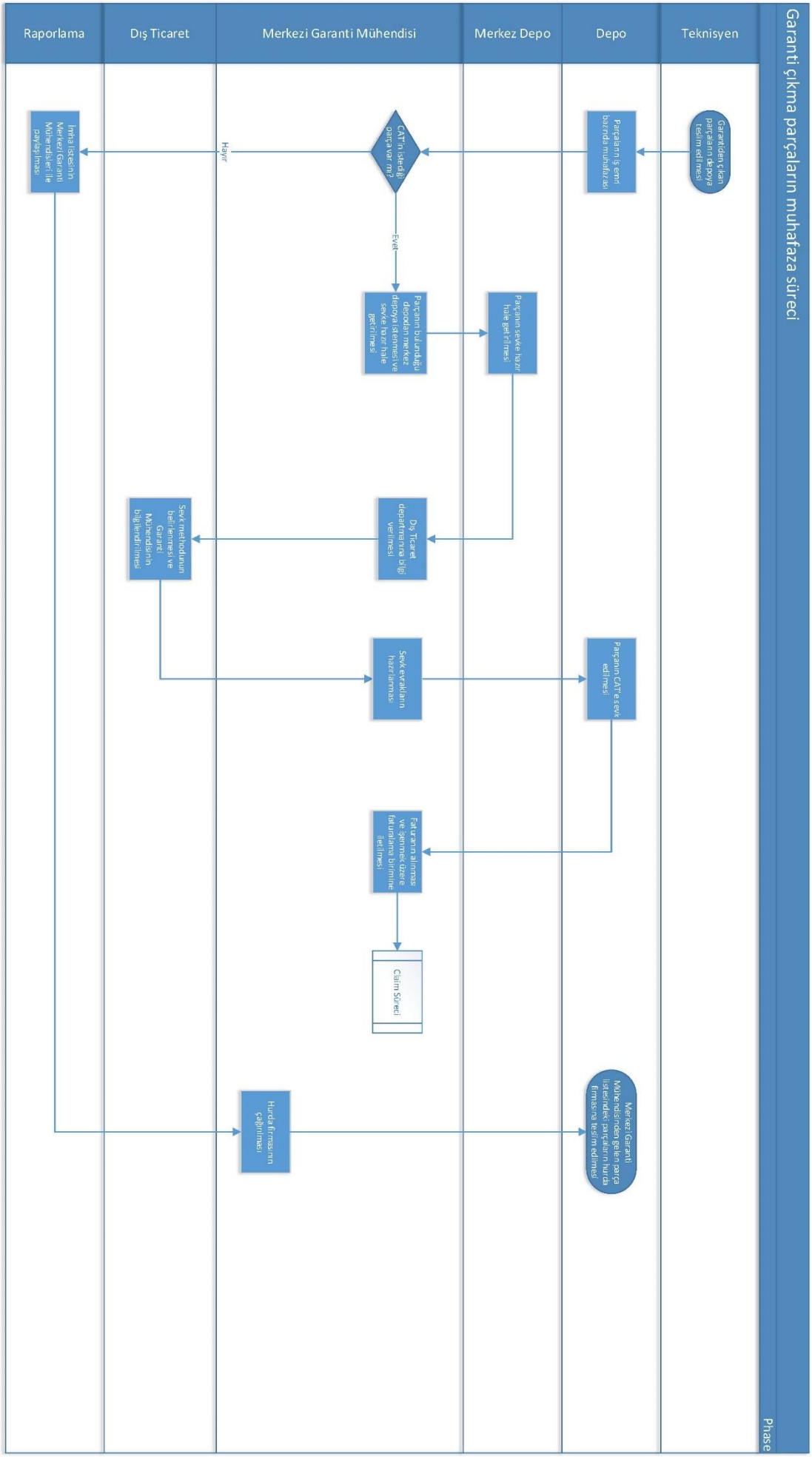
Overall Expenses Approval		
Allowed	Not Allowed	Adjusted

Reason Codes			
One	Two	Three	Four
RE1	R09	R48	R14

Appx-4


Garanti İş Emri Süreci
Phase
Müşteri
Merkezi Garanti Mühendisi
Servis Planlama
Teknisyen
Parça Planlama
Depo
Faturalama
Garanti bavurusu
Estimate İş Emri Açılması
Arıza ile ilgili modifikasyon var mı?
Evet
Modifikasyon süreci
Hayır
Ürün garanti kapsamında mı?
İyi niyet garantisi talebi var mı?
İyi Niyet Garanti Süreci
Müşteriye ürünün garanti kapsamı dışında olduğu bilgisinin verilmesi & Garanti dışı iş emri süreci
İş emrinin açılarak servisin yönlendirilmesi
Arıza tespitin yapılması ve gerekli parça listesi çıkarılması
Parça gerekli mi?
Parça listesi oluşturulması ve Garanti Mühendisi onayına gönderilmesi
Parçalar garanti kapsamında mı?
Parçaların planlanması ve Servis Planlamaya geliş süresi hakkında bilgi verilmesi
Parçalar tamamlandığında servisin yönlendirilmesi
Servisin icrası
Garantiden çıkan parçaların muhafazası süreci
Teyidin oluşturulması ve Garanti Mühendisi onayına sunulması
Garantiye atılacak maliyetler doğru mu?
Teyitin tamamlanması
Claim süreci

Appx-5


Garanti çıkma parçaların muhafaza süreci
Teknisyen
Depo
Merkez Depo
Merkezi Garanti Mühendisi
Dış Ticaret
Raporlama
Garantiden çıkan parçaların depoya teslim edilmesi
Parçaların işlemi bazında muhafazası
CAT'in istediği parça var mı?
Hayır
Evet
İmha listesinin Merkez Garanti Mühendisleri ile paylaşılması
Parçanın bulunduğu depodan merkez deposuna istenmesi ve sevke hazır hale getirilmesi
Parçanın sevke hazır hale getirilmesi
Dış Ticaret departmanına bilgi verilmesi
Sevk methodunun belirlenmesi ve Garanti Mühendisinin bilgilendirilmesi
Sevk evraklarının hazırlanması
Parçanın CAT'e sevk edilmesi
Faturanın alınması ve işlenmek üzere faturalama birimine iletilmesi
Claim Süreci
Hurda firmasının çağrılması
Merkezi Garanti Mühendisinden gelen parça listesindeki parçaların hurda firmasına teslim edilmesi
Phase

RESUME

Murat Can Atalay

Work Experience; Borusan Machine & Power Systems / Caterpillar, (01.08.2012 – Present)

- Business Development Engineer / Head Office – Service (01.01.2017 – Present),
- Warranty and Technical Communication Engineer/ Head Office – Service (01.07.2014 – 31.12.2016),
- Service Support Engineer /Head Office – Service (15.09.2012 – 30.06.2014)

Education

- Degree: Doğuş University, Industrial Engineering (2008 -2013)
- Master Degree: Doğuş University, Engineering and Technology Management (Sep 2013 – Jan 2017)

Certifications

- Six Sigma Green Belt Certified (SSGBC) – Borusan 6sigma

Academic Research Activities

- Boğaziçi Üniversitesi YBS.2014 (16 Oct 2014) "Implementation of Quality Function Distribution in Software Processing Development"(Murat Can Atalay, Yasemin Karagül, Asena Çağıl Öztaş -2014)
  http://misprivate.boun.edu.tr/kutlu/ybs2014/ozetler.htm