

**ISTANBUL TECHNICAL UNIVERSITY**  
**Faculty of Computer Science and Informatics**

**SOFTWARE INTERNSHIP**  
**ROBOTIC PROCESS AUTOMATION DEVELOPMENT**

# **INTERNSHIP PROGRAM REPORT**

**ÖMER MALİK KALEMBAŞI**  
**150180112**

**SUMMER / 2022**

**Istanbul Technical University**

**Faculty of Computer Science and Informatics**

**INTERNSHIP REPORT**

Academic Year: 2021/2022  
Internship Term: ☒ Summer ☐ Spring ☐ Fall

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☒ No  
  
In the Graduation Term? ☐ Yes  
☒ No  
  
Taking a class at Summer  
School? ☐ Yes (Number of Courses: \_\_\_\_\_)  
☒ No

**Institution Information**

Company Name: BORUSAN MAKİNA VE GÜÇ SİS. A.Ş.  
Department: ROBOTIC AND ARTIFICIAL INTELLIGENCE DEPARTMENT  
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34865 Kartal/İstanbul

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Corporate Phone: +905497472635

### **Internship Work Information**

Internship Location: ☒ Turkey  
☐ Abroad  
Internship Start Date: 19.08.2022  
Internship End Date: 16.09.2022  
Number of Days Worked: 20  
During your internship, did you have insurance? ☒ Yes, I was insured by İTÜ.  
☐ Yes, I was insured by institution.  
☐ No, I did my internship abroad.  
☐ No.

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# **1 INFORMATION ABOUT THE INSTITUTION**

BorusanCat [1] is a subsidiary of Borusan Holding and is the distributor of Caterpillar for Middle and Far Asian geographies such as Russia, Azerbaijan, Kazakhstan. The company markets and provides technical service for CAT products. In the department where I did my internship, in the Robotics and Artificial Intelligence team, I worked as an RPA developer intern in the robotics team.

The robotics team is responsible for automating processes and making improvements that will save manpower and time in line with the demands of business units and process mining. Their projects include robots that need to be controlled by daily and weekly schedules such as PDF extractions, SAP processes, data storage and control operations, automatic tender controls. They use the Kofax RPA tool [2] as an auxiliary tool. System dashboard and assign projects control is carried out over Jira platform.

During my internship, I was responsible for adapting the KOFAX RPA tool and developing a project here. My project was to create an automation robot that would extract similar data from 5 different types of PDF invoices and then process and control these data in SAP, upon the request of the company's Kazakhstan branch. At the end of the internship process, the robot I developed was put live and is actively working on the calendar.

## **2 INTRODUCTION**

During this internship period, my goal and task was to adapt to the KOFAX RPA tool, to develop a project here, to test myself in practice on algorithms and database management, and to see the systematic functioning in corporate company planning.

## **3 DESCRIPTION AND ANALYSIS OF THE INTERNSHIP PROJECT**

The internship process can be broadly classified under four headings: Adapting to KOFAX, Project development, Functional tests and putting the project live, presentation to colleagues.

### **3.1 Adapting to KOFAX**

First, I finished the 10 video certified training of the Kofax Kapow Training series to get used to the KOFAX tool and RPA [3]. Then I practiced using the RPA tool on the website "<https://www.rpachallenge.com>" [4]. Each time this site is refreshed, tags such as 'First Name', 'Phone Number', 'Address' are replaced and the robot you are using is expected to write and save the correct data taken from the Excel file (Figure 3) against these tags. With this exercise, I understood the importance of the 'name tag' and its usage areas in sustainable algorithm development.



Figure 1: Kofax Kapow Certified Training [3]

RPA Challenge

Input Forms
Shortest Path
Movie Search

Instructions

EN

1. The goal of this challenge is to create a workflow that will input data from a spreadsheet into the form fields on the screen.

2. Beware! The fields will change position on the screen after every submission throughout 10 rounds thus the workflow must correctly identify where each spreadsheet record must be typed every time.

3. The actual countdown of the challenge will begin once you click the Start button until then you may submit the form as many times as you wish without receiving penalties.

Good luck!

DOWNLOAD EXCEL

START

Phone Number

Address

Last Name

First Name

Role in Company

Email

Company Name

SUBMIT

Figure 2: "https://www.rpachallenge.com" web site [4]

	A	B	C	D	E	F	G
1	First Name	Last Name	Company Name	Role in Company	Address	Email	Phone Number
2	John	Smith	IT Solutions	Analyst	98 North Road	jsmith@itsolutions.co.uk	40716543298
3	Jane	Dorsey	MediCare	Medical Engineer	11 Crown Street	jdorsey@mc.com	40791345621
4	Albert	Kipling	Waterfront	Accountant	22 Guild Street	kipling@waterfront.com	40735416854
5	Michael	Robertson	MediCare	IT Specialist	17 Farburn Terrace	mrobertson@mc.com	40733652145
6	Doug	Derrick	Timepath Inc.	Analyst	99 Shire Oak Road	dderrick@timepath.co.uk	40799885412
7	Jessie	Marlowe	Aperture Inc.	Scientist	27 Cheshire Street	jmarlowe@aperture.us	40733154268
8	Stan	Hamm	Sugarwell	Advisor	10 Dam Road	shamm@sugarwell.org	40712462257
9	Michelle	Norton	Aperture Inc.	Scientist	13 White Rabbit Street	mnorton@aperture.us	40731254562
10	Stacy	Shelby	TechDev	HR Manager	19 Pineapple Boulevard	sshelby@techdev.com	40741785214
11	Lara	Palmer	Timepath Inc.	Programmer	87 Orange Street	lpalmer@timepath.co.uk	40731653845
12							
13							
14							
15							
16							

Figure 3: challenge.xlsx file

## 3.2 Project Development

There are two robots developed, one of them is PDF Extraction Robot, another is SAP Process Robot. While starting the project, I reviewed the PDD document prepared by the business analyst at the request of the company's Kazakhstan branch. The requested process was for BorusanCat to collect certain data from invoices in PDF format issued from 5 different companies, and to control and save each invoice in the SAP system. Workflow shown below as Figure 4.

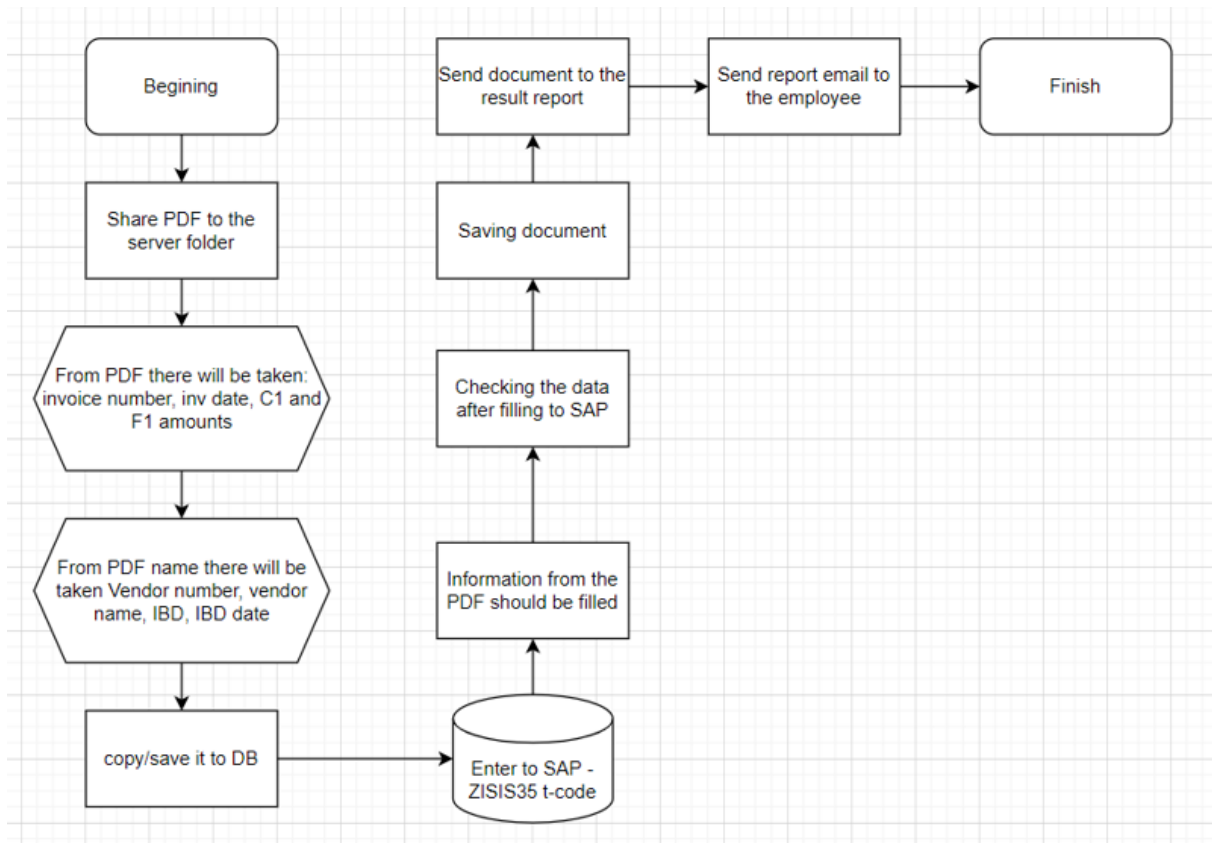


Figure 4: Workflow



### 3.2.1 PDF Extraction

The data that needed to be extracted automatically from invoices (Figure 14) were posting date, reference, vendor account, document date, currency, sales document, expense values, freight costs and total invoice. A sample invoice from the analysis document is shown in appendix as a figure (Figure 15). Invoicing companies and exact values will be included in the report in a censored manner as per company policy.

If we look inside the extraction robot (Figure 5), first of all, a general type (Figure 16) is created to store the variables and a table is created in the database with this type. The data extracted from each PDF is typed and stored in the database.

The robot pulls the pdfs in turn from the common folder (Figure 17) and extracts the posting date, vendor account and sales document data from the pdf names (Figure 18) and fills in the type. Then, it goes to the appropriate branch (Figure 6) according to the invoice type in the pdf name, extracts the reference, document date, currency, expense values, freight cost and total invoice data from the invoice content and fills in the type (Figure 7). Finally, he writes the data he filled in the type (Figure 20) to the database and saves it here (Figure 21). Type includes columns such as robot execution date, file name, status, process message to keep control of the process, apart from data.

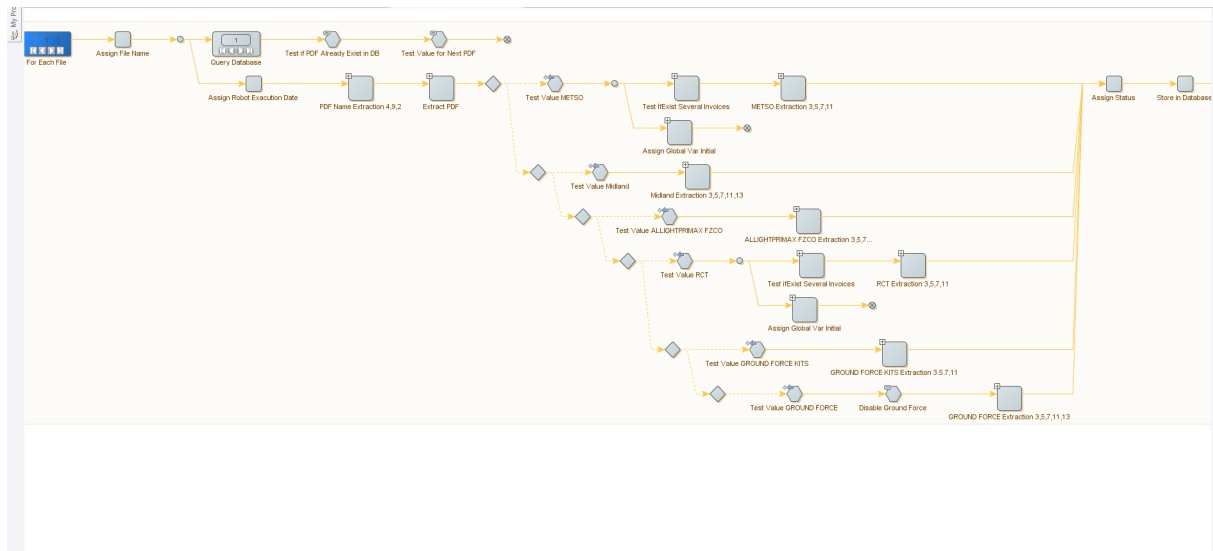


Figure 5: General look to PDF Extraction Robot

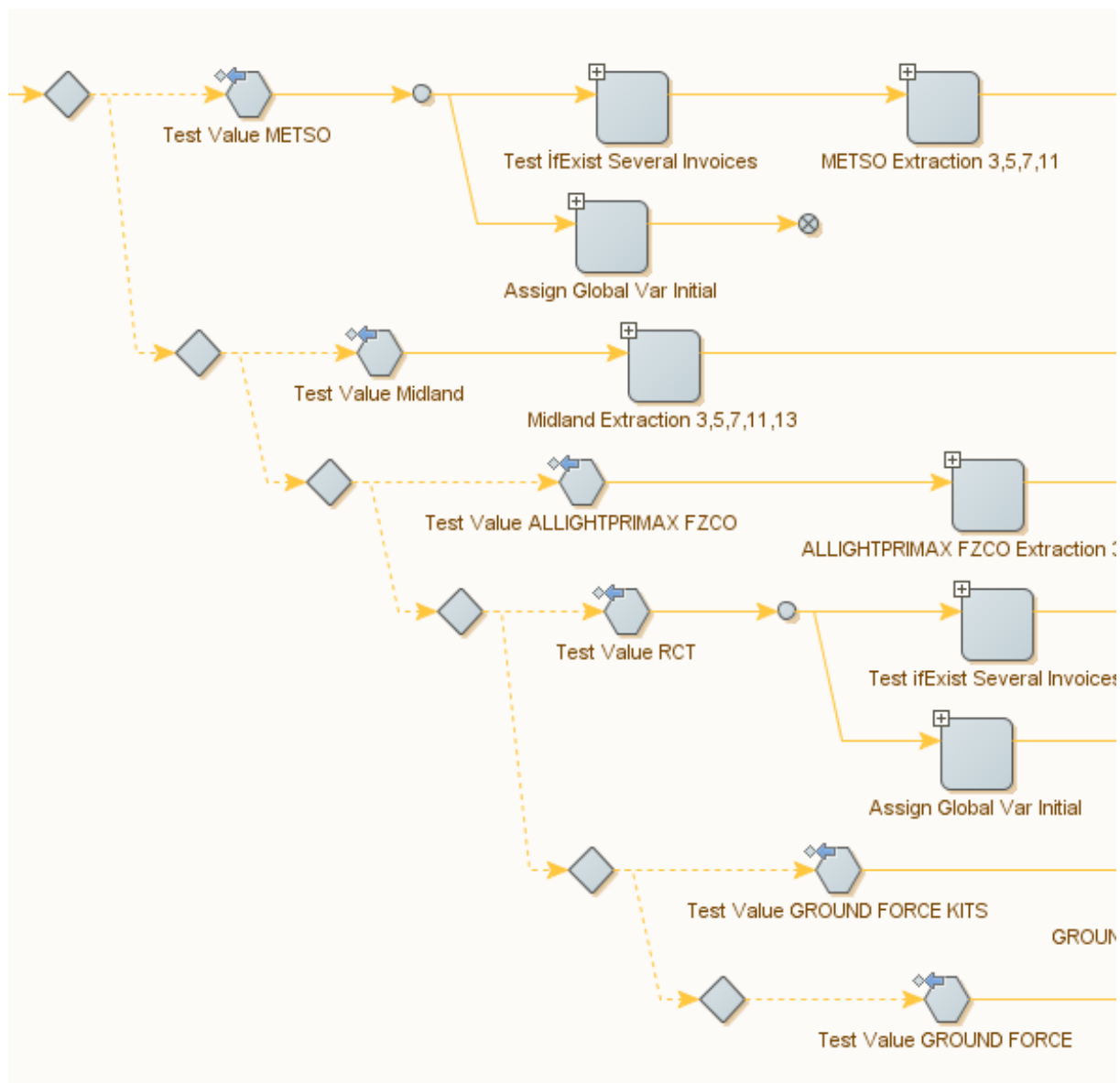


Figure 6: Try steps that decide which branch going to select in order to PDF type

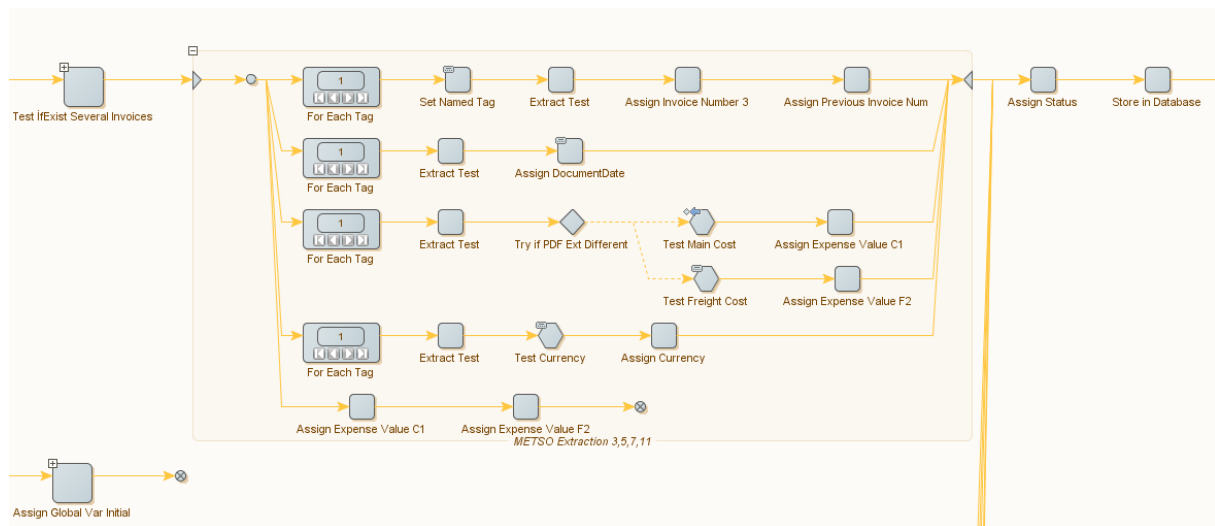


Figure 7: Inside an extraction branch, in order to selected PDF type, there are 4 branches more, similarly

### 3.2.2 SAP Process

Let's look inside the SAP Process Robot (Figure 8). The purpose of this robot, as seen in the workflow, is to log in to SAP and then go to the 'ZISIS35' transaction code, query the data obtained by the PDF Extraction robot from the database, and save it by filling in the transaction screen (Figure 9). After successfully completing all these processes, the robot writes the numbers of the recorded invoices into an excel file (Figure 10) and sends a result mail to the relevant business units (Figure 25).

While the robot is logging into SAP, it encrypts the password so that it is not seen by third parties and automates the process. In this way, the password cannot be shared with the developer and third parties who come later or access the robot development.

To summarize the operation of the process robot simply, it finds the data and the relevant tags, writes the data it receives from the database, ticks the appropriate boxes, simulates the screen, and then saves it. As a result of the transaction, it receives the process message on the SAP screen and writes it to the database.

Figure 8: SAP Process which taken from analyst document

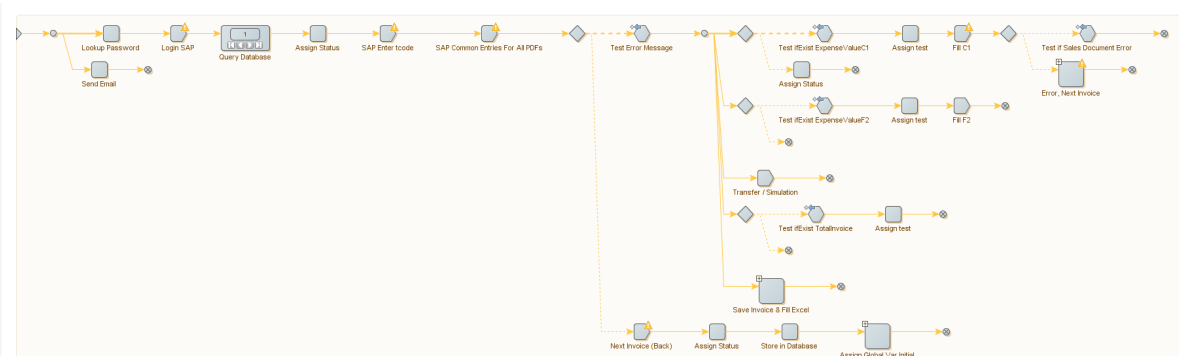


Figure 9: General look to SAP Process Robot

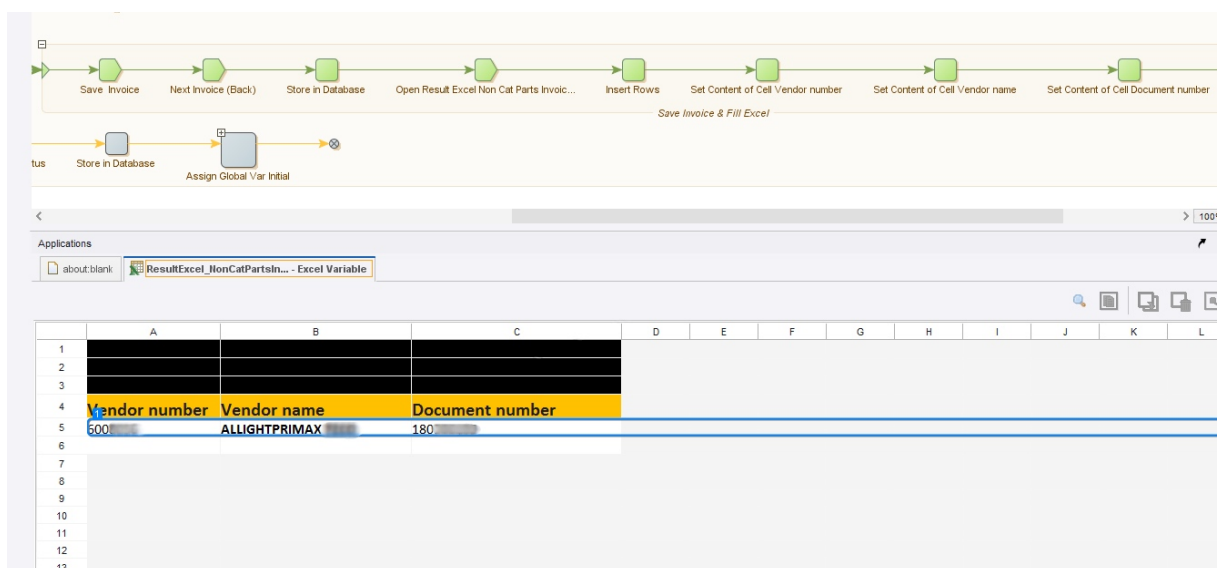


Figure 10: Excel file prepared by robot after steps completed successfully

### 3.3 Functional Tests and Putting the Project Live

After the development was completed, functional tests were started. Invoices coming to the business unit were entered into the system by the robot. Five different types of invoices were tested and it was seen that the automation performed the process successfully. After the tests, the robot was taken live and a shortcut 'Kapplet' was created via KOFAX Environment for easy access of the business unit.

Kapplets (Figure 11) are the robot operation screen developed by KOFAX tool, running on Kofax Management Console, and accessible with user name and password. The business unit that sent the robot request can operate the robot manually or on a scheduled basis by logging into this screen with the user name and password assigned to it after the robot is developed. In this project, the business unit that requested the robot wanted to run the robot manually instead of schedule. User and password were assigned to them. Its user has been granted access only for the robots he has requested.

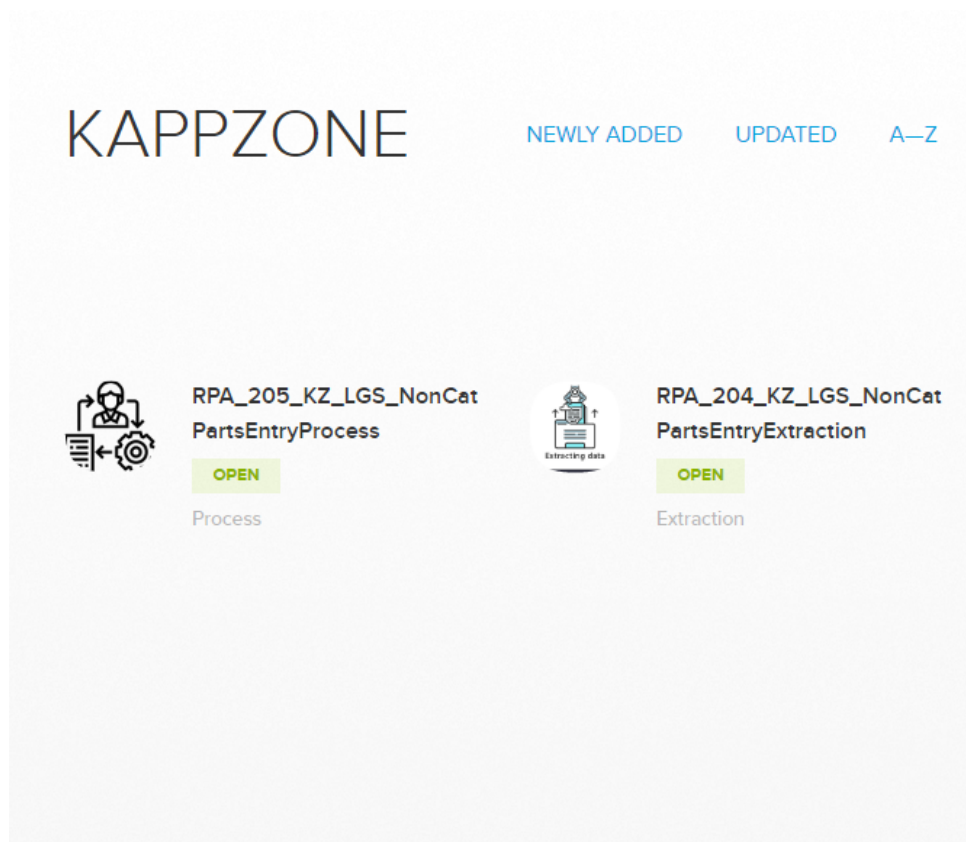


Figure 11: PDF Extraction Robot and SAP Process Robot's Kapplets

### 3.4 Presentation to Colleagues

In the final, I prepared and presented a presentation in which I explained the robot flow process, development and results to my colleagues, manager and business analysts in the department.



Figure 12: Presentation file preview

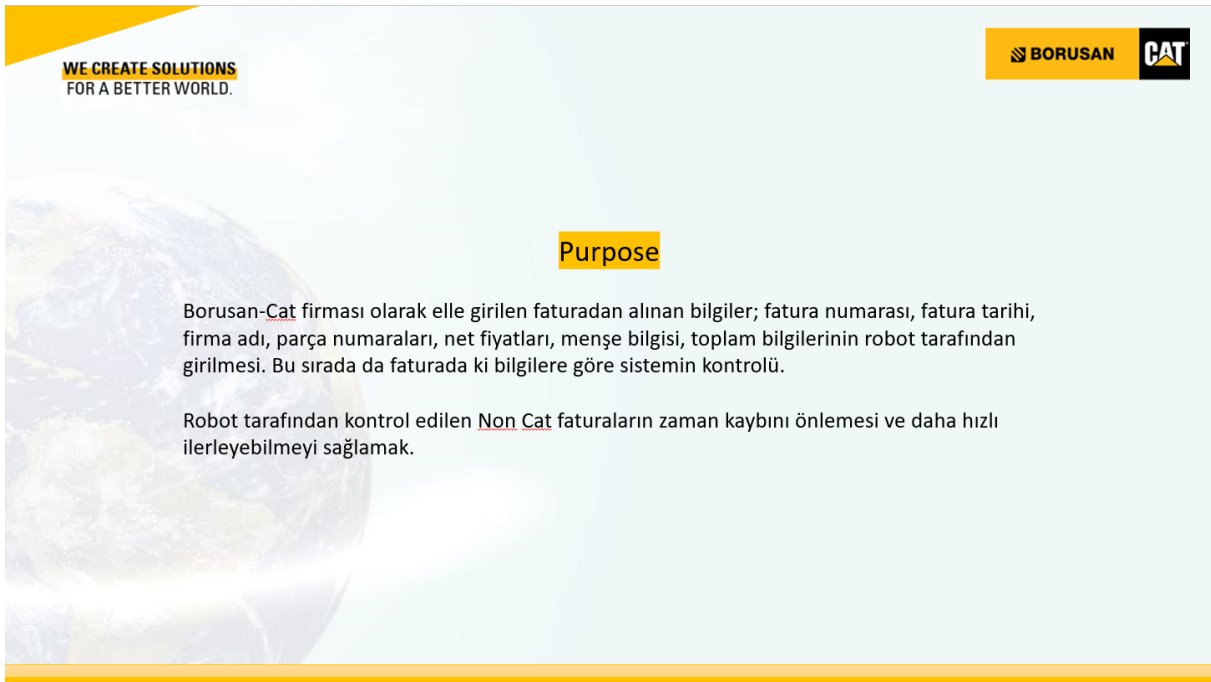


Figure 13: Presentation file preview

## 4 CONCLUSIONS

This internship program has been very beneficial for me. I witnessed the operation of the corporate company, the division of labor, the flow chart and how the works were controlled and followed. I improved my algorithm and database skills. I started learning and used Robotic Process Automation, which I had not had the chance to practice before. I was in constant contact with business analysts and colleagues. They supported me by discovering and applying things myself rather than asking. They did not set a deadline for the project, they said that the important thing is not to finish it in a short time, but to have a project that works flawlessly at the end of the job. KOFAX is a useful tool that facilitates the process, once you become familiar with this tool, the process becomes easier. I am very happy with what I learned and I think that my internship process was both visionary, instructive, productive and fun.

## 5 REFERENCES

- [1] <https://www.borusancat.com/tr>
- [2] <https://www.kofax.com/>
- [3] <http://docshield.kofax.com/RPA/>
- [4] <https://www.rpachallenge.com/>
- [5] <https://www.w3schools.com/sql/>

## 6 APPENDIX

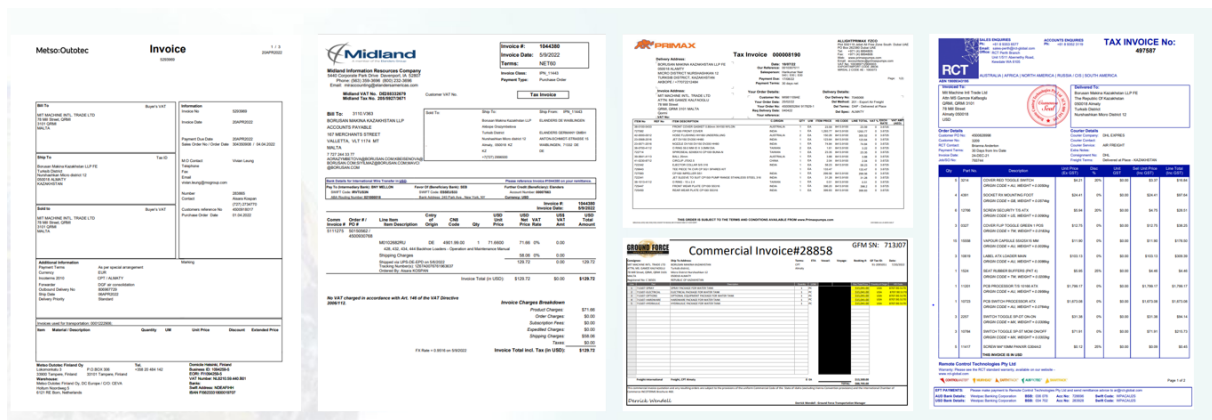


Figure 14: Invoice types



Metso:Outotec

## Invoice

5289802

27.3  
24MAR2022

Invoices used for transportation: 0001219447:

Item	Material / Description	Quantity	UM	Unit Price	Discou	Price
10	945116 CABLE GROUP SPEED SENSOR Country of Origin: FI Commodity code	5,00	EA	180,00	32,00 %	12,00
SubTotal						612,00
Total Freight						82,69
VAT						0,00
Total Tax						0,00
Total (EUR)						694,69

Send the shipping docs for review before dispatching

Customs Code	Country of Origin	Number of Pieces	Total Net Weight(KG)	Total Value
8544.42.90	FI	5,000	1,700	612,00

Package ID	Package Type	Description	Tracking ID	Dimensions (CM)			Measured Gross Weight(KG)
				L	W	H	
1005070282	Carton, 38x37x29cm		1643819800286 61542	38,000	37,000	29,000	3,000
Number of Packages(EA)		1					Measured Total Gross Weight(KG)
Total Volume(m3)		0,041 M3					Measured Total Net Weight(kg)
							1,700

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ECRI: FI1094259-5  
VAT Number: NL8210.59.440.B01  
Banks:  
Swift Address: NDEAFIHH  
IBAN FI5623331800019707

6007967\_180289909\_24.03.2022\_METSO

Figure 15: PDF sample to extract

Name	Storage Name	Attribute Type	Default Value	Storable	Required	Part of Database Key
RobotExecutionDate		Date		✓		
FileName		Short Text		✓		
CompanyCode		Short Text	MT01	✓		
PostingDate		Short Text		✓		
Reference		Short Text		✓		✓
VendorAccount		Short Text		✓		
DocumentDate		Short Text		✓		
BusinessArea		Short Text	KZ99	✓		
Currency		Short Text		✓		
RelatedDoc		Short Text	T Inbound Delivery	✓		
SalesDocument		Short Text		✓		
ExpenseValueC1		Number		✓		
ExpenseValueF2		Number		✓		
TotalInvoice		Number		✓		
Status		Short Text		✓		
ProcessMessage		Short Text		✓		

Figure 16: Empty type ready to fill, database key selected as 'reference', because of Invoice number for each invoice is unique.

6007_1802_09.02.2022_METSO.PDF	2/9/2022 8:21 AM	Chrome HTML Document	60 KB
6007_1802_02.03.2022_METSO.pdf	3/2/2022 6:21 PM	Chrome HTML Document	642 KB
6007_1802_25.02.2022_METSO.pdf	2/25/2022 7:15 PM	Chrome HTML Document	38 KB
6007_1802_05.05.2022_METSO.pdf	5/5/2022 2:08 PM	Chrome HTML Document	41 KB
6007_1802_16.08.2022_METSO.pdf	8/18/2022 10:13 AM	Chrome HTML Document	69 KB
6007_1802_03.02.2022_MIDLAND.pdf	2/3/2022 1:04 PM	Chrome HTML Document	432 KB
6007_1802_09.02.2022_MIDLAND.pdf	2/9/2022 12:08 PM	Chrome HTML Document	432 KB
6007_1802_11.02.2022_MIDLAND.pdf	2/11/2022 7:59 PM	Chrome HTML Document	434 KB
6007_1802_28.04.2022_MIDLAND.pdf	4/29/2022 5:59 AM	Chrome HTML Document	435 KB
6007_1802_05.03.2022_MIDLAND.pdf	3/9/2022 7:08 AM	Chrome HTML Document	434 KB

Figure 17: Shared folder which robots pulls the PDFs

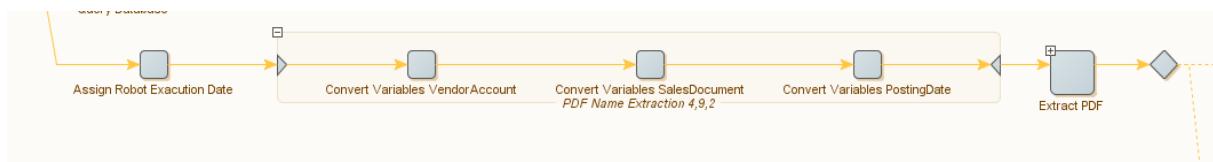


Figure 18: PDF name extraction steps

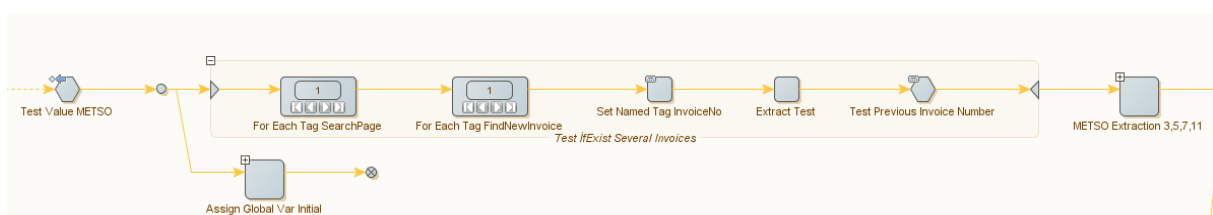


Figure 19: Flow example represents if one PDF involves several invoices

RPA\_204\_KZ\_LGS\_NonCatPartsEntryf Type: RPA\_204\_KZ\_LGS\_NonCatPartsEntryExtraction\_PDFDatas

RobotExecutionDate: 2022-09-02 16:01:32.619 Now

FileName: 6007967\_ PDF

CompanyCode:

PostingDate: 09.02.2022

Reference:

VendorAccount:

DocumentDate: 19.01.2022

BusinessArea: K2

Currency: EUR

RelatedDoc: T Inbound Delivery

SalesDocument: 18

ExpenseValueC1: 5

ExpenseValueF2: 2

TotalInvoice:

Status: 01\_Extracted

ProcessMessage:

Figure 20: After data extractions done, general look into type

Table: RPA\_204\_KZ\_LGS\_NonCatPartsEntryExtraction\_PDFDatas

Export to: Excel XML CSV

RobotExecutionDate	FileName	CompanyCode	PostingDate	Reference	VendorAccount	DocumentDate	BusinessArea	Currency	RelatedDoc	SalesDocument	ExpenseValueC1	ExpenseValueF2	TotalInvoice	Status	ProcessMessage	Delete
2022-08-27 22:03:23.345	6008056_180306185_21.07.2022_ALLI...	MT01	21.07.2022	000008190	6008056	19.07.2022	K299	USD	T Inbound Delivery	180306185	3505.58	1270.0	4775.58	01_Extracted	null	
2022-08-27 22:03:19.385	6008056_180296488_06.05.2022_ALLI...	MT01	06.05.2022	000008098	6008056	22.04.2022	K299	USD	T Inbound Delivery	180296488	2382.87	1500.0	25362.87	01_Extracted	null	
2022-08-27 22:04:24.187	6008073_180309683_11.08.2022_GRO...	MT01	11.08.2022	573204	6008073	29.07.2022	K299	USD	T Inbound Delivery	180309683	101933.0	null	null	01_Extracted	null	
2022-08-27 22:02:24.374	6007967_180289934_02.03.2022_MET...	MT01	02.03.2022	5273424	6007967	24.02.2022	K299	EUR	T Inbound Delivery	180289934	656.31	363.11	null	01_Extracted	null	
2022-08-27 22:02:59.199	6007968_180285725_05.03.2022_MID...	MT01	05.03.2022	1817745	6007968	04.03.2022	K299	USD	T Inbound Delivery	180285725	3160.74	1482.43	null	01_Extracted	null	
2022-08-27 22:02:42.973	6007968_180281714_03.02.2022_MID...	MT01	03.02.2022	0996656	6007968	06.01.2022	K299	USD	T Inbound Delivery	180281714	71.66	59.05	null	01_Extracted	null	
2022-08-27 22:03:11.294	6007968_180297809_18.05.2022_MID...	MT01	18.05.2022	1044380	6007968	09.05.2022	K299	USD	T Inbound Delivery	180297809	71.66	58.06	null	01_Extracted	null	
2022-08-27 22:03:03.25	6007968_180292502_12.04.2022_MID...	MT01	12.04.2022	1932756	6007968	08.04.2022	K299	USD	T Inbound Delivery	180292502	32.8	80.53	null	01_Extracted	null	
2022-08-27 22:02:37.45	6007967_180310049_16.08.2022_MET...	MT01	16.08.2022	5309617	6007967	04.08.2022	K299	EUR	T Inbound Delivery	180310049	183.66	null	null	01_Extracted	null	
2022-08-27 22:04:16.95	6008073_180309683_11.08.2022_GRO...	MT01	11.08.2022	713407	6008073	29.07.2022	K299	USD	T Inbound Delivery	180309683	88765.8	null	null	01_Extracted	null	
2022-08-27 22:02:20.4	6007967_180283704_09.02.2022_MET...	MT01	09.02.2022	5279184	6007967	19.01.2022	K299	EUR	T Inbound Delivery	180283704	5038.54	2737.02	null	01_Extracted	null	
2022-08-27 22:04:20.581	6008073_180309682_11.08.2022_GRO...	MT01	11.08.2022	713410	6008073	29.07.2022	K299	USD	T Inbound Delivery	180309682	88765.8	null	null	01_Extracted	null	
2022-08-27 22:03:07.262	6007968_180292967_10.04.2022_MID...	MT01	10.04.2022	1034543	6007968	13.04.2022	K299	USD	T Inbound Delivery	180292967	336.7	129.96	null	01_Extracted	null	
2022-08-27 22:03:42.338	6008071_180297760_17.05.2022_RCT...	MT01	17.05.2022	516293	6008071	22.04.2022	K299	USD	T Inbound Delivery	180297760	11323.89	null	null	01_Extracted	null	
2022-08-27 22:03:36.907	6008071_180294896_27.04.2022_RCT...	MT01	27.04.2022	508848	6008071	31.03.2022	K299	USD	T Inbound Delivery	180294896	11964.6	null	null	01_Extracted	null	
2022-08-27 22:03:49.705	6008071_180309697_05.08.2022_RCT...	MT01	05.08.2022	519997	6008071	19.07.2022	K299	USD	T Inbound Delivery	180309697	9765.7	null	null	01_Extracted	null	
2022-08-27 22:02:55.192	6007968_180285913_28.04.2022_MID...	MT01	28.04.2022	1036118	6007968	18.04.2022	K299	USD	T Inbound Delivery	180285913	336.79	172.96	null	01_Extracted	null	
2022-08-27 22:02:29.877	6007967_180289973_25.02.2022_MET...	MT01	25.02.2022	5284114	6007967	17.02.2022	K299	EUR	T Inbound Delivery	180289973	114.72	158.0	null	01_Extracted	null	
2022-08-27 22:02:47.148	6007968_180283423_09.02.2022_MID...	MT01	09.02.2022	1066280	6007968	31.01.2022	K299	USD	T Inbound Delivery	180283423	469.27	96.31	null	01_Extracted	null	
2022-08-27 22:03:35.407	6008071_180285985_28.03.2022_RCT...	MT01	28.03.2022	505912	6008071	14.03.2022	K299	USD	T Inbound Delivery	180285985	2000.84	null	null	01_Extracted	null	
2022-08-27 22:02:33.403	6007967_180293686_05.05.2022_MET...	MT01	05.05.2022	5293989	6007967	29.04.2022	K299	EUR	T Inbound Delivery	180293686	1046.99	null	null	01_Extracted	null	
2022-08-27 22:02:51.209	6007968_180294291_11.02.2022_MID...	MT01	11.02.2022	1009789	6007968	09.02.2022	K299	USD	T Inbound Delivery	180294291	1407.81	173.76	null	01_Extracted	null	
2022-08-27 22:02:42.338	6008071_180287760_17.05.2022_RCT...	MT01	17.05.2022	519556	6008071	27.04.2022	K299	USD	T Inbound Delivery	180287760	6373.23	null	null	01_Extracted	null	
2022-08-27 22:02:37.45	6007967_180310049_16.08.2022_MET...	MT01	16.08.2022	5309615	6007967	04.08.2022	K299	EUR	T Inbound Delivery	180310049	1421.2	168.43	null	01_Extracted	null	
2022-08-27 22:02:42.338	6008071_180297760_17.05.2022_RCT...	MT01	17.05.2022	508877	6008071	06.04.2022	K299	USD	T Inbound Delivery	180297760	1888.22	null	null	01_Extracted	null	
2022-08-27 22:03:49.705	6008071_180309697_05.08.2022_RCT...	MT01	05.08.2022	519972	6008071	19.07.2022	K299	USD	T Inbound Delivery	180309697	197.37	null	null	01_Extracted	null	

Figure 21: After all data extractions done, general look to database

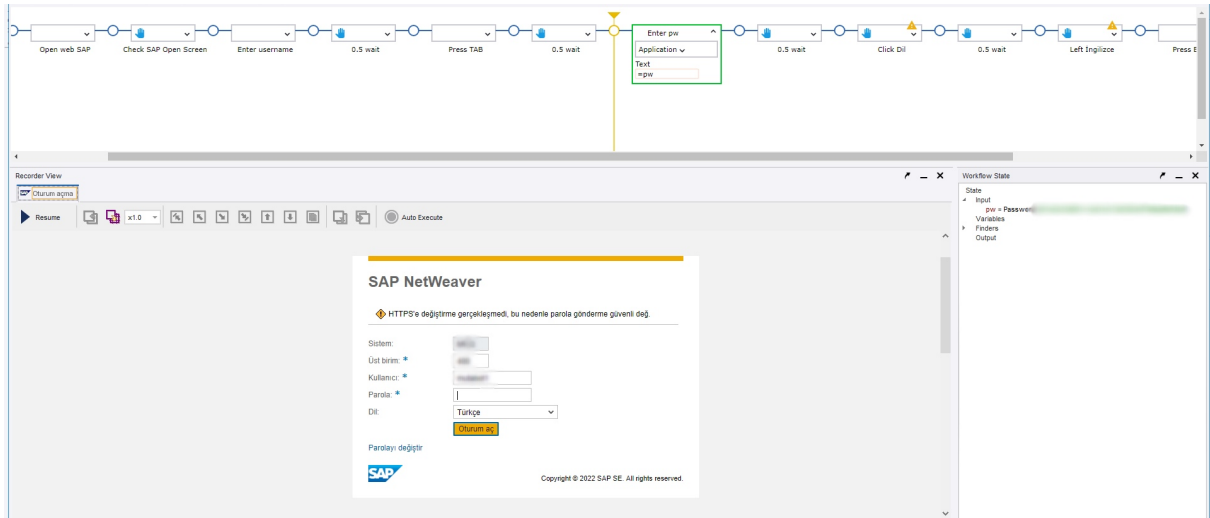


Figure 22: Login SAP steps

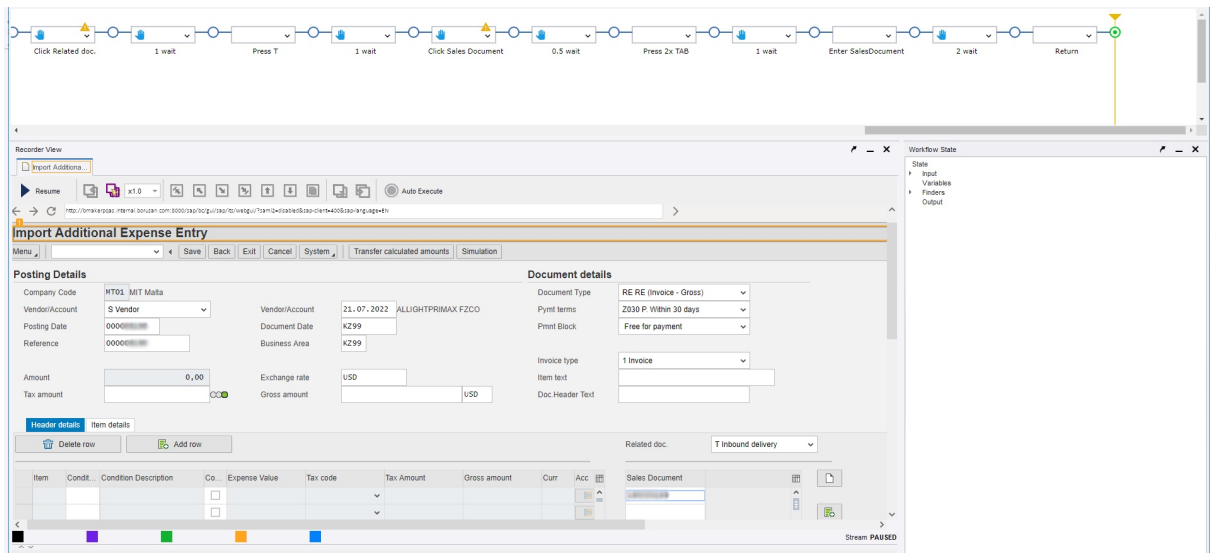


Figure 23: SAP look while robot running

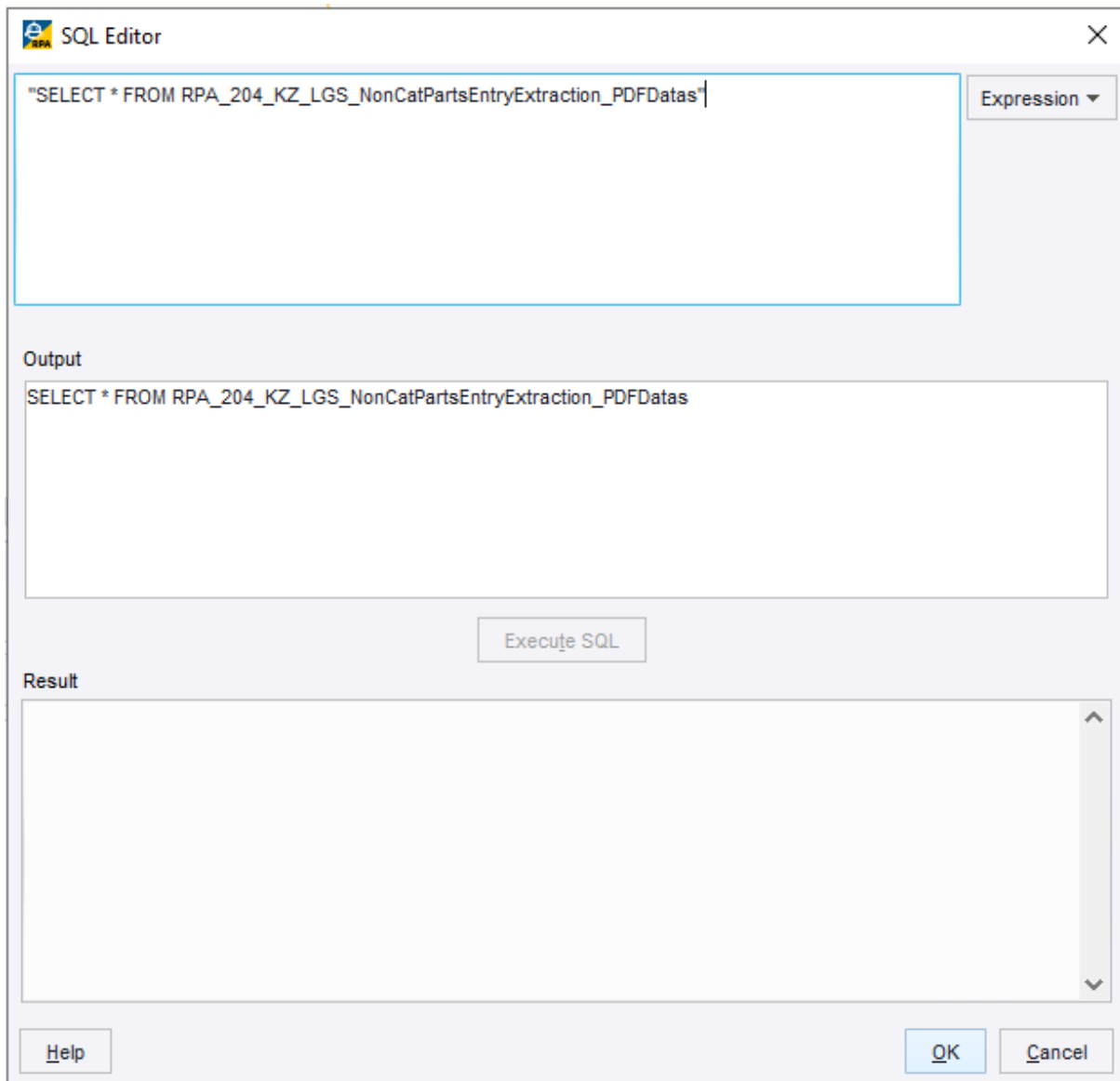


Figure 24: Query Database step and SQL Query example

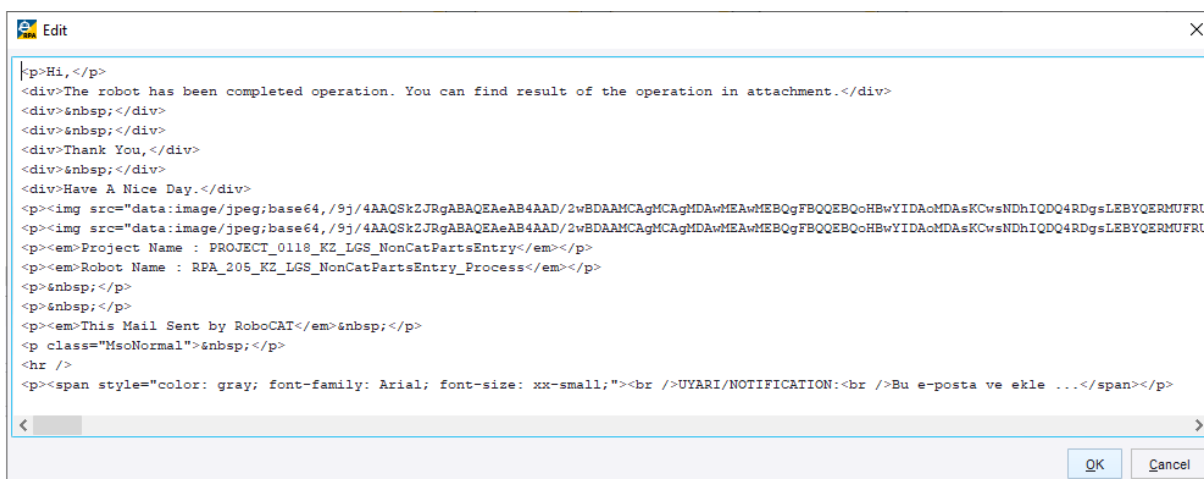


Figure 25: HTML source that written for sending result mail