# Business Process Automation

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An Investigation of how automation helps businesses to meet their long-term goals and how dramatically it enables companies to reduce their operational cost. I am researching the impact on the overall ROI (Return on Investment) and productivity of businesses after implementing RPA (Robotic Process Automation) in their ecosystem.

|        Topic        | Page No. |

1. **Introduction**

We can say that automation is a very new concept of Artificial Intelligence. Artificial Intelligence is tremendously changing our world and the way we work. There are so many definitions for Artificial Intelligence but in general, we can say that it is intelligence that is artificially generated by machines to accomplish certain tasks without any human intervention or intelligence. Artificial intelligence is evolving day by day and occupying every single industry whether it is healthcare, logistics, banking, finance, tourism, manufacturing, etc. Data is the backbone of all these technologies and data-driven decision-making is the center of all this. Various sub-sets of Artificial Intelligence add a unique value to AI and make AI a robust tool to encounter the challenges of the 21$^{st}$ century. First, I want to describe technologies that directly or indirectly leverage Artificial Intelligence.

1.2 **Machine Learning** It is a subfield of Artificial Intelligence and it enables computers to learn and improve over time. Machine learning detects trends from historical patterns and provides us with output accordingly. For instance, if we have the data for a company's sales for the last three years, based on that particular information, we can use machine learning Regression models to generate a forecast for the next year's sales. From the classification perspective, we take cancer prediction as an example in which we use classification models such as Decision Tree, Random Forest, or Logistic Regression to identify the benign and malign cells from the patient's data. We can say that Machine Learning is a very important component of AI.

1.3 **Deep Learning** It is also a family of Machine Learning and it's all about replicating the human brain. Deep Learning uses neural networks to mimic human actions and it works well with the structure and unstructured data. Virtual assistants, chatbots, and face recognition are a few examples of deep

learning. It is still a grey area of Artificial Intelligence and a lot of research going on this.

**1.4 Natural Language Processing (NLP)** With the advent of Natural Language Processing, now we can analyze textual data or the data which is available in alphabetical form. NLP converts all alphabetical information into numbers which is also known as vectorization, so we can get insights from the textual data. It is a very useful technology and so many companies use this technology to deal with unstructured data. Amazon's Alexa is a very good example of this which can understand human voices and respond accordingly.

**1.5 Robot** It refers to automation in which a certain activity is accomplished by machines that are generally done by human beings. We have seen so many examples of robots where machines replace humans. As far as my project is concerned, we only talk about software robots, a kind of software application that doesn't have any physical properties such as an arm or leg.

**1.6 Digital Workforce** We use this kind of term when companies started using a workforce that is driven by technology such as bots, programs, and software applications that are able to accomplish certain tasks without any human intervention. The digital workforce allows companies to dramatically reduce their operational cost and adds real value to the overall ROI (Return on Investment) of the company.

**1.7 Robotic Process Automation (RPA)** We mainly use RPA to automate business processes and it is a very robust technology to automate rule-based, mundane, and other repetitive tasks of the organizations. RPA is not like a robot with arms and legs but it is a kind of software application that works automatically and it only automates knowledge worker tasks. If we can successfully implement this sort of technology in our financial or operational ecosystem so we will be able to reduce the huge amount of operational cost of the company and we can also streamline our projects due to the high speed and accuracy of the RPA. One of the biggest benefits of technology in business is to automate workflows and even we can leverage automation to optimize profit margin

As we have discussed above the various subfields of Artificial Intelligence but in this research, I will mainly focus on Robotic Process Automation (RPA) which helps businesses to replace humans with software applications. As we have already discussed in the pilot report that the RPA is an exciting area of technology and it helps companies to transform themselves. We can measure the output of the RPA by seeing the quick ROI (Return on Investment). RPA term is coined by Pat Geary who was the chief evangelist of Blue Prism at that time it is believed that this term is chosen for marketing purposes because RPA means Robotic Process Automation and there is no physical robot involved in that, it is just a software application. If we see the other term "Process" which is also not correct and, in my view, the task is the appropriate word for that because it accomplishes certain tasks. RPA combines Artificial Intelligence, screen scraping, OCR (Optical Character Recognition), NLP (Natural Language Processing), and workflow automation. RPA is evolving day by day and companies are using RPA to increase productivity, reduce operational costs, and better customer service experience.

**It is better to take a view of some of the major players of the RPA and companies which already implemented RPA in their operational ecosystem.**

UI Path: **"**Robotic Process Automation is the technology that allows anyone today to configure computer software or a robot to emulate and integrate the actions of a human interacting within digital systems to execute a business process. RPA robots utilize the user interface to capture data and manipulate applications just like humans do. They interpret trigger responses and communicate with other systems to perform a vast variety of repetitive tasks. Only substantially better: an RPA software robot never sleeps, makes zero mistakes, and costs a lot less than an employee."

Automation Anywhere: "RPA is as simple and powerful as it sounds. Robotic Process Automation enables you with tools to create your software robots to automate any business process. Your bots are configurable software set up to perform the tasks you assign and control."

Kryon Systems: "Robotic Process Automation enables enterprises to create true virtual workforces that drive business agility and efficiency. A virtual workforce, comprised of software robots that can execute business tasks on enterprise applications, becomes an integral part of an enterprise's greater workforce. It is managed just as any other team in the organization and can interact with people just as other employees would interact with one another. Virtual workers (robots) complete business processes, just as a person would, but in less time, with greater accuracy, and at a fraction of the cost. RPA stands out for its ability to impact business outcomes, resulting in significant ROI."

Before we start developing some automation bots with the help of UI Path Studio Environment, we need to address the whole process in a sequence which requires implementing such technology in a real environment. There is a **life cycle** that we have to follow while implementing RPA in the organization's ecosystem and this is the first important step in the **Project Management** of the **RPA**. In the following paragraph, I will describe each component of the RPA lifecycle.

## 2. Life Cycle of the RPA
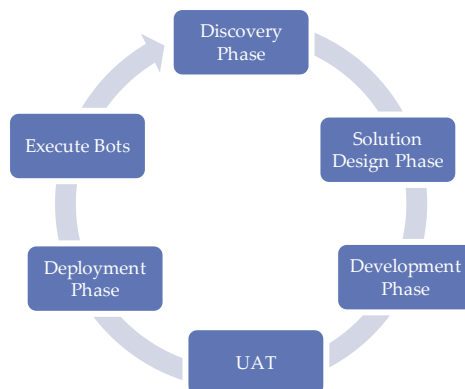


**Figure 1: Lifecycle of the RPA**

**2.1 Discovery Phase** The starting phase is the discovery phase of the RPA in which requirements are analyzed, for instance, if the client requires to build a bot that filter some data from the excel file based on certain conditions so the client explained the requirement to the process architect and process architect is the one who interacts with the client and provides them solutions according to their needs. We have to understand one thing we cannot automate everything, to successfully implement RPA we need to do a task that is rule-based, mundane, repetitive, or high-volume business activity.

**2.2 Solution Design Phase** Next phase is the Solution design phase in which the solution of your automation is designed. The process architect sits down with the technical architect and then they create a process definition document that contains information about every step of the process. After developing the design for the process, the next step is to decide the budget, manpower, time duration that how much time we are going to spend on the project, etc.

After considering all these factors the next step is to design the **object model flowchart** which indicates the complete process of the development.  It is a kind of technical documentation of the RPA so anyone can refer to this documentation to develop bots in the future.

Initialization → Condition → Next Step → Condition → Last Step
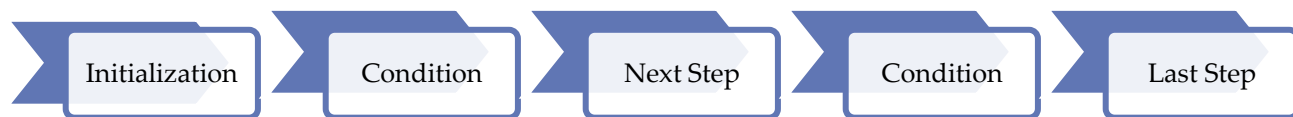
**Figure 2:Object Model Flowchart**

Once the object model flowchart is designed, the next step is to choose which particular tool we want to automate our tasks because there are many tools available in the market such as UI Path, Automation Anywhere, Blue Prism, etc. It all depends on the client on which tools they want to choose.

**2.3 Development Phase** This is a phase when we start developing bots and the automation developer refers to the documentation and designing of the bots according to the client's needs. This is the phase when automation developer comes into the picture and start developing workflows. Workflows are basic steps involved in a process so we try to capture those processes one by one in a sequence and then automate those processes with the help of RPA. Generally, in the UI Path, we use drag and drop and visual basic programming to set some conditions.

**2.4 UAT (User Acceptance Test)** in this phase of the RPA lifecycle, bots are being tested by the testing team. The bots are tested in the pre-production environment to test how users can use these bots to automate something and if there is any error to still have to be rectified. It is the same as any other software testing.

**2.5 Deployment Phase** After successfully testing the bot now the final phase is the deployment of the application in the production environment. Now, users can automate their tasks by using RPA and also refers to the documentation to build other bots with similar features.

## 3   Architecture Of the UI Path RPA

When it comes to UI Path automation so there are three main components involved in that.

**3.1 UI Path Studio** It is a visual designer that we can use to build automation workflows. It is a GUI dashboard that enables us to design automation workflows with the help of pre-built activities. There are various steps that we use while automating workflows and we use various studio features in the whole process. I am giving a brief introduction to the features of the studio environment below.

**3.1.1   GUI Dashboard** It is a visual dashboard that we use to create sequences and flowcharts to automate certain tasks. There are various pre-defined activities available that we use to build a bot.

**3.1.2   Complexity Level** There are three main complexity levels in the UI Path Studio sequence, flowchart, and state machine. We use sequence if the task is simple and rule-based. We can use a flowchart if there are some conditions in the process that we have to follow because a flowchart allows us to set some conditions and it is a kind of tree shape structure that contain various nods and each nod contains a binary value (0,1) or a decision point (True, False) which we can use accordingly. We can use the state machine when automation requires a finite number of states in its execution. Transitions are another important factor in the state machine which allow us to add some conditions as well.

**3.1.3   Recorders** Ui Path RPA allows us to record certain tasks to automate processes. It is more convenient for non-medical background employees because they can easily record all their steps one by one in the process and automate their tasks instead of writing code for the automation.

**3.1.4   Logging and Exception Handling** UI Path provides us with various tools to handle debugging and exceptions that are quite useful and we can use these tools during our project for troubleshooting.

**3.1.5   Integrated with OCR (Optical Character Recognition) technologies** We know that we can perform the advanced level of screen scraping with the help of RPA because it is integrated with OCR (Optical Character Recognition) technologies and it is quite useful when we have to fetch some information from the pdf files or online images.

**3.1.6   Libraries** It is a very useful feature of the UI Path RPA because it contains multiple reusable components.

**3.2 UI Path Robot** When it comes to RPA robots so we have to understand one thing it is not a kind of physical robot but it is a software application that can accomplish tasks that are generally done by human beings. It is a platform that executes the automation workflows in the UI Path Studio and this is the only

function of the Robots. There are single UI Path robots and multiple UI Path robots based on the task we will automate.

**3.3 UI Path Orchestrator** In general we can say that the UI Path Orchestrator manages all the attended and unattended robots and allow us to deploy, trigger, monitor, schedule, and track the robots. It orchestrates the execution of the workflows by robots.

Ui Path architecture comprises all three components and all the components work together and execute a specific task. There are the following three main layers in RPA architecture.
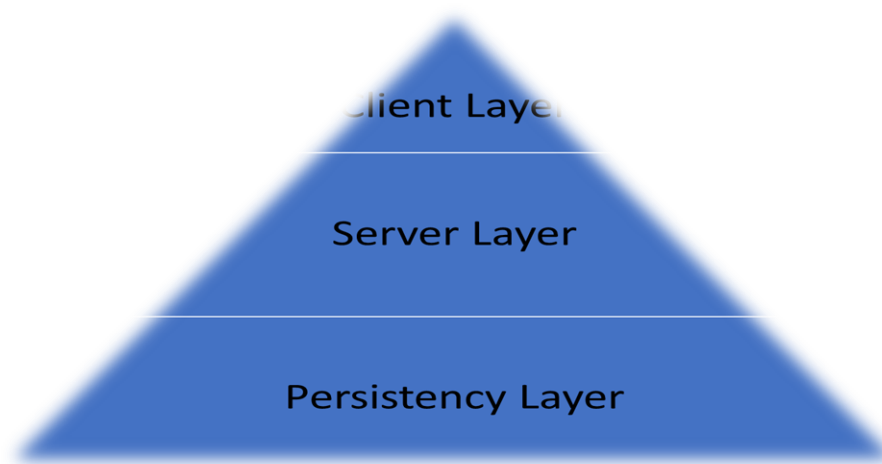


**Figure 3: Layers of the RPA Architecture**

   a. **Client Layer** This is the first layer of the RPA architecture and it is the most useful layer because it comprises the UI Path Studio and the UI Path Robot. we have already discussed that we run and develop all our bots in the studio environment and the robot helps us to execute all our bots.

   b. **Server Layer** Once we develop our bot in the studio, the next step is to upload it to the orchestrator. The orchestrator works as an administrator and manages all bots on the server. When it comes to project management, so we need a server where we run and manage all

applications so the server layer is very important in the case of RPA and we can run our bots on various computers with the help of Orchestrator.

c. **Persistency Layer** The main function of this layer is a database management and robot configuration. This layer keeps all the history of the changes in the data and restores the data, so we can say this layer plays a crucial role in the RPA architecture.

4. **Types of RPA**

As we know that the RPA is evolving day by day and still a lot of research going on in this area of automation. We can divide RPA technology into different groups.

**4.1 Attended RPA** This kind of bot we found in the first phase of the RPA, works with the human operator and provides them assistance in their tasks while working. Call centers are the perfect examples of this kind of bot when bots find the information while agents talk to the customer which makes the process faster.

4.2 **Unattended RPA** This is the new version of the RPA which is quite advanced and is capable enough to accomplish certain tasks without any human intervention. It is generally triggered by a certain activity, for instance, if we get an email so it will automatically start functioning after getting the mail.

4.3 **Intelligent Process Automation (IPA)** This is the latest version of the RPA in which RPA started working with Artificial Intelligence and it started improving its performance over time due to machine learning capabilities. We can say that Artificial Intelligence enhances RPA capabilities to take a better decisions without any human intervention.

5. **Bot Development**

Here, I am going to explain how we develop automation bots from scratch and the different types of designing methods that we can use while developing RPA bots such as creating a workflow, sequence, flowchart, and recording methods. After installing the studio environment in our system, we can see the following page.
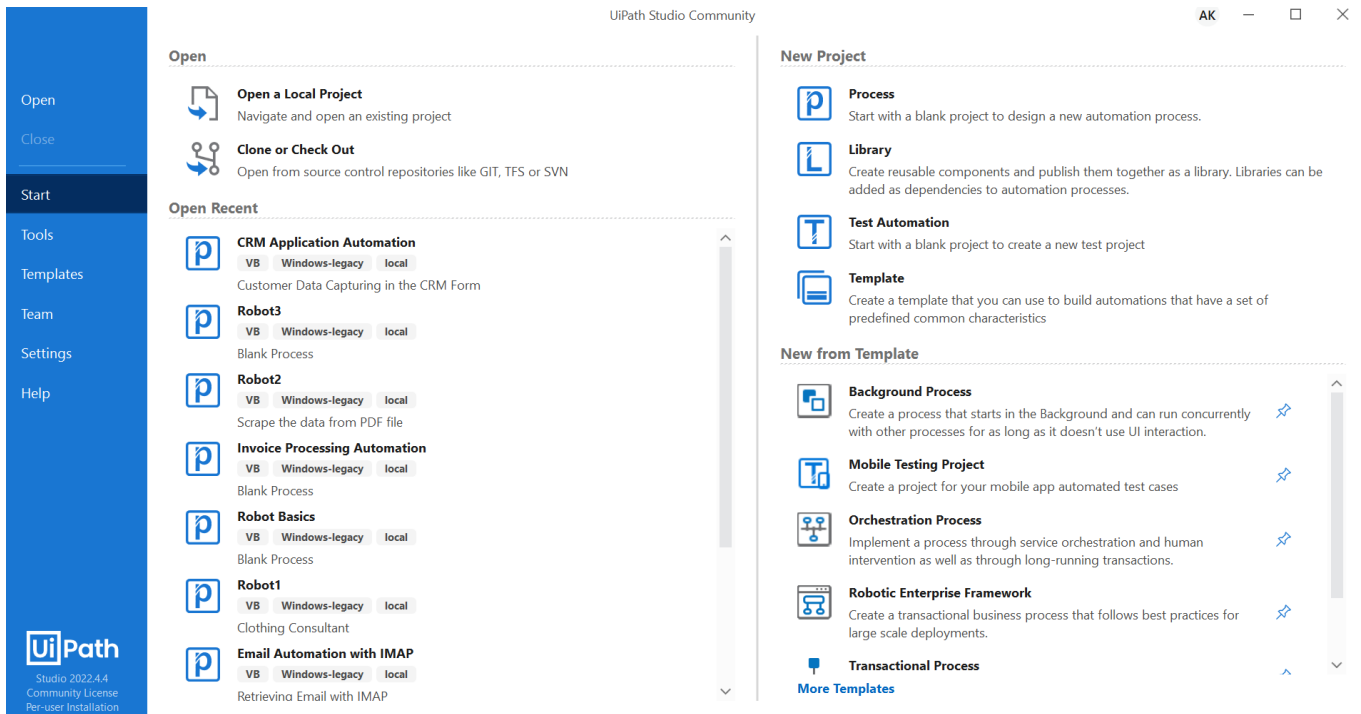
**Figure 4: Ui Path Studio Main Page**

**Open Function**: with the help of the Open function, we can navigate our computer system and find a UI Path process there and select from there. The Clone and Check Out function gives us access to version control and we can track the bot development process through GitHub. This is very useful in a collaborative working environment.

**New Project**: We can start creating a new process from here and then it will automatically add to the library. A library is a place where we create reusable components and publish them together. Test Automation will help us to test some projects and the template helps us to build automation that has a predefined common characteristic.

**New Template**: This function provides us to prebuild processes that we can use if it matches our task requirements. This is the faster way to develop bots because we don't need to create flowcharts or sequences from scratch.

**Help:** It is a kind of help center and if we are stuck somewhere so we can use this function.

**Settings**: We can use this function to perform certain changes in the studio environment.

**Tools:** With the help of this function, we can install different browsers and provide extensions to the studio.

### 5.1 Design Screen of the UI Path Studio
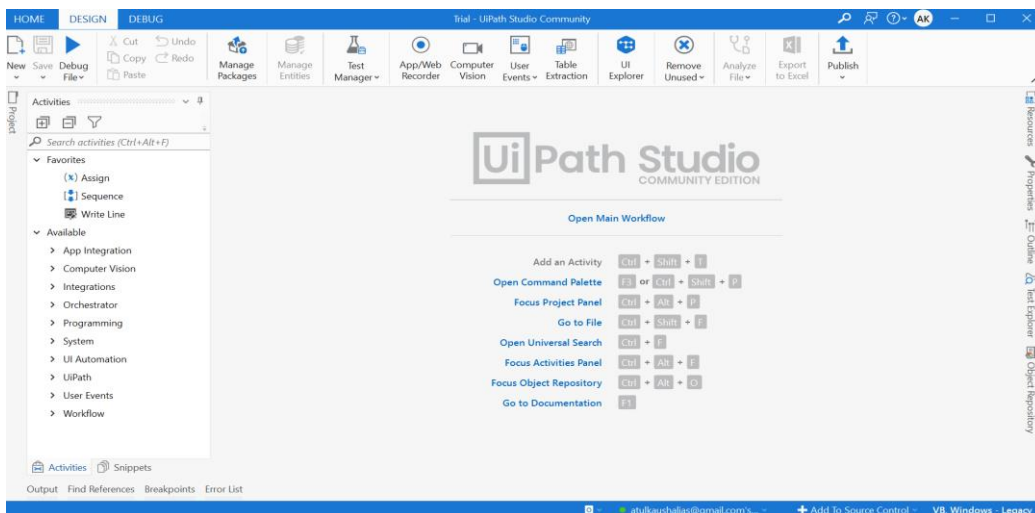


**Figure 5: Design Screen**

We can see that there are three main functions at the top of the page, the "Home" function will take you back to the main page and we can toggle between the Design and Debug screens. On the left side of the screen, there is an activities tab that contains all the important functions which we are going to use while developing bots.

### 5.2 Log Message

This is a very important feature of the studio and it comes into the picture when we have to work with big automaton projects, it helps us to document every step of the workflow. It works after dragging and dropping into the workflow and then

entering a comment. When we run the bot so we can see the log message at the bottom of the output panel.

### 5.3 Variables

Understanding the variable is quite important while we are working with RPA, Variables are like a container that contains the different types of data. We need to click on the variable tab to create the variable or we can also use the shortcut CTRL+K to create the variable. After that, we need to select the variable type, and we can choose the following types of data.

- Boolean: we use this data type for condition purposes and it contains two values, True or False.
- Int32: This data type holds integer values without any decimal point.
- String: Textual data type comes into this category.
- Object: We can customize this data type with other variables.
- System.Data.DataTable: This data type we use to deal with large data sets.
- Array of [T]: A string of values comes into this category and we can manipulate this type of data by using loops.
- Browse for types: This function will provide us with various other data types which we can use according to our needs.

### 5.4 Loops and Conditionals

Loops are the most important features of computer programming languages because it helps us to iterate one particular thing until a condition is met. There are three types of loops we use in UI Path.

**5.4.1** **For Each Loop** With the help of this function we can iterate the data in a sequence one by one. For using this particular function we need to drag and drop each activity in a sequence as we can see in the figure: 6.
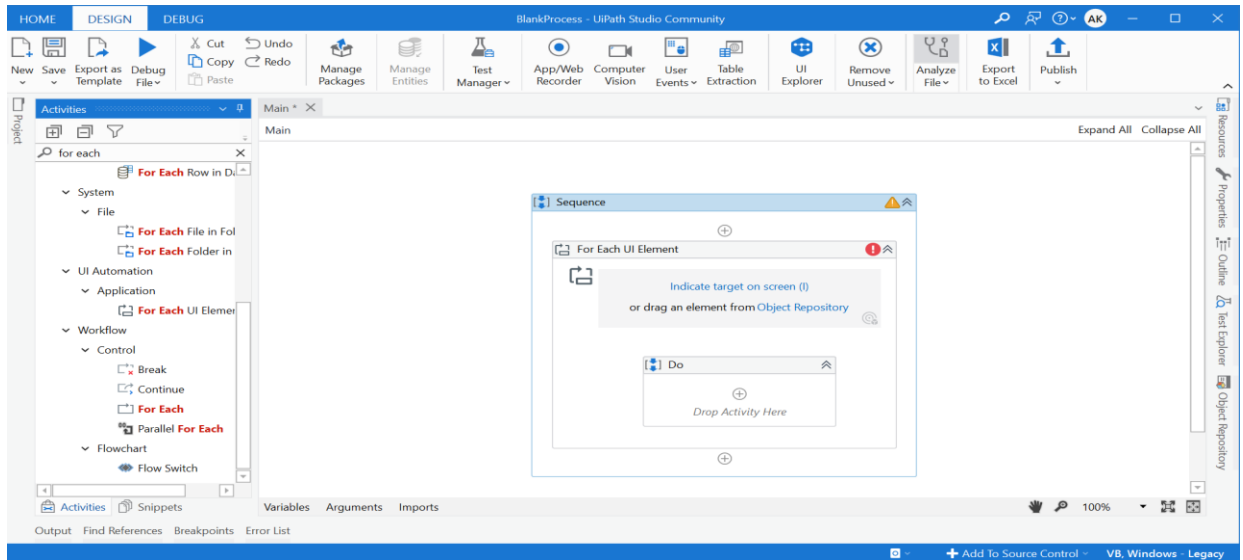
**Figure 6: For Each Activity**

### 5.4.2 Do While Loop and While Loop

A "Do While Loop" iterate through the whole dataset until a condition is met. We need to drag and drop the "Do While Loop" from the activities panel and then in the body part, we need to assign certain activities. The next step is assigning the variable from the bottom of the variable tab and then provide a name to the variable which is "counter" then we need to select the data type which is Int32 in this case. Now, this counter will go through the loop and we need to enter a VB expression "counter + 1" which will add one value whenever the loop runs.

We have to be very careful while we implement this code in the sequence because we need to add "ToString" at the end of the code ((counter+1).ToString) to convert the integer to a string otherwise we will get an error.
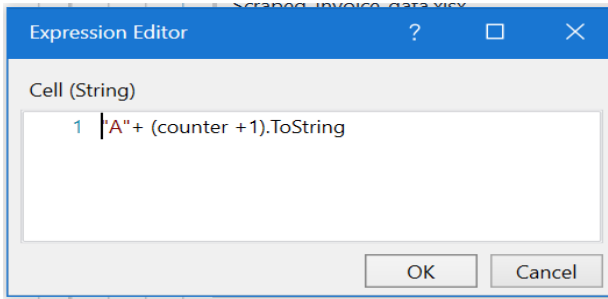
### 5.4.3 If/Then/Else Conditionals

These functions are very important in programming languages when we have to take certain decisions based on certain conditions. We can use this kind of conditional approach with the bots. First, we need to drag and drop a sequence and then create a variable which will be Int32 datatype. Then we need to give the input dialog in the sequence and after that, we can use the "If" activity to set a condition.

### 5.5 Switch

As we saw in the above paragraph that the "If" activity is quite valuable but there are certain limitations of this activity such as multiple pathways, if there are multiple possible pathways so using this activity is too cumbersome, that's why Switch comes into the picture, it enables us to select one item out of multiple.

### 6. Debugging

Debugging is a process in which we follow certain steps to solve a certain problem in the project and UI Path also provides us debugging option which is very helpful to identify or remove the error. We can use shortcut F6 to debug the current file. We can use the break function to pause the file and the debugged activity will be highlighted during the process so we can easily find out where is the main problem. After completing the process, we can use the stop button to exit and back to the design mode. We can use shortcut F12 for stopping the process.

### 7. Methodologies to Develop a Bot

There are two main methodologies that we can use to develop a bot in UI Path Automation. Generally, we use Sequence in most cases to develop a bot but if we have to develop a bot where we need certain decisions based on certain criteria so we can use a flowchart to develop a bot.

### 7.1 Flowchart

We can use the flowchart to develop a bot when certain conditions are true and it is a good way of developing in non-linear processes. This is a good way to develop a bot when we have to recommend something. Here, I will develop a bot for demonstration purposes that will recommend clothing according to the weather in that area.

In this demonstration, I am going to take the weather information from Google and then our bot will recommend the clothes which we have to wear in that particular location. As we know that first, we need to drag and drop the sequence into the main workflow before starting a project so we start with a new blank process. We have to take certain decisions while developing the bot so we are using a flowchart container here in this project. To get data from users, we need to use the input dialog which we can find in the activity panel in the system activity. After implementing the input dialog now, the next requirement is to provide a title and label to the dialog. We need to open the properties panel to provide the title and label and after that, we need to assign a variable by using the shortcut CTRL+K. I am providing the variable "city "a generic data type, and the sequence's scope. As we know that int32 can contain only numbers and Boolean value can take only true and false so we are using here generic value which means that it can take any data type. We can use generic value in those cases where sometimes we need a string and sometimes, we need to use an integer.

After providing an input dialog now the next step is to get the weather information from Google so we need to open a browser. We need to create another sequence for this process where we will get the weather information from the browser. In my case browser is not already open so we need to drag the "open browser" activity and drop it into the sequence, here, we need to provide the URL of the browser so if we want to open the Google so we type the URL of that which is https://www.google.co.uk. Ui path is also providing various browsers such as IE, Firefox, and Chrome so we can choose one of them.
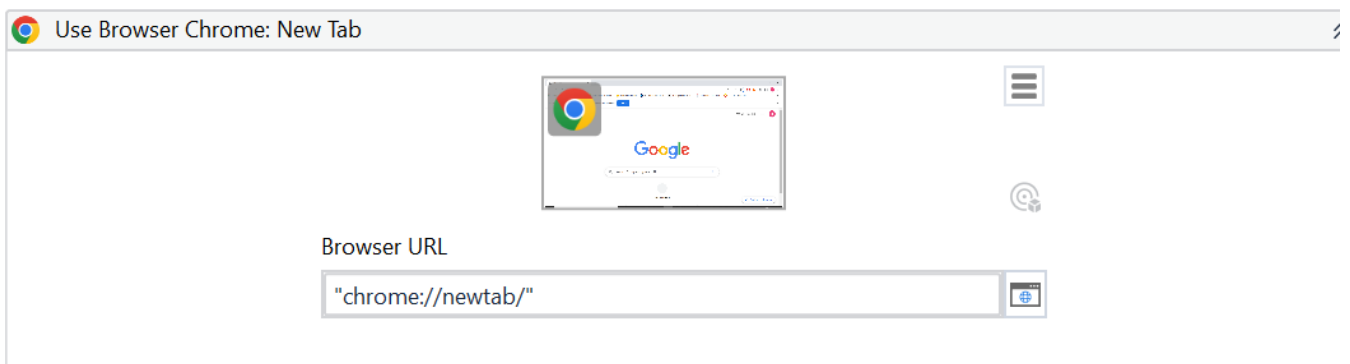


Now we need to add type into activity so we can type into the browser and here we need to indicate which element we want to type into, after that we write a code which helps us to get that particular information. As we create a variable earlier so we use that variable "city" plus we need to provide the information which is the "weather in Fahrenheit" in our case.
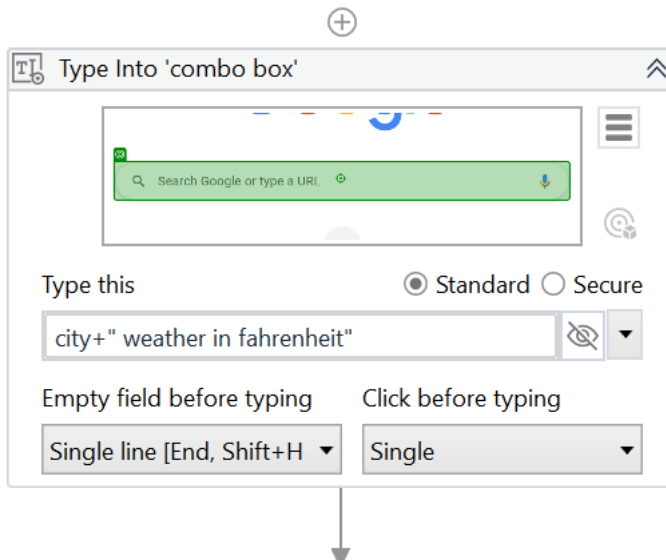
After typing the value in the browser now the next step is to press enter for searching the value so we need to access the keyboard. To access the keyboard, we drag the "send hotkey" activity in the sequence this activity allows us to press any button on the keyboard. We want to search the item in the browser so we need to press enter with the help of send hotkey and we can even define the element here by clicking the specific element.
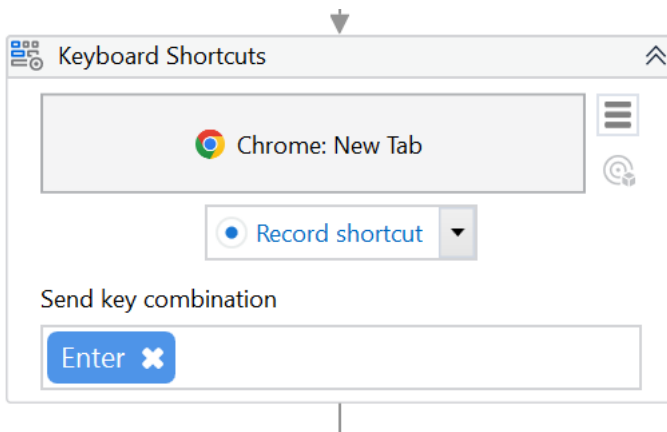


We will get the weather information page after clicking the enter so now we need to scrape this particular information from the Google browser. We can use the "Get

Full Text" screen scraping activity here to fetch that particular information from the browser. After dragging this particular activity from the activity panel now we need to specify the element from the following page.
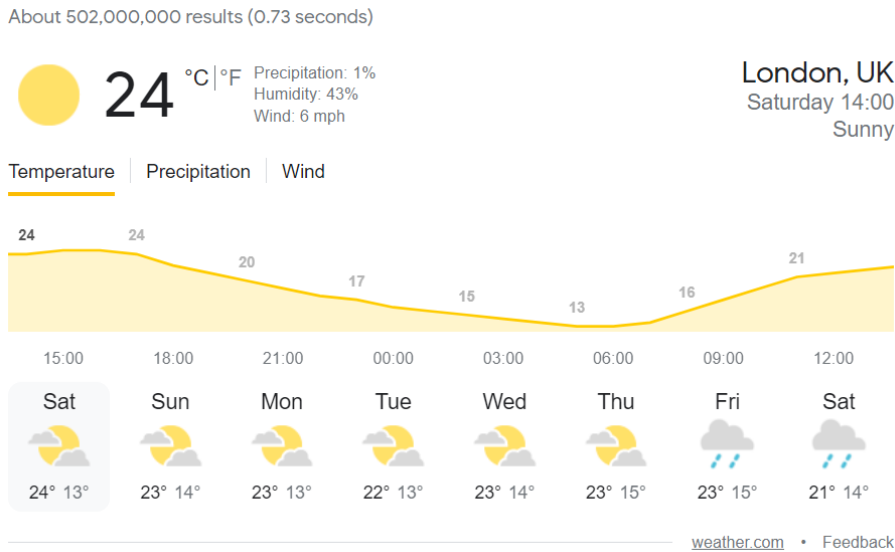


We will scrap weather information from the browser and also, we need to assign the variables. We got all the information now we will close the browser by using the "close tab" activity.
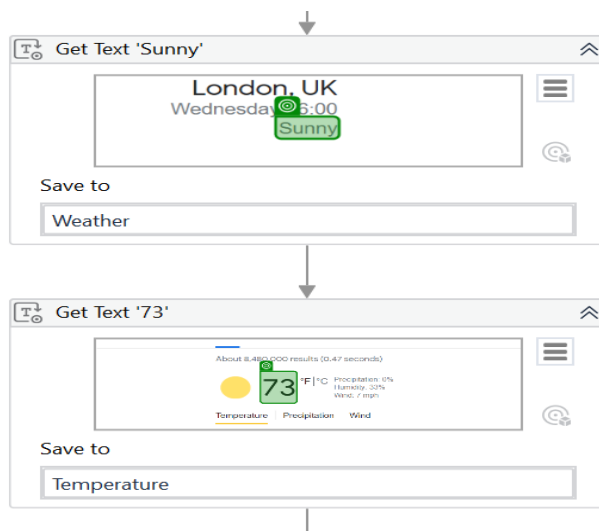
As we know that this is a clothing-recommended bot, we are creating which means we need to take certain decisions and when we need to build a decision-making bot, a flowchart is the best option available. We drag the flowchart from the activity panel and then we also drag "flow decision". We need to provide a decision point in the flow decision so we are assigning a condition of " Too Cold" and if it is too cold so we need to assign a suggestion by connecting the arrow to the flow decision and if it is too hot so we need to connect another arrow to another flow decision.

The next step is to add constraints in the flow of decisions and to do so we need to click on the flow decision and then set a condition from the properties panel. It is a Boolean value which means if the condition is true so it will follow that path and if it is false so it will go further to the next assigning value. We will set a condition through the property panel and in this case, we need a temperature less than 40 degrees which means it is too cold. We can see in the picture below that how we set the condition and also we can convert this onto an integer by using the "Cint" function.
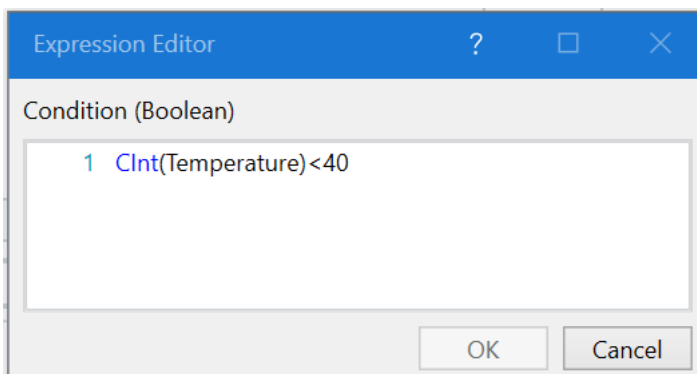


Now, it's time to set recommendations in the assigning section so first, we need to assign a variable here "outfit suggestion" and we have to be very careful while assigning the variable that the scope must be set to the sequence so it can access the whole sequence. In the value section, we need to set a temperature expression, and if it is too cold so we set a suggestion that please wear a jacket because it is less than 40 degrees. We will follow the same steps in the too-hot decision flow and

assign there that you can wear shorts because the temperature is more than 40 degrees. Now we have the last section which means that the temperature is not too cold or not too hot so we can assign a value of "bring a light jacket".
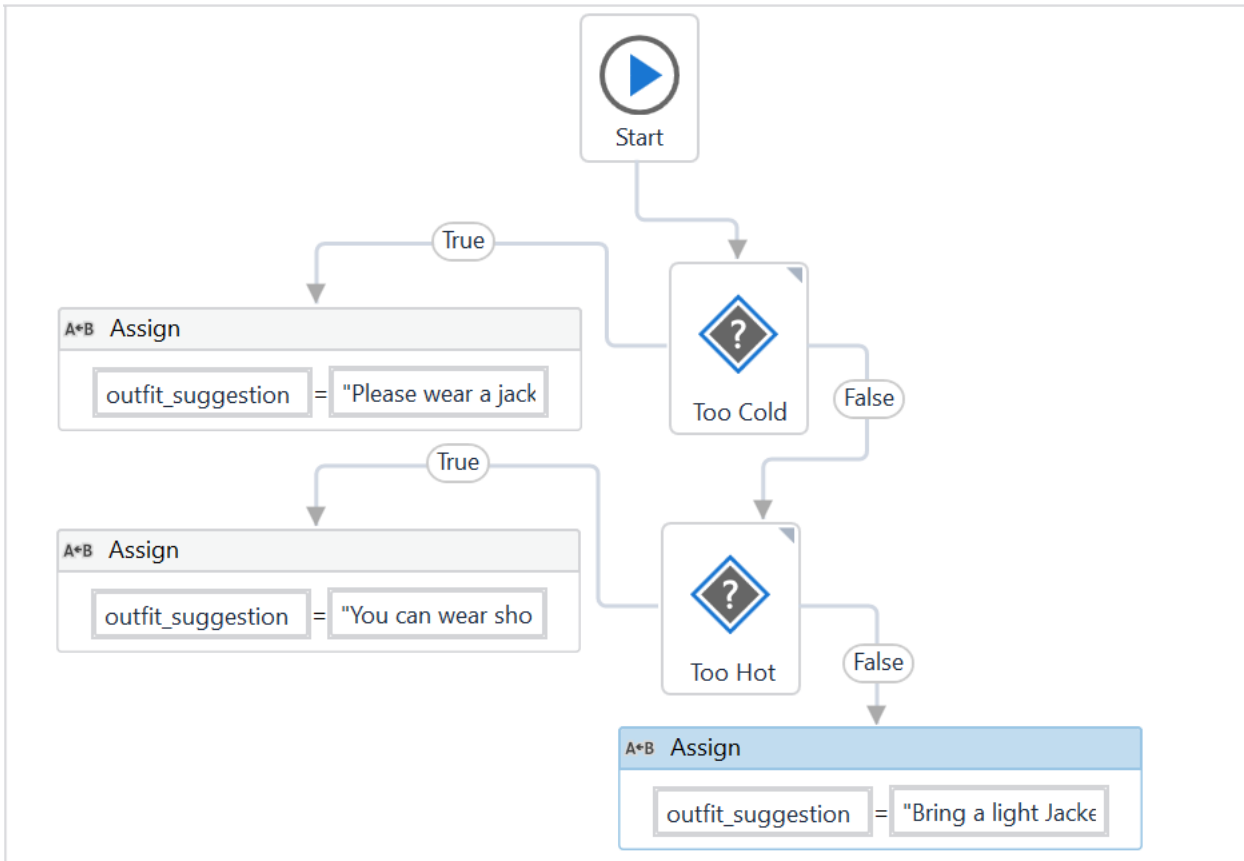


The last step is to drag a message box that provides us with information according to the weather of that particular location. We can use the following visual basic code to concatenate the information and display it in front of us.

"The Temperature in "+ city+" is "+Temperature+" degree Fahrenheit" +vbCr + Weather + vbCr + outfit_suggestion

If we run our bot so the message box will pop up with the following information as we can see below in the picture and this information is based on the live weather condition of that particular area.
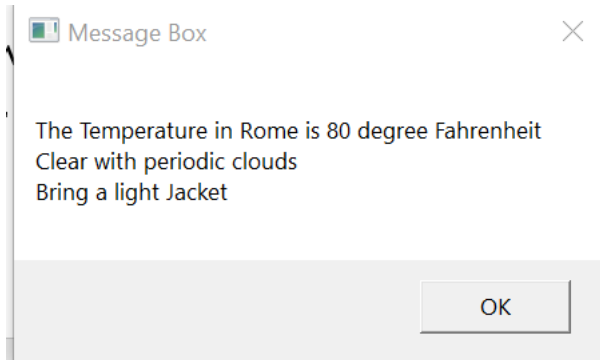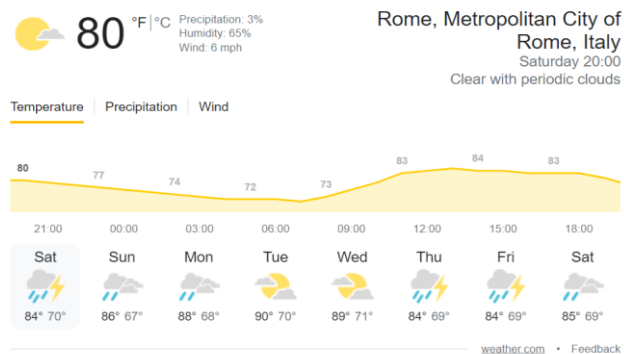
This is how we develop bots with the help of flow charts.

**7.2 Sequence**

We can use this particular methodology of bot development where we do not need to make any decisions or the task is a step in a sequence that we have to follow one by one. Sequences are good in linear processes because it allows us to switch from one activity to another one by one. It is a single block activity and it can be reused again. For instance, if we are developing a bot that filters specific information from the big dataset so we set a certain condition in the sequence, and if we want to reuse that particular bot in other projects so we can change the conditions from the sequence and set a new condition according to the new project so we do not need to develop a bot from the scratch.

In finance, it's a very common function to find a transaction ID of a certain price value in which we have to follow certain steps one by one to get that ID so this is

the best sequence project because we don't need to take a certain decision, we only need to follow certain steps in a sequence to fetch that particular ID. First, we need to drag and drop the "use application" in a sequence to access that particular application from where we will get the ID and we need to provide a path to the application. Use Application is a very important function in UI Path and generally, we use this activity to open a browser or any other application on the computer. We will use the following application where we automatically fill the value and get the transaction ID.
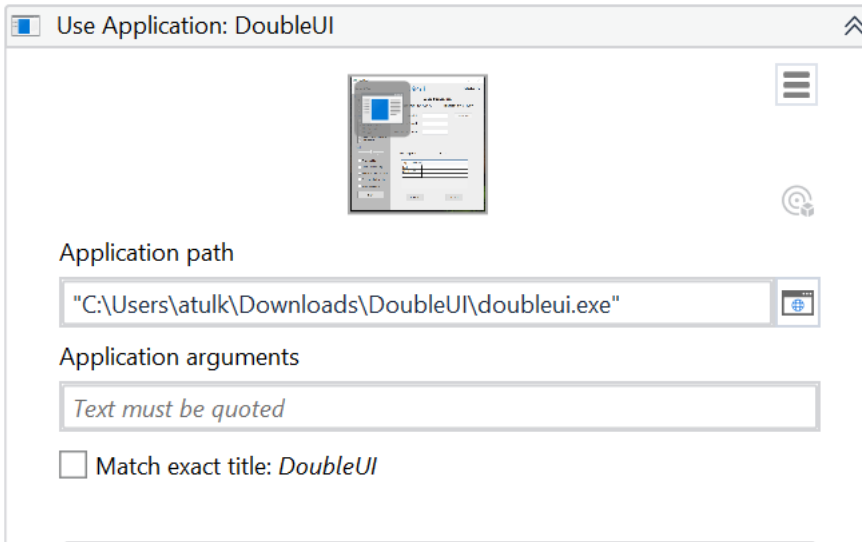
The next step in the sequence is to drag and drop the 'type into' activity in the sequence because we need to write a value in that and every ID would be unique and based on the price value. Here, we need to specify the column where we add the value.
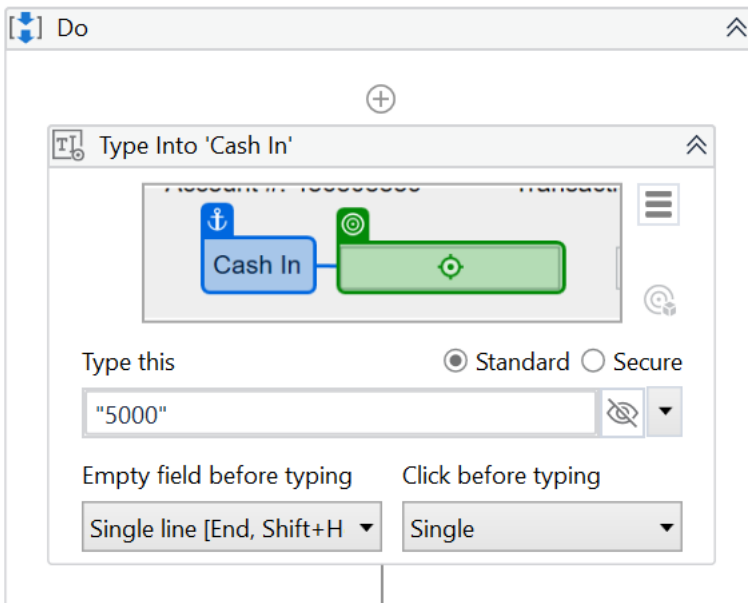


After adding the appropriate value now, the next step is to click on the accept button so we will click on the specific element or we can also use the enter button from the keyboard by using the "hot key" activity. We need to drag and drop the

"get Text" activity from the activities panel to get the specific information as we want to fetch the ID value so we specify the element on the application form. We also need to specify a message box that provides the transaction ID number.
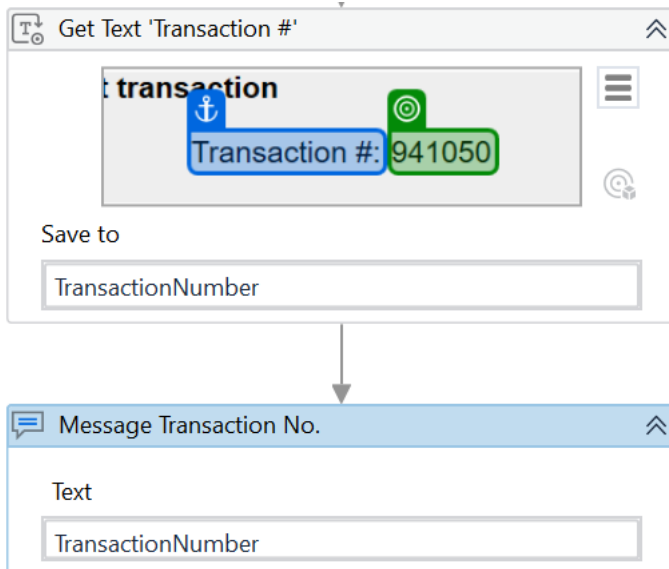


In this demo, we have seen if the task is linear and we have to follow certain steps one by one in a sequence so we can use sequence to develop bots and this is the simplest way to develop an RPA bot.

### 8. Invoice Process Automation

Invoice Processing is a very crucial task in the finance department of any organization and employees handle thousands of pdf invoice files every day, so it is very important to automate this kind of high-volume business activity and mundane tasks to make our employees more efficient in that and streamline our projects. With the help of the UI Path Studio development environment, I will try to mimic such invoice processing tasks.

I did some research and found that employees such as finance assistants and account assistants are spent most of their time dealing with invoices if we will successfully implement this kind of software application in their financial ecosystem so we can save a lot of precious time. As we know that I am using the

UI Path Studio environment to automate specific activities, so I will open the studio and start a new project. We can see in the following diagram below that how we can go to the "Home" page and access the "Process" on the right side to create a new project.
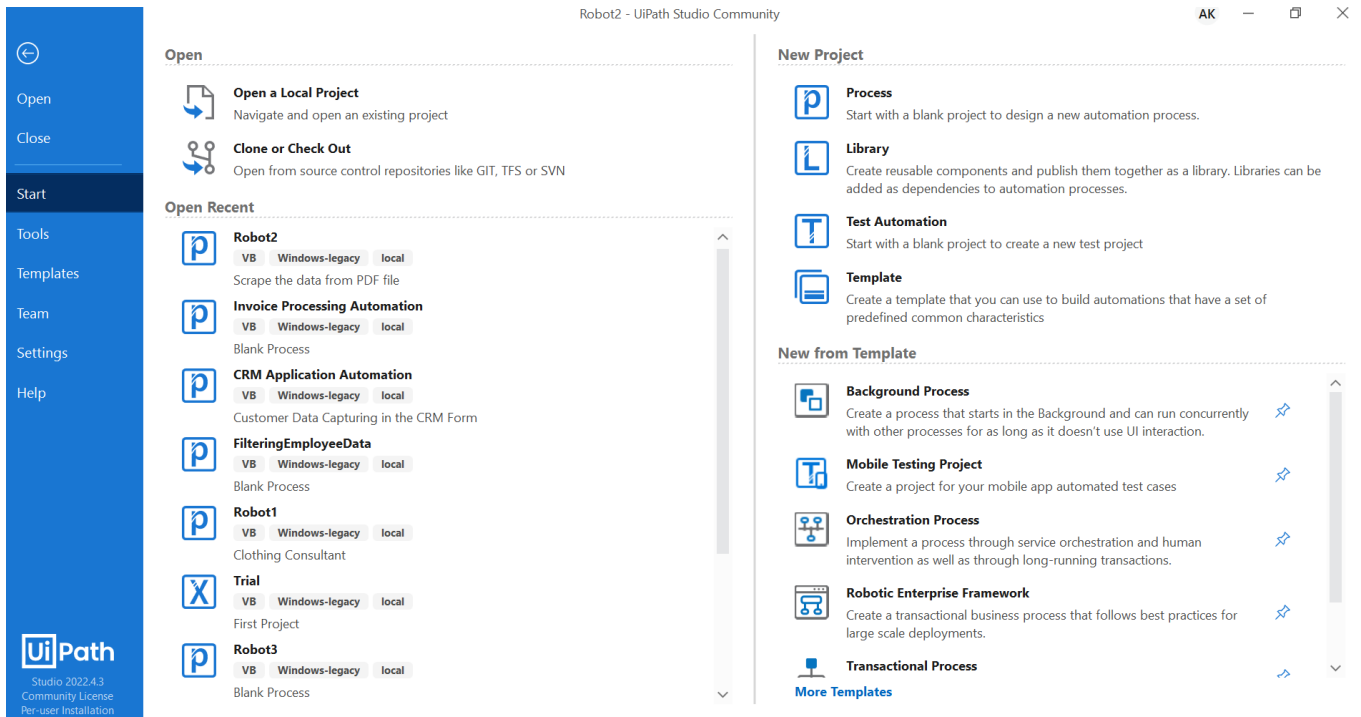


The above diagram shows the main page where we create our project and start automating it. As we know that I am going to deal with pdf files of the invoices in this project, so first I collected 1000 pdf files that replicate an invoice file and contain information such as price, company name, customer ID, Invoice ID, etc. I am trying to get specific information from the pdf file and entering that particular information into an excel sheet. I am giving the screenshot of the pdf file which I am using in this project and there are around 1000 files containing different information. I am automatically targeting the total price and company name for demonstration purposes and trying to enter it into another excel file.

As we have discussed above that we only use flowcharts in complex scenarios so this activity is based on certain continuous steps, so we are using sequence here. We know that on the left-hand side of the panel we can get various activities so we get the sequence from there and drag the sequence to the middle of the studio where we start our task.

First, we try to read all 1000 pdf files and contain that information in a variable called "file list", that's why we drag the assign function here in the sequence and use this code directory.Getfiles("1000_Invoices","*.pdf")

Where 1000_files is the file path to fetch all pdf files and *.pdf indicates that the file is in pdf form and * is a wildcard which means some sort of text behind that pdf.
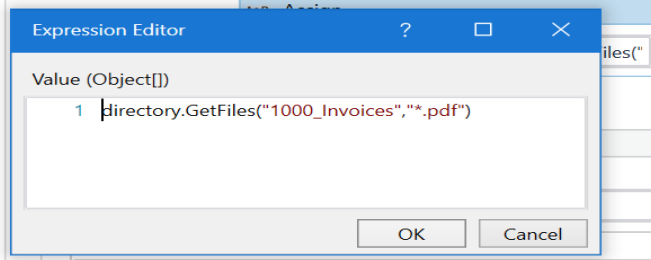
After getting all pdf files, the next step is to access all 1000 files one by one, which means we need to make a loop here to iterate all files in a sequence. We can see below how we create a loop in the studio with the help of the "For Each" activity.
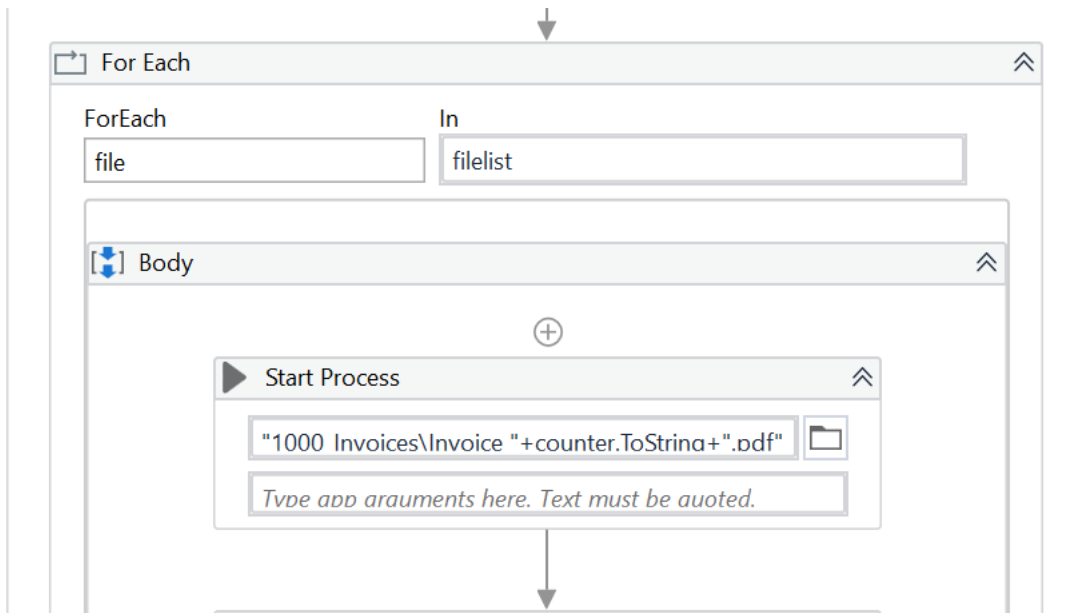


From the activity panel, we will drag the start process which helps us to open each pdf file one by one. We will use the following code to access all the files from start to end.
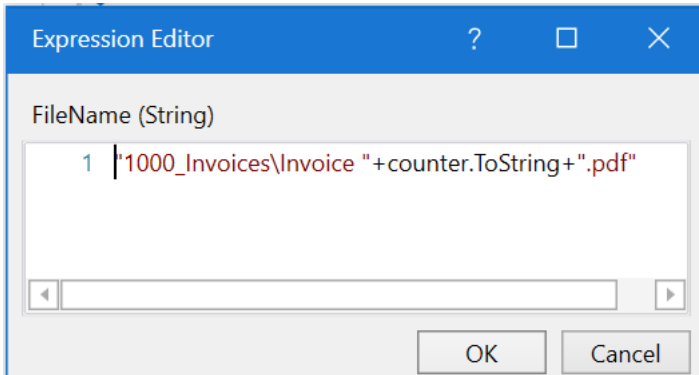
We also have to assign the counter to iterate the loop, as we can see in the image below and we use this loop at the end of the sequence.
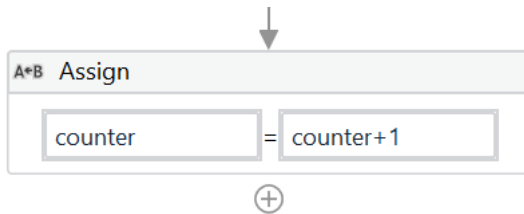


Send Hotkeys is a very useful function in the studio because it gives us access to keyboard activities. If we want to capture a specific element on the pdf file so we have to activate computer vision on each element of the pdf file so we use the shortcut Shift+Ctrl+5. To access the keyboard, we use send hotkey function and activate each element on the pdf with that shortcut, and then we will press enter.
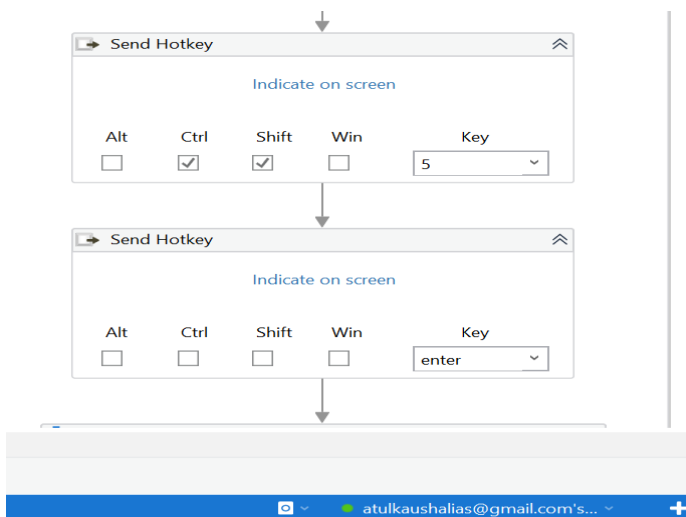
Now the next step is scraping the data from the pdf file, to do that, we drag the get text function from the activities panel. It gives us the option to indicate elements on the pdf which we want to scrap so we click on that link and try to fetch the company name and the total price from the pdf.
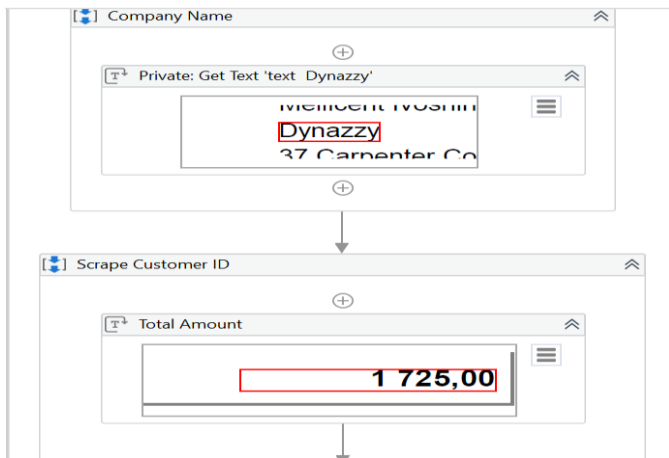


The best thing about the studio environment is that it also gives us a screenshot of that particular element so we can easily identify what information we are going to scrape as we can see in the above image.

**Limitation**

We have seen how we capture information from the pdf file with the help of the get text function but the problem is that every single pdf file contains different information so how do robots target various information?

**Solution**

As we have discussed above that we use the Get text function to get information from the pdf so when we will get the information that particular information is added to the selector if we open the selector, we find that particular company name is there so we need to make changes in that particular name because every pdf file contains different company's name, when we have to make the value

dynamic so we use asterisk * symbol in visual basics which is a wildcard character there. We can see below in the picture how we create a name equal to asterisk *.



After fetching all appropriate information from the pdf file, now it's time to enter that particular information in an excel worksheet. To type data in the excel sheet, we need to get the "Write Cell" function from the activities panel where we need to add certain information about the data.
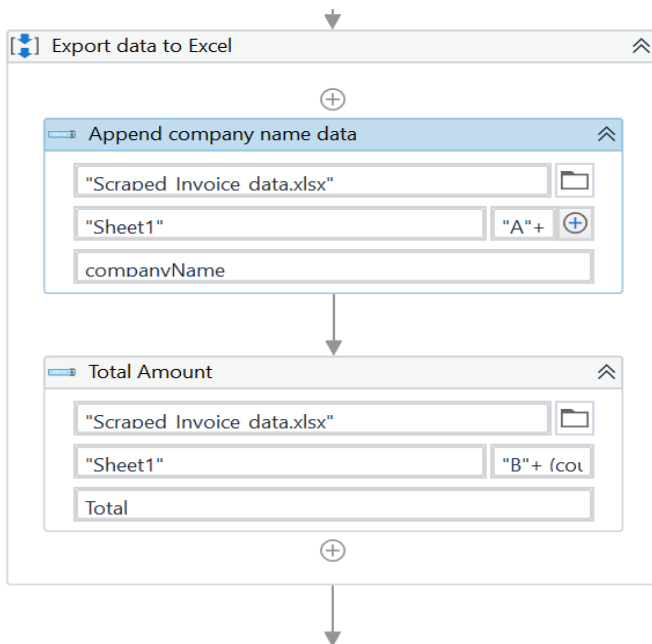


We can see in the above image indicate the write cell structure in which we need to add some information. The first line is the file path of the excel sheet and then in the second line we have to indicate the sheet number and on the right side, we add this code "A"+(counter +1).To string which indicates that we have to type data in

column A and counter+1 iterate each file one by one so it will type data into different cells and "To string" converts all data into a string.

**Key Outcomes**

- Bot can scrape all important information from the pdf invoice and type that information into an excel sheet without any human intervention.

- It can process all 1000 pdf files in less than 10 minutes.

- After implementing this kind of RPA system in the financial ecosystem we can boost productivity and streamline our projects.

- It boosts the morale of the employees because now they can do some decision-making acidity instead of doing data entry kind of boring job whole day.

- Hilti is a global manufacturing company and I got this information from the finance team of Hilti that they have to process 3700 invoices every month which means our bot is capable enough to accomplish the such task in a few minutes.

**Case Study (Uber Automation Journey)**

Uber is a great example in front of us who is taking help from the RPA to streamline its projects, coordinate operations worldwide, and ensure regulatory compliance. Uber started its automation journey with financial services where it uses RPA in invoice processing for its global operations.  With the help of Accenture, Uber has developed the global strategy for RPA because processing invoices in the USA require different procedures than in other regions such as UK and China. RPA also helps Uber in regulatory compliance and follows all standards while automating processing. Automated business processes have had a

significant impact on Uber's operations and revenue, we will discuss some of the key outcomes below.

**Key Outcomes**

- After three years, Uber has more than 100 automation bots, which saves Uber an estimated $10 million per year.

- Able to automate invoicing for around 80 customers across seven main portals.

- Raises customer satisfaction.

- Decreases error.

- Started with 20% invoices with automation two years ago and are now able to automate 70% invoice processing through RPA.

### 9. Email Automation

We have discussed above that how RPA emulates human actions in business processes and helps us to extract important information from pdf files. Here in this bot, we build email process automation so that when we will get invoice pdf emails from the supplier, they will automatically be saved in the specific folder. After implementing this kind of bot in the business process, we don't need to open inboxes again and again or download invoices one by one so we can save a lot of precious time and energy for the employees. This is the same process we can use in sending emails to the senior managers or stakeholders.

In RPA email can either work as an input to the process or an output to the process. In input, it can read the mail's body or subject line from the inboxes and it can also download attachments automatically, on the other hand, as an output it can send emails to others. If we type mail in the activities panel so we find that UI

Path is providing us with various tools to deal with email and this particular package is designed to facilitate automating email-related tasks, it covers various protocols such as IMAP, POP3, or SMTP

**9.1 IMAP (Internet Message Access Protocol)** It is only used for reading messages but it also provides some other functions as well, such as moving messages from one folder to another.

**9.2 SMTP (Simple Mail Transfer Protocol)** We use this function to send messages.

**9.3 POP (Post Office Protocol)** It is mainly used for reading messages and most email servers support this function.

**9.4 Exchange** It is a Microsoft Enterprise Email solution. It provides us with lots of features such as deleting mail, getting emails, sending emails, and moving emails from one folder to another.

**9.5 Outlook** It works with the desktop application API and it can integrate automatically with outlook if it is available in the system. It is the simplest method to use because it doesn't require any configuration. With the help of this function, we can send emails, get emails, and move emails from one folder to another.

**Saving Email Attachments with Outlook**

In this demonstration, I'm going to use the outlook method which is very simple to use and we don't need to provide any configuration in that so I will try to download attachments from the inbox in a specific folder.

As we know that we have to start our project in the studio with the process option, from where we can start our project with a given name. The next step is to drag a sequence for the required activities and as we are using the outlook function in this project so we need to drag the "Get Outlook Mail Message" function, then we need to provide a variable for this so I am creating a variable named "MailMessages" which is a list mail messages data type. When we open the properties panel on the right side of the main page so we need to provide the "Inbox" name there in the

input section as well as a number, for instance, I want to target the first 50 emails so I am providing 50 in the options section and there are other options available for the filtering purpose which we can use in case of a certain condition.
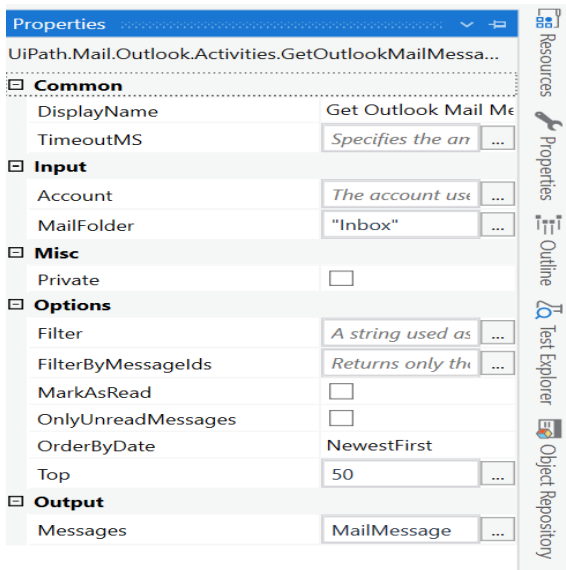


The second step is creating a loop to get each file one by one from the email so we need to drag the "For Each" activity where we provide the variable "MailMessages" which we have created earlier and in the body part we will use "Save Attachments" activity to save all files in a corresponding folder. After successfully running the code we can check in that particular folder that the attached files from the mail are automatically downloaded.
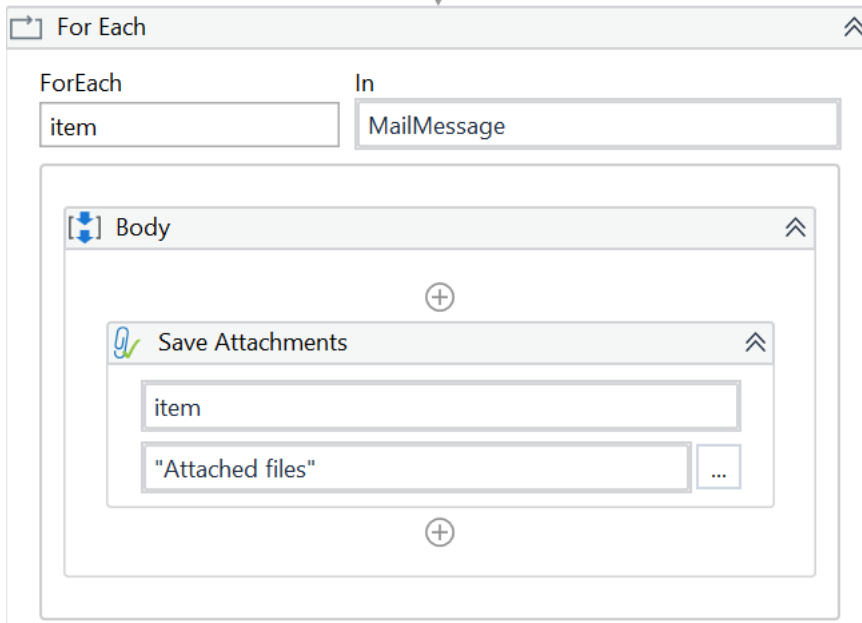
## 9.6 Retrieving Email with IMAP

IMAP is another method to deal with emails so in this project I am going to use IMAP to retrieve unread emails from the inbox. First, we need to save Gmail credentials so we drag the get username activity in a sequence and supply the username and password to the credentials. We also store those particular credentials in a variable named Gmail Credentials.
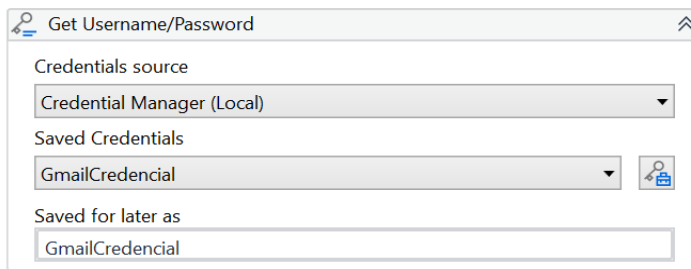


As we know that we are using IMAP in this project so we drag the get IMAP mail messages from the activities panel likewise we drag get outlook mail messages in the previous project.  We need to supply the appropriate credentials in the
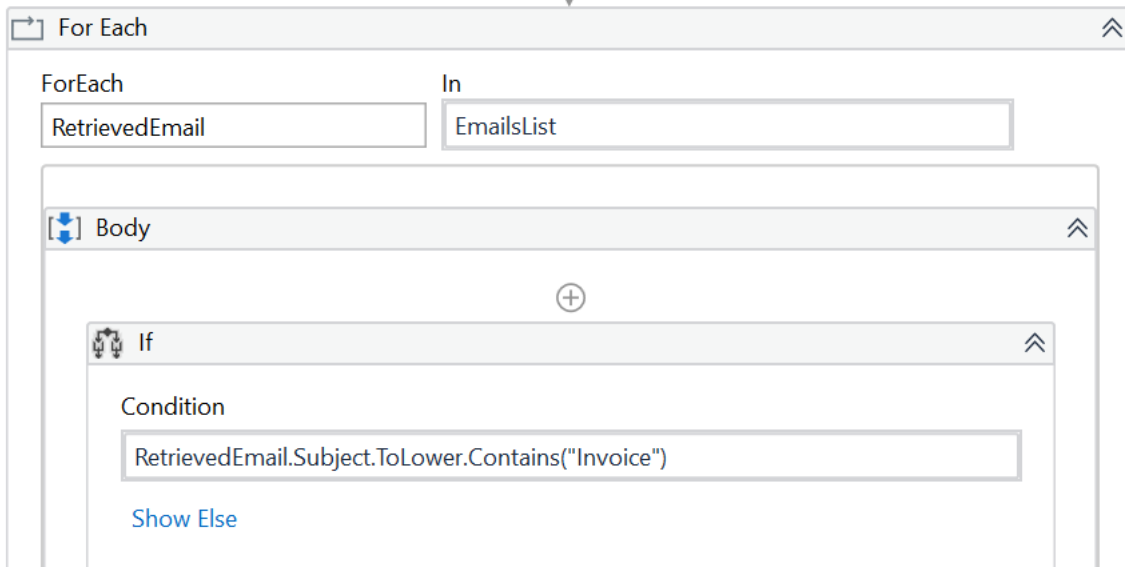
property panel as given below in the picture such as server, port, mail folder, password, etc.
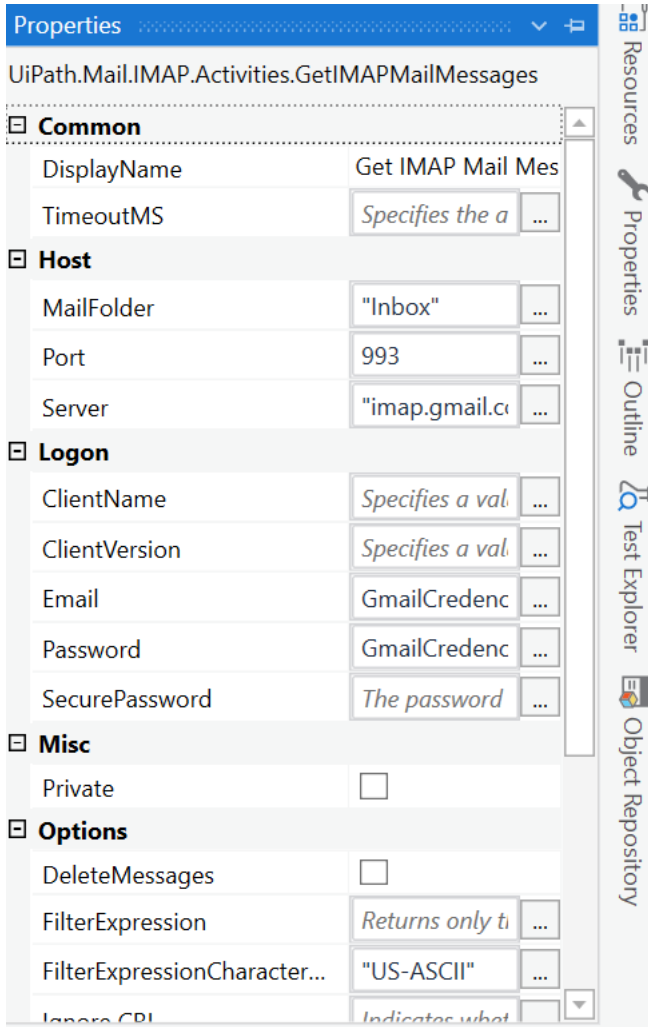


The next step is the iteration of all the emails which meet the condition so we use for each activity to create a loop and then set a condition with the help of the if activity.

In this condition, we set retrieved emails with the subject where the subject contains the invoice so it can target only those emails. We are using "to lower" to help the bot to work with the small and capital letter because it is case-sensitive. The last step is to save that particular information from the email and save attachments in a specific folder. We create a new folder named Data to save the emails and attachments and then we supply the file path to the folder. If we run the bot and then check the data folder so we can find the information of the email and attachments successfully saved there.
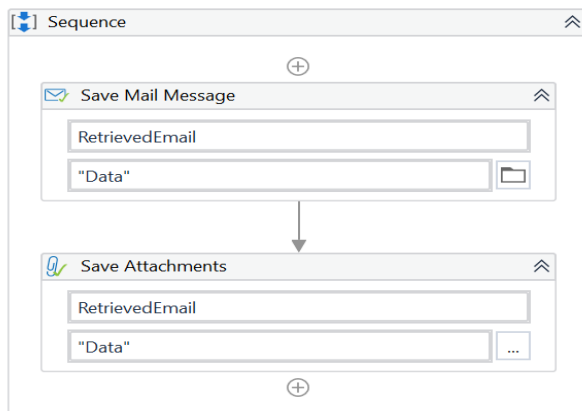
**Case Study (Major Retailer & Accelirate)**

The account payable (AP) task is a very critical task in any organization's finance team and companies manage thousands of invoices every month. Invoice processing is a real burden on the retail companies in the USA and especially the invoices come from the gasoline and freight vendors, which arrived at a rate of 200 to 500 per day on average. It is a very labor-intensive task to deal with such a sheer quantity of invoices manually. Accelirate and UI Path partners created a solution combining RPA with Optical Character Recognition (OCR) and UI Path document understanding, which helps robots how to extract, interpret and process data from a wide range of documents. This solution includes six steps.

1. **A bot reads emails containing invoices** The bot only targets those emails which contain attached invoices and then it saves the file into a specific folder for document understanding.

2. **Bot splits the invoices** The second step is to split the invoices uniformly with the help of OCR so it's easy to identify elements on the pdf.

3. **Extracting the data,** the bot uses OCR and machine learning to extract useful information from the file such as company name, price, customer ID, etc. then it can use appropriately with that information.

4. **Moving the data to a queue** Bot follows a 95% confidence rate and if the extraction meets this level so it will move the invoices to a queue for payment processing.

5. **The Bot repeats the whole process** The bot repeats the process from one to four until each invoice has been reconciled.

6. **Generating reports** After the reconciliation bot generates the report that how many items were processed and all this information recorded for bookkeeping purposes.

**Key Outcomes**

- Bot automatically downloads the pdf from the email so we don't need anyone to check the email and download files from there.
- It triggers when we get the new mail.
- 7000 invoices processed monthly.

- 30 seconds spent on each invoice which was previously used to take around 3-5 minutes.

- 160+ hours saved monthly.

- 95% confidence score for invoice processing with machine learning model.

### 10. CRM Automation

CRM stands for Customer Relationship Management which helps companies in marketing, sales, customer service, and support. Collecting accurate customer information is one of the most important aspects of customer relationship management and this technology has been widely embraced throughout the business worldwide. Building long-term relationships with customers to grow your company is the primary goal of CRM. We use this technology in the cloud where teams record and analyze the interaction between the company and the users. It is a business strategy for managing relationships with potential customers.

We use CRM to record customer information such as email, address, unique customer ID, phone number, etc. so it gives us a better view of our relationship with a particular customer over time. We can also use CRM in customer segmentation and customer preferences which helps companies to target the right customer with the right product.

Here in this project, I will try to add customer information automatically in a CRM application form. First, I am taking some random customer data in a CSV file which I am going to add automatically to the CRM application form with the help of RPA.

We will initiate our project from the process function on the main page of the studio and then we drag the sequence for adding processes. The first function we need in this project is the "Read Range" activity which we will get from the activity panel. Read Range is a very useful function to read a CSV file so we use this function to read our customer information from the excel file. After providing the file path we set sheet number, which is sheet 1 in our case we also need to provide a variable here to contain the data so I am creating a variable named customer data which is a data table data type. The second step is to open the CRM application form where we need to add that particular information so we drag "Use Application" from the application activity, we need to provide a URL there so the bot can open the browser automatically.
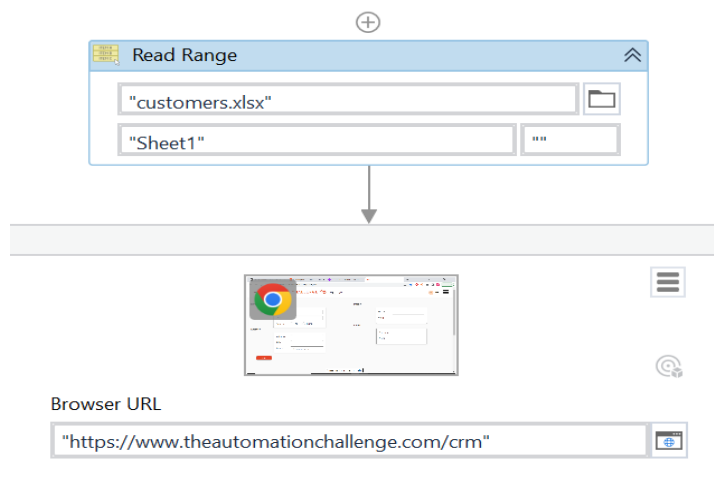


After opening the browser now, we need to create a while loop so the bot can fetch each customer's information one by one so first, we set the condition Row Number < Customer Data. Rows. Count, which refers to each line of the table, and the loop will run until the last row. We also have to create a variable here so I am creating a variable called Row Number which is an int32 data type.

Now we start typing the information in the CRM application form so for that, we use the "Type Into" function from the activities panel and here we need to provide the exact element where we want to type that particular information so it provides us a click button where we target that particular element. We can see in the following code how we are providing the element to get that particular information from the dataset in which customer data is a data table and then the row is giving the reference for each row number and the first column is the first name so we are providing that column name in the code and then at the end, we convert all the information into a string by using "ToString" code.
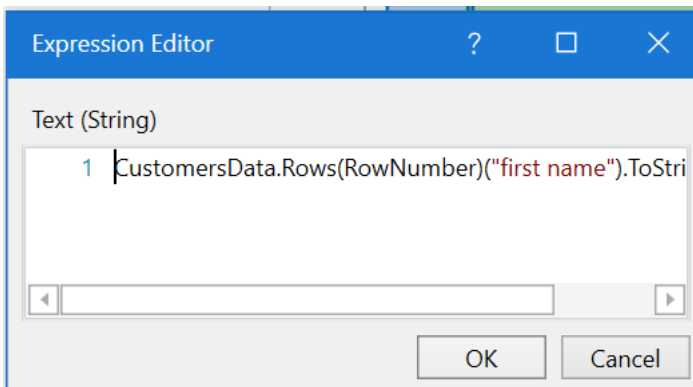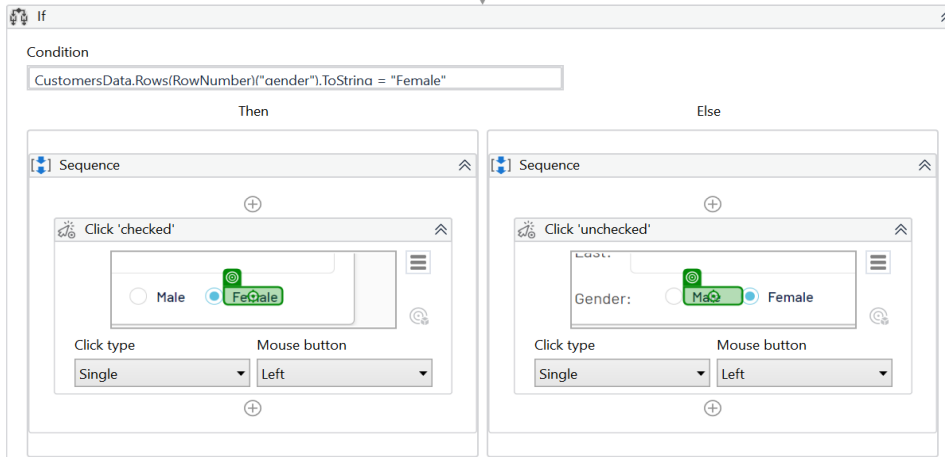


The same code we can apply to the last name column as we can see below.
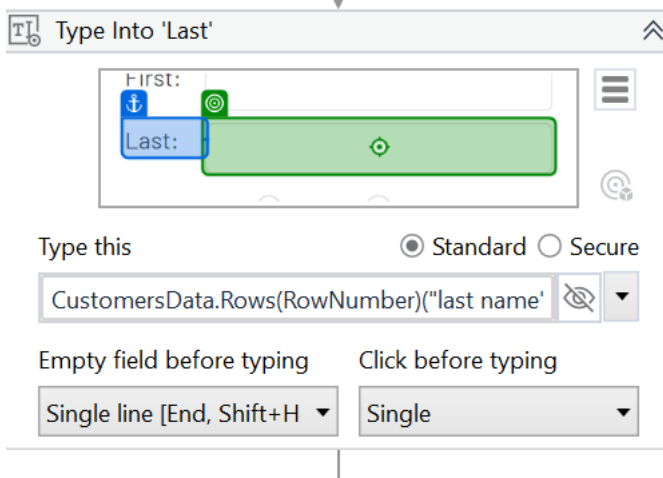


The third step is a bit challenging because we have two options here male or female and we have to click appropriately so we use the if function here where we

set a condition if the gender is female so click otherwise click on the male, another side.



The next column is the address so we write the same visual basic code to get that particular information from the dataset and then after clicking on the element we provide the exact space where we want to type that information.
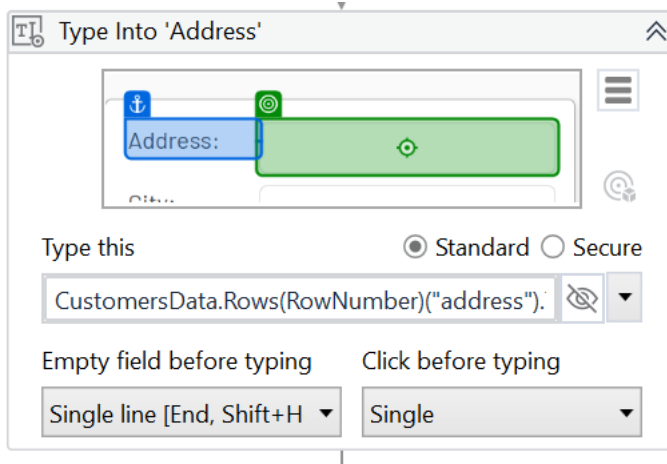


We will write all the visual basic code for all columns in a sequence one by one and also provide the exact space of the typing by clicking on the CRM application. At last, we need to click on the add button to save that particular customer information so here we use the click function and provide the exact element for clicking, then we will start our loop to iterate all the rows one by one in which row

number is a variable that we created earlier and "row number + 1" refers to the iteration that it will move further by adding one.
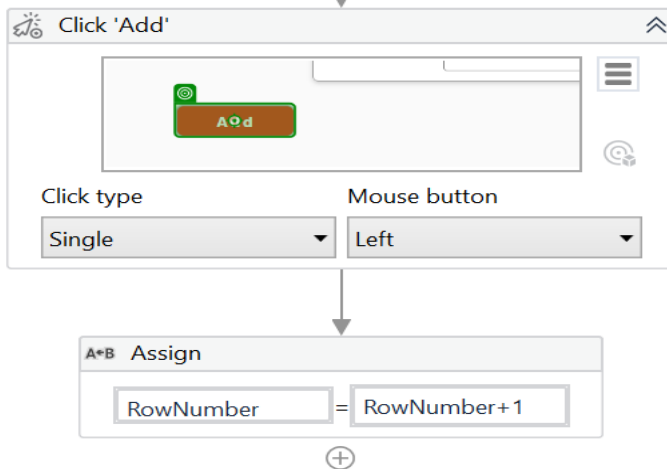


Now if we run the code so we can see how it is filling all the customer's information in the CRM application with high speed and accuracy.

**Key Outcomes**

- Bot will trigger when we will get new customer details.
- It can enter a massive amount of customer data automatically.
- We will get a high level of accuracy and speed.
- We can target the right customer at the right time with the right price.
- It will optimize customer satisfaction.
- It will increase sales.

**Limitations**

We can say that the after automating CRM application we can save a lot of precious time but there are certain limitations of this application such as if we want to update a customer's data so, in that case, we need to do it manually but as I mentioned before that still lot of research going on so maybe in future, we can even add some automation function which can automatically update every information from the customer datasets such as addresses and phone numbers. We can even use some functions such as triggers which we use in SQL servers in the data

warehouse management so that particular triggers can automatically update the data values and refresh all the data.

### 11. Data Filtering Automation

In this section, I am going to work mainly with datasets that how we deal with datasets with the help of RPA, and how we automate certain tasks such as data filtering and merging data based on certain conditions. I will build an RPA bot with the help of UI Path Studio which helps us to retrieve specific information from the dataset. This particular bot is perfect for HR, Finance, and other departments of the organization where they need to deal with a massive amount of data. For instance, if HR wants the information of the employees who join the company in a certain period or wants to retrieve information of those employees who earn a certain amount of salary, etc. so in this kind of activity we use data filtering bots which fetch all the specific information within few seconds after one click. Even in SQL, we need to write an appropriate clause to retrieve that particular information but these RPA bots can provide all the information without writing any code and we can also change the conditions of the bots and use one bot in many ways according to our needs.

Here in this project, I am going to filter specific information from the dataset so first I got some employees' data which contains information such as Name, Age, Income, Work, etc. then we will set a condition and retrieve information based on those criteria. Since we are going to work with an excel file and we have to read the excel file so we use the "Read Range "activity which is quite useful in this kind of project. After getting the read range activity from the activities panel now we have to specify the file path to the data folder also, we need to supply the sheet number which is sheet 1 in our case and we leave the range section blank because we target the whole range in the sheet. Since there are headers in our dataset so we checked the header property to identify that. We need to create an output variable to contain that data.
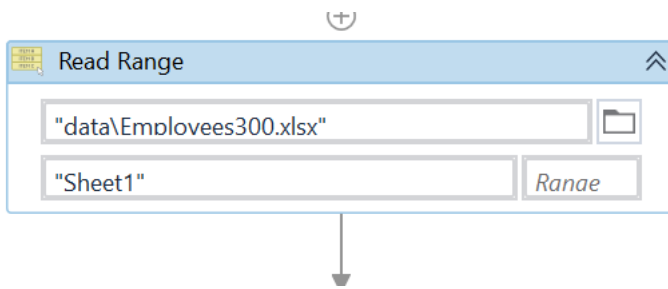
Secondly, we use it to filter data table activity to set a condition. If we click on the filter wizard button so we get a table-like box where we customize our conditions. In the first column, we need to provide the input data table name as well as the output data table name. In the filter row, we need to provide a specific column where we want to set a condition and there are various mathematical operations that we can use in our condition such as greater than, lower than, addition, multiplication, etc.
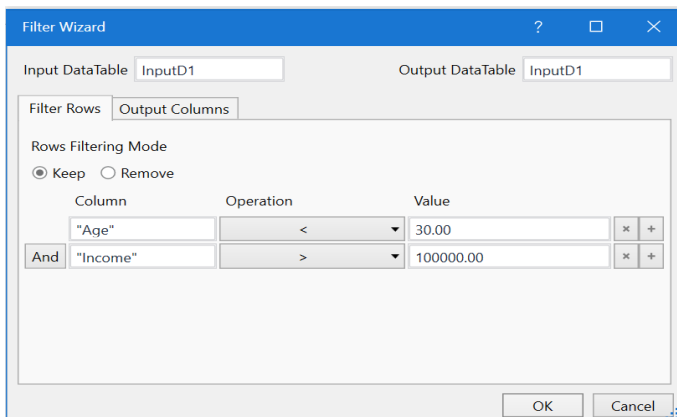


The next step is building a data table to store that filtered information so we drag and drop the "Build Data Table" activity. After building the data table now we use it for each activity to iterate each row in the data table and extract only the information which meets the criteria. We use the "Get Row Item" activity which outputs the specific value from the current row.
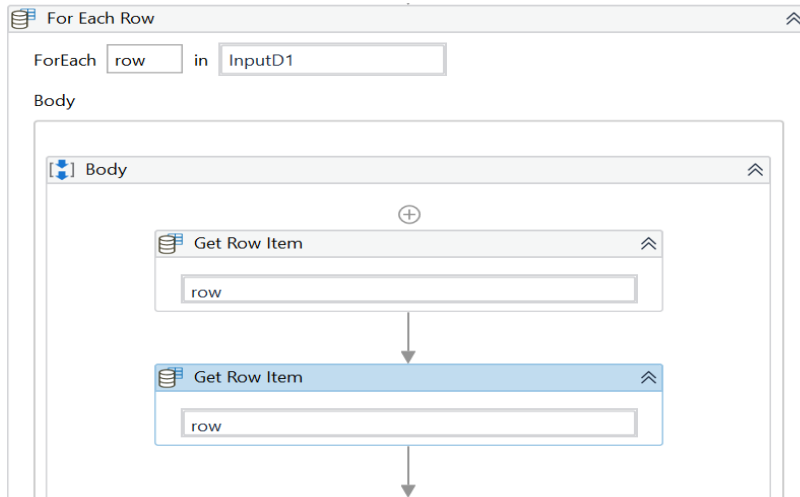
We use the assign function to extract the information from a certain cell. We define the new variable named income and then we need to write the visual basic code to fetch that particular column Row. Item array (4). To string where 4 indicates the income column, it is the fifth column but counting starts from 0 so we use 4 here. We use to add data row activity to add the data into the new data table variable. We save the new file by using the excel application scope then specify the excel file and then add write range activity as we can see in the picture below.
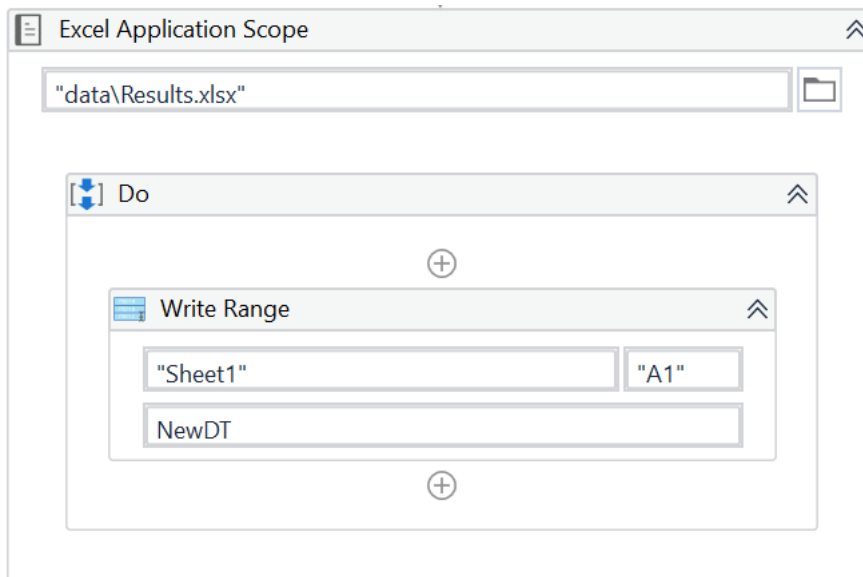


**Key Outcomes**

- We can fetch any information within a second from the huge datasets based on certain conditions.
- We can use one bot in different cases, just we need to change the condition from the wizard panel.
- After developing a bot, we don't need to write any SQL code or any clause to fetch certain information, with one click we can retrieve appropriate information as we set in the condition.
- Bot is capable enough to process a massive amount of data within a few seconds.
- It will Boost the productivity and morale of the employees.
- Free up time for employees to be more innovative or creative.

## 12. Conclusion

In conclusion, we can say that the RPA is evolving day by day and occupying every single industry. It enables companies to boost their productivity and reduce their operational cost. We have seen that it is making our employees more efficient and we can even streamline our projects with the help of RPA. In this project, first I have discussed the lifecycle of the RPA and how we implement such an automation tool into real business scenarios and I have also discussed various phases of the RPA such as the Discovery phase, solution design phase, Development Phase, and Deployment phase. Lifecycle is a very crucial part of RPA project management and we have to follow every single step one by one in a sequence. I have explained the architecture of the RPA and how we use the Studio environment to develop bots, Orchestrator to manage attended and unattended bots, and various layers of the RPA. In Bot development, I have explained every single component of the RPA and how we use Studio and visual basic programming to develop such bots. I have covered various functions in the various departments of the business such as Marketing, HR, Finance, Administration, etc. where we implement such technology to automate mundane repetitive tasks. I was successfully able to automate invoice processing tasks in which my bot is capable enough to automate invoice-related tasks in a few minutes. I got one thousand invoice PDF and then automatically get the information from the PDF files and enter that particular information in the excel sheet so RPA bot is able to perform such task in less than ten minutes whereas human operator will take so many days

to accomplish such tasks. RPA is giving us a high level of accuracy whereas humans are prone to make mistakes. Automation frees up time to focus on other strategic initiatives such as developing better customer relationships and delivering high-quality services. We can say that it is still a grey area and with a lot of research going on in this particular domain of AI, we can see outstanding results in the future with the help of RPA and It will put a significant impact on businesses.

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