1:What is Robotic Process Automation?

The term automation is derived from the Greek words *autos* meaning self, and *motos*, meaning moving.
It is believed to have been coined in the 1940s when there was an increased use of automated devices in mechanized production lines in the Ford Motor Company.

Automation, in simple words, is technology that deals with the application of machines and computers to the production of goods and services. This helps in getting work done with little or no human assistance.
With the advent of computers, many software systems were developed to accomplish tasks that were previously done on paper to manage businesses, or not being done at all due to the lack of tools. Some of these are bookkeeping, inventory management, and communications management.
There is also a type of software that ties these systems and people together in workflows, known as **Business Process Management** (**BPM**) tools. This software has been developed for areas such as record systems, engagement systems, insight systems, and innovation systems. These mostly replicate processes in real-life scenarios.

Scope and techniques of automation

There are various techniques used and available to automate steps and processes in an organization where software systems are being used to accomplish certain tasks. Before we look at these techniques however, let us see what *can* be automated and what *should* be automated.

What should be automated?

There are a few aspects that must be taken into consideration for choosing automation candidates. The following processes should be automated:

- Repetitive steps
- Time-consuming steps
- High-risk tasks
- Tasks with a low-quality yield
- Tasks involving multiple people and multiple steps
- And everything else!

What can be automated?

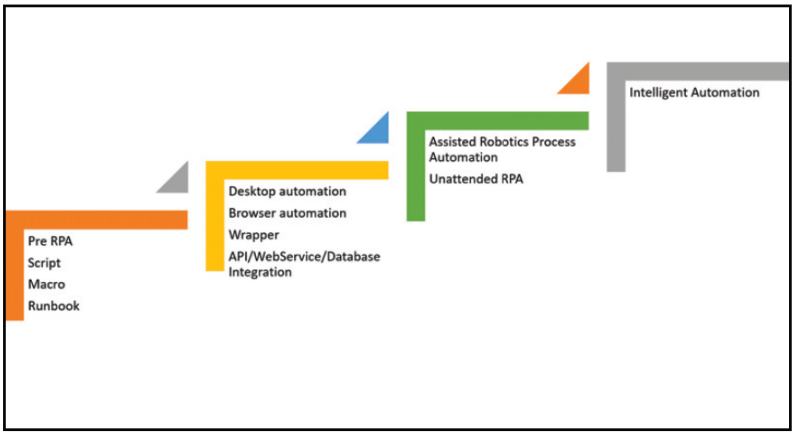
In order to automate something, it needs to have the following characteristics:

- Well defined and rule-based steps
- Logical
- An input to the task can be diverted to the software system
- Input can be deciphered by software systems with available techniques
- The output system is accessible
- Benefits are more than the cost

Techniques of automation

There are various techniques available for automation.
Custom software: Developing new software to perform repetitive tasks.

Runbook: Runbooks are typically used for IT-based operations. They are a compilation of a set of commands or tasks that are performed for maintenance and other types of activities.
Batch: Batch files used to very popular. They used to compile a sequence of commands that could be run by a single click or command. They can also be scheduled to be run at a specific time using the scheduler.
Wrapper: Wraps around existing software or hosts client applications. The wrapper monitors activities in a client app and performs actions based on rules. For example: Putting validation on top of a mainframe application using hummingbird Hosting a website inside a shell, navigation, and actions
Browser automation: Greasemonkey and many other web macro software helped in browser-based automation. It can be used to read from a website and save to a database. It can also write to fields based on rules. Using this technique, a whole website can be changed, and components can be added or removed from the website.
Desktop automation: Desktop automation used to mean that multiple screens on a desktop were woven together to present a single screen, and if there was some data transfer from one screen to another, it could be done automatically.
Database/web service integration: In database integration, we read/write to a client database directly. In web service integration, we communicate with the client system using a web service:



Robotic process automation

Robotic process automation (**RPA**) is transformational burgeoning area. *Robot* in Robotic process automation means software programs that mimic human actions.
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.
In addition, these software Robots also perform complex calculations and decision making on the basis of the data and predefined rules.

Some of the technologies being adopted with RPA are as follows:
Machine learning
Natural language processing
Natural language generation
Computer vision
With the inclusion of the preceding technologies, sometimes it is also referred to as intelligent automation.

With the advent of RPA, it has become much easier to automate tasks. Now, we need to know only the steps taken by humans and make the Robots mimic the action on a computer screen using mouse and keyboard.
RPA platforms allow the program, called Robots, to interact with any application in the same way a human would do, hence, automating rule-based work by recording those steps for later playback.
An important point that distinguishes RPA from traditional automation is that the software Robot is *trained* using steps that are illustrative rather than using instructions based on code. Thus, a person with little programming experience can be trained on these platforms to automate simple to complex processes.

Also, RPA software, unlike traditional automation, is capable of adapting to dynamic circumstances, for example, when checking an electronic form of new employees in a company. If the pin code is missing in a form, in traditional automation the software would point out the blank field as an exception, and then a human being would search for the relevant pin code and correct the form. In RPA however, the software is capable of performing all the tasks mentioned previously with no human assistance.
From tedious, repetitive, and high volume tasks, to diverse, complicated systems that need to work together lucidly, RPA can handle it all. There is consistency in quality, accuracy, productivity and efficiency, faster delivery of services, and of course, lower operation costs.

What can RPA do?

RPA has matured beyond doing mundane repetitive tasks, and is seen as a transformational technology that can bring tremendous value to the organization adopting it. The ability to create full audit trails is significant for improving the quality of work being done and eliminating human error. Once trained, these Robots will perform tasks with the same precision over and over again. These Robots can interact with applications irrespective of the technologies on which the applications are built.

With the inclusion of AI technologies, RPA now has the capability to read from images or scanned documents, and it can interpret unstructured data and formats as well.

Benefits of RPA

The following industries can benefit a lot from RPA:

- **Business process outsourcing** (**BPO**): With RPA and its benefits of reduced costs, the BPO sector can now depend less on outsourced labor.
- **Insurance**: The complexity and number of tasks that must be managed in the insurance sector, from managing policies, to filing and processing claims across multiple platforms, provides an ideal environment for the use of RPA technology.
- **Financial sector**: From day-to-day activities and handling an enormous amount of data, to performing complex workflows, RPA has been helping to transform this sector into an efficient and reliable one.
- **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 will 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.

The following are the benefits of RPA:

- **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 the human error occurred, the detection of errors is much simpler in RPA. 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 these 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 the collected data such as transaction received time, transaction complete time, and predictions can be made for the incoming volume and 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.
- **Increased speed**: Robots are very fast and sometimes the speed of execution has to be reduced to match the speed and latency of the application on which these Robots work..
- **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 defined set of steps to be taken while doing a task.
- **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 the 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.
- **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.
- **Time savings**: Not only does the virtual workforce complete large volumes of work in a shorter span of time with precision, but they help save time in another way too. If there is any change□say, a technology upgrade it is much easier and faster for the virtual workforce to adapt to the changes. This can be done by bringing about modifications in the programming or introducing new processes.
- **Non- invasive**: RPA, as we know, works at the user interface just like a human would. This ensures that it can be implemented without bringing changes to the existing computer systems. This helps in reducing risks and complexities that would arise in the case of traditional IT deployments.
- **Better management**: RPA allows for managing, deploying, and monitoring Robots through a centralized platform. This also lessens the need for governance.
- **Better customer service**: Since Robots can work around the clock, capacity increases. This leaves humans to focus on customer service and satisfaction. Also, better quality of services delivered to customers at faster speeds greatly boosts customer satisfaction.
- **Increased employee satisfaction**: With repetitive, dreary tasks now being taken over by the virtual workforce, employees are not just relieved of their workload, but can also engage in better quality work that requires the use of human capabilities and strengths such as emotional intelligence, reasoning, or tending to

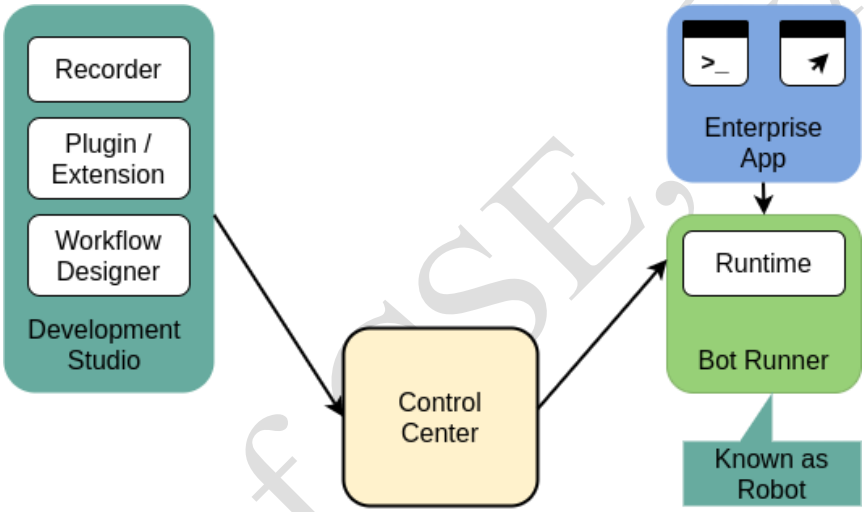
customers. Thus, RPA doesn't take away work, it just frees humans from tedious, mind-numbing work, giving us an opportunity to engage in much more satisfying jobs.

- The applicability of RPA is across industries such as banking and financial services, insurance, healthcare, manufacturing, telecom, travel, and logistics..

Components of RPA

The following are the basic or core components of RPA:

- **Recorder**
- **Development Studio**
- **Plugin/Extension**
- **Bot Runner**
- **Control Center**:



- **Recorder :** The recorder is the part of the development studio that developers use to configure the Robots. It is like the macro recorder in Excel, the bot recorder in any platform, records steps. It records mouse and keyboard movements on the UI and this recording can be replayed to do the same steps again and again. This enables rapid automation.
- **Development studio:** The development studio is used by developers to create Robot configuration or train the Robots. Using the development studio, a set of instructions and decision-making logic is coded for Robots to execute. Some platforms provide flow-charting capabilities such as Visio, so it becomes very easy to plot steps in a process, whereas some other platforms require coding. In most studios, in order to do commercial development, developers need to have a fair amount of knowledge of programming, for example, loops, if else, variable assignment, and so on.
- **Extensions and plugins:** Most platforms offer many plugins and extensions to ease the development and running of bots. In many applications, such as Java SAP, it is not easy to individually identify controls of the UI through traditional techniques. RPA vendors have developed plugins and extensions to help with these issues.

- **Bot runner:** This is also referred to as the Robot, other components make it run.
- **Control center:** The objective of the control room is to provide Robot management capabilities. It monitors and controls a Robot's operation in a network. It can be used to start/stop Robots, make schedules for them, maintain and publish code, redeploy Robots to different tasks, and manage licenses and credentials.

RPA platforms

The burgeoning RPA vendor market has been showing continual and steady growth. While the largest market is the US, followed by the UK, the market in **Asia Pacific Countries** (**APAC**) is also showing considerable progress. Successful pilot projects and increased customer satisfaction among the early adopters of RPA will encourage new players to adopt this technology. There is growing demand for RPA, especially in industries that need largescale deployments. The major markets for RPA are banking and finance, healthcare and pharmaceuticals, telecom and media, and retail.

A few key vendors, their client market, and company specifications are mentioned in the following sections.

Automation Anywhere

Automation Anywhere helps to automate business processes for companies. They focus on RPA, cognitive data (machine learning and natural language processing), and business analytics. Their bots are capable of handling both structured as well as unstructured data.
The system has three basic components:
1. *A development client* for the creation of a bot
2. *A runtime environment* for the deployment of a bot
3. *A centralized command system* for handling multiple bots, analyzing their performance:

HQ: San Jose, California, USA
Est: 2003
CEO: Mihir Shukla
Some key clients: Deloitte, Accenture, AT&T, GM, J P Morgan Chase
Source of revenue by region: Its highest source of revenue is the USA, which accounts for more than half its revenue, followed by APAC, then UK and continental Europe
Source of revenue by industry: The **Banking, Financial services, and Insurance** (**BFSI**) accounts for more than half of its revenue, followed by healthcare, telecom, media, and others

UiPath

UiPath is an RPA technology vendor who designs and delivers software that helps automate businesses. The RPA platform consists of three parts:
UiPath Studio to design the processes
UiPath Robot to automate tasks designed in UiPath Studio
UiPath Orchestrator to run and manage the processes:
HQ: Bucharest, Romania
CEO: Daniel Dines
Key Clients: Atos, AXA, BBC, Capgemini, CenturyLink, Cognizant, Middlesea, OpusCapita, and SAP
Source of revenue by region: North America, Continental Europe, the UK, and APAC
Source of revenue by industry: BFSI, healthcare, telecom and media, and retail.

Blue Prism

Blue Prism aims to provide automation that enterprises can use according to their needs. Blue Prism aims to do this by providing automation that is scalable, configurable, and centrally managed. It sells its software through its partners, some of which are Accenture, Capgemini, Deloitte, Digital Workforce Nordic, HPE, HCL, IBM, TCS, Tech Mahindra, Thoughtonomy, and Wipro:
HQ: United Kingdom
Est: 2001
CEO: Alastair Bathgate
Key Clients: BNY Mellon, RWE npower, and Telefonica O2
Source of revenue by region: More than half of its revenue source comes from the UK, followed by North America, Continental Europe, and APAC
Source of revenue by industry: BFSI, health, and pharmaceuticals, retail and consumer, telecom and media, manufacturing, public sector, travel, and transportation

WorkFusion

WorkFusion offers automation that is based on RPA and machine learning. It delivers software as a solution for automating high volume data. WorkFusion enables man and machine to work in tandem while managing, optimizing, or automating tasks:
HQ: New York, USA
Est: 2011
CEO: Max Yangkelivich, Andrew Volkov
Key Clients: Thomson Reuters, Infogroup, Citi, and Standard Bank
Source of revenue by region: North America provides more than 80% of WorkFusion's revenue, followed by Europe, APAC, and MEA
Source of revenue by industry: Around 90% of its revenue comes from the BFSI sector, followed by the retail and consumer sectors

Thoughtonomy

Thoughtonomy delivers software that helps automate business and IT processes. It uses Blue Prism and other automation software and customizes it:
HQ: London, UK
Est: 2013
CEO: Terry Walby
Key Clients: Atos, Fujitsu, CGI, Unite BT, and Business Systems
Sources of Revenue by region: Around 70% of revenue comes solely from the UK. The rest comes from Continental Europe, North America, APAC, and the
Middle East and Africa (**MEA**)
Sources of Revenue by industry: A major part of its revenue comes from thirdparty clients, followed by BFSI, public sector, telecom, healthcare, retail, and
consumer sectors

KOFAX

Kofax's Kapow RPA platform is capable of automating and delivering processes that are repetitive and rule-based. It uses Robots for extracting and consolidating information. The software platform consists of a management console to deploy and manage bots, Robt performance, and a monitoring system.
HQ: Irvine, California
CEO: Paul Rooke
Key Clients: Arrow Electronics, Delta Dental of Colorado, Pitt Ohio, Audi
Sources of revenue by region: North America accounts for almost half of its revenue, followed by Continental Europe, APAC, and LATAM (Latin America)
Sources of revenue by industry: BFSI, retail, consumer, travel, transportation, public sector, manufacturing, and healthcare

About UiPath

Headquartered in Bucharest, UiPath is an RPA vendor that provides software to help organizations automate their business processes. The company aims to do away with repetitive and tedious tasks, allowing humans to engage in more creative and inspiring activities.
UiPath was founded by Daniel Dines, who is the CEO. It has offices in London, Bucharest, Tokyo, Paris, Singapore, Melbourne, Hong Kong, and Bengaluru. With clients spread across the world, from North America to the United Kingdom, Continental Europe to Asia Pacific countries, the company has shown remarkable growth in the last year, both in terms of revenue and its workforce.
Major clients of UiPath in the industry include BFSI, Telecom and media, healthcare, retail and consumer, and manufacturing. The basic components of the UiPath RPA platform are in line with what was explained in *Components of RPA*, these components are necessary for enterprise deployment. The components of the UiPath platform are UiPath Studio, UiPath Robot, and UiPath Orchestrator, see the following sections.

- **UiPath Studio :** UiPath Studio helps users with no coding skills to design Robotic processes in a visual interface. It is a flowchart-based modeling tool. Thus, automation is faster and more convenient. Multiple people can contribute to the same workflow. The presence of a visual signal that points out errors in the model, and a recorder that performs what the user executes, make modeling much easier.
- **UiPath Robot:** UiPath Robot runs the processes designed in UiPath Studio. It works in both attended (working only on human trigger) and unattended environments (self-trigger and work on their own).
- **UiPath Orchestrator:** UiPath Orchestrator is a web-based platform that runs and manages Robots. It is capable of deploying multiple Robots, and monitoring and inspecting their activities.

The future of automation

Throughout the history of human civilization, there has been many major turning points in innovation and discoveries that have instilled awe as well as fear in the minds of people, so much so that the word *Luddite* (used for people who were strongly opposed to the introduction of textile mills during the *First Industrial Revolution* for fear of losing their livelihoods) has now become synonymous with all people who are against new technologies, be it industrialization, automation, or computerization.

The buzzword today is the **Fourth Industrial Revolution** the current age where technology is embedded within societies and even the human body be it Robotics, 3D printing, nanotechnology, Internet of Things, or autonomous vehicles. This will fundamentally change the way we live, work, and interact with one another.

Technological changes and innovations are taking place today at an unprecedented pace and scope and are having an impact on many disciplines. Technological innovation has reached a stage where machines have now entered the realm of what was once considered exclusively human. For these reasons, there is a wide section of people who fear this age of Robots. While the arguments over how much of our lives will be taken over by Robots are endless, what cannot be denied is that Robots are here to stay.

There are various advantages of automation today; there are also fears surrounding its advancement, which are not completely unfounded. As mentioned earlier, this time automation is capable of impacting a wide range of disciplines. Thus, unlike in the past where only blue collar jobs were at risk of being replaced by machines, this time even white collar jobs are believed to be at risk. While this is not untrue, reports suggest that only around 5% of the total jobs may be *totally* replaced by automation. For other jobs, automation will only replace a part of the job and not completely take over.

There are, of course, those jobs in the 5% category that run the risk of being completely automated. These are the jobs that are routine, repetitive, and predictable. A few examples are telemarketing, data entry operation, clerical work, retail sales, cashiers, toll booth operators, and fast food jobs.