1 APPLICATION

This chapter provides details about the execution of the lean six sigma DMAIC project. The phases used for the define, measure and analyze case study are applied in detail in this chapter. The first part of the application starts by presenting the results obtained in the execution of the define phase. These results are followed by the presentation of the results from the execution of the measurement phase. Then, a presentation of the results obtained from the execution of the analysis phase is carried out. The implementation section also ends with the development of recommendations to permanently improve and control the order processing process

1.1 General Information About the Company

The application starts with giving general information about the company where lean six sigma method is used. This company, which operates in the service sector where lean six sigma is applied and used in the analysis, is based in Serbia and is traded on a cryptocurrency exchange serving in 42 different countries. In June 2022, cryptocurrency exchanges ranked in the top 50 in the world ranking in net income distribution, with a daily trading volume of more than 3 million dollars. Although the company where the application was made is an international company, the data used is limited only to Turkey.

Data security is a high priority due to the company's business and the market it is in. Therefore, in the application with the company, restrictions were imposed by the company. These restrictions are listed as follows;

- Not publishing certain parts of the workflow diagram,
- No identifying or implying information about the company,
- Not sharing information on all financial matters, even for implementation, and not disclosing the budget,
- Financial calculations that may occur within the implementation are made within the company itself and the project manager is not included in this process.
- A positive or negative response.

The service provided by the company can be examined under two general headings as mobile application and web application. The departments where customer satisfaction may be related to the interviews with the company were decided as follows:

- Business Development Department,

-Online Reputation Management Department,

-Customer Support Unit,

-Financial Security and Compliance Control Department: This is a department created as a requirement of the firm's market. It serves as the department that deals with issues such as security of opened accounts, account verification, reporting possible threats, taking action, process and quality management compliance control.

In addition, the request of the company to carry out the process for the website side of the process before the examination was accepted. The application was made for the website part of the company. Since there is always a distinction between mobile or web in data collection tools, it was examined and confirmed that there would be no need for any contamination or cleaning process in the website data.

1.2 Key Performance Indicators

The variables or customer service key performance indicators to be used in the analysis are listed as follows. These indicators were determined by reviewing the literature on companies operating in the service sector and in line with expert opinions.

Customer satisfaction score (CSAT)

The CSAT, referred to as the customer satisfaction score, can refer to a variety of different measures. In simple adaptations, it refers to how a customer rates their satisfaction with a product or service on a specific scale during or after consumption. Users are simply asked the question "How would you rate your experience with us?" on a 5-point Likert scale ranging from not at all satisfied to very satisfied (Grigoroudis & Siskos, 2010). Finally, the overall customer satisfaction score is calculated by dividing the number of satisfied users by the total number of users.

$$CSAT = \frac{\text{memnun olan kullanıcı sayısı}}{\text{toplam alınan cevap sayısı}}$$

Companies using CSAT often collect data from multiple service points. Collecting data from multiple sources allows comparison of different parts and points in the business process to find weak links in the service from the customer's perspective.

Figure 4. 1 Sample Survey Question

Net Promoter Score (NPS)

NPS, referred to as Net Promoter Score, is a metric introduced by Frederick F. Reichheld in his 2003 paper. He later concluded in multiple case studies that there is a strong relationship between willingness to recommend a service, repeat purchases and referrals. Reichheld's research formalized the NPS into a single question, "How likely are you to recommend the service to someone else?" with the response a score on a scale from 0 to 10. Responses were grouped into three sections shown in the figure. Responses between 0 and 6 are from detractors, 7 and 8 are from passive customers and 9 to 10 are from supporters.

Figure 4. 2 NPS Sample Question

The calculation of the net promoter score is as follows;

$$NPS = \frac{\text{destekçilerin sayısı} - \text{kötüleyenlerin sayısı}}{\text{yanıtlayan sayısı}} \times 100$$

The above formula leads to a score that can range from -100 to 100. The purpose of tracking the share of promoters stems from the idea that promoters are the most loyal customers who drive the company's growth through both purchase and word-of-mouth marketing. By focusing on the strengths of the business valued by promoters and the weaknesses pointed out by detractors, important steps are likely to be taken towards achieving higher customer loyalty (Reichheld, 2003).

Customer Effort Score (CES)

CES, originally referred to as Customer Effort Score, was created in HBR articles (Dixon et al., 2010). Research has shown that instead of satisfying customers, reducing the effort required from the customer to purchase or use a service is more important in building loyalty to a company. In determining this metric, users were expected to respond to the statement "It was easy to handle my problem" on a scale from 1 to 7. 7 means "Strongly Agree". Ratings from 5 to 7 can be grouped as the proportion of customers who think that the services offered provide easy solutions to customers. Figure 4.3 below shows an example statement.

	Firma süreci benim için kolaylaştırdı.
☐	Kesinlikle Katılmıyorum
☐	Katılmıyorum
☐	Kısmen Katılmıyorum
☐	Katılıyorum/Katılmıyorum
☐	Kısmen Katılıyorum
☐	Katılıyorum
☐	Kesinlikle Katılıyorum

Figure 4. 3 Ces Sample Question

The customer effort score to be obtained after collecting the data in line with the answers given to this statement can be calculated with the following formula.

$$CES = \frac{\text{5-7 arası skor veren cevap sayısı}}{\text{toplam alınan cevap sayısı}}$$

1.3 DMAIC

Before starting the DMAIC process with the company, firstly, a line graph for the six-month customer satisfaction scores for the periods January 2022 and June 2022 was drawn and shown in Figure 4.4.

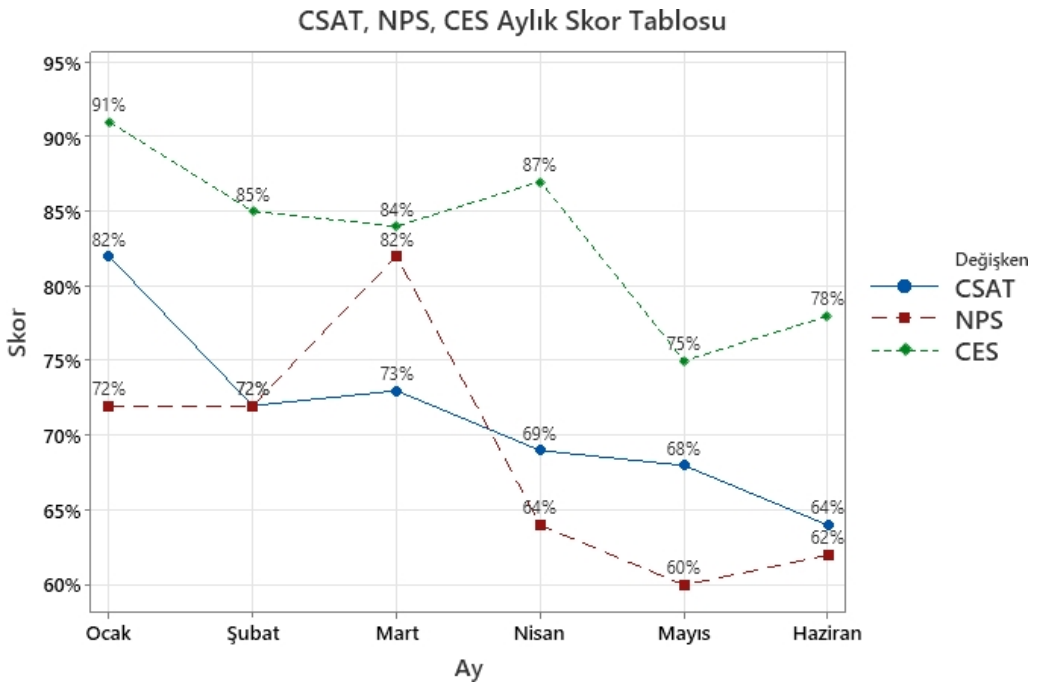

Figure 4. 4 Customer satisfaction scores between January 2022 and June 2022

Figure 4.4 shows that the firm has experienced a steady decline in csat, nps and ces scores over the last 6 months, with the lowest monthly score for each heading occurring in the last 2 months.

The model of the study and a list of the methods used in the implementation process are as indicated in Table 4.1. These stages are detailed in the sub-headings.

Table 4. 1 Methods Used in the Implementation Process

Define	· Voice of the Customer · Project Agreement · Pareto · Fishbone Analysis
Measure	· Process Flow Map · CTQ · Basic Statistical Analysis · Basic Chart Analysis
Analyze	· Root Cause Analysis · Fishbone Analysis

	· Chart Analysis · Statistical Analysis
Improve	· Experimental Design · Pilot Study

1.3.1 Description

In the first step of the DMAIC application, define, Voice of the Customer, Project Contract, Pareto Analysis and Swot Analysis were used. With these analyzes used in this section, the objectives of the project were tried to be revealed in general.

The concept of customer satisfaction is an interactive and unstable concept, especially in the service sector. Increasing customer satisfaction therefore remains a very general objective. Although the data collection and analysis stages were applied in the measurement and analysis section, they were also used in the definition section to make the objective more specific.

In the identification section, the voice of the customer was first applied and the following findings were obtained as a result of the examination:

- Telephone survey with users for the voice of the customer app

  data were used. These data were obtained by calling 48 hours after each transaction completed within the system, unless otherwise specified by the users. The surveys were categorized by company experts. As an example of these categories, customer voice from the surveys is shown in Table 4.2.

Table 4. 2 Voice of the Customer Table

Voice of the Customer	**What does the customer want?**	**How can we meet this request?**
The account verification process took too long.	Faster account verification.	Speeding up the account verification process
I have problems with deposits. It is tiring to constantly connect to customer support.	Solving your own problem without connecting to support.	Creating more detailed FAQs. Development of a chatbot.
Working friends can be rude, especially at night. It is difficult to work at night, but they are paid accordingly. They don't need to reflect this negativity on us.	Polite and understanding approach.	By providing training to the support unit
The interface of the site, especially the analysis section, is very complicated.	Streamlining the user interface.	-
There can be processing delays at peak times. That's why I suffered a loss.	Flawless site data flow speed.	-
There are very bad comments about the site. It scares me.	Trusting the company.	Making and monitoring online reputation arrangements

The user interface and site checkout flow sections of the customer voice results were rejected to be examined by the company subject to the application. It was stated that since the general functioning of the site is the same for all countries, no action can be taken on these issues according to regional surveys.

- The outputs obtained from the customer satisfaction survey from the customer voice were pareto analyzed according to categories (Figure 4.5) and the results of the analysis were

The first 3 findings been scrutinized. These findings are expressed as follows:

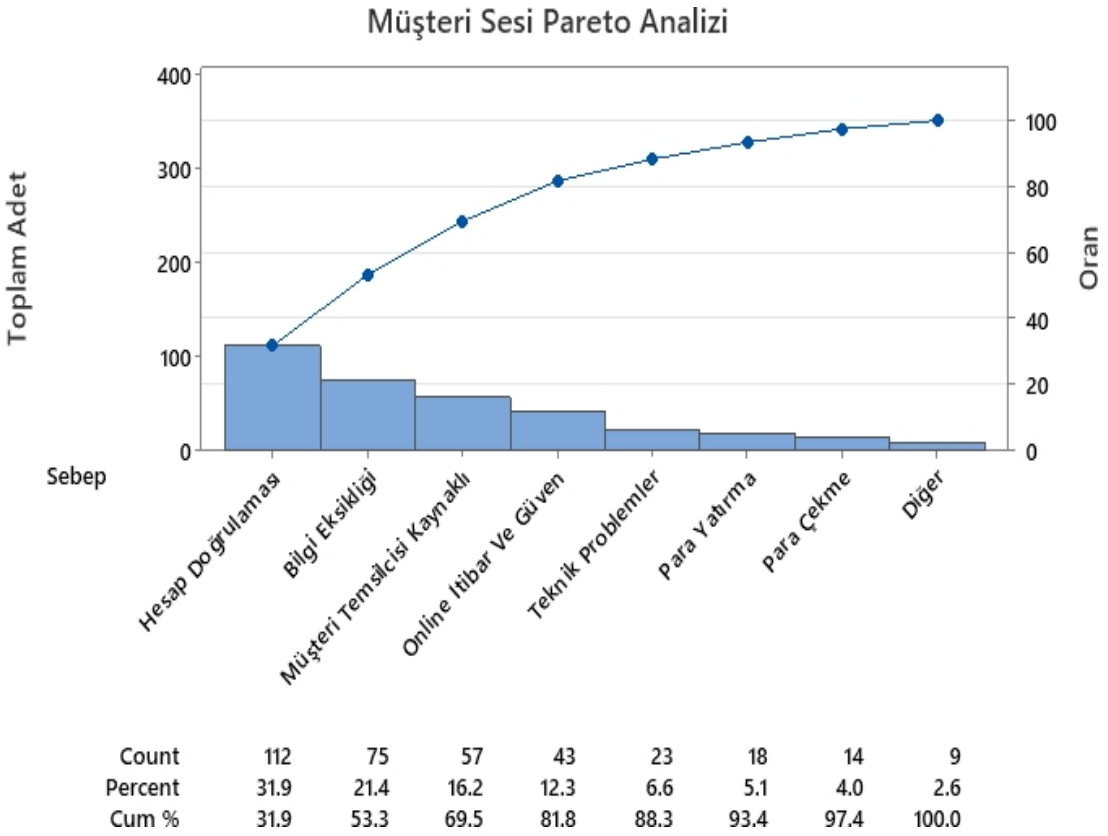

Figure 4. 5 Voice of the Customer Pareto Analysis

After analyzing the survey data, the first 3 topics (Account Verification, Lack of Information, Customer Representative-related) were analyzed. Acting together with the team and experts, these headings were sub-categorized. The created scheme is given in Figure 4.6.

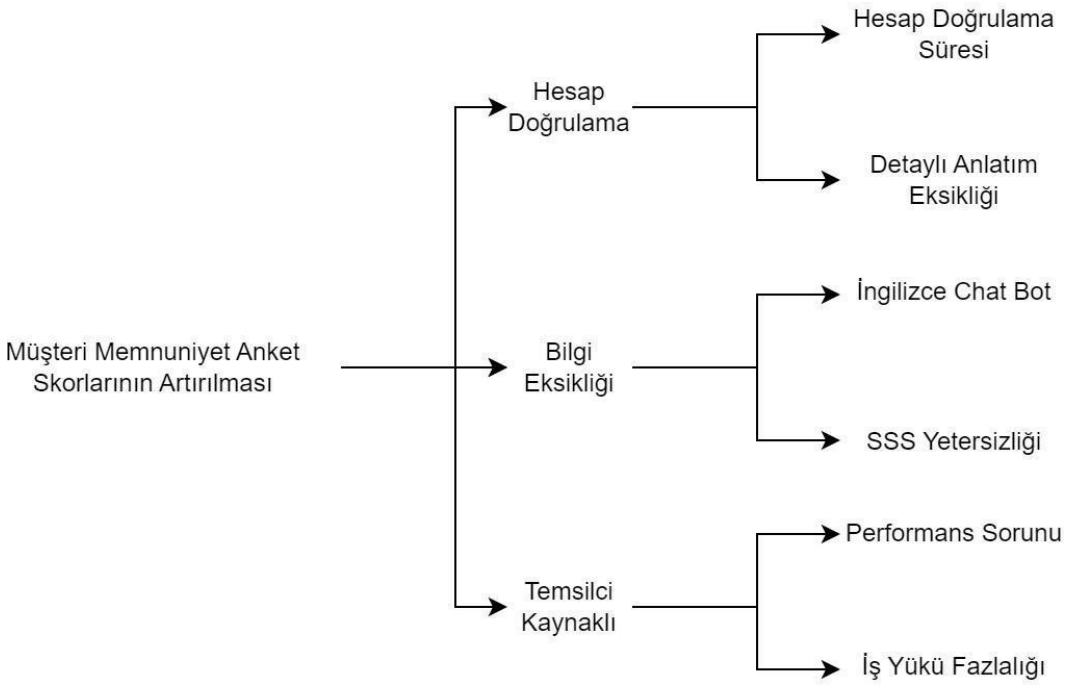

Figure 4. 6 Selecting CTQ

Alt The number of questionnaires used to distinguish the categories is shared in Table 4.3.

Table 4. 3 Customer Dissatisfaction Surveys

Cause of Customer Dissatisfaction	Number of Surveys
Account Verification Period	98
Lack of Detailed Explanation in Account Verification	22
No Turkish Chat Bot	45
SSS Failure	30
Employee Performance Problem	26
Excessive Workload	31

Of the surveys received from customers, 98 were related to account verification time, 22 to the lack of detailed explanation in account verification, 45 to the lack of a Turkish Chat Bot, 30 to the insufficiency of FAQs, 26 to Employee Performance Problems, and finally 31 to excessive workload. The distribution of subcategories related to the account verification process, which received the most negative surveys, is shown in Figure 4.7 with a circular graph.

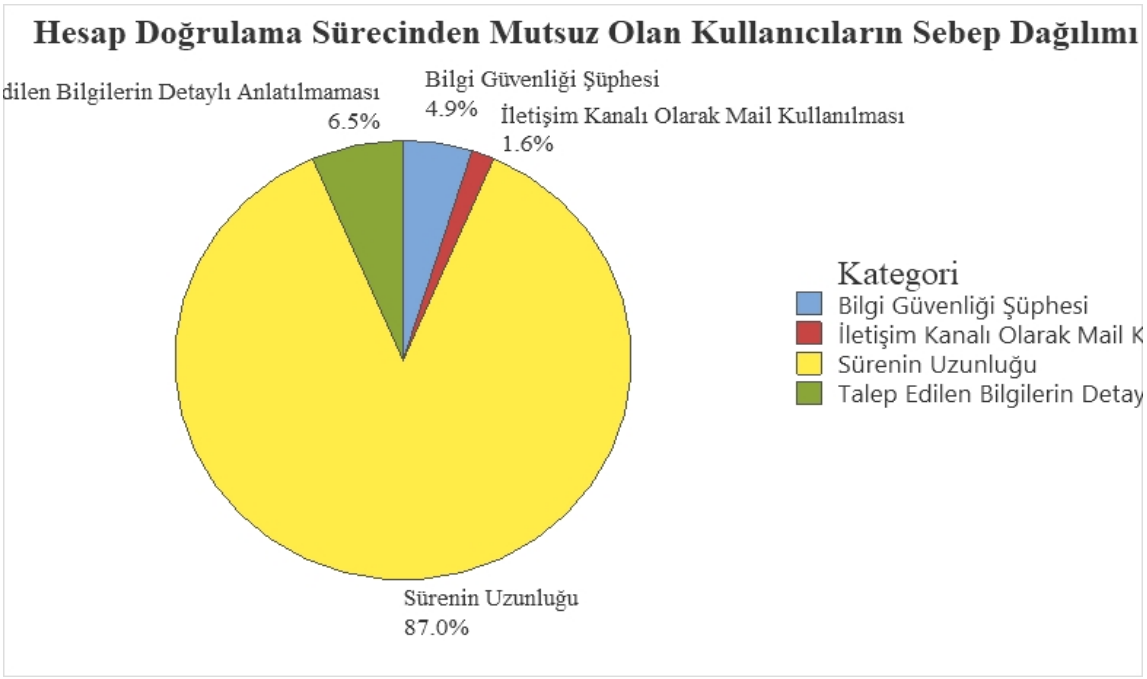

Figure 4. 7 Reason Distribution of Users Unhappy in the HD Process

As can be seen in Figure 4.7, the length of the duration accounts for 87% of the sub-headings of the account generation process. As a result, based on the voice of the customer and customer satisfaction surveys, the overall improvement target of the project was tried to be revealed and defined at this stage. The length of the account verification process was chosen as the main subject of investigation. For account verification processes, the company informs users that it will be completed within 72 hours. The average account verification time of users who were dissatisfied with the length of the process was around 94 hours. As CTQ, it is recommended to reduce the average to 72 hours and to improve the process flow. It was also emphasized that side issues that may be relevant should be identified and investigations should be initiated.

1.3.2 Measurement

In the previous measurement phase related to the process length in the account verification process, the process map of the account verification process was first created. Some details of the prioritization and workflow specified in the process map were requested to be kept confidential by the company.

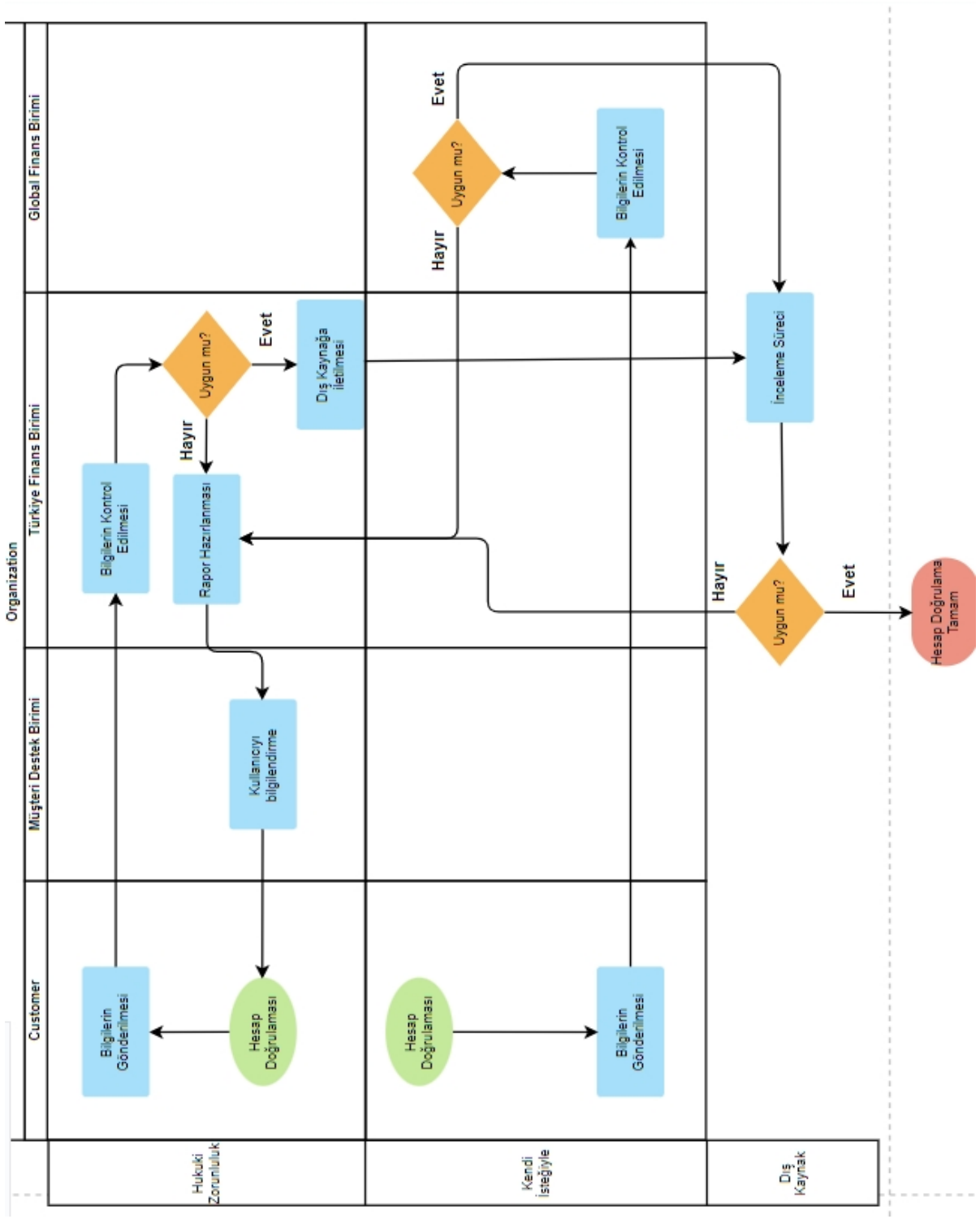

Figure 4. 8 Process map of the account verification process

First, a (Figure 4.8was created for the account verification process, thus revealing the areas that need to be examined. It was also a descriptive activity for the data requirements.

Account verification transactions can be done in two different ways after becoming a member of the site. First of all, it is realized in the form of being initiated by the company as a legal obligation (HZ) due to the use of the site or by the members themselves (KR).

The customer-generated processes in the data collection process (sending the information) were excluded from the reviews. Users were informed that the company's promise to complete the work within 72 hours did not include any waiting time caused by the customer.

Data for the last 3 months was requested under 5 different headings regarding the account verification process, but the data was not shared as the problems experienced in legal processes were outsourced.

- Obligatory-start (HZ1)
- Userswithinsufficient/incorrect information who initiated the process Obligatory (HZ2)
- Mandatory-initiated(KR1)
- Users with insufficient/incorrect information who initiated the process voluntarily (KR2)

Table 4. 4 Descriptive Statistics

TS: Tamamlanma Süresi
GS: Görüntülenme Süresi
BKES: Bilgilerin Kontrol Edilmesi Süresi
RHS: Rapor Hazırlama Süresi
DTKİ: Destek Takımının Kullanıcıya İletmesi
BTKES: Bilgilerin Tekrar Kontrol Edilmesi Süresi

HZ	***N***	***N****	***Mean***	***SE Mean***	***StDev***	***Min***	***Q1***	***Median***	***Q3***	***Max***
TS	66	0	54.4	0.355	2.888		52.3		56.0	64.9
GS	66	0	4.7	0.338	2.748	0.4	2.6		6.4	14.6
BKES	66	0	1.6	0.084	0.681	0.4	1.1		2.2	2.7
KR										
TS	45	0	60.8	0.802	5.380		56.7		65.5	69.5
GS	45	0	11.7	0.812	5.449		7.5		16.5	20.4
BKES	45	0	1.1	0.073	0.492		0.7	1.1	1.6	2.0
HZ2										
TS	39	0	73.2	1.04	6.48		68.1		77.5	88.4
GS	39	0	5.2	0.610	3.811		2.5	4.3	6.6	17.6
BKES	39	0	1.5	0.128	0.797		0.9	1.4	2.3	2.7
RHS	39	0	4.1	0.208	1.301		3.1	4.0	5.3	6.0
WTKI	39	0	6.5	0.550	3.437		4.5	6.1	9.7	12.0
BTKES	39	0	7.9	0.549	3.431		4.4		10.5	12.5
KR2										
TS	33	0	87.9	1.492	8.574		80.6		94.0	107.8
GS	33	0	11.7	0.852	4.892		7.0		15.9	20.2
BKES	33	0	1.1	0.109	0.629		0.4	1.0	1.7	2.0
RHS	33	0	13.9	0.962	5.526		8.4		17.9	23.7

WTKI	33	0	5.0	0.467	2.680	1.4	2.4	4.8	6.7	11.1
BTKES	33	0	8.2	0.599	3.442	2.1	5.5	9.1	11.0	12.6

General statistical information of the data to be used is given in Table 4.4. The target of completing the account verification process within 72 hours accepted by the company was not found to be a problem in HZ1 and KR1. HZ1 is completed in 54.4 hours on average and KR1 is completed in 60.8 hours on average. Since these two titles did not experience any delay in account verification, they were exempted from further analysis. However, since the HZ data is well below the target and the standard deviation is low, it will be used again in the analysis section during the analysis of customer satisfaction.

HZ2 and KR2 do not meet the company's target of completing account verification within 72 hours. HZ2 is completed in 73.2 hours on average and KR2 in 87.9 hours on average. In addition, the standard deviation (8.574) in KR2 is very high, indicating that there may be more than one problem. Investigations and applications on these two topics. First, the confidence intervals of HZ2 (Figure 4.9and KR2 (Figure 4.10) data were analyzed.

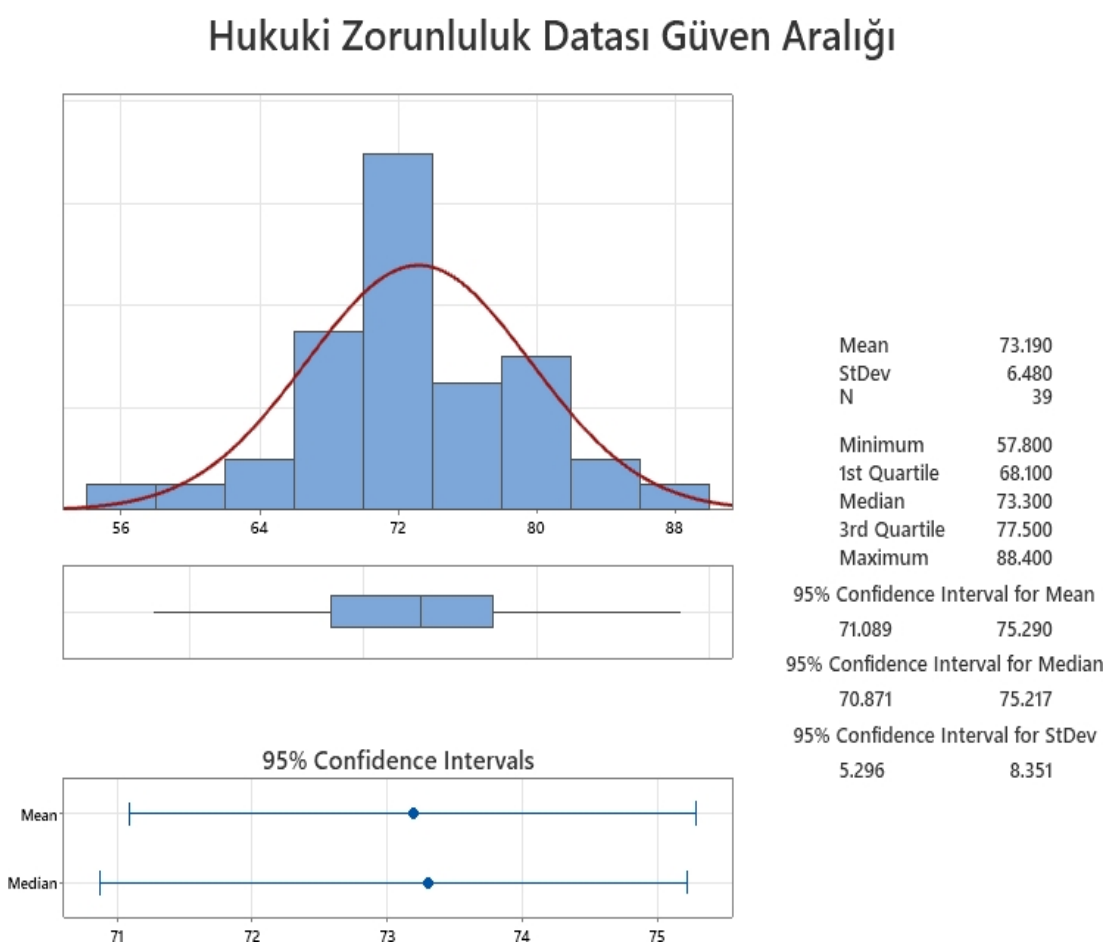

Figure 4. 9 HZ (Data Confidence Interval Analysis

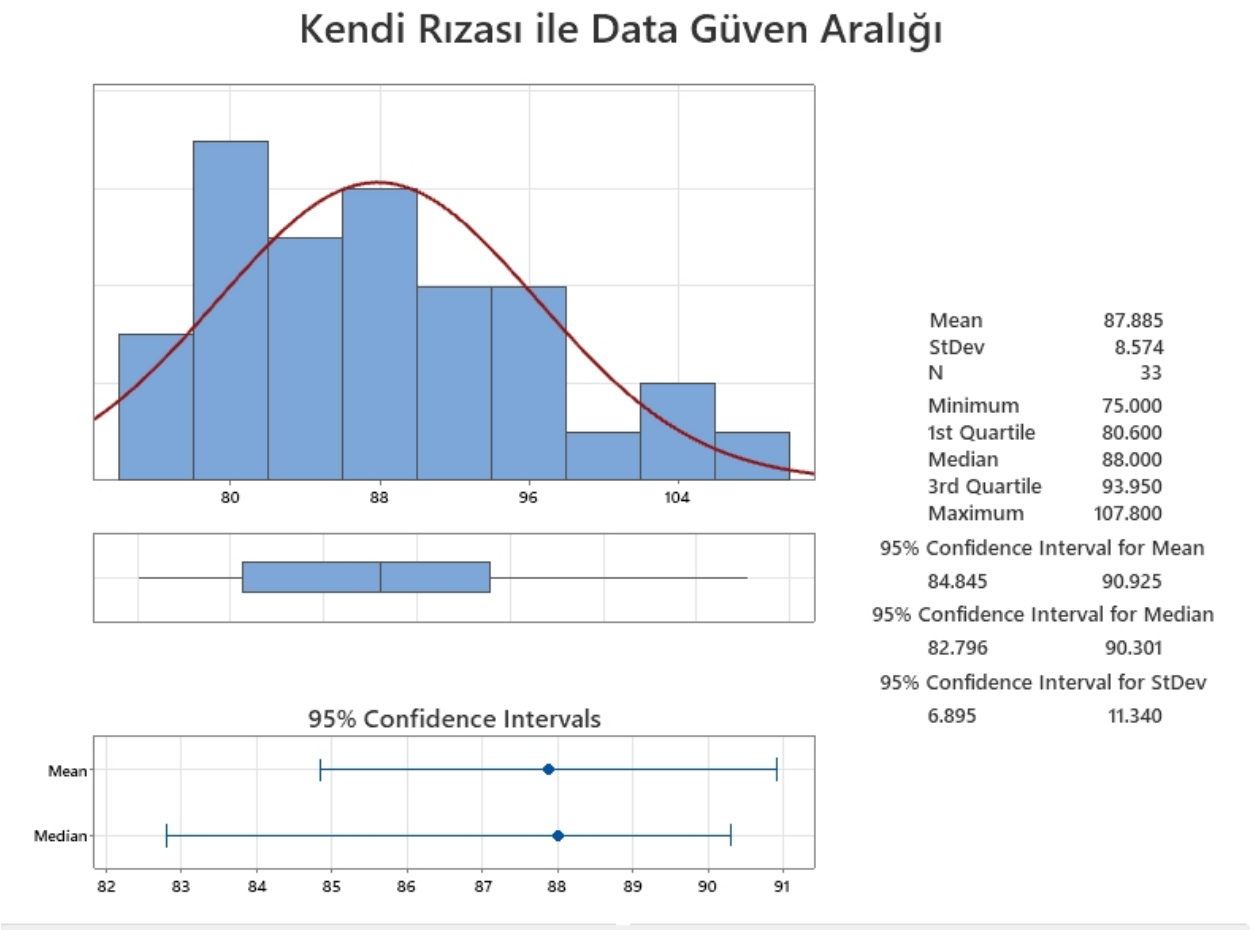

Figure 4. 10 KR (Mandatory) Data Confidence Interval Analysis

The information on the confidence interval analysis was shared with the team and probability graphs were examined under the titles of normal-lognormal-weibull in order to find the ideal distribution for use in the analysis phase :

- The distribution of reports starting with legal obligation was considered normal with a mean of 73.19 minutes, a standard deviation of 6.480 and the lowest A^2 value (0.269) (Figure 4.11).
- The distribution of reports starting with legal obligation was considered lognormal with a mean of 87.88 minutes, a standard deviation of 8.574 and the lowest A^2 value (0.327) (Figure 4.12).

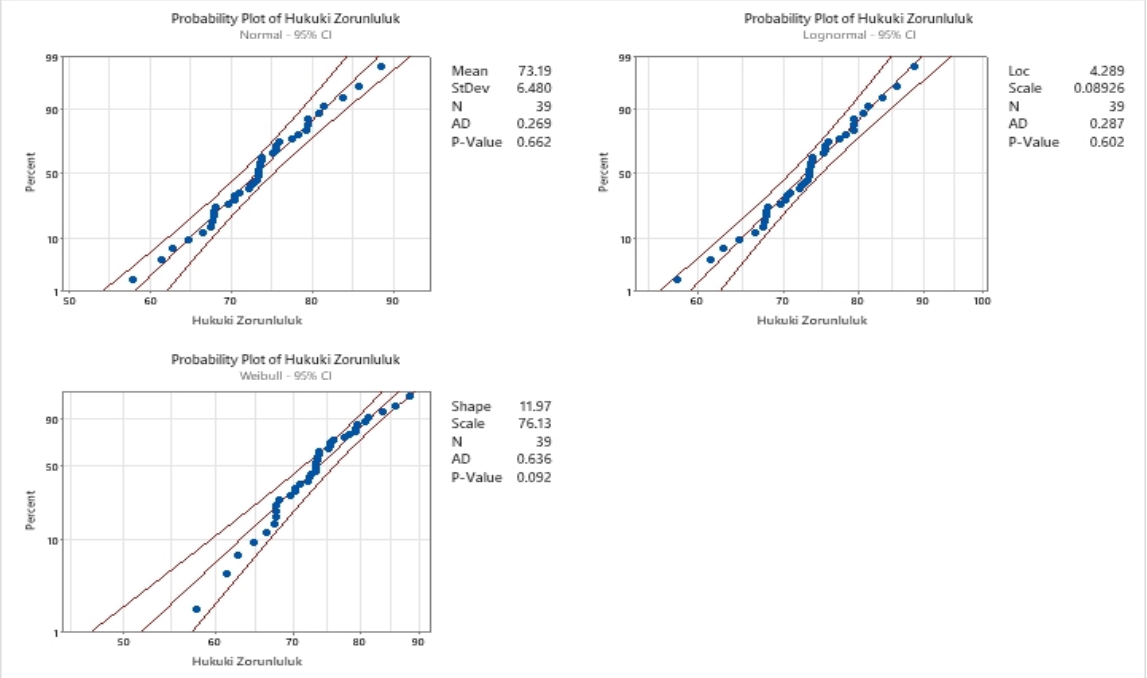

Figure 4. 11 HZ (Obligatory) Ideal Distribution Test

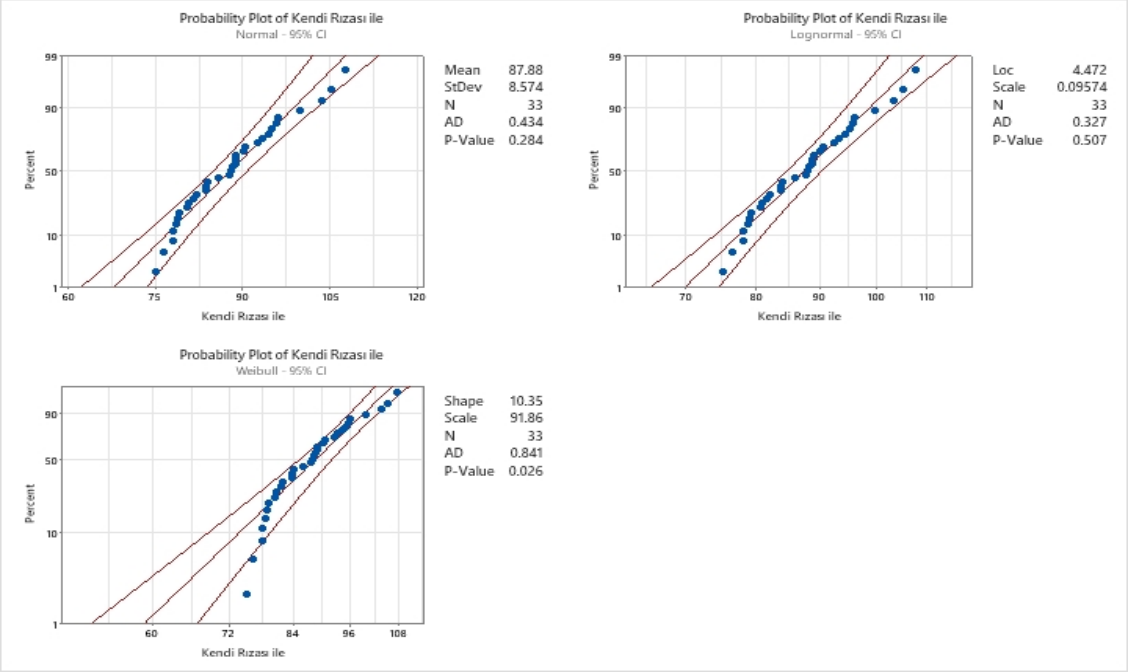

Figure 4. 12 KR (Mandatory) Ideal Distribution Test

1.3.3 Analysis

In this last stage, after the measurement phase, root cause analysis was applied as a team for issues that may be related to the account validation period. Brainstorming, 5 reasons, swot analysis methods were used in the root cause analysis process. Four findings were obtained as the root cause of the delay in account verification time. These headings are expressed as follows:

1. Contact
2. Process
3. Employee
4. Programs

These main headings the reasons for the delay in the account verification process. The sub-factors affecting these reasons are analyzed with a fishbone analysis in Figure
4.13 is shown above.

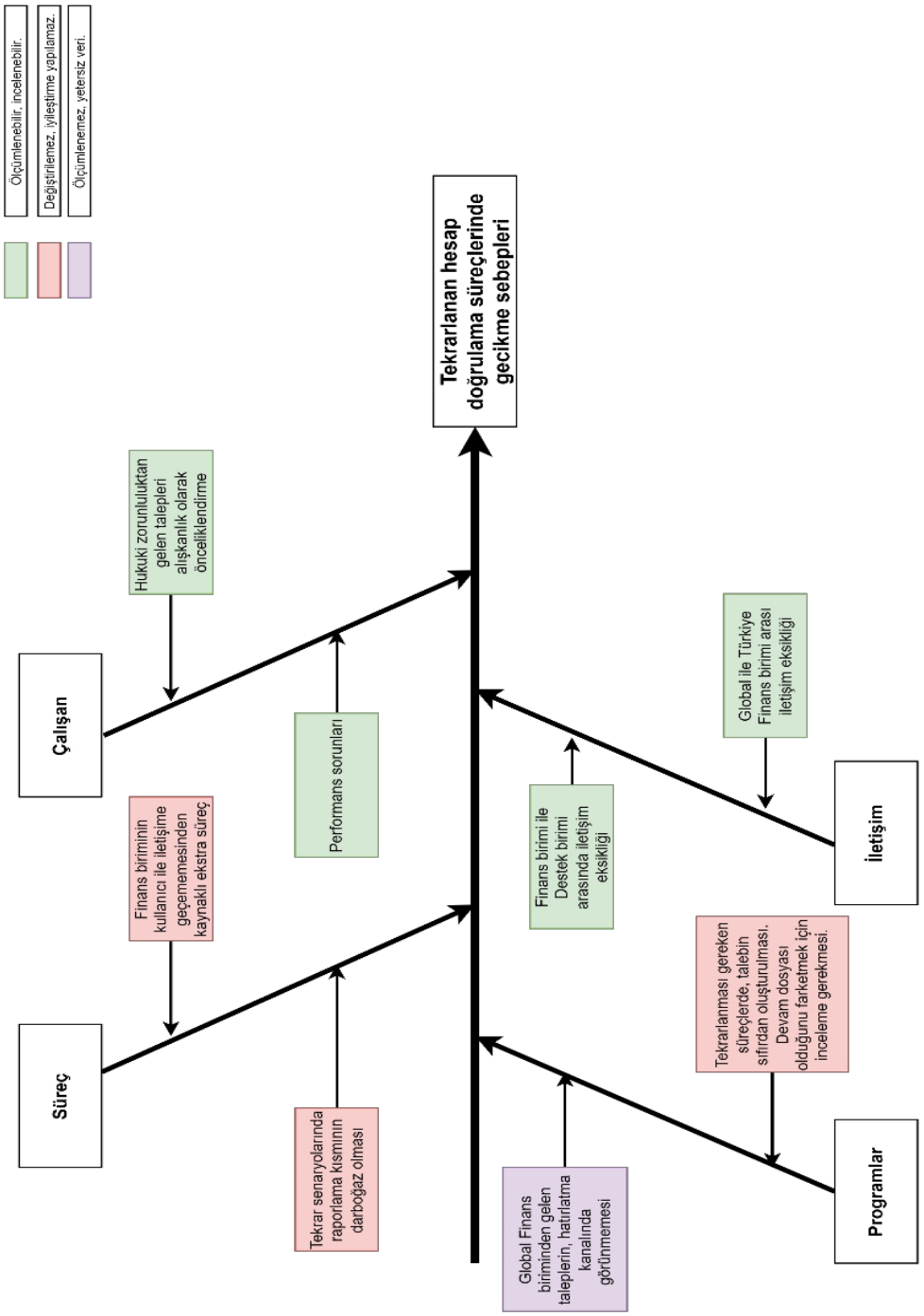

Figure 4. 13 Fishbone Diagram

We tried to help the team to see the fishbone analysis process better. Each accepted sub-heading was reviewed again by the team and the team and the team decided on the constraints and suitability. The items that cannot be changed or improved have been removed from the list due to constraints or lack of data sharing by the company. One of the factors

Another one was excluded from the list due to the lack of data sources that could be measured. Considering these situations and limitations, the analysis process was initiated for 4 topics. These headings are expressed as follows.

1. Habitually prioritizing requests that come from legal obligations,
2. Lack of communication between finance and support,
3. Lack of communication between global and Turkish finance,
4. Performance issues

As a result of the examination of these factors, the impact of performance issues on the account verification process was analyzed and evaluated together with the quality and human resources departments of the company. No value directly affecting the process was found between the two departments.

Based on these findings, 5 questions were asked with a joint decision. It was revealed that 3 of these questions were related to the account verification process. These questions are as follows;

1. Is there a relationship between account verification time and customer satisfaction?
2. Is there a correlation between lack of communication with support and increased account verification time?
3. Is there a correlation habitual prioritization of legal obligation requests and longer self-initiated account verification times?

In line with these questions, hypotheses were formed one by one as stated below, and the hypotheses were analyzed with the Minitab program in line with the following analyses and the results were interpreted.

- Whether there is a relationship between account verification and customer satisfaction

  ANOVA analysis was applied for controlling the scores of the customer satisfaction questionnaire. The customer satisfaction questionnaire consists of 1-2-3-4-5 scores and 4-5 scores within the company

Satisfied 1-2-3 scores are as dissatisfied customers. The hypothesis formed at this stage is expressed as follows.

= There is no relationship between account verification time and customer satisfaction.

= There is a significant relationship between account verification time and customer satisfaction.

In order to test the hypothesis, Ona-way ANOVA test, which is a one-way analysis of variance in Minitab program, was applied in the analysis of the data. The findings obtained are shared on Table 4.5.

Table 4. 5 One-Way Anova Analysis Results

Factor Information

Factor	***Levels***	***Values***
Factor	5	1, 2, 3, 5, 4

Welch's Test

Source	***DF Num***	***DF Den***	***F-Value***	***P-Value***
Factor	4	642704	116.04	0.12

Model Summary

R-sq	***R-sq(adj)***	***R-sq(pred)***
75.45%	74.69%	73.52%

Means

Factor	***N***	***Mean***	***StDev***	***95% CI***
1	27	85.59	8.72	(82.14, 89.04)
2	27	85.41	8.02	(82.24, 88.58)

3	27	78.96	5.69	(76.71, 81.21)
4	27	63.96	5.52	(61.78, 66.15)
5	27	57.33	4.73	(55.46, 59.20)

Since the p-value (0.012) calculated as a result of the analysis is less than 0.05, the hypothesis Ho is rejected and the alternative hypothesis H1 is accepted. The R-sq value of 77.13% shows the strength of the interaction.

The data scatter plot between account verification time and customer satisfaction is shown in Figure 4.14;

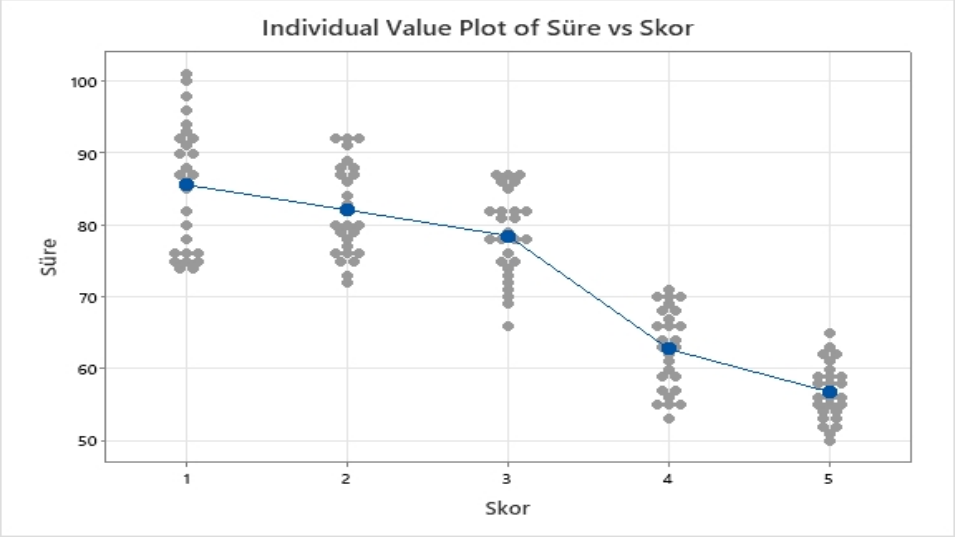

Figure 4. 14 Data Distribution Graph for time and score

Finally, redundancy variance analysis was applied and the findings are shown in Figure 4.15.

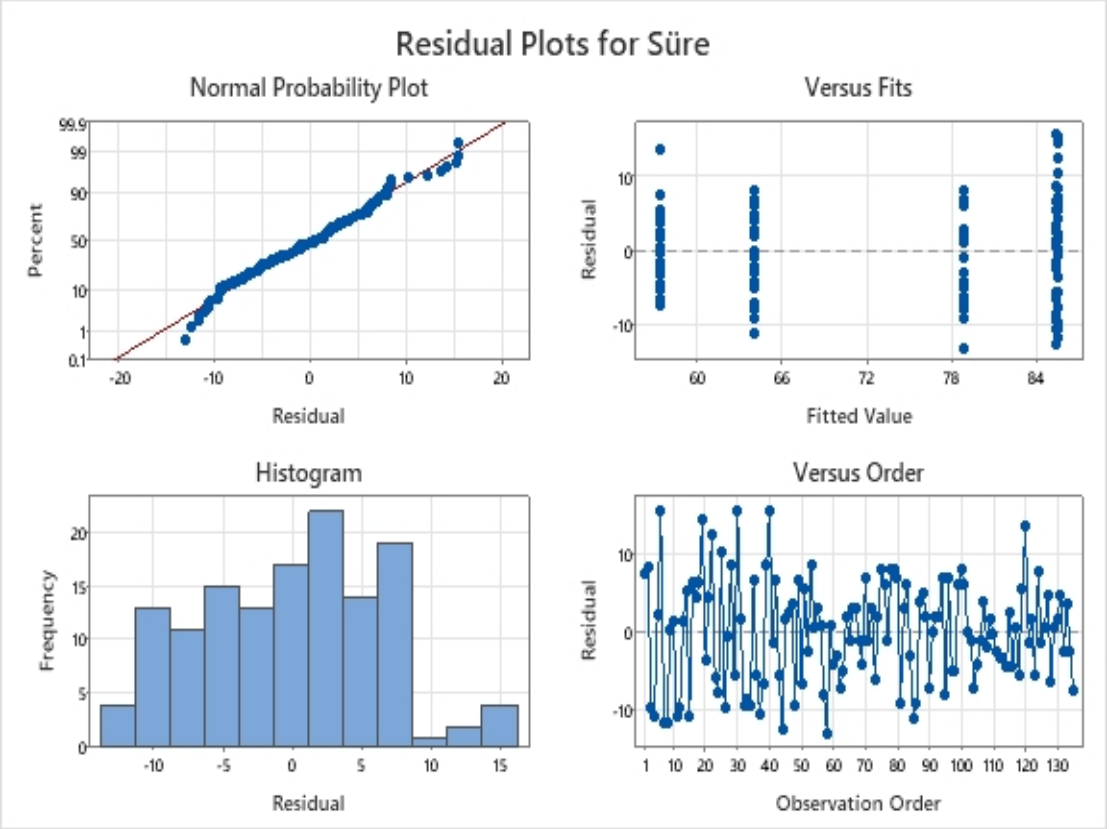

Figure 4. 15 ANOVA Data Distribution Control
F

Since there is no problem in data distribution in general, ANOVA analysis is accepted. It is revealed that there is a strong relationship between account verification time and customer satisfaction.

□ In the second hypothesis, lack of communication with the support unit and account whether there is a relationship between the increase in the verification time. The hypothesis formed at this stage is expressed as follows.

=

There is no correlation between lack of communication with support and increased account verification time.

=

There is a significant relationship between lack of communication with support and increased account verification time.

For this hypothesis, first of all, a brainstorming was conducted on how it could be controlled with the team. Since lack of communication is a gray area to measure, the most ideal ways to measure it with the team were considered.

In the workflow diagram, the sending process of the customer representative is considered as a communication deficiency. After the report preparation process is completed, the finance unit cannot forward the report to the user due to legal restrictions. The finance unit sends an e-mail to the support unit in order to forward the report, and it is enough for the support unit to forward the e-mail from the pool to complete the process. Since the support unit does not spend any time in this process, the process of waiting for the mail to be forwarded is accepted as a lack of communication. In order to test this hypothesis, regression analysis was performed with the support of MINITAB program and the results are shared on Table 4.6.

Table 4. 6 Regression Analysis

Model Summary

S	R-sq	R-sq(adj)
2.51377	0.4792	0.4651

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	215.1	215.1	34.04	0
Error	37	233.8	6.3		
Total	38	448.9			

Regression equation

Support Team = - 2.749 + 0.3672 Total Duration

Since the P value observed as a result of the analysis is (0.000)< 0.05, Ho hypothesis is rejected and the alternative hypothesis H1 accepted. The R-sq value of 47.9% shows the strength of the interaction.

Scatter diagram showing the effect of total time, expressed as the independent variable in the regression analysis, on support team time loss Figure
It is expressed in 4.16.

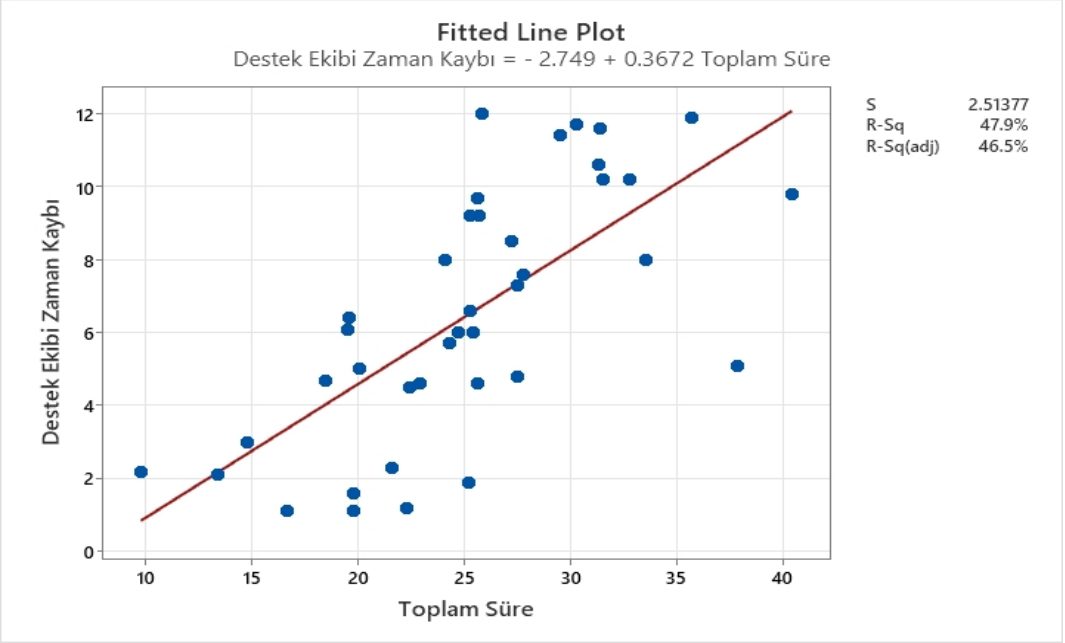

Figure 4. 16 Regression Analysis Data Distribution Graph for Total Time Lost

Finally, a general distribution analysis was conducted. The findings obtained as a result of the analysis are shown in Figure 4.17.

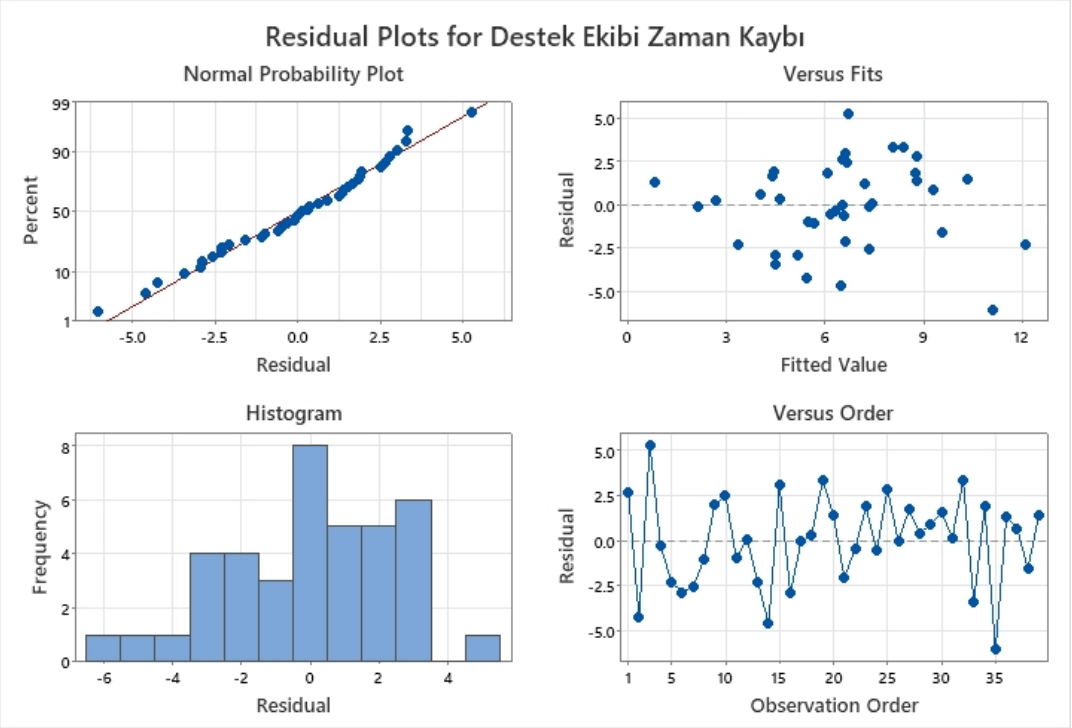

Figure 4. 17 Regression Analysis Data Distribution Control For Support team Time

The results of the regression analysis accepted since there is no general problem in the data distributions as seen in Figure 4.17. It is accepted that the lack of communication between the support unit and the finance unit has a statistical effect on the account verification process.

□ At this stage, we tried to analyze whether the habitual prioritization of legal obligation requests affects the lengthening of voluntary account verification times. It was decided to use a two-sample t-test to measure work habits. For the measurement of work habits, 15 files were randomly selected on the same day. In this process, the completion and acceptance times of two types of reports received by the Turkish Finance Unit compared. Although there is no difference in terms of the procedures performed, the time differences that may occur between them are considered as "time loss". The ideal report preparation time accepted as 5 hours after the review and interaction with other departments within the company. The analysis data related to this process are presented in Table

Shared on 4.7.

Table 4. 7 T Sample T Test

Descriptive Statistics

Sample	*N*	*Mean*	*StDev*	*SE Mean*
CR Report Duration	13	12.0615	3.8346	1.0635
HZ Report Duration	13	3.7923	1.0492	0.291

Estimation for Difference

Difference	*95% CI for Difference*
8.27	(5.89, 10.65)

Test

Null hypothesis	$H_0: \mu_1 - \mu_2 0=$
Alternative hypothesis	$H_1: \mu_1 \neq 0$

T-Value	*DF*	*P-Value*
7.5	13	0.002

As a result of the analysis, it was revealed that there was a difference of 8.27 hours between the average durations according to the type of report in the reporting process where all processes and transactions were the same. Since the P value is < 0.05, the alternative hypothesis is accepted. There are delays in the report preparation process due to habits.

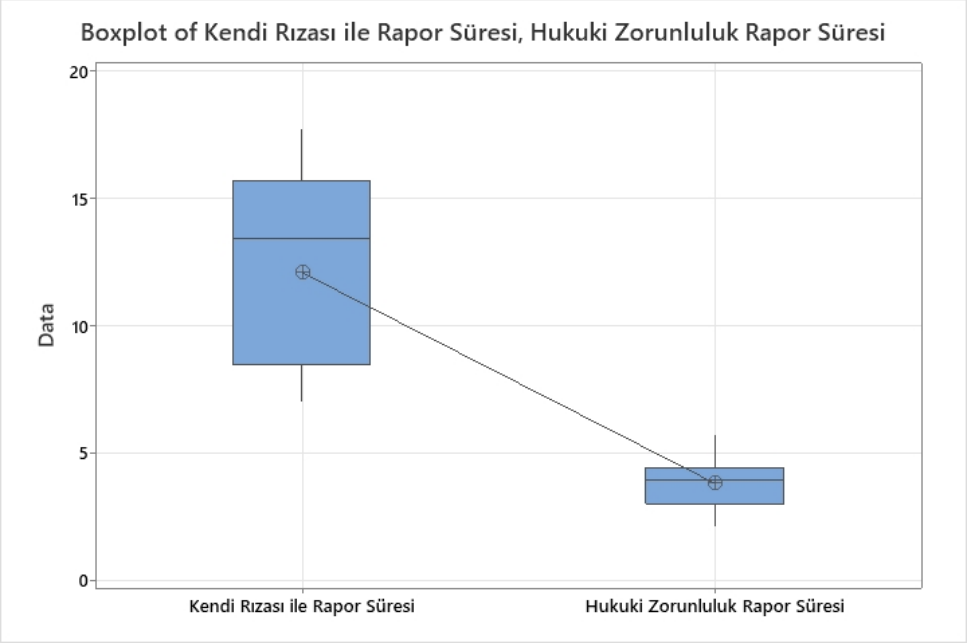

Figure 4. 18 Box Plot for Mandorty vs Obligatory Report Prep

Finally, a box plot was prepared for a better visualization of the difference and is shown in Figure 4.18.

1.3.4 Improvement

Under this heading, alternatives for improvement were tried to be presented by focusing on the root causes found in the previous stages. First of all, a fishbone diagram was drawn for possible improvements and an improvement plan was created.

In the improvement plan, an experimental design was conducted for the habit of prioritizing reports and a pilot study was conducted for the lack of communication between employees.

□ Experimental design

The report identifies two main topics where improvements can be made regarding the prioritization problem.

- Requirement to accept incoming reports in date order with software (Jira) support
- Adjusting teams according to employee performances

The analysis section of the report identified that there were delays in account verification processes due to prioritization habits. are imbalances in the processes due to prioritization. Two software support (X,Y) proposals were accepted to solve this problem. In addition, the grouping of employees according to their performance (A,B) and the division of labor were provided by the Quality Unit and Team Leaders.

Three days of data were collected for software support and groups experimental design. The number of reports, report completion time, and the number of reports that did not meet the 60-minute target are shown on Table 4.8.

Table 4. 8 Experimental Design Data

Day	Program	Group	Number of Reports	Number of Reports Not Completed in Target Period	Ratio of Reports Not Completed in Target Period
1	X	A	30	4	13.33%
2	X	A	34	6	17.65%
3	X	A	28	5	17.86%
4	X	B	32	3	9.38%
5	X	B	37	5	13.51%
6	X	B	29	5	17.24%
7	Y	A	25	2	8.00%
8	Y	A	29	3	10.34%
9	Y	A	34	2	5.88%
10	Y	B	30	1	3.33%
11	Y	B	34	2	5.88%
12	Y	B	28	2	7.14%

In the first examinations, it is seen that program Y may be a better option than X. In order to see the effects of programs and formed groups on the account verification process, General Linear ANOVA method was used and the information is shared on Table 4.9.

Table 4. 9 General Linear ANOVA

Factor Information

Factor	*Type*	*Levels*	*Values*
Program	Fixed	2	X, Y
Group	Fixed	2	A, B

Analysis of Variance

Source	*DF*	*Adj SS*	*Adj MS*	*F-Value*	*P-Value*
Program	1	0.019507	0.01951	25.37	0.001
Group	1	0.00229	0.00229	2.98	0.123
Program*Group	1	0.000006	0.00001	0.01	0.933
Error	8	0.006151	0.00077		
Total	11	0.027953			

It is seen that the p value of the effect of the programs on the process is below 0.05 and the p value of the groupings is above 0.05. In order to show the emerging values of each factor, a main effects graph was prepared and shared on Figure 4.19.

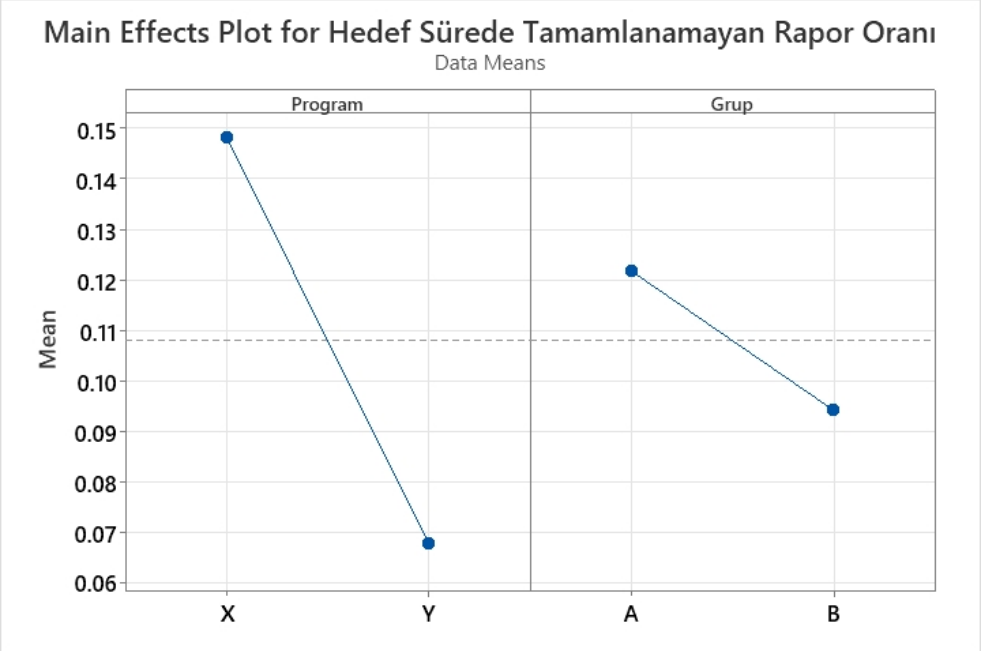

Figure 4. 19 ANOVA Main Effects Plot for Report rate who not completed in Time

. Figure 4.19 that the ideal value is the y program. As the final control process, the interrelationship diagram is shown in Figure 4.20.

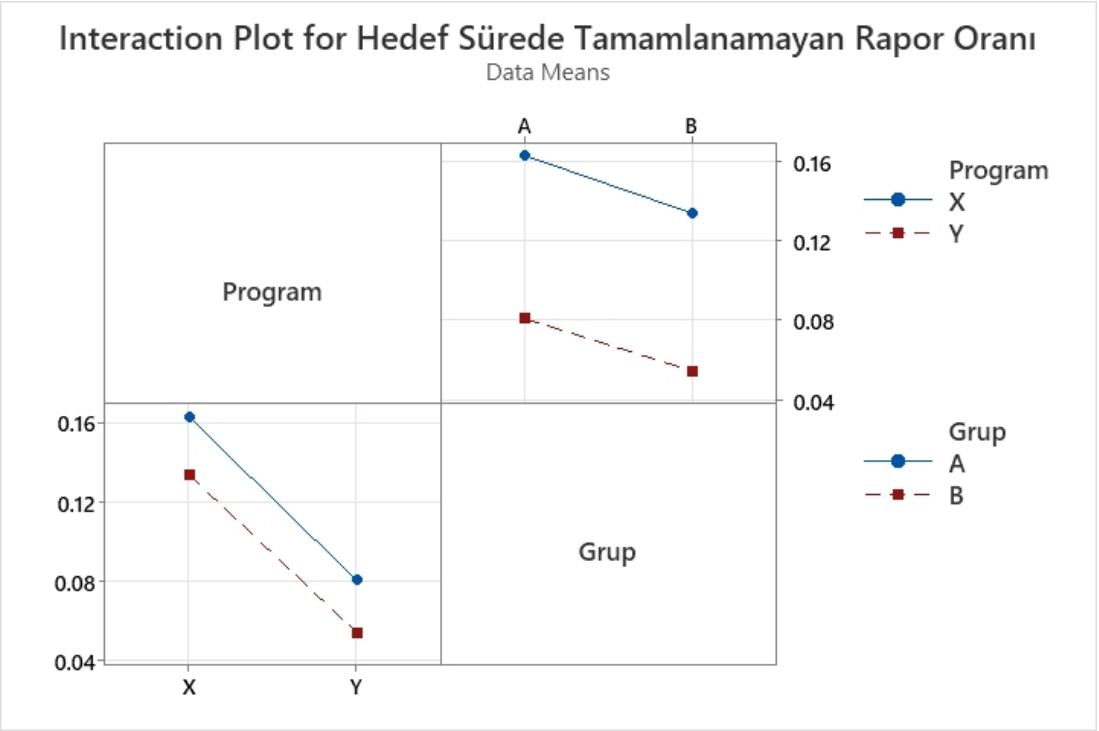

Figure 4. 20 Mutual Relationship Diagram Bofore/After

Based on Figure 4.20, the most ideal values: Y program and B group. As a result, the request for splitting into groups was not accepted as it had little effect on the calculation verification time, and approval was obtained from the company to conduct a pilot study using the Y program.

During the one-month pilot study period, two weeks were monitored using the normal process and two weeks using the Y program. In the two-week values, the report times of users who started the account verification process with their own consent decreased and the data distribution was optimized (Figure 4.21).

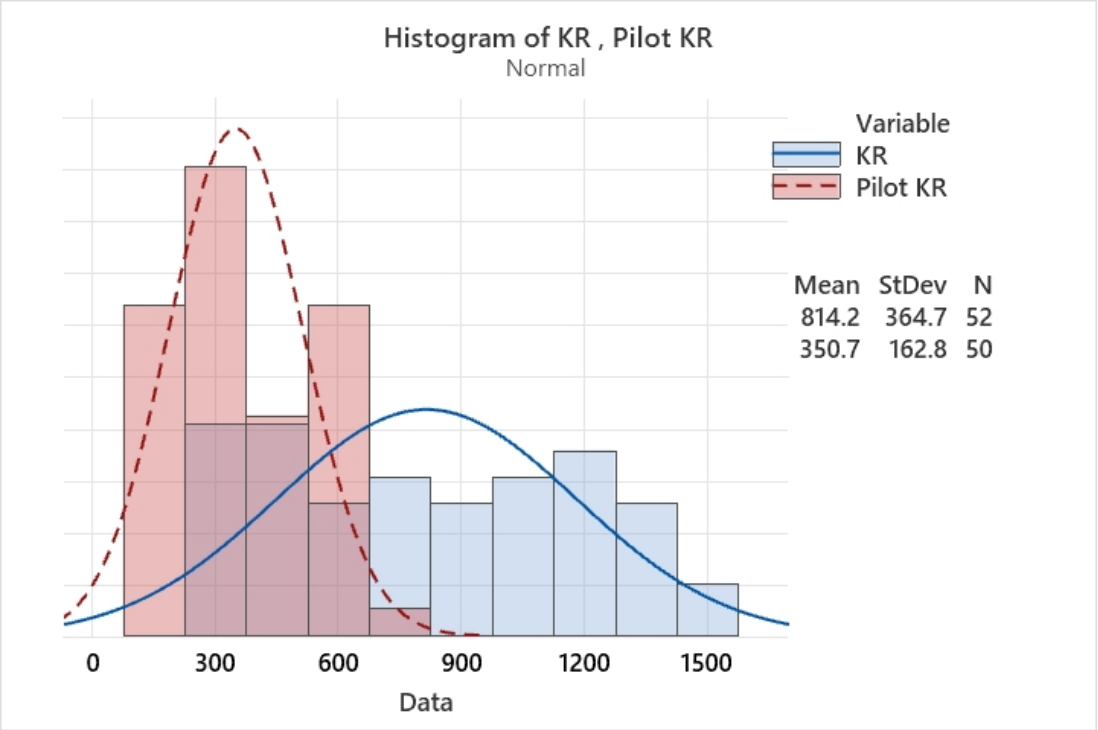

Figure 4. 21 GC Pilot Study Results
for Mandtory

Reporting times, which started with the legal obligation, increased and data distribution has been optimized (Figure 4.22).

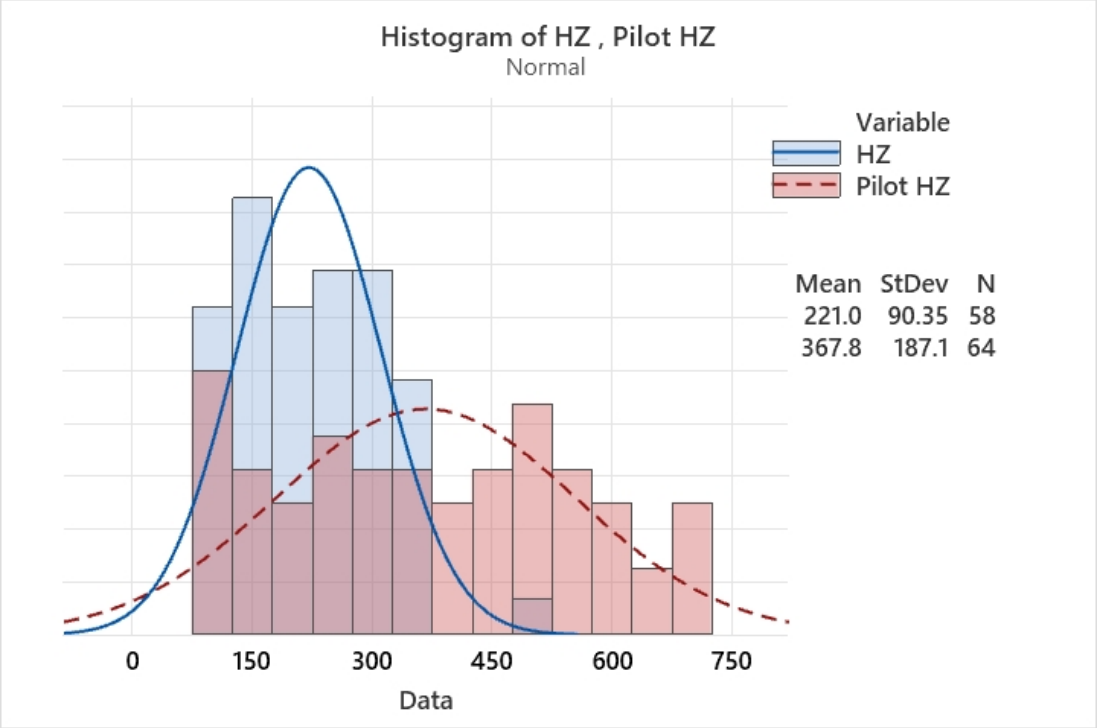

Figure 4. 22 HZ Pilot Study Results
f

Finally, all reporting data is shown in a single area, Figure 4.23, to clearly see the improvement in the process.

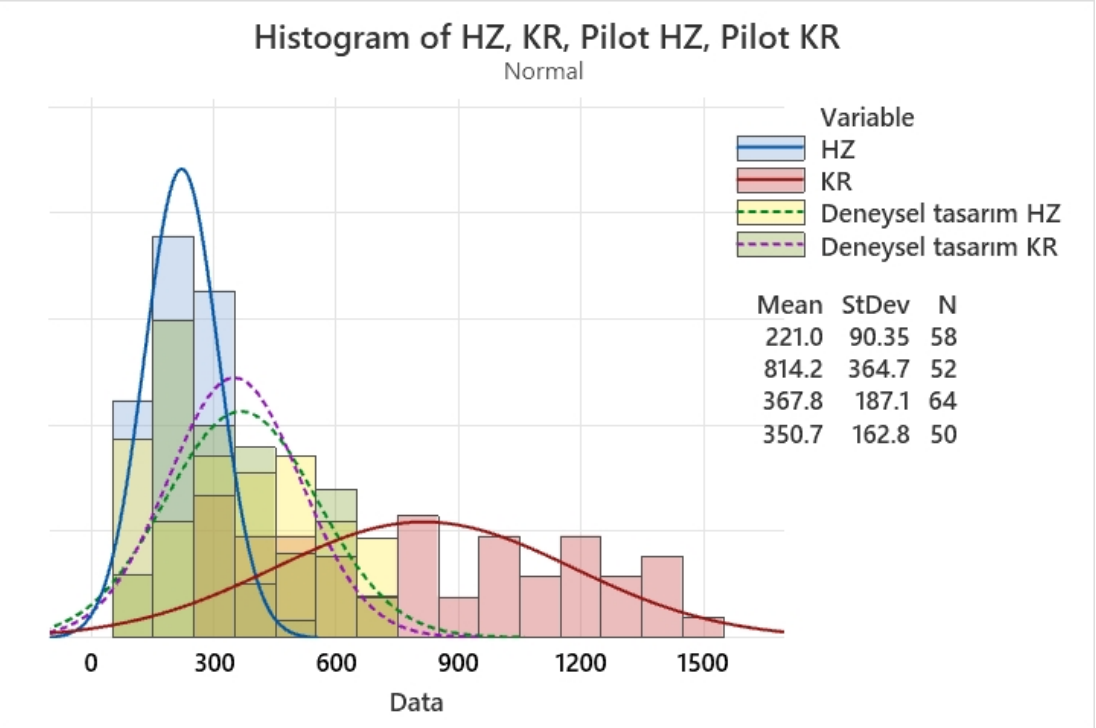

Figure 4. 23 Pilot Study Results Graph

In line with the results obtained, the active use of the Y program was approved by the company management.

A single solution was offered by the company as a common decision for the waiting and lack of communication experienced by call center employees; The reports prepared in the normal process fall into the call center general e-mail address pool and employees return if they check them. Process change was planned for this situation and supported by the program. The prepared reports are no longer directed to the general mail pool, but to the personal e-mail address used by the call center employees for work through the program algorithm. In this way, it was stated that employees can receive notifications as soon as the mail arrives and can handle the process faster since it is a task defined for them. This solution process was examined in a pilot study.

The pilot study was designed for one month, with two weeks of normal and two weeks of new business process supported by the program. The data obtained as a result of the follow-up is shown in Figure 4.24.

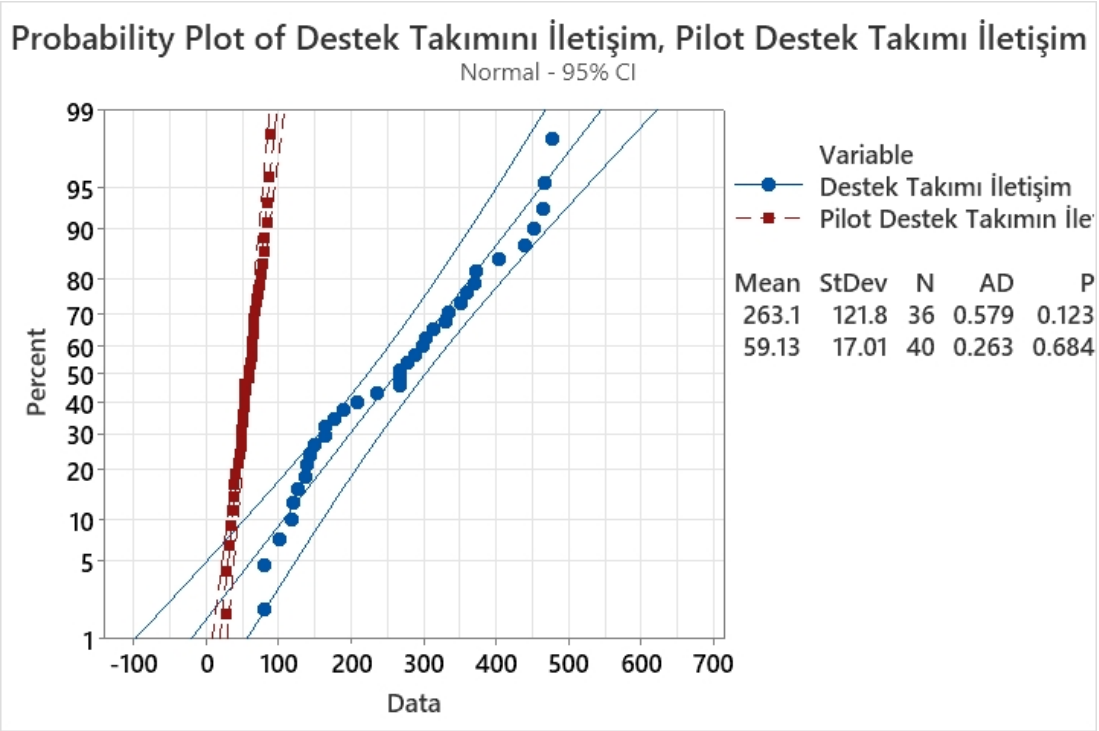

Figure 4. Pilot Study Data for **24** Support units

As a result of the pilot study, a process acceleration of 3.5 hours was achieved. While it took 263.1 minutes to complete the transactions in the old process, this time was reduced to 59.1 minutes in the pilot study. This information was shared with the management and approval was obtained for implementation.

1.3.5 Check

In this process, mechanisms were prepared to control the general changes after the implementation process. Information on the changes that occurred after the improvement process is given in Figure 4.25.

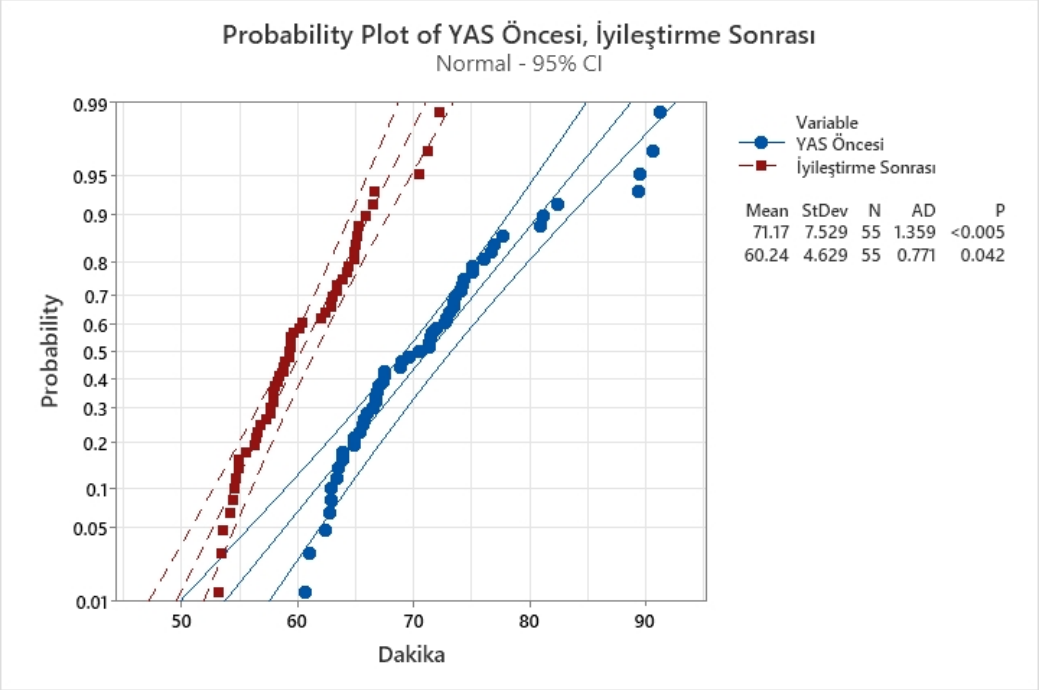

Figure 4. 25 Analysis of Account Verification Processes Before and After Implementation

After the controls, improvements were made in two-month processes, and an overall improvement of 12.5% was achieved in account verification processes. The 72-hour account verification process was reduced to 60.2 hours.

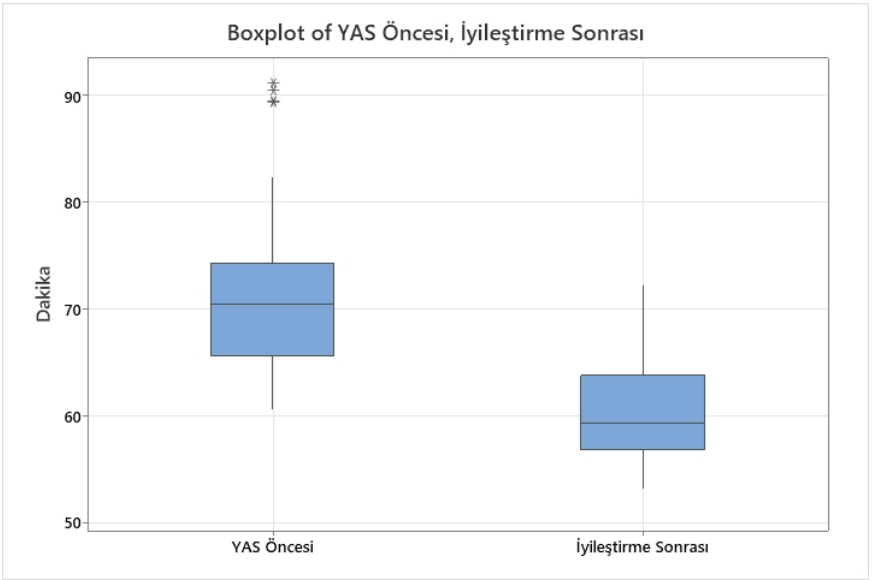

Figure 4. 26 Box Plot Before and After

As can be seen in Figure 4.26, after the DMAIC process, the data distribution became more regular and the standard deviation became more reasonable.

As a result of these improvements, the overall customer satisfaction score increased by 12.4%. In customer satisfaction surveys, a 34% increase in customer satisfaction was achieved in the section related to the account verification process. In recurring reports, the customer satisfaction rate increased by 56.6%.

2 CONCLUSIONS AND RECOMMENDATIONS

Lean and Six Sigma are two of the most widely used management strategies in various companies today, both in the manufacturing and service sectors. They are perceived and implemented as effective continuous improvement programs that facilitate companies' journey towards higher competitive advantages, better product quality and customer satisfaction.

Lean manufacturing comes from Toyota, one of the world's most respected automobile companies. The first formulation of Lean was the Toyota Production System, initiated by Taiichi Ohno. The main driver behind the development of Lean was the elimination of waste. On the other hand, Six Sigma, founded at Motorola Corp. is a systematic and data-driven approach to process and quality improvement that aims to reduce the defect rate to 3.4 defects per million units produced. The main issue driving the development of Six Sigma was the need for quality improvement when manufacturing complex products with a large number of components.

Lean and Six Sigma have different roots, they are in fact synergistic and support each other in achieving quality, whether in customer service, product, process or workforce training (Pepper and Spedding, 2010). Six Sigma's approach of reducing variables and Lean Manufacturing's philosophy of eliminating waste formed the basis of the project. In the first part of the study, general information about the study is given, and in the second part, the concept, history, methodology and value concept of Lean Manufacturing are explained. In the third part, general information about the concept of Six Sigma, its historical development and the methodologies it uses is given. In the third part, detailed information about Lean Six Sigma, where Lean and Six Sigma are combined, is given and the methods used in the project are tried to be explained in detail.

In the last part of the study, it is aimed to increase B2C customer satisfaction scores in a cryptocurrency exchange company offering software as a service (SaaS). After giving general information about the company and Customer Experience, the DMAIC process started in line with Lean Six Sigma teachings. The steps followed in the implementation and the findings obtained as a result of the techniques used are summarized as follows:

In the definition phase, based on the survey information received from the usersthe general outlines of the project, its objectives and the general map of the areas that can be examined were mapped. First of all, the monthly trend of the customer satisfaction score, NPS and CES scores measured by the company's customers through the survey was extracted for the last 6 months. With this information, the ongoing decline in the company's customer satisfaction score was shown. Afterwards, the project contract was prepared, including the definition of the necessary tasks, estimated duration, identification of expert black belt and sponsors. Finally, in the identification step, the voice of the customer was prepared based on the surveys. According to these results, the categories of account verification, lack of information and agent-related problems were the ones that received the most negative survey responses. For the account verification process, a re-examination that 87% of users who were unhappy with the account verification process were unhappy with the length of time this process took. CTQs were also determined according to these results.

In the measurement phase, first a process map was prepared and then data collection plans related to the account verification processes were prepared. Due to the business structure, account verification can be completed in 4 different ways. Data for these headings were collected separately and analyzed under different headings. These headings are as follows;

- Users with appropriate information starting as a legal obligation (HZ1)
- Users with insufficient/incorrect information starting as a legal obligation (HZ2)
- Users with appropriate information who initiated the process voluntarily (CR1)
- Users with insufficient/incorrect information who initiated the process voluntarily (CR2)

Based on this information, HZ1 (54.4 hours) and KR1 (60.8 hours) were below the target of 72 hours, while HZ2 (73.2 hours) and KR2 (87.9 hours) were above the target.

In the analysis phase, first of all, a fishbone analysis was conducted together with the team and the root causes of users who are unhappy with the account verification process

Interviews were conducted in order to find out. After these interviews, 5 questions that may be related to the process were asked, and 3 of these questions identified topics that could affect the process and that could be improved. These questions are as follows;

1. Is there a relationship between account verification time and customer satisfaction?
2. Is there a correlation habitual prioritization of legal obligation requests and longer self-initiated account verification times?
3. Is there a correlation between lack of communication with support and increased account verification time?

In the ANOVA analysis prepared for the first question, the R-sq 77.13% that there is a strong link between customer satisfaction and the account verification process resulted in the acceptance of the hypothesis (P value (0.012)< 0.05). Based this analysis, the groundwork for improvements to be made in account verification times and future questions was prepared and continued. Regression analysis was used for the second question, and since the P-value observed as a result of the analysis was (0.000)< 0.05, the hypothesis Ho was rejected and the alternative hypothesis H1 was accepted. The R-sq value of 47.9% shows the strength of the interaction. For the last questionsince habit measurement is a gray area, brainstorming was conducted and 15 files were randomly selected and it was decided to use a two-sample t-test. In this process, the completion and acceptance times of two types of reports received by the Turkish Finance Unit were compared. Although there is no difference in terms of the procedures performed, the time differences that may occur between them are considered as "time loss". The ideal report preparation time was accepted as 5 hours after the examination and interaction with other departments within the company. As a result of the analysis, it was revealed that there was a difference of 8.27 hours between the average times according to the type of report in the reporting process where all processes and procedures were the same. Since the P value is < 0.05, the alternative hypothesis is accepted.

During the improvement phase, meetings were held with the company and improvement options from the parties were examined and listed. Two main topics that can be improved regarding the report prioritization problem were identified.

- Requirement to accept reports received with software support in date order
- Adjusting teams according to employee performances

An experimental design was applied to examine these two topics, and while the solution of adjusting the team according to employee performances did not have a sufficient effect, the topic of organizing the process with software support was accepted. A pilot study was conducted on this solution and after the results were shared, the company approved the change.

Another solution adopted during the improvement phase was a process change planned for the waiting and lack of communication experienced by call center employees and supported by the program. As a result of the analysis of this, a process acceleration of 3.5 hours was achieved in the pilot study. Likewise, this application was also approved by the company.

Finally, in the control phase, the necessary systems were established to monitor and manage changes, customer satisfaction scores increased by 12% in a 2-month period, report preparation times were reduced to 60.2 hours in general, and in the section related to the account verification process in customer satisfaction surveys
34% increase in customer satisfaction was achieved. In repeated reports, the CSAT score increased by 56.6%.

Within the scope of the project, the 80% customer satisfaction score set by the company could not be achieved, and the customer satisfaction score of 64% was reduced to 76%. The fact that the company did not adopt Lean Six Sigma as a culture and that there were no employees/managers with generational skills, which is the most basic need, were major factors in the failure to achieve the set target.

Another main objective of the project was to introduce the Lean Six Sigma culture to the company, demonstrate its functionality and ensure its sustainability. Despite limited access and authorizations, the company was satisfied with this project and started the necessary investigations to adopt Lean Six Sigma as a culture. Such activities cannot be expected to contribute to the business in the long term if they are accepted as a culture of the company, become sustainable and are supported by the management continuously. These projects

should be recognized by the management as an ongoing and living activity. The biggest restriction made by the company during the project process was to exclude the parts that may be related to the software offered by the company as a service from the scope of the project. Since every country uses the online platform created as a service in the same way, the company avoided changes that could have a global impact by starting only from Turkish data. Due to this justifiable constraint, the pros and cons of using Lean Six Sigma for software development were discussed in detail in the interviews with the company. The company was shown the intersection points of Lean Six Sigma and Agile Sigma and information was shared about Agile Sigma.

In the age of digitalization, the number of companies offering software as a service is increasing day by day. This study has tried to show that the use of lean six sigma in such companies can have a positive impact.

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