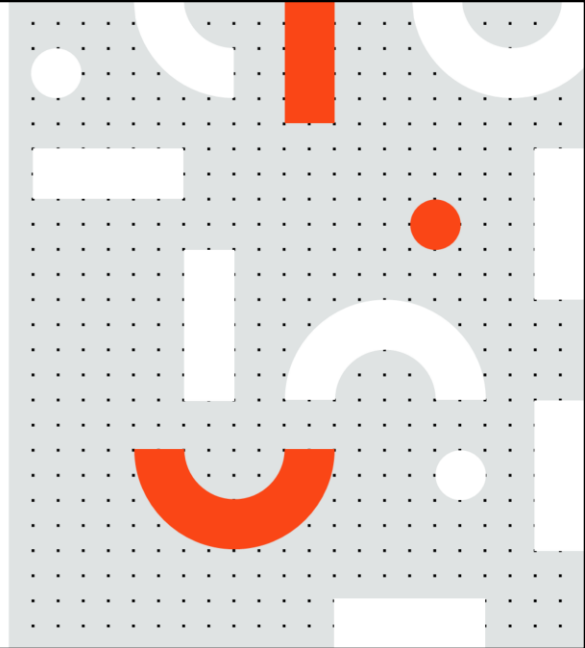



# RPA Design & Development v1.1

## Lesson 3 RPA Basics



After completing this module, students should be able to:

- Describe RPA, where it can be applied and how its implemented
- Describe the business and management side of RPA implementation in an organization



# Agenda

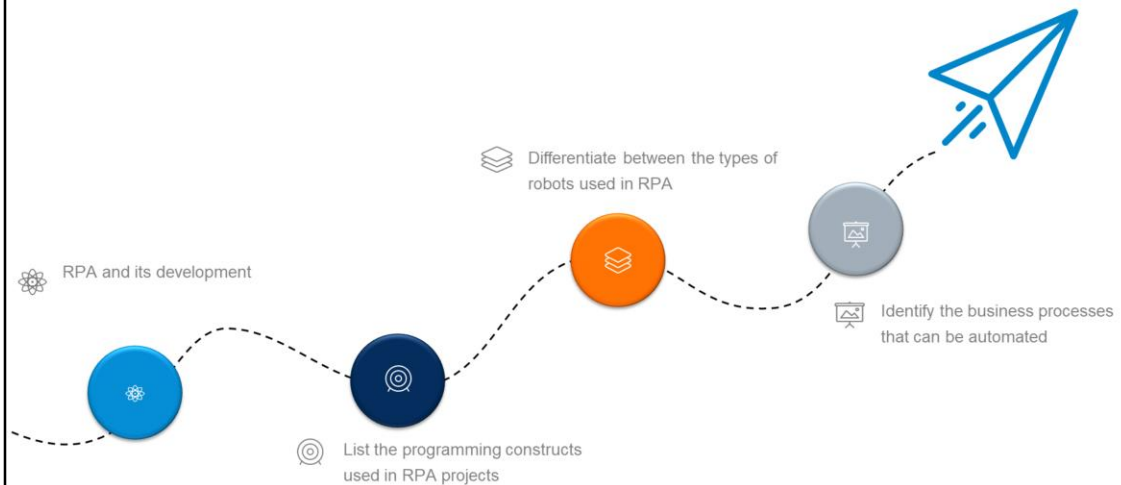
- Automation and RPA**
  - History of Automation
  - Automation and its benefits
  - Introduction to RPA
- Programming Constructs in RPA**
  - Processes and Flowcharts
  - Control flow in RPA
  - RPA Programming constructs
- Robots in RPA**
  - Introduction to Robots
  - Types of Robots
- RPA in Business and Technology**
  - Processes and Automation
  - Benefits of RPA Automation

In this lesson, we will cover the following topics:

- Automation and RPA
  - Automation and its benefits
  - Evolution of automation into RPA
  - Introduction to RPA
- Programming Constructs in RPA
  - Processes and Flowcharts
  - Control flow in RPA
  - Glossary of programming constructs
- Robots in RPA
  - Introduction to Robots
  - Types of Robots
- RPA in Business and Technology
  - Processes and Automation
  - Benefits of RPA automation

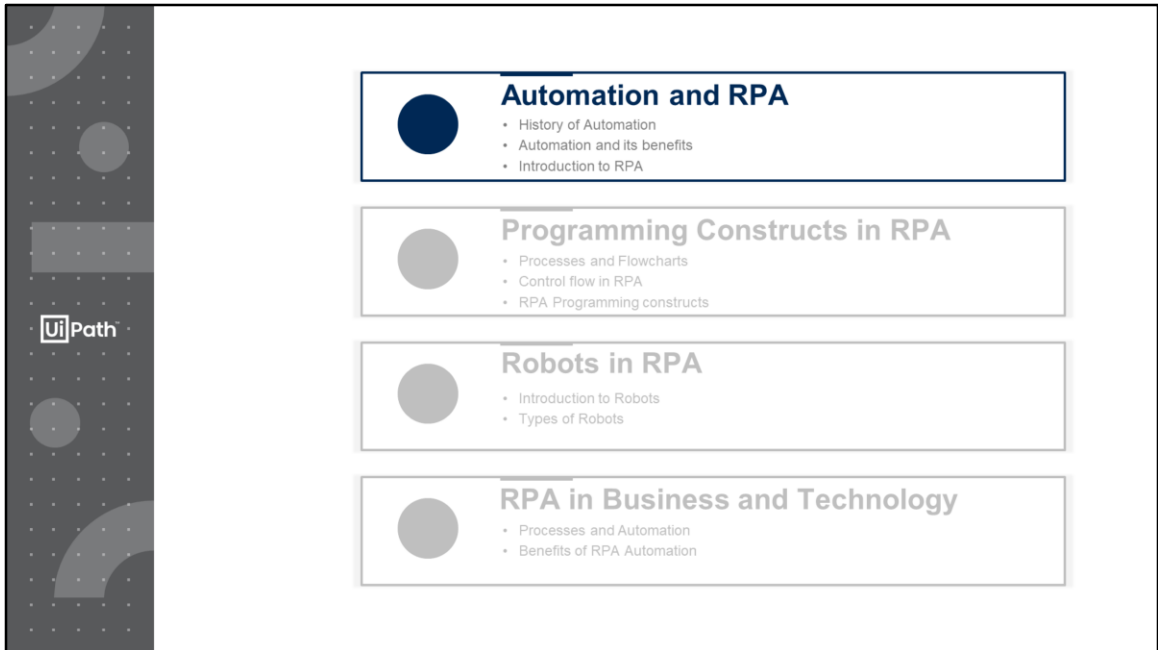
- The RPA journey

## Learning Objectives

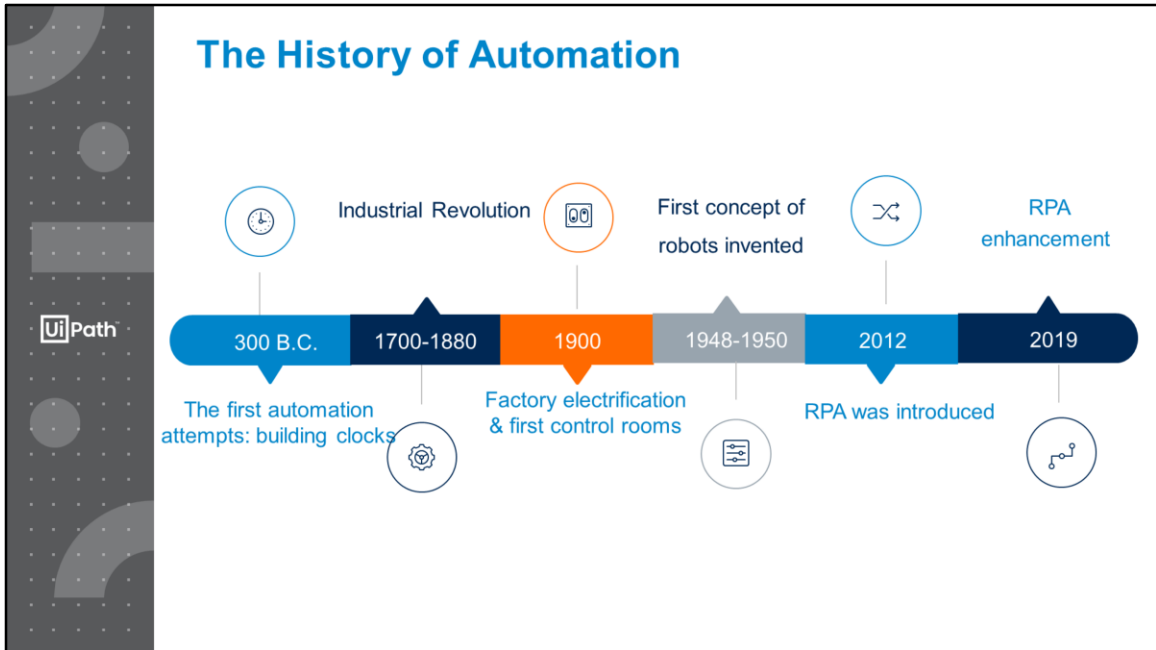


At the end of this lesson, you will be able to:

- Understand that RPA is a type of automation and understand its special features
- List the programming constructs used in RPA
- Differentiate between the types of robots used in RPA
- Identify the business processes that can be automated



In this topic, we will learn about the history of automation, its benefits, and the meaning of RPA.

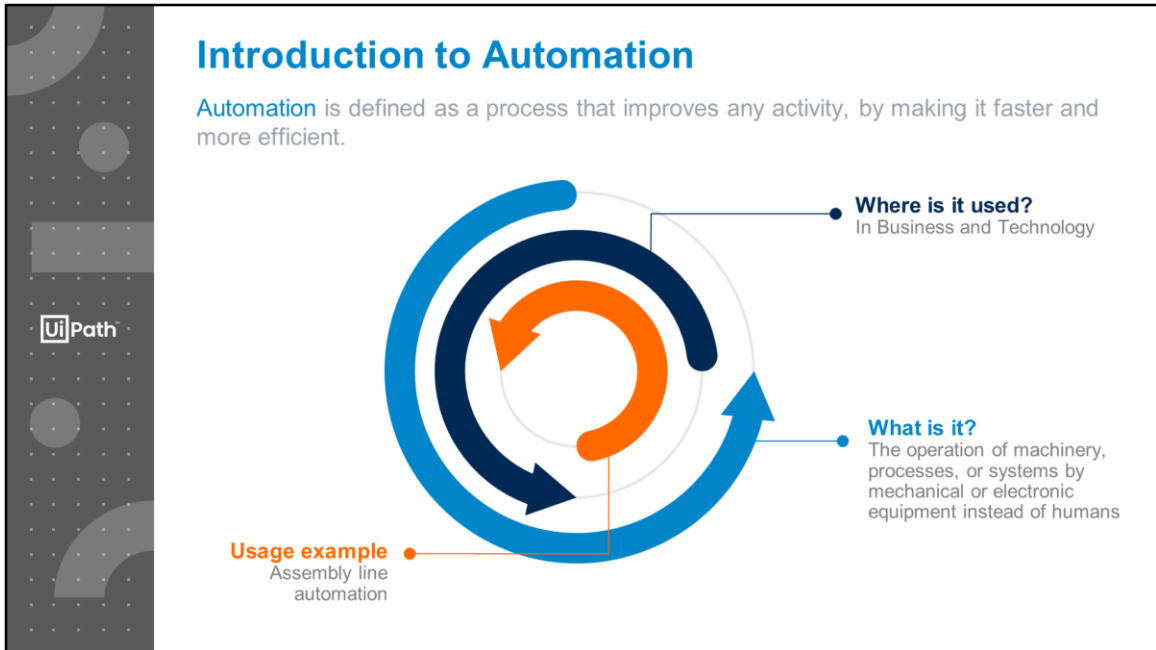


The history of automation began more than 2300 years ago.

- The first attempts at automation are linked to the idea of measuring the time. The Greeks, the Arabs, and the Egyptians made attempts to automate water clocks (or clepsydras, used from the 16<sup>th</sup> century BC).
- At the beginning of the 19th century, many factories were electrified, creating the need for a centralized control. The first attempts were simple on/off mechanisms.
- The evolution of RPA is happening with the integration of Latest technology like Artificial Intelligence , improved OCR Tools and Enhanced improvement in VM and Citrix Automations as per the latest upgrade.

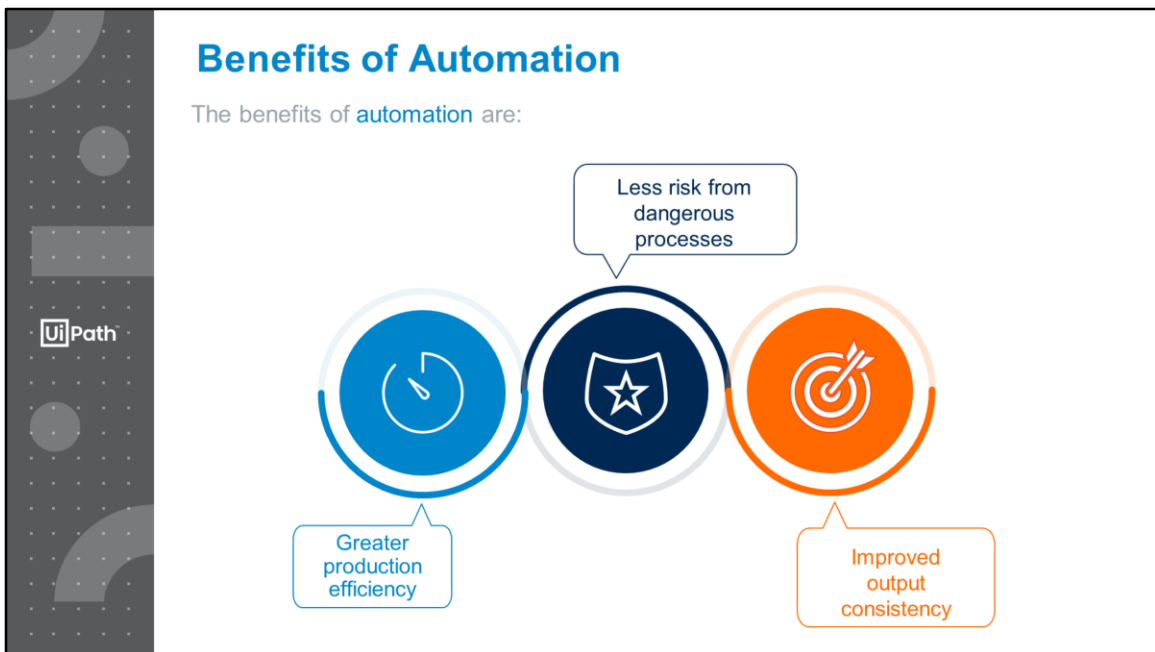
### Additional Notes\*

The term Automation was coined by an engineer working for ford motors, DS Harder. The concept of Automation was first used in Automobile Industry.



Automation is a way of improving the process mechanism by removing the unwanted or repetitive tasks so that the overall performance is enhanced. Automation impacts the overall efficiency and productivity of any business process by freeing the human workers from the monotony of repetitive work. These resources can be better utilized in more productive work.

The best instance of automation in the business and technology field consists of manufacturing process, which previously required human labor, but is now becoming more automated.



There are certain activities in which risk is involved making life vulnerable to danger. Automation has taken over such risky tasks thereby, safeguarding precious human life. Automation also led to an improvement in the productivity in operations leading to decreased cost and decreased average handling time for executing any activity.

### **Additional Notes\***

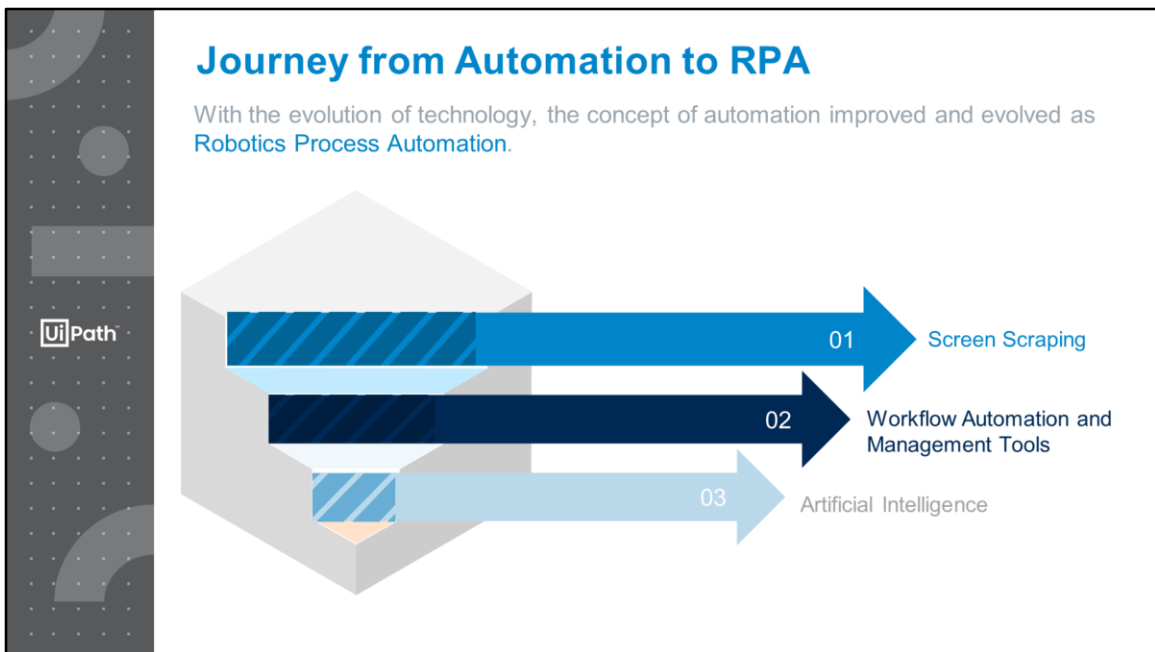
Let us understand the benefits of automation by considering an example: We know that there are many steps and complex procedures involved in on-boarding of candidates by a Human Resource team. These require manpower, time, and finance. There are various steps which are repetitive in nature and can be eliminated once we automate the process.

Example: Collection and storage of important documents on a common shared drive can be automated.

This makes the process simple and defined thereby, reducing rework of repetitive nature.

Hence, through automation we are able to save time and money as well.





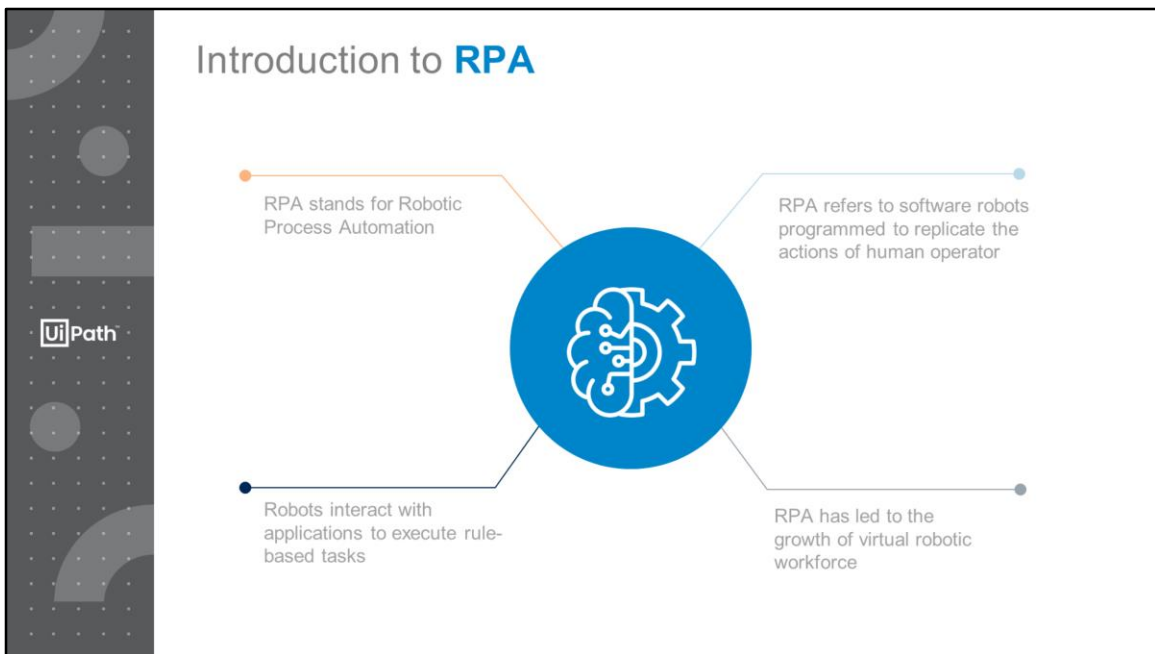
How did automation become RPA?

Three technological advancements that helped in evolution of automation to RPA are: Screen Scraping, Work Flow Automation, and Artificial Intelligence.

- **Screen Scraping** software enables robots to interact with different user interface elements and documents, such as .pdf files, to extract data for further processing. The extraction of data is facilitated by OCR engines and Computer Vision libraries.
- **Workflow Automation and Management Tools** provide visual representations of business or mechanical processes, minimize the human intervention required in their execution, and eliminate the redundant steps, thus increasing their efficiency.
- **Artificial Intelligence** consists of technologies such as Machine Learning, Cognitive Engines, and Natural Language Processing. The tasks that were previously dependent on humans for their judgement and decision-making ability, can now be done by AI. E.g. financial planning and fraud detection.

### Additional Notes\*

With the advancements in technology, there are continuous improvements in the automating approach as well. To make automation more effective, many advanced technology are being integrated with the existing tools making them more reliable and consistent .



## What is RPA?

RPA stands for Robotic Process Automation. It refers to "software robots" which are programmed to use computer programs in the same way as a human operator would.

In simple words, RPA involves the use of software that mimics human actions while interacting with applications in a computer and accomplishing rule-based tasks. This often requires reading from and typing or clicking on existing applications that are used to perform the given tasks. RPA can also replicate the actions performed by a user in the graphical user interface of an application.

Virtual robotics workforce is defined as digital software robots performing certain activity and adding to the productivity. Hence, we can say that they have digitized workforce. They are known as virtual because they are purely digitized and perform the same activity what human being does. The basic difference between RPA and traditional automation is that the software robot is trained using steps that are illustrative rather than using instruction based on code .

Also, RPA, unlike the traditional automation, is capable of adapting to dynamic circumstances.

## Advantages of RPA

The advantages of adopting an RPA solution into business are:



The implementation of an RPA solution brings several benefits. Some of the main advantages of businesses adopting an RPA solution are as follows:

- Increased execution speed:
  - RPA robots are much quicker and efficient than a human operator.
- Improved accuracy:
  - RPA leads to improved accuracy as the designed robot works on the given instruction.
- Improved compliance and governance:
  - RPA solutions have already been adopted to ensure regulatory compliance, especially in the banking sector. Since the Robot Login details are secure and unique, the activity carried out is well controlled and supervised leading to improved regulatory compliance. This creates transparency and allows the user to recognize any issue or defect easily.
- Reduced cost of process execution:
  - The work capacity of robots is superior to that of human workers. When an RPA solution is implemented, the task execution rate is considerably increased, and the corresponding costs are decreased. A robot can work 24\*7, there is no time constraint. This increases the

- productivity time and improves the output.
- Easier scaling:
  - The amount of work involved in a process can vary, as unexpected changes are likely to occur in most business environments. If an RPA solution is used, companies can easily adapt by scaling the solution up or down, depending on the requirements, regardless of how volatile they might turn out to be.

**Additional Notes\***

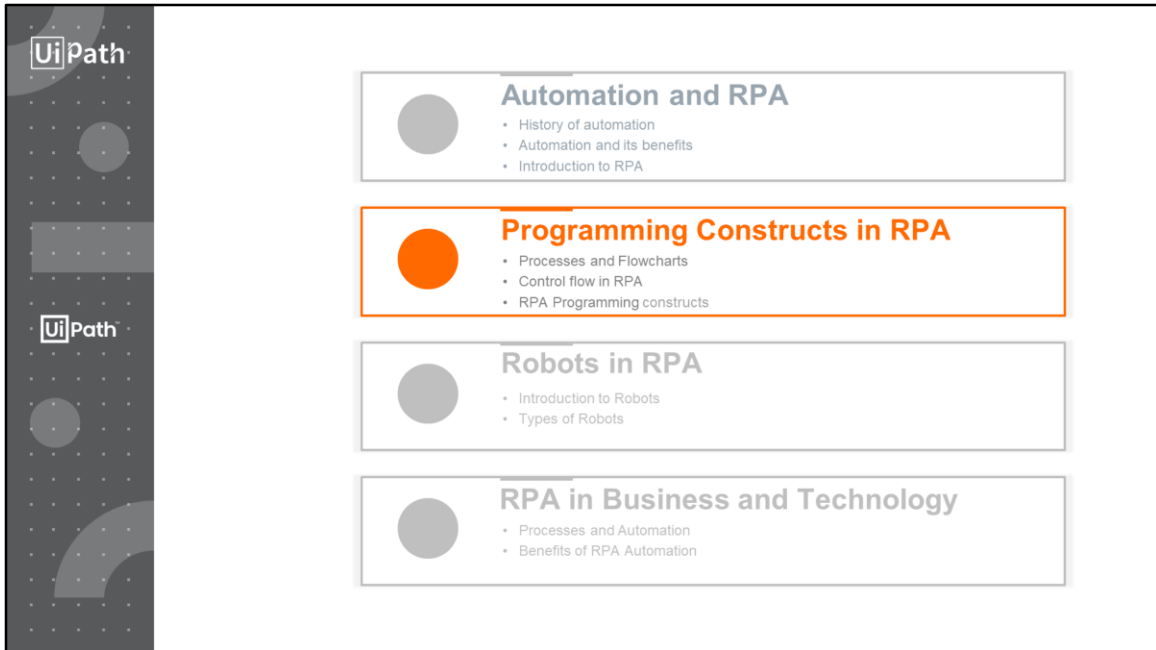
RPA is highly scalable, up as well as down. Whether one requires an increase or reduction in the virtual workforce, robots can be quickly deployed at zero or minimum costs while maintaining consistency in the quality of work.

## Automation vs RPA


These below features will help explore the characteristics of Automation and RPA:

Automation	Robotics Process Automation
The method by which we improve the existing process and improve the efficiency is called automation	The advanced form of automation involving latest technology like screen scraping , workflow and Artificial intelligence
This was first time used in heavy industry by DS Harder an engineer working for Ford motors .	The term was coined by Blue Prism in 2012
Example: Heavy Industries like: Automobile, Manufacturing etc.	Example: Finance, Healthcare, Insurance etc.

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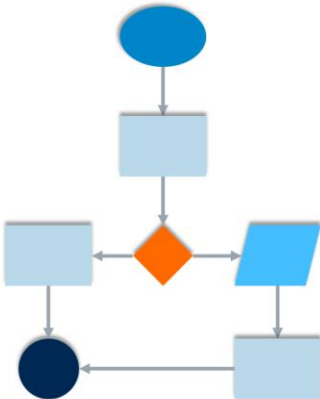


In this topic, we will learn about processes, flowcharts, control flow, and programming constructs in RPA.



## Process

A **process** is defined as a series of steps, activities, and decisions involved in the way work is accomplished.



1. There are typically two ways to represent a process:
  - As a **sequence**, where actions come one after the other
  - As a **flowchart**, where there are multiple decision points and logical branches
2. The process chosen for automation is split into simple actions and mapped in the RPA tool.
3. The RPA developer analyzes and configures the mapped process by introducing decision points, variables, pre-defined operations, and other types of elements available in the RPA tool.
4. Once the logic is replicated in the workflow, the process is ready for automation.

### **Process :**

The process is represented either as a succession of steps, or as a flowchart, where the decision points are more easily represented.

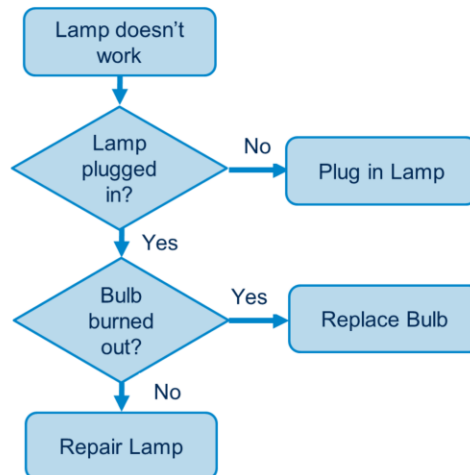
In its simplest form, RPA replicates the actions that were presented by the user using the graphical user interface. The RPA tool tries to draw the process to be able to translate it into small steps and understand its underlying logic.

Very simple processes can be replicated as such, without other interventions. However, in case of complex business processes, an RPA developer needs to configure the workflow in order to make business decisions or do complex operations. RPA involves the use of robotic control flow to capture the logic and decisions of a business process. RPA tools offer plenty of activities and technologies to match the needs and complexity of real-life processes.



## Flowchart

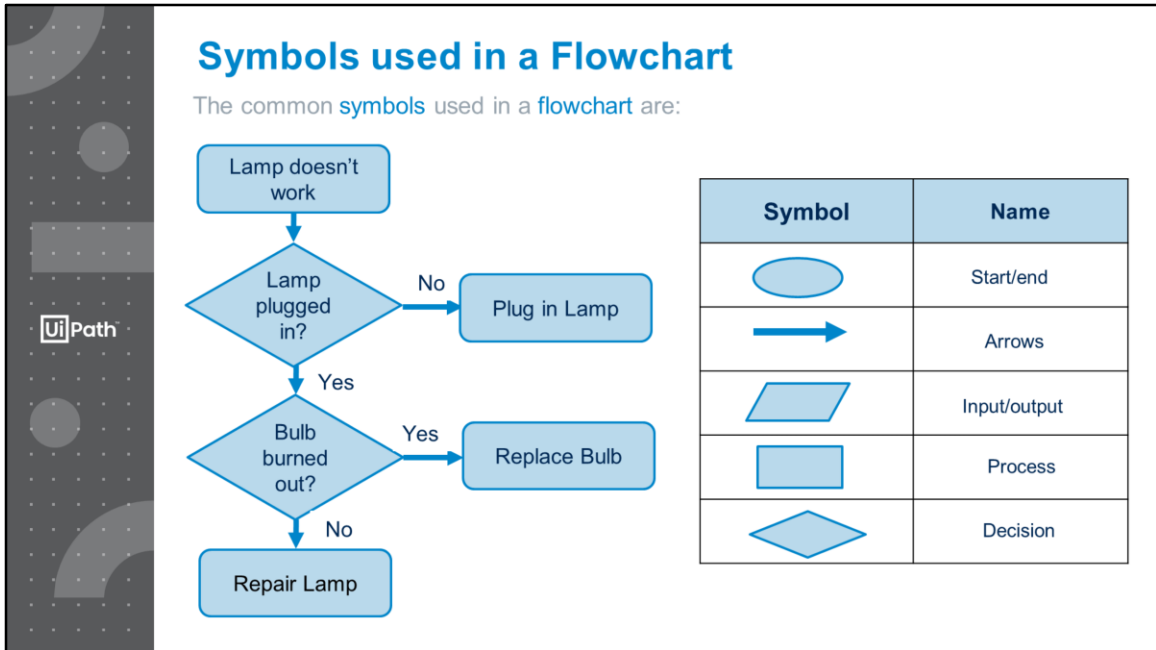
Flowchart depicts the flow of a program and is also known as process flow diagram.



A flowchart is also known as process flowchart or process flow diagram. It is pictorial representation of steps that are involved in any process in a sequential manner. It consists of a sequence of action, entry point, exit point, and the decision required.

A flowchart is suitable for dealing with more complex projects as it enables you to connect activities and integrate decisions.

Once the business logic has been replicated in the workflow, the automation is ready to be implemented.



Commonly used symbols in Flowchart:

- **Oval or Pill:** This is used to represent the start or end of a process or a flowchart.
- **Arrow:** This is used to represent the direction of flow and connects other shapes together.
- **Parallelogram:** This is used to represent input/output
- **Rectangle:** This is used to represent an event which is controlled within the process. Typically this will be a step or action which is taken.
- **Diamond:** Used to represent a decision point in the process. Typically, the statement in the symbol will require a 'yes' or 'no' response and branch to different parts of the flowchart accordingly.

In addition to these symbols, following additional symbols are also used in flowcharts:

- **Direct data:** Direct data object in a process flow represents information stored which can be accessed directly. This object represents a computer's hard drive.

- **Circle:** Used to represent a point at which the flowchart connects with another process. The name or reference for the other process should appear within the symbol.
- **Internal storage:** This is an object which is commonly found in programming flowcharts to illustrate the information stored in memory, as opposed to on a file.
- **Predefined process:** This allows you to write one subroutine and call it as often as you like from anywhere in the code.
- **Data object:** The data object, often referred to as the I/O shape shows the inputs to and outputs from a process.
- **Document:** The Document object is a rectangle with a wave-like base. This shape is used to represent a Document or Report in a process flow.
- **Stored data:** This is a general data storage object used in the process flow as opposed to data which could be also stored on a hard drive, magnetic tape, memory card, or any other storage device.
- **Manual input:** This object is represented by a rectangle with the top sloping up from left to right. The manual input object signifies an action where the user is prompted for information that must be manually inputted into a system.

## RPA Programming Constructs

Programming constructs are the backbone of any programming language. Some important programming constructs are:



Programming constructs form an integral part of any coding. The Programming constructs are the backbone and form the foundation of any programming language. They are the building blocks of programming. The term construct in general means “invent or make up.” In programming, constructs are defined as the logical and structural approach required to define the underlying principle of programming.

There are important programming constructs that we generally utilize to make the programming logical and structural.

- **Sequence:** The term sequence denotes the first step or the first block of programming. It indicates the next process or step that needs to be taken.
- **Selection:** Once the programmer has constructed the sequence, it is important to select a course of action on the basis of the given conditions. Hence, we can say that selection allow a programmer to choose among the various alternatives that best suit the requirement .
- **Repetition:** A repetition construct causes a group of one or more program statements to be invoked or applied repeatedly until some

- end condition is met.
- **Control Statements:** These are common ways of controlling the flow of logic, operations, functions in a program/algorithm. These act like the 'plumbing' of a program or algorithm. Examples: 'if' statements, 'while' or 'for each' loops
  - **Data Types:** Data types are used to specify any kind of expected class of information. Common data types are Integer (0, 1, 2), Float (0.5, 1.234, 20.3) and Character ('a', 'b', 'c'). String are one or more characters ("Tom"), Boolean (holding either a 'True' or 'False' value). Each language can define its own data types.



**Scope:** A scope is a specific context that is relevant to the program at any particular point in time. The scope has to be very clear and defined for the success of the project.

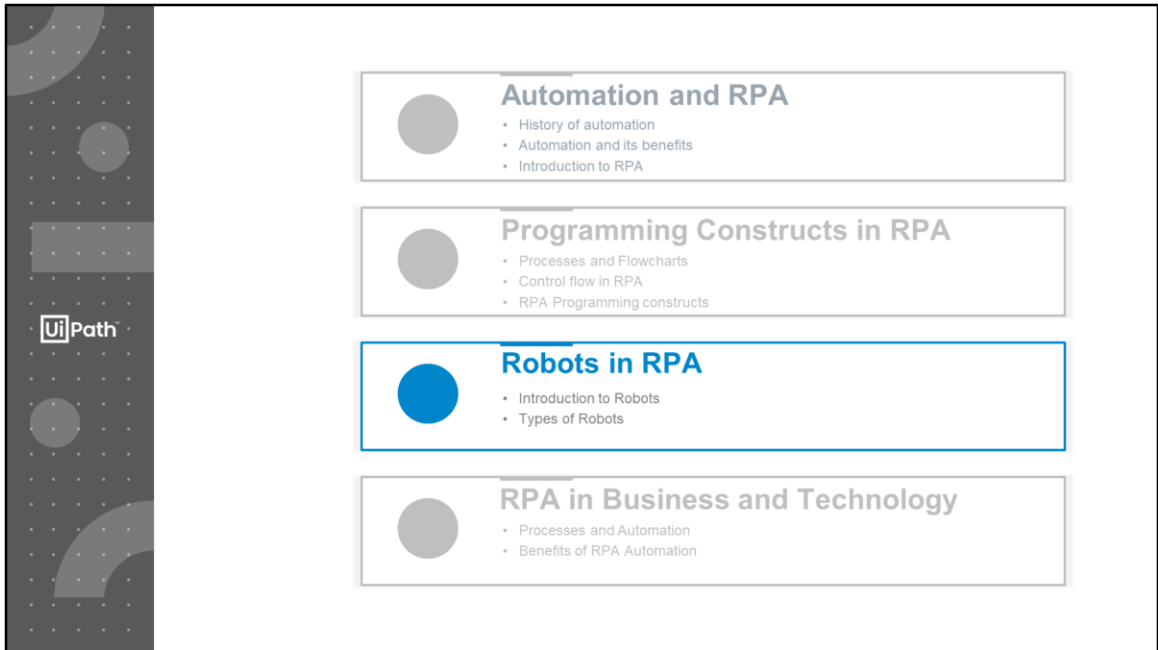
**Validation:** At any step in a process or automation, there might need for validation. It is defined as the act of verifying the qualities of a process to ensure that they are correct. Validating data in a process is often a critical requirement before execution. Common examples are making sure that:

- The data types match what was expected
- The types of values (say Integers) are within a certain threshold (0-100).

**Input /Output:** For each piece of automation or algorithm, there might be an expected Input and/or Output. Any information or data that is sent to a computer for processing is considered input. Input is the data at the entry point of the automation. Any information that has been processed by and sent out from a computer or other electronic device is considered output. Output is the data being returned at the end of the automation.

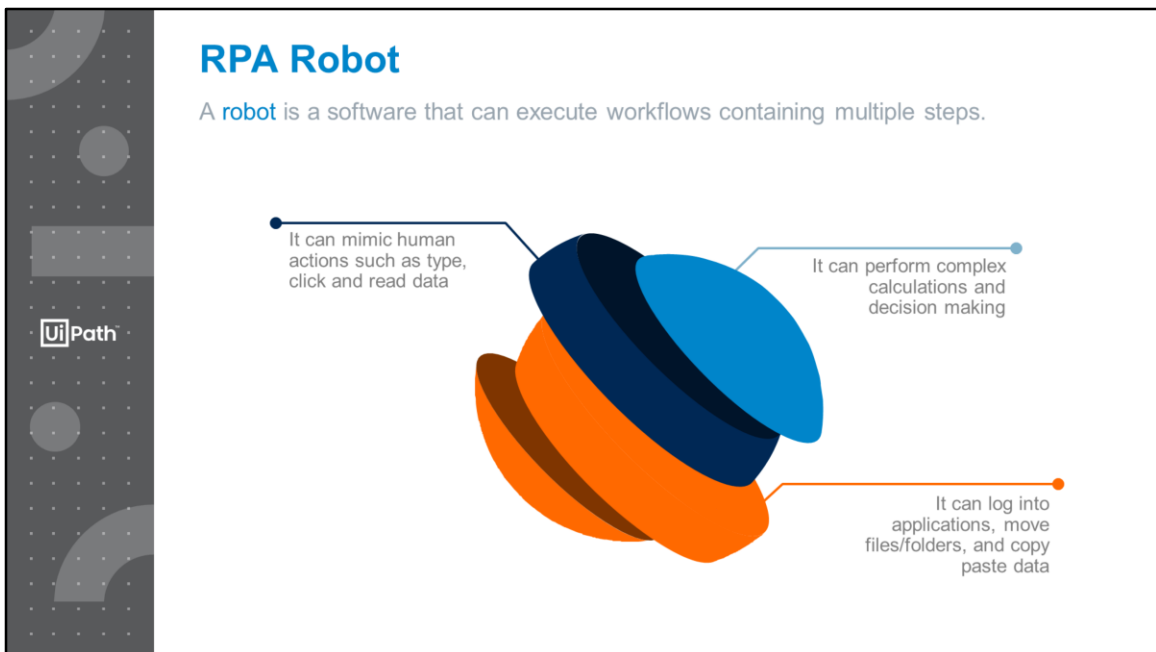
**Risk/Error Handling:** Every process should be evaluated for risk. This generally includes looking at every step of the process that can fail, or result in a failure later on in the process. This also involves quantifying how a possible failure could harm the overall system or business. By identifying all possible risks, error handling can be implemented to mitigate or completely reduce that risk. Error handling makes programming effective and more reliable, so that the activities executed by the program are useful and have zero impact on the productivity. No machine can be 100% efficient (ideal case) but we should try to minimize the error .

**Optical Character Recognition (OCR):** OCR refers to the software that analyzes images for alphanumeric characters. It processes a digital image by locating and identifying characters such as letters, numbers, and symbols.



In this topic, we will talk about software robots, their types, and the difference between the software bot and physical bot.





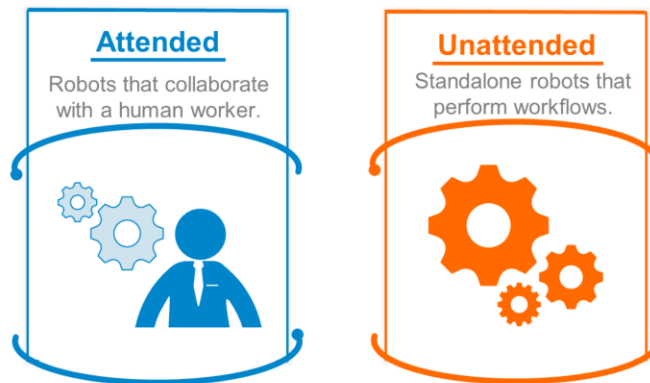
A robot is a software which can be taught how to execute workflows that contain multiple steps in various applications. These software robots also perform complex calculations and decision making on the basis of data and predefined rules. RPA robot interacts with applications. Once trained, these robot perform the tasks with precision.

#### **Additional Notes\***

The software robots are designed for improving efficiency and saving time. They are versatile and work 24\*7. They are efficient and are cost effective as they save resources . The software robot can perform task such as loop, control, pathfinding, data filtering, and sharing data.

## Types of RPA Robots

In RPA, robots are categorized on the basis of manual intervention required.



In RPA, robots are categorized as Attended and Unattended Robot on the basis of whether or not they require manual intervention.

**Attended robots** collaborate with human workers on business activities, speeding up repetitive front-office tasks. They reside on the workstation of the human worker and are perfect collaborators in service desk, helpdesk, and call center activities.

They work in the background and ensure high productivity and low handling times, while the human workers can continue to carry out their tasks unhindered.

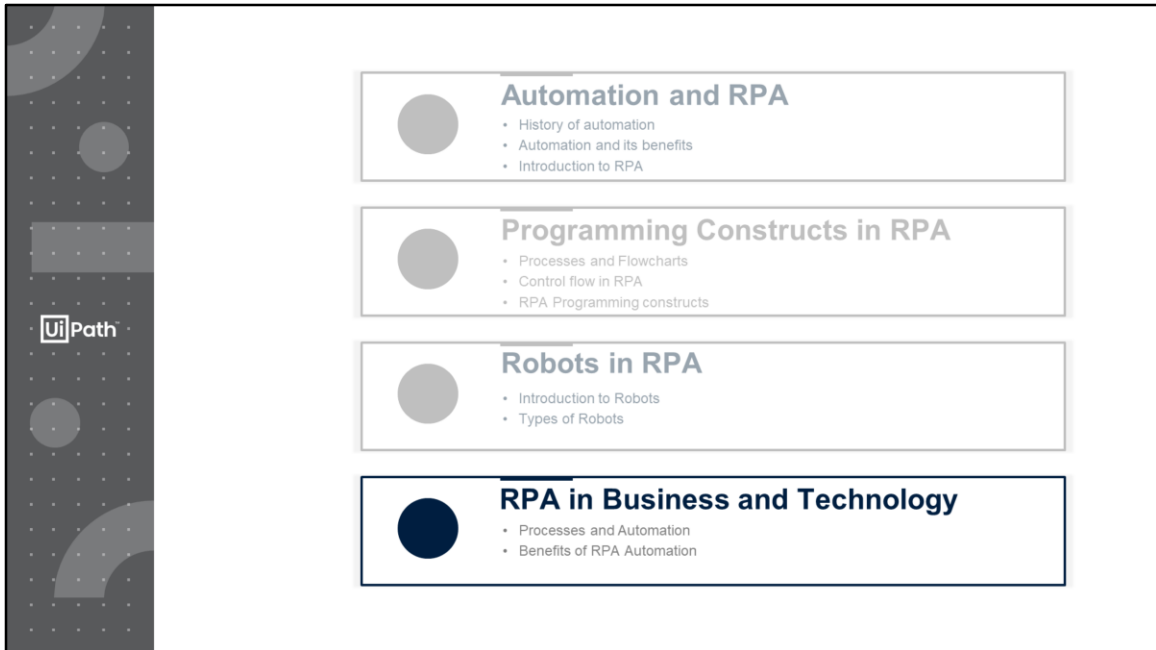
They need manual intervention and hence they are not fully automated.

Manual intervention is required where human activity or intelligence is required for the further execution or completing the task.

**Unattended robots** can operate without human touch on any variety of back-office activities. They can run in both physical and virtual environments. They can also be scheduled to start and stop at any time as per the business requirements.

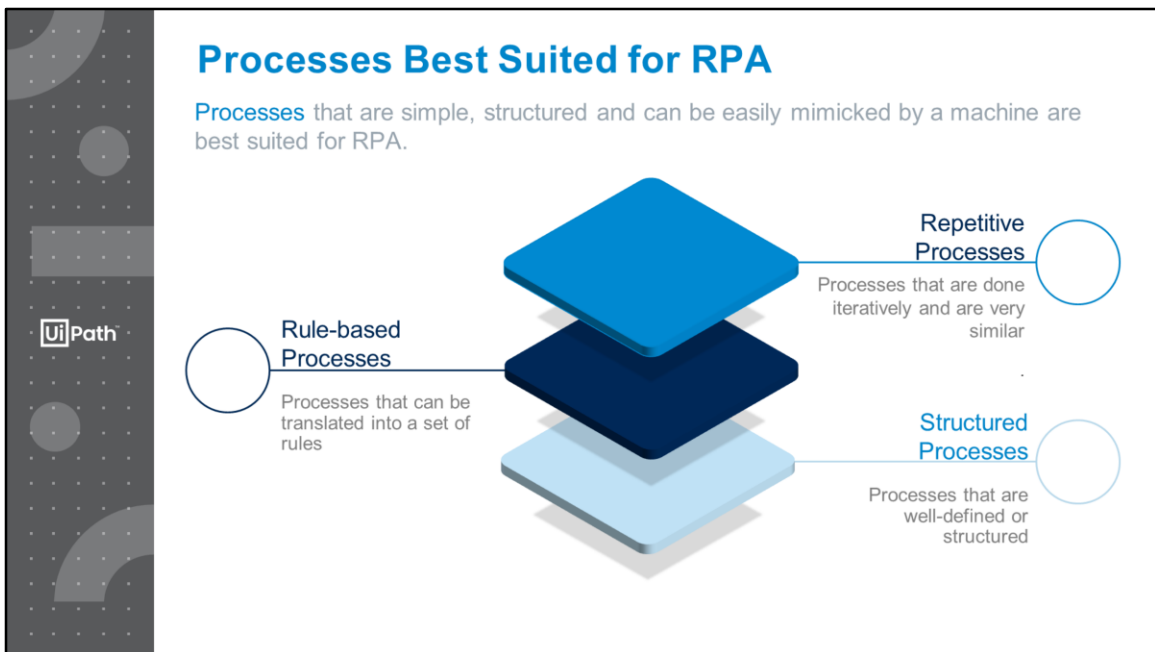
The unattended robots are maintained and guided remotely by server. These

robots are designed to work end to end without any interventions.



The diverse scope of RPA is growing day by day. In this topic, we will talk about the processes and automation, their benefits, and their evolving journey.

RPA is making its presence felt not only in information technology but also in other verticals such as finance, accounting, supply chain management, and many more.



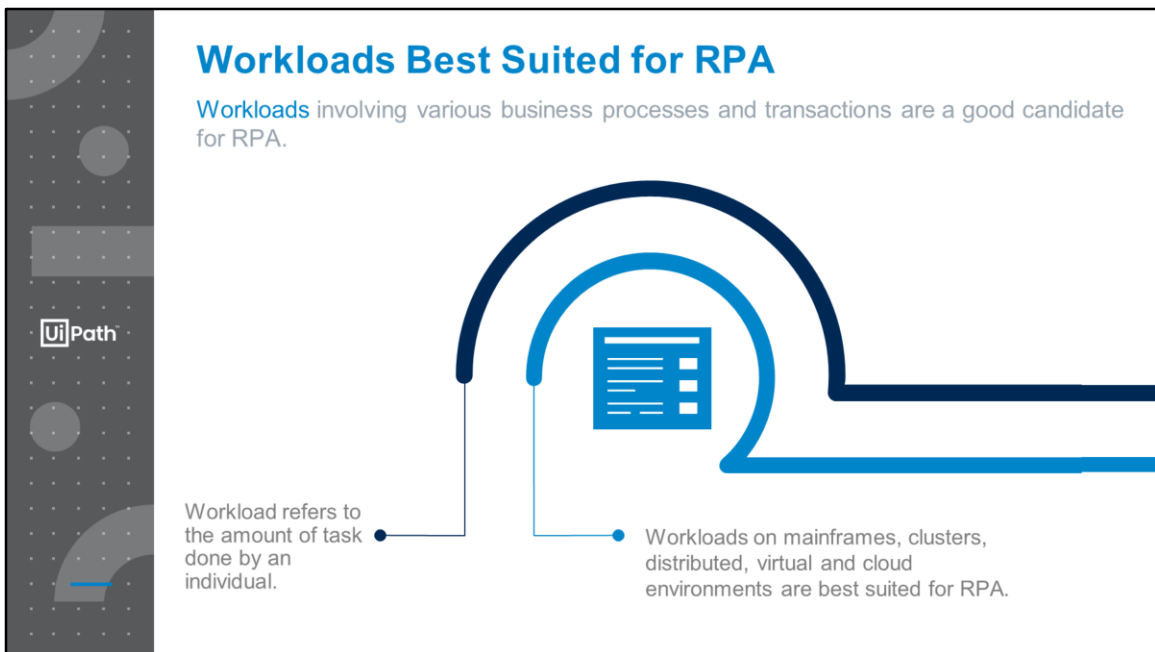
With increasing demand of implementation of RPA, it is very important to understand the limitation and scope of these tools when we talk about their contribution.

Processes that are simple, structured and can be easily mimicked by a machine are best suited for RPA.

They are repetitive, rule based and structured processes.

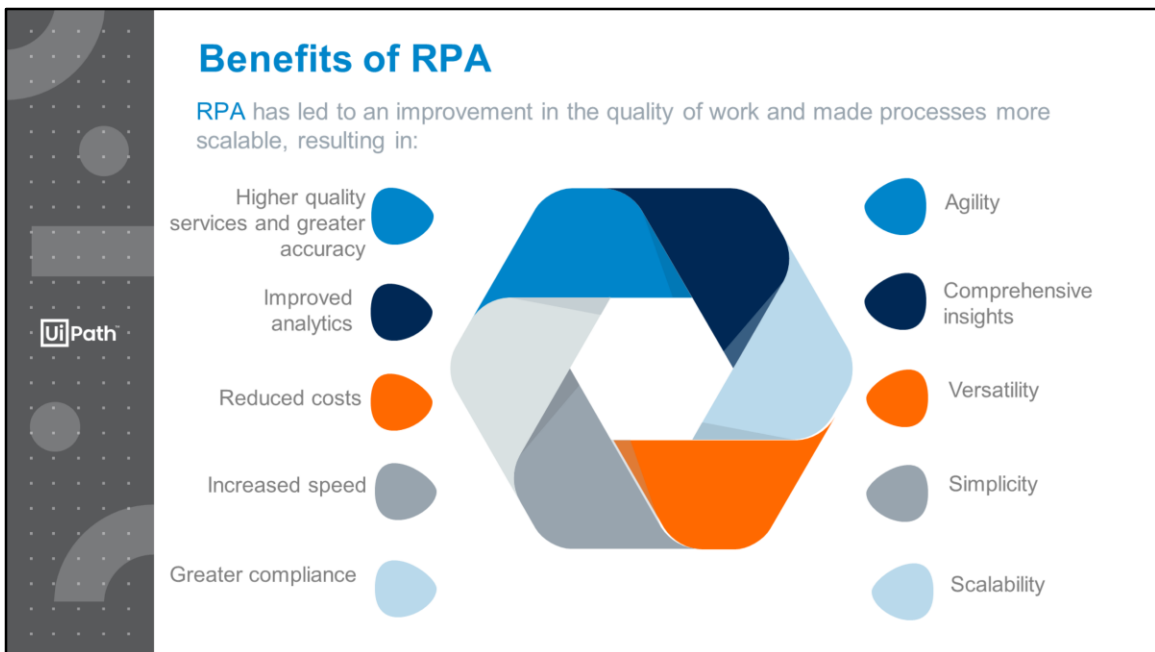
- **Repetitive:** Processes that are done iteratively and are very similar in each iteration are good candidates. Automation speeds up the execution of those processes resulting in increased productivity.
- **Rule-based:** If the way of handling a specific process does not undergo significant changes with each iteration, it can easily be translated into a set of rules to be followed by RPA robots. A rule-based process is therefore a great candidate for automation.
- **Structured:** Are the aspects of the process well-defined or structured? If that is the case, the automation of the process is easy to perform. The consistency and accuracy of robots is greater than a human worker could accomplish. That means they are less prone to error. Moreover, robots can be built to report all relevant data around their processes immediately, so it is very easy to keep track of their activity.

Processes involving complex data require human intelligence. Research analytics and follow up are still considered a challenge for RPA.



### Workload:

The term workload refers to the amount of task done by an individual. The term work load is defined in corresponding to the quantitative and qualitative approach. The quantitative approach is to measure the amount of work where as qualitative approach measures the quality of the work done. The activity of managing and automating various business processes and transactions, preferably in virtual and cloud environments. There are various workloads that are a good candidate for automation. They are mainframes, clusters, distributed, virtual and cloud environments.



Implementation of RPA in business and technology has resulted in:

- **Higher quality services, greater accuracy:**

With reduced human error and greater compliance, the quality of work is much better. Also, while it is difficult to trace the point at which a human error occurred, the detection of errors is much simpler in RPA. This is because every step in the automation process is recorded, making it faster to pinpoint errors with ease. A reduction or removal of errors also means greater accuracy of data, leading to better quality analytics and hence better decision making.

- **Improved analytics:**

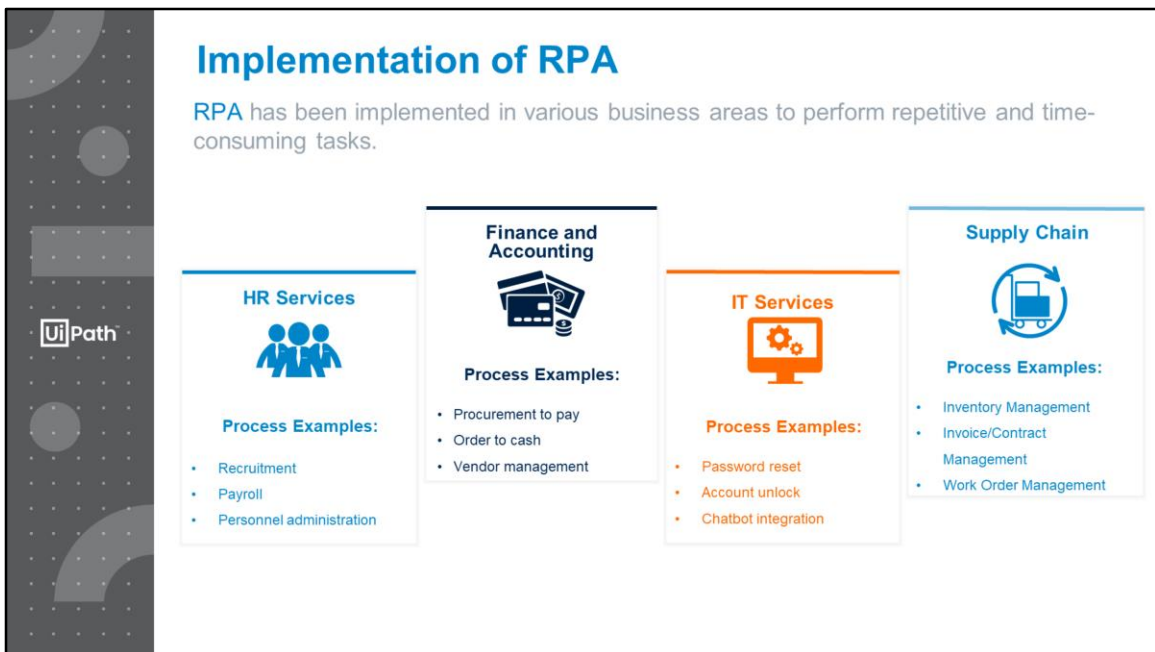
Since software robots can log each action taken with the appropriate tag and metadata, it is very easy to get business insights and other analytical data. Using analytics on collected data such as transaction received time and transaction complete time, predictions can be made for the incoming volume and the ability to complete the tasks on time.

- **Reduced costs:**

Nowadays, it is commonplace to hear that one robot is equivalent to three human full-time executives (FTE). This is based on the simple fact that one FTE works for eight hours a day, while a robot can work for 24 hours without a break. Increased availability and productivity means the cost of operations is reduced tremendously. The speed of the work being performed coupled with multitasking results in further reductions in cost.



- **Increased speed:**  
Robots are very fast. Increased speed results in better response times and an increase in the volume of the tasks being performed.
- **Greater compliance:**  
As mentioned earlier, a full audit trail is one of the highlights of RPA and can result in greater compliance. These robots do not deviate from the steps to be taken before completing a task it will certainly result in better compliance with the necessary regulations and standards.
- **Agility:**  
Reducing and increasing the number of robot resources requires managing the volume of the business process. This is just a click away. More robots can be deployed to perform the same task easily. Redeployment of resources does not require any kind of coding or reconfiguration.
- **Comprehensive insights:**  
In addition to audit trail and time stamping, robots can tag transactions to use them later, in reports for business insight. By using these business insights, better decisions can be made for the improvement of the business. This recorded data can also be used for forecasting.
- **Versatility:**  
RPA is applicable across industries performing a wide range of tasks, from small to large businesses, simple to complex processes.
- **Simplicity:**  
RPA does not need prior programming knowledge. Most platforms provide designs in the form of flowcharts. This simplicity enables easy automation of business processes, leaving the IT professionals relatively free to carry out higher value work. Also, since automation is carried out by people from within the department or area of work, no requirements are lost in translation between the business unit and the development team, which may have happened otherwise in traditional automation.
- **Scalability:**  
RPA is highly scalable, up as well as down. Whether one requires an increase or reduction in the virtual workforce, robots can be quickly deployed at zero or minimum costs while maintaining consistency in the quality of work.



Let's take a look at the industries and processes that have been improved with the help of RPA.

- **HR Services** involve a variety of repetitive processes, which are highly-standardized through different template forms. These processes take place regularly and with high frequency. Some examples of repetitive processes include recruitment, data entry, payroll, personnel administration. We can infer that repetitive, highly-standardized, regular, and frequent processes are the first ones to be considered when deciding what should be automated.
- **Finance and Accounting** is an area where a significant amount of processes have already been automated by many companies. Processes such as Procurement to Pay, Order to Cash, Vendor Management, and many others have proven ideal candidates for automation, bringing important benefits such as cost savings, error reduction, and faster processing to the business.
- **IT Services** is another department where RPA can be leveraged. Typical IT support scenarios, such as password reset and account unlock, can easily be automated. Automating these simple tasks allows the IT department members to focus on more important and sophisticated projects.
- **Supply Chain** processes are typically repetitive and time-consuming. Activities such as Inventory Management, Invoice and Contract

Management or Work Order Management make good candidates for RPA.

**Utility companies:**

These companies (such as gas, electricity, and water) deal with a lot of monetary transactions and can leverage RPA to automate tasks such as meter reading, billing, and processing customer payments.

**Healthcare:**

Data entry, patient scheduling, and more importantly billing and claims processing, are important areas where RPA can be used. RPA can help in optimizing patient appointments, sending them automatic reminders of their appointments and eliminating human error in patient records. This leaves workers to focus more on the needs of the patients, and also leads to improved patient experience.

## Practice Makes Perfect...



Think of a process in your life or job that can be automated. Now let's look at the programming concepts and identify possible input/output, risk, and other features that a developer should be aware of to implement this process.

- What are some of the benefits of automating a part of your job/life?
- What are some risks?
- What parts of the process are difficult to automate, what parts are simple?
- Can we calculate the cost of automating this process, with the benefit of having it automated?

The point of this exercise is to help the students apply the new concepts in familiar contexts. Naturally, there's not a single correct answer; judgement is important, and so is the ability to make connections between concepts and context.

## Takeaways

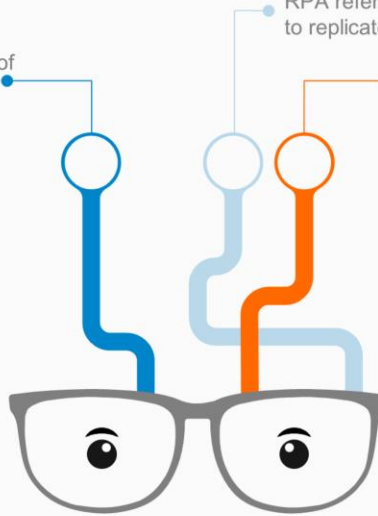
### Automation and RPA



Automation is defined as a process of improving an activity by removing repetitive tasks.

RPA refers to software robots programmed to replicate the actions of human operator.

A process is defined as a series of steps, activities, and decisions involved in the way work is accomplished.



The point of the Recap & Summary section is to go through the most important points covered in the lesson, after the students had the chance to see them in practice and obtain a consolidated view.

The teacher should use facilitation questions to help the students map the key points and offer a safe space to get questions and comments from them.

Some examples of facilitation questions

1. What are the technologies that pre-dated and enabled the development of RPA?
2. Are they still relevant today?
3. Do they have other uses outside RPA?
4. What are the advancement and improvement happening in RPA.

## Takeaways

### Programming constructs, Robots, RPA in Business and Technology

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Programming constructs are the backbone of any programming language.

A robot is a software that can execute workflows containing multiple steps in various applications.

RPA works best for repetitive, rule based and structured processes.

The point of the Recap & Summary section is to go through the most important points covered in the lesson, after the students had the chance to see them in practice and obtain a consolidated view.

The teacher should use facilitation questions to help the students map the key points and offer a safe space to get questions and comments from them.

Some examples of facilitation questions

1. What is RPA and how is it different from other kinds of automation?
2. What is a robot?
3. How many types of robots are there?

## Questions & Answers



### **Q&A**

Now it's your turn. What's on your mind at the end of this?



## Who coined the term – Automation?

- a) Henry Ford
- b) DS Harder
- c) Mark Austin
- d) Graham Bell

Correct answer: b) DS Harder coined the term – Automation.



## What is RPA?

- a) Robot Process Automation
- b) Robotic Process Automation
- c) Robotics Process Argument


Correct answer: b)Robotics Process Automation



**What does the Diamond symbol in a flowchart represent?**

- a) Input
- b) Output
- c) Decision Making
- d) Event

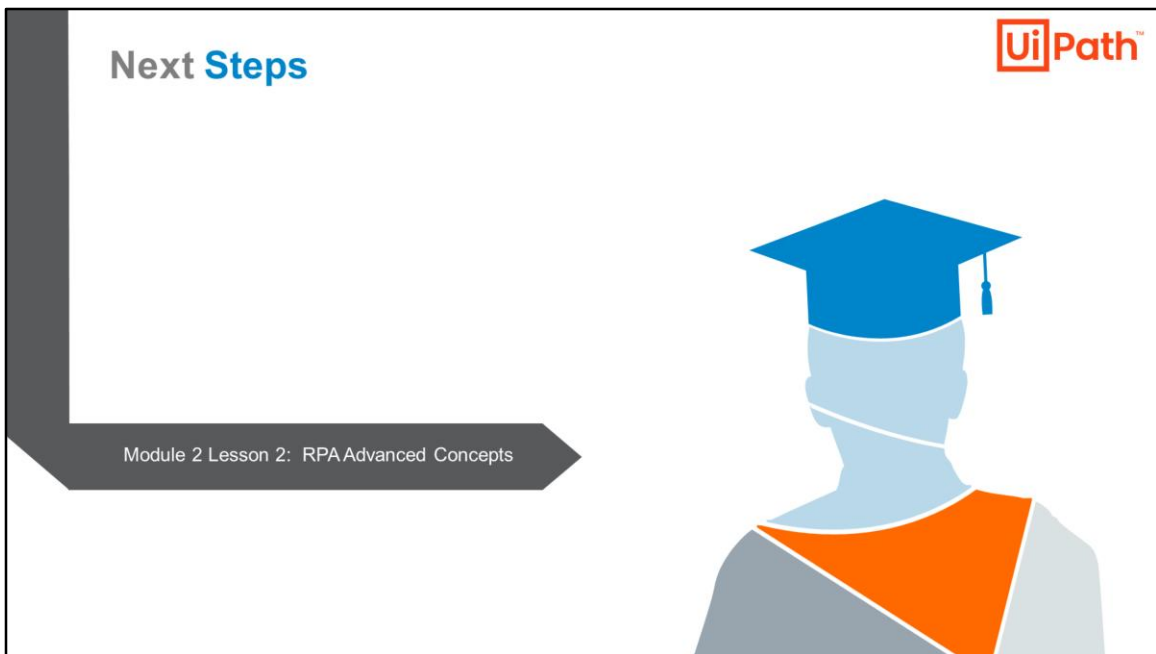
Correct answer: c) The Diamond symbol in a flowchart represents Decision Making.



**RPA is best suited for \_\_\_\_\_.**

- a) Repetitive process
- b) Unstructured process
- c) Complex data process

Correct answer: a) RPA is best suited for repetitive process.



In the next lesson, we will be covering the structure of RPA, where it can be applied and the business and management side of RPA implementation in an organization