

Robotics Process Automation Using NLP

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Abstract:

Now days every organization is become more and more competitive to become market leader in the business, in order to achieve number one in the market, organization have to provide the good services to their customers. To achieve this organization, need to meet the TAT of each task also they need to provide the error less delivery/services and that should be available to customers 24*7. RPA has become good solution to the organization to provide the services on time, error free and available 24*7 to the customer. In BFSI many activities take place in the back office, e.g. Many customers of banks closes their account for purpose of switching from one type to other (Savings to Current), some want to close account with clearance of balance, closure charges, fines if any. This is the back office activity in office for which teams work to read closure request, perform validations, perform closure steps in respective applications, calculating clearance, closing request and respond to request. As Banks has over thousands of branches and crores of customers this task has turnaround time (TAT) and it is repetitive and ruled based task. It take banks cost in terms of infrastructure, people and time to perform such operations, also needs accuracy and speed to perform such work. In such cases we can use RPA sing NLP and provide the good service to the customers. Various branch all across the world can send email to back office about the closure of saving accounts and Bot can read the email the process the request accordingly.

1 Introduction

Technology is quickly advancing; computers have started listening and speaking, and we have robots that can handle imprecise tasks that are currently done by humans. Organizations have to respond to increased challenges from customers' needs and remain competitive by reducing cost. Robotic Process Automation (RPA) enables organizations to automate repetitive and tedious tasks and therefore provides a way of reducing operating costs (Forrester Research, 2014). Organizations that have made use of the RPA technology have not only noticed massive savings on full-time equivalent (FTE), they have also experienced other benefits including improved service, quality and speed, lower error rate and staff satisfaction^[1].

Automation is a system that functions without direct human interaction. Many automated systems have this in common: taking out the most unreliable factor (human error) thus improving precision, quality, and accuracy. The first idea of how to automate processes using software came in 1935, when the computer scientist Alan Turing described how a systematic algorithm could work processes more effectively. His ideas on algorithms and automation had a lasting impact. The term Robotic Process Automation (RPA) was first used in 2012 and was created by marketing director Patric Geary, who worked for the RPA software company, Blue Prism^[2]. RPA is a newly developed technology and there is no proper research from the early stages of use. RPA began to gain popularity in 2014 and 2015 when companies started to announce considerable savings due to automation. The market for RPA back-office automation was becoming more significant by early 2016, but it

was still relatively small-scale during this time [1]. According to Horses for Sources Research (2017) and Everest Group research (2017), the global RPA market which includes both RPA services and RPA software increased by about 64% from 2016 to 2017 (from \$271 million to \$443 million) [3].

Robotic Process Automation (RPA) is a methodology where a computer software is used to complete a specific process that was previously done by a human. Robotic automation software does not replace systems. Instead, it works with the system and performs a particular task in the same way as it has been asked to complete [6]. RPA interacts with a computer system the same way a human would, but much faster and at a lower cost. Instead of using a salary-paid employee to do a repetitive task on the computer, RPA can be used to do the processes that includes the typing and clicking the same way as a human. RPA does not require changing old systems. RPA can be integrated with any software used by humans and it can be implemented in a short period of time for the purpose of carrying out operational procedures [4].

Some processes are better suited for robotic automation than others. One example of a simple process that is well suited for RPA is a process that includes the tasks of signing in to a computer system, getting data from the system and transforming it to another digital output eventually passing it on to another computer system [5]. This process can be seen in Figure 1.



Figure 1.1 data and transformation

RPA automation potential increases with more routine and more manual processes. No routine Tasks with little recurring patterns are not well-suited for automation [4]. Sutherland (2013) and Willcocks & Lacity (2016) defined features that a process has to have to increase the opportunity of being suited for RPA [1], [6] Figure 1.2 shows an example of these features.

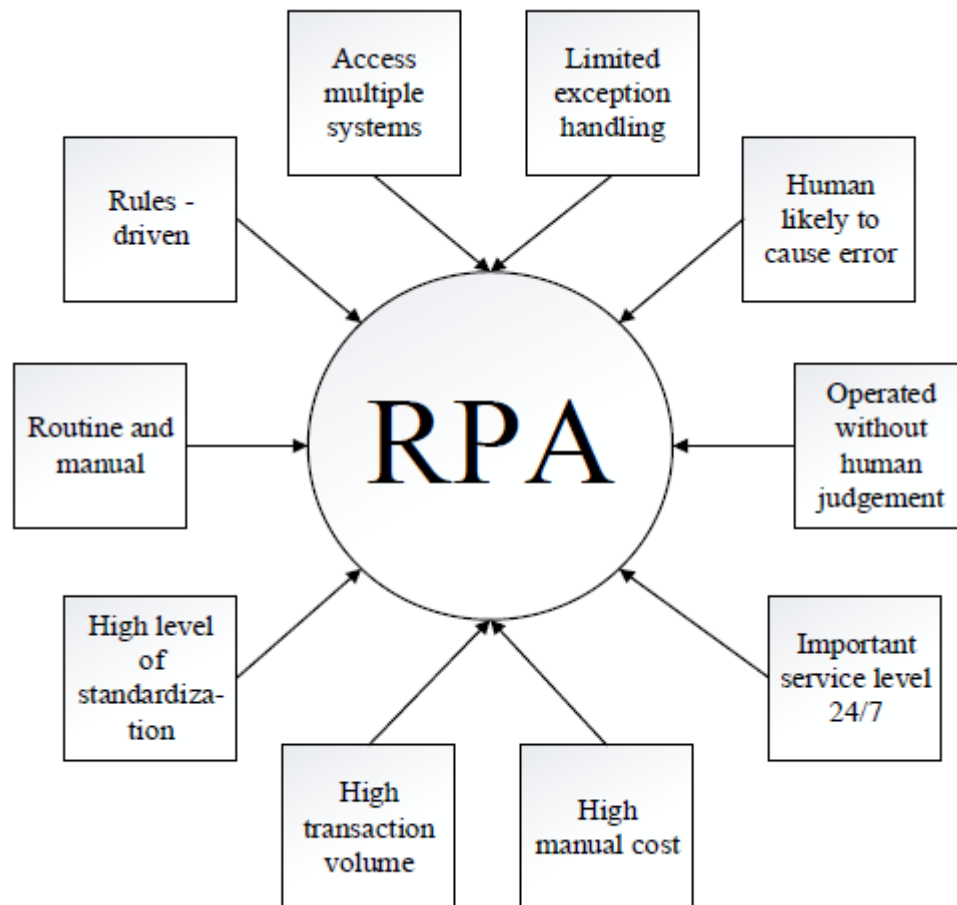


Figure 1.2 features

RPA robots exist as a software that is installed on a computer. It is called a software robot due to its operating principle ^[4]. The RPA software robot communicates with other IT systems on the front-end, while other traditional software are integrated via the back-end ^[4]. This is one reason why RPA is classified as lightweight IT, but other conventional software are classified as heavyweight IT. A more detailed explanation of the RPA classification and the main differences of lightweight IT and heavyweight IT as below.

RPA tools:

The key to making a quick transition from a process which is done by a human to an efficient automated process is to choose the right automation software (Mohapatra, 2013). When organizations have decided to implement RPA they have to find out what RPA software is best suited for the business. Around mid-2017, there were over 45 tools that were marketed as RPA (Hindle et al., 2018). According to Hindle et al. (2018), Blue Prism is the market leader in enterprise RPA. Other vendors are, for example, UiPath, Automation Anywhere, Workfusion, and Advanced System concept (Lu et al., 2017)

Distinguishing “real” RPA applications is important. RPA software does exactly what it is trained to do so there

are no terms of “intelligence” in RPA software (Burgess, 2016). Machine Learning is a subdivision of Artificial Intelligence (AI) that provides learning capabilities. It allows computer systems to learn from data or experience, rather than by following pre-programmed rules (The Royal Society, 2017). With AI it is possible to provide structured outputs from unstructured inputs. Even though RPA does not have self-learning capabilities, it can be used for the further process of the structured output from AI (Burgess, 2016). This is one of many examples of how RPA can be used as an extension to other tools.

RPA software is sometimes confused with screen scraping tools. Screen scraping automation tools are easier to learn and cheaper than other process automation tools, but it can sometimes be hard to distinguish between screen automation and process automation tools. Screen scrapers only understand a window located in a specific location, so it relies on X and Y coordinates. Recognizing a window defined by a location will no longer work if the window is moved to another screen [5]. RPA tool, not a screen scraping tool; it interacts with data through Java, Html, Selenium [5] an example of a process that was automated using robotic software from Automation Edge. The process has five main tasks, which are the following:

1. Login to System
2. Open Excel sheet
3. Get data from Excel sheet
4. Put data information from Excel to Order system
5. Take note of Order reference

Implementation methodology

Implementation methodology for BPM that includes six phases: commit, research, analyze, design, implement and support. The implementation methodology can be seen in Figure 3.

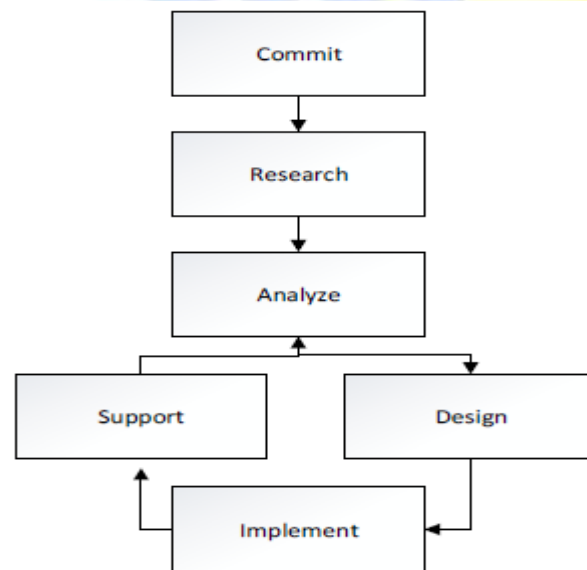


Figure 1.3: Implementation methodology for BPM (Chang, 2006)

When the first phase is implemented, the company is committed to the decision to adopt BPM from top-level executives. The changes that are implemented in the organization are cultural, and changes must have designed and implemented business improvement. The research phase is about analyzing the existing business process

and selecting a business process management tools. The next four phases go in a cycle with the objective of implementing the project by focusing on the small amount of the processes that were analyzed in the research phase. Once a project is finished, a new cycle starts again from the beginning. The cycle starts by analyzing. The analysis consists of project planning and analysis of the processes that are supposed to be implemented for the specific project. The design phase is about building a prototype and building the best process management solution. The implementation phase is about developing the program that is needed for process solution, testing it and then going live with the process.

Upside of RPA

With Robotic Process Automation, one can easily mechanize business processes swiftly and cost effectively. For example, Finance & Accounting is a back-office function that is a perfect fit for RPA, as many of the processes are rules-based and can be easily performed by a robotic workforce. Robotic Process Automation often include 40% to 70% labor cost-reductions and near-zero error rates. The briefing of the benefits is summarized below.

Economies of Large Scale

On average, an RPA robot is 1/3rd of the cost of an average employee's salary (varies from firm to firm). Beyond the obvious rate of remuneration, a robot does not need To take breaks or require benefits. In fact, your robots will work 24 x 7 x 365, even when the world is sleeping.

Reduces the cycle time

For a process involving a Turnaround time of x minutes, post implementation of RPA usually results in a TAT reduction of anywhere between 30% - 70%, i.e. the same process may be done by the robot in a record time of $0.7x - 0.3x$ minutes of time.

Precision

RPA minimizes human error, as robots have indefinite attention spans and don't make mistakes in their calculations since they are backed by logic. When a robot encounters a transaction that does not go by its code or parameters, the transaction is dealt as an exception and set aside for a human to intervene.

Analytics

RPA software has an informative dashboard in the form of key analytics where the user will be readily informed what their robots are doing at all times, how many transactions have been executed, how many of them failed as exceptions and were set aside, and so on.

Concentration on Core Business

RPA majorly deals with repetitive, mundane tasks which do not involve much of human intervention, minimal logic and so on. These activities form a very considerable part of the employee's time and hence are Non-core activities. Since RPA handles these going forward, employees can be mobilized to focus on more core activities of the business

One-time Investment

Setting up RPA is a One time investment and effort. The robots need not be paid as in the case of employee. Only an annual maintenance fee may be required for any upgrades or new version enhancements, if any.

2 Literature Survey

The importance of automation is dated to as back as since World War 2 where an intensive use of sophisticated control devices was seen in the military. Developing a specific way in which people can manufacture goods or provide services more easily and efficiently is called production technology. After the beginning of the Industrial Revolution, the working conditions and the lifestyle of people changed drastically. Since then, the word 'Automation' speaks for itself, and the industries have not stopped to develop and implement new and innovative methods to improve their business [8].

The First Industrial Revolution also called as Industry 1.0 and was seen towards the end of the 18th century. This type of revolution replaced the muscle power of animals and human beings with machines powered by steam and electricity. Private ventures developed from serving a predetermined number of clients to huge associations with proprietors, supervisor and workers helping a more significant amount of customers. This industrial revolution was the beginning of a new era, wherein the focus was now mainly on efficiency and productivity [8].

The Second Industrial Revolution also called Industry 2.0. It began in the 19th century. It introduced the concept of mass production with the help of electrical energy. In this revolution, the worker/ labourer became the one who operated the machines and supervised the automated control systems. The mechanisms that helped in mass production were far more efficient and resourceful in a friendly way as compared to the steam machines. The other inventions that were concerned with this revolution are the first assembly line for mass production, Just in Time manufacturing (JIT) and Lean manufacturing. These mainly focused on optimization of workers and the resources [8].

The Third Industrial Revolution also called Industry 3.0. It was first seen during the early stages of the 20th century. The breakthrough of this revolution was the development of transistors and the Programmable Logic Circuits (PLC's) which helped in syncing the software with the electrical and hardware systems. These new developments created ways in which higher accuracy could be achieved at a faster rate with reduced human interaction. The integration of electrical, mechanical and software technologies gave rise to the term,

'Automation.' There was widespread adoption of Computer Numerical Control (CNC) and Industrial Robots which allowed the manufacturing systems to be flexible. Technologies like Computer Aided Design (CAD) and Computer Aided Process Planning (CAPP) allowed the manufacturing processes to be integrated with computers. The use of software systems also allowed the organizations to keep track of the inventory (inventory planning), logistics planning, scheduling and tracking the various activities. To further their businesses, the organizations completely automated their production with the help of electronics and software. By doing so, the organizations became more versatile and opened their businesses easily around the world. This evolution prompted the development of the idea of Supply Chain Management [8].

The Fourth Industrial Revolution also called Industry 4.0. This provides new paradigms for the production and management of the organization. It has drastically changed the way in which an organization operates. Interoperability, virtualization, decentralization, real-time capability, service orientation and modularity are just a few things that have been developed during this revolution. Technically the developments made during this revolution are what is being used in the industry in the present times. It represents how the industries evolved from the use of embedded systems to Cyber-Physical systems (CPS). The CPS are the mechanisms which are controlled by algorithms mainly run by computers and can easily transfer.

Data or make the same data available on different platforms at the same time. This revolution has seen the maximum amount of technological developments regarding automation and digitalization of organizations. The main aim of Industry 4.0 is to provide end-to-end digitization and reduce the human interaction with the non-value adding and mundane tasks to a minimum. This is justified with the development of the Internet of Things (IoT), Cloud Computing, Business Process Management (BPM) and Robotic Process Automation (RPA) [8].

The digitalization of the processes related to an organization is of keen interest and is the top priority for them to transform their factories/businesses into smart factories/businesses. The key to success in achieving this goal is dependent on how they run their processes and how flexible they are. Digitalization of the functioning of an organization cannot take place within the nick of time. It is a slow, thoughtful process that can take up to a couple of years for implementation, but once integrated into the system, it will reap benefits for an extended period.

We have seen how the automated tools and machinery made its way into the manufacturing processes and almost how seamlessly they have been integrated into the system. IoT and Cloud-based manufacturing have revolutionized the production processes, and with the help of CPS, the machines can communicate with each other to use the resource optimally.

Hence, we can say that automation is an invention wherein there is minimal human intervention during the processes performed in the organization. Automation is categorized into two different forms, i.e. automation of physical systems and automation of software-based systems. CNC, Industrial robots, Automated Guided Vehicle (AGV) are a few of the examples that can be classified as physical systems. Whereas IoT, Business

Process Automation and Robotic Process Automation are categorized as software systems or can also be called software automation systems.

Automation is divided into two categories, i.e. Hard Automation and Soft Automation. Hard Automation also called Fixed Automation refers to the production and manufacturing processes performed by a robot or a machine. Whereas Soft Automation also called Flexible Automation refers to the programming part of the process which can be changed according to the needs of the customer. Automating the methods of processing the transactions, addition and removal of information, retrieval of data, response triggers and communication are as important as the automation of manufacturing and production processes. Service Automation is a part of Soft Automation and is the latest Industrial Revolution that promotes the development of automation. Service Automation is the new technological development that aims to deliver an optimum user experience by automating the redundant manual labour. There are various tools and terms associated with Service Automation, some of them being, Artificial Intelligence, BPM, Machine Learning (ML) and RPA^[9].

According to IEEE Standards Association, Robotic Process Automation is defined as “A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management.” (Moffitt et al., 2018). With the help of RPA, the organizations can implement robots to automate the extensive work in the back office as well as the activities in the front office. By doing so, they will re assign workers to more value-adding tasks. The RPA software can perform processes that would require sending out daily emails which are saved in a particular location, extracting information from a specific file, verification of data received from the vendors, making decisions based on predefined set of data and creating pre-filled documents for the organization. (Anagnoste, 2017).

For customer satisfaction, organizations must complete the given tasks within a specific time, with the right amount of dedication, following a particular set of standards and maintaining the quality of the outcome. The tasks may include, Customer Relationship Management (CRM), maintaining spreadsheets, collecting data from various databases and other such repetitive tasks. Now imagine if these tasks were done automatically so that the workers could be assigned to more value-adding positions which will be beneficial for the organization and also keep the talented worker involved more towards their forte (Santiago, 2017). This is what RPA does. It automates the routine tasks which require the worker to follow a set of rules and regulations. RPA can generally be confused with the physical robots that help in the manufacturing and production processes. Hence, it is essential to understand what exactly RPA means. Unlike the physical robots, RPA is a software-based solution with the configuration of carrying out repetitive tasks which are more inclined towards the backend processes of the organization. The robotic automation software does not replace the already existing systems of the organization. As a matter of fact, they work in coherence with the system. RPA can be coordinated with any software utilized by people, and it very well may be executed in a brief time frame to carry out operational techniques. The benefit is that RPA coordinates with the system correctly in the way a human would but only in a much faster and an efficient manner (Guðrún Lilja Sigurðardóttir, 2018).

Proposed System

Robots are remaking the manufacturing industry by creating higher production rates and improved quality, RPA “robots” are revolutionizing the way we think about and administer business processes, IT support processes, workflow processes, remote infrastructure and back-office work. RPA provides dramatic improvements in accuracy and cycle time and increased productivity in transaction processing while it elevates the nature of work by removing people from dull, repetitive tasks.

2.1 Problem Definition

Many customers of banks closes their account for purpose of switching from one type to other (Savings to Current), some want to close account with clearance of balance, closure charges, fines if any. This is the back office activity in office for which teams work to read closure request, perform validations, perform closure steps in respective applications, calculating clearance, closing request and respond to request. As Banks has over thousands of branches and crores of customers this task has turnaround time (TAT) and it is repetitive and ruled based task. It take banks cost in terms of infrastructure, people and time to perform such operations, also needs accuracy and speed to perform such work.

2.2 Proposed System: Robotics Process Automation based Account Closure process.

We propose RPA based more technologically -advanced solution to business around the world models that adopt automation, whether in-house or offshored, will cut costs, drive efficiency and improve quality. In proposed technique, the concept of robotics process automation is used to perform for processing a transaction, manipulating data, triggering responses and communicating with other digital systems used in account closure process.

Any company that uses labor on a large scale for logic based process work, where people are performing high-volume, rules driven, highly transactional process functions, will boost their capabilities and save money and time with robotic process automation software.

Just as industrial robots are remaking the manufacturing industry by creating higher production rates and improved quality, RPA provides dramatic improvements in accuracy and cycle time and increased productivity in transaction processing while it elevates the nature of work by removing people from dull, repetitive tasks.

Advantages:

- Improved Efficiency – The beauty of RPA is that it is designed to alleviate human workers of their mundane, repetitive daily tasks. When technology handles these tasks and workflows, the process runs much quicker and subsequently more efficiently.
- Greater Productivity – When technology does the heavy lifting, as is the case with RPA, output can be significantly increased. Furthermore, knowledge workers will be freed up to apply their skills and experience to more important projects that drive innovation and growth.

- Elimination of Human Error – Even the most careful human worker can make an occasional mistake. Unfortunately, sometimes these errors can prove to be incredibly costly. With robotic process automation technology, this risk is eliminated, resulting in greater accuracy.
- Cost Savings – While implementing robotic process automation does require an upfront investment, the overall increase in efficiency and productivity as well as reduction in human errors more than justify the expense.
- Turnover – When your human employees are no longer bogged down by boring, repetitive and mundane tasks, satisfaction levels will naturally rise. Furthermore, workers will appreciate the ability to participate in more high-level projects, also leading to greater employee satisfaction and retention.

2.3 Algorithm

In this section, we introduce algorithms for account closure process using RPA. These algorithm initially uses common steps used by manual user and evolves in phases, for any phase of process one part is chosen with lower complexity and once automation completes for decided part it is released for user acceptance testing (UAT), as per feedback existing phase is modified with addition another task. This iteration continues until the all the features are automated for chosen process. System flow diagram is shown in fig.2.1.

It consist of following steps.

- 1] Start.
- 2] Read request(s) data from the source system.
- 3] If request found processed go step 9 and step 10. Otherwise goto step 5.
- 4] Store data in staging table
- 5] Apply validation on data.
- 6] If not valid goto step 9 and step 10. Otherwise goto step 7.
- 7] Perform closing operation as per specified rules.
- 8] Perform verifier steps.
- 9] Respond in source system according request.
- 10] Stop

In step 2 accessing of one application leverage for reading and capturing the fields Account No., CVS Score, Customer Name, A/c closure reason code, Lien/ Closure fee waiver requested, a/c no. for fund transfer, Scheme code, Account Type from pending request for processing is coded. It is then stored in staging table along with additional flags for sub steps are marked for processing step 7 also validations for example Check the length of account if the transfer to is “A/c no” in request and if length not equal to 15 digit, log the process exception

updating staging table with status = “Hold, Incorrect account number”. Send the request to originator with remarks “Transfer to account number in i-Leverage is incorrect, please correct and confirm. and processed request is responded as per step 9.

Process validations in step 5 are applied on captured fields by applying predefined rules as when “Closure fee waiver requested” = “Yes” then “Deferred Charges to be recovered” should be “No” and if “Closure fee waiver requested” = “No” then “Deferred Charges to be recovered” should be “Yes”. If this rule doesn’t satisfy process exception is raised and request is returned to originator with remarks “Treatment for deferred charges and closure charges needs to be consistent. Kindly update the request and resend”. Update the table with the status “Hold, treatment for deferred charges and closure charges needs to be consistent”.

When the value of “Closure fee waiver requested” is consistent with “Deferred Charges to be recovered” and the request is for waiver of charges, the request is returned to originator for nullification of balance with the remarks “Waiver of closure and deferred charges has been requested. Kindly nullify the balance and re-send the request”. Update the table with status “Hold, waiver of closure and deferred charges has been requested. Kindly nullify the balance”

In steps 7 closure steps are coded according to rules and validations in finacle application all the processing is based on the captured fields and newly populated data by using provided data for example account number provided in request used for validating name of customer to get the name specified menu “HACI” is accessed in finacle by robot and given account number is entered in account number text box and “TAB” key is pressed to get name to be populated another validation When account date opened is less than 6 months, closure charges are must, unless branch not requested for waiver of closure charges . Figure 2.1 shows system flow diagram.

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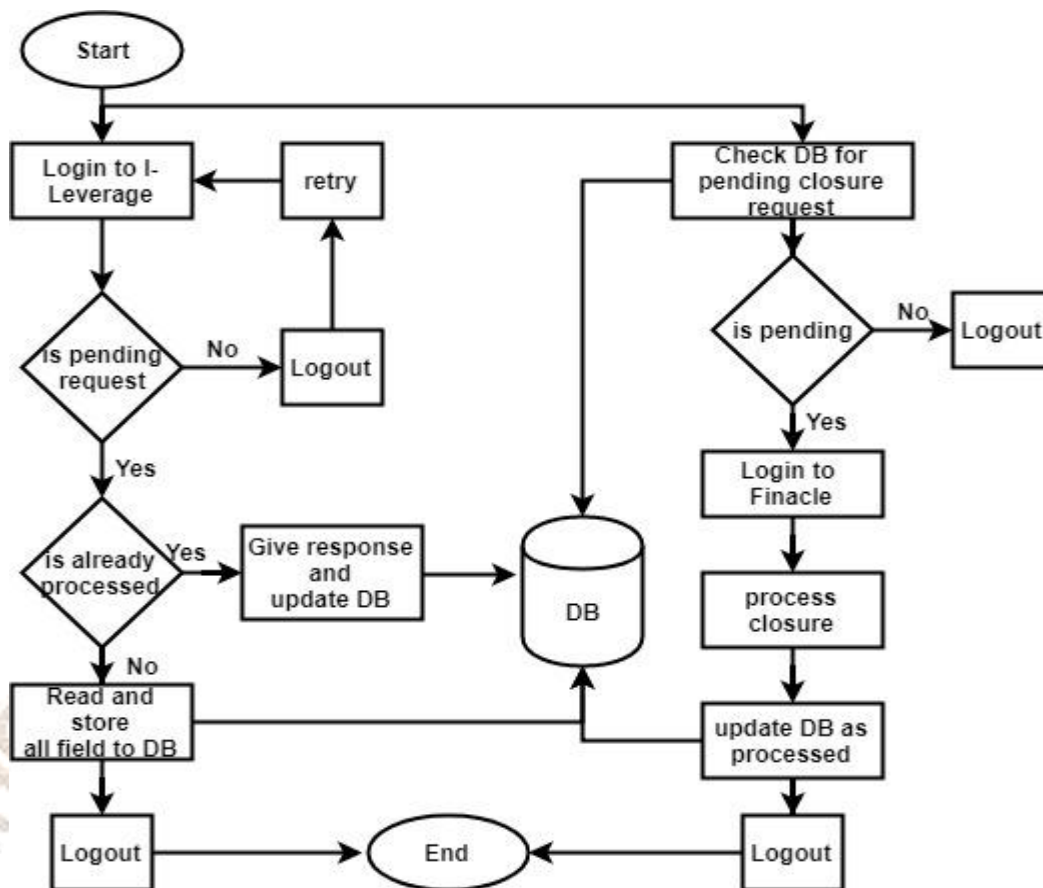


Figure2.1: Saving A/C closure system flow diagram

In step 8 verification steps are performed by robot for reconfirmation of steps performed like account number entered, amount to be transferred after closure, transfer to account name, pan. In step 9 response is given as per final status in database it may as processed successfully or need to push it to checker verification or required to forward to CLH_Maker for manual handling Process or the forward request as below to “Central Liability Hub” Team member name designated to do verification.

2.2.1 Authentication, Start and Stop Robot:

Authentication is a crucial identification process to eliminate attacks targeting data integrity. The initialization process for each time is carried out with new login and updating logging details like use rid, login time in client db by robot before initialization of actual process. Starting the robot is handle with tool named batch executer this batch is scheduled for every 15 min from 8 am to 9 pm, batch is .bat files which calls .jar project file.

Stopping robot is either of two ways, table contains column stop time whis is validated each time at the time of login for closure process also holiday list is checked in table and second fourth Saturday working also handled in code it is as shown below;

```
if ( database date= = today's date){
```

```
stop execution=true;
```

```
System.exit(0)
```

```
}else if ( database time<current time){
```

```
stop execution=true;
```

```
System.exit(0)
```

3 System Design

The framework of the proposed scheme is shown in Fig.4.1 consisting of agents, batch executer, browser, web applications, databases, log4j. In this scheme, newly added node is authenticated by the randomly chosen authenticated node. It provides mutual authentication between a remote server located in the local management office and an agent based execution of robot, agent is ip for physical or virtual machines

3.1 System Architecture

As shown in Fig. 4.1 consisting of retransmission sequence generation (RSG), DS generation (DSG), and authentication and encrypt/decrypt module .The Supplicant Smart meter receives readings from the smart appliances which is to be encrypted. It then sends to transceiver module i.e. RS-232 Converter. Then RS (retransmission sequence) is generated. Hash algorithm that is SHA-1 is applied to RS for generating DS (Dynamic Sequence).The supplicant smart meter is not authenticated which is then authorized by neighboring authenticated smart meter and then registered for further process. After receiving the encrypted data control center decrypt it and generate RS and DS of its own.

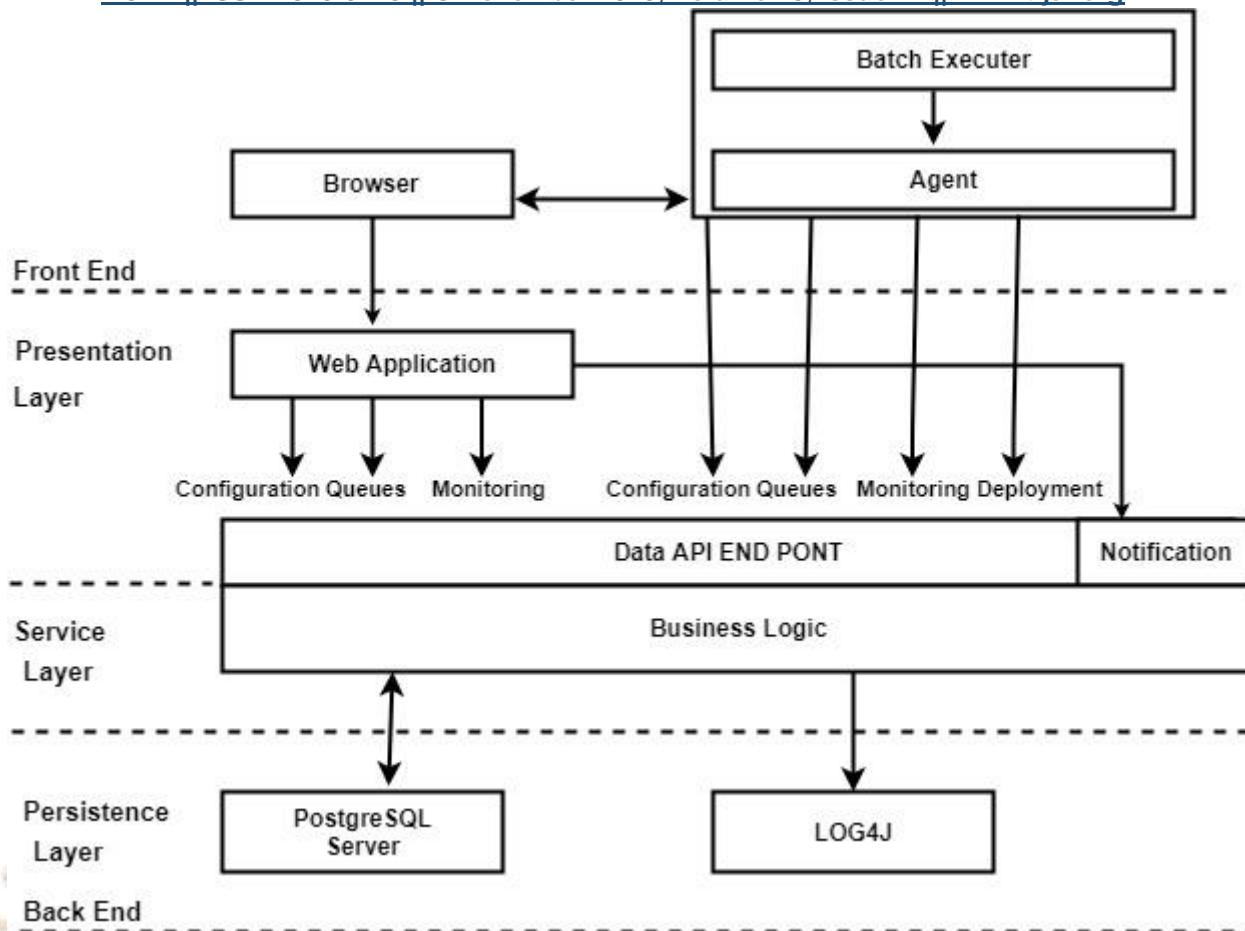


Figure.3.1: System Architecture

3.2 Module description

In this section we will describes all modules shown in Fig.3.1 that are require to implement proposed scheme.

Browser:

Browser are Applications under robotic process execution and which are application specific some run on Internet explorer, google chrome, etc. It is required to keep call to drivers of required browser with batch executor.

3.2.1 Batch Executor :

Batch executor is the tool named Automation edge from Automation Edge Company which takes input of java code jar, configuration files, .property files zipped and call to .jar file in .bat file which then controls execution of robots for scheduling purposes. For example Finacle code is called in .bat files as

echo off

java -jar FinacleMain.jar %1% %2%..%n%

here %1% is path of jar;

%2% to %n% are the runtime parameters if any.

3.2.2 Agent :

In general agent is physical or virtual machine where our robot runs, it is referred as agent because batch executor of Automation edge tools continuously monitors this allocated ip for specified task completion, failure or any network failures for assigned code.

3.2.3 Web Application :

This is well suited for enterprises applications like ERP, SAP or any other record processing application. These applications are data intensive and they are loaded with repetitive tasks.

- **Configuration management :**

In this module, deployment, updation of bots to newer version is performed. Branching and merging of RPA bots is also performed since they are reusable across the libraries. It also includes installation of dependant components like JAVA version, required database access.

- **Queues :**

The Queues page enables you to create new queues. It also provides you with viewing access of executing, failure and completed status on previously created queues, charts with the transaction status progress over time, and on various other details, such as average execution time and the total number of successful transactions.

Requests						Download Requests
Id	Workflow Name	Status	Agent Name	Created	Completed	
8901581	Finade Maker 2_PS	ExecutionStarted	IDC_2Finade_Maker	15-May-2023 08:00:00		
8901580	Finade Maker 24_PS	ExecutionStarted	IDC_24Finade_Maker_...	15-May-2023 08:00:00		
8901579	Finade Maker6_PS	ExecutionStarted	IDC_6Finade_Maker	15-May-2023 08:00:00		
8901578	Finade Maker14_PS	ExecutionStarted	IDC_14Finade_Maker_...	15-May-2023 08:00:00		
8901577	Finade Maker20_PS	ExecutionStarted	IDC_20FinadeMaker	15-May-2023 08:00:00		
8901574	Finade Maker5_PS	Failure	IDC_5Finade_Maker_L...	15-May-2023 08:00:00	15-May-2023 10:36:19	
8901573	Finade Maker_PS	ExecutionStarted	IDC_0FinadeMaker	15-May-2023 08:00:00		
8901572	Finade Maker21_PS	ExecutionStarted	IDC_21FinadeMaker	15-May-2023 08:00:00		

Requests Download Requests

Id	Workflow Name	Status	Agent Name	Created	Completed
B903765	CR_ECRM_ROBOT4	Complete	IDC_4ileverage_Local	15-May-2023 11:50:00	15-May-2023 11:50:38
B903749	CR_ECRM_ROBOT3	Complete	IDC_3ileverage_Local	15-May-2023 11:50:00	15-May-2023 11:50:40
B903745	CR_ECRM_ROBOT8	Complete	IDC_8ileverage_Local	15-May-2023 11:50:00	15-May-2023 11:50:24
B903739	CR_ECRM_ROBOT7	Complete	IDC_7ileverage_Local	15-May-2023 11:49:00	15-May-2023 11:49:33
B903737	CR_ECRM_ROBOT6	Complete	IDC_6ileverage_Local	15-May-2023 11:48:00	15-May-2023 11:48:36
B903736	CR_ECRM_ROBOT1	Complete	IDC_1ileverage1_Local	15-May-2023 11:48:00	15-May-2023 11:48:26
B903732	CR_ECRM_ROBOT5	Complete	IDC_5ileverage_Local	15-May-2023 11:47:00	15-May-2023 11:47:31
B903719	CR_ECRM_ROBOT2	Complete	IDC_2ileverage_Local	15-May-2023 11:47:00	15-May-2023 11:47:39
B903712	CR_ECRM_ROBOT9	Complete	IDC_9ileverage_Local	15-May-2023 11:46:00	15-May-2023 11:46:46
B903711	CR_ECRM_ROBOT	Complete	IDC_1ileverage_Local	15-May-2023 11:46:00	15-May-2023 11:46:40

Page 1 of 6788 (Total 67874 Record(s)) Page Size: 10 1 2 3 4 5 6 7 8 9 10 1/6788

Figure.4.3: Queues

3.2.4 Monitoring :

Displays information about all the existing Robots on an aggregate basis, and allows you to check the overall health of the Robots in your system. On this page, you may isolate data per environment or robot type so that you can quickly act in the event of an error. You may also control the granularity of the displayed data, to have a more accurate overview on how your Robots are performing in time.

Agents Search Download Agent

Agent Name	Mode	Assigned Workflows	Active Workflows	Status	Resource Utilization			Actions
					CPU	Memory	Heap	
IDC_13Finade_Maker_Local	Standard	2	1	Running	95.92%	38.28%	64.79%	
IDC_14Finade_Maker_Local	Standard	1	1	Running	95.95%	38.22%	43.60%	
IDC_22Finade_Maker_Local	Standard	1	1	Running	40.31%	25.60%	4.30%	
IDC_23Finade_Maker_Local	Standard	1	1	Running	42.35%	25.73%	16.65%	
IDC_24Finade_Maker_Local	Standard	1	1	Running	42.77%	25.87%	11.77%	
IDC_25Finade_Maker_Local	Standard	1	1	Running	43.33%	25.80%	2.64%	

Figure.4.1: Monitoring

3.2.5 Deployment:

Deployment enables data endpoint used by the Robots to query data the version that needs to be executed if you use the Start Job command in Agent.

3.2.6 Data API Endpoint and Notification:

Beside Web Application architecture also contains a service layer which exposes a API mainly consisting of OData endpoints. API is consumed by both the Web Application and the Agents. The Agent is the supervisor of one or more Robots on the client computer. The Notification API also uses a WebSocket communication for getting status of robot.

3.2.7 Business Logic :

All the rules and steps for closure process are implemented here using java and supporting robotic library such as selenium, autoit also its kept configurable dynamically to increase or decrease robots count.

3.2.8 PostgreSQL Server :

PostgreSQL 9.5 is used for all storing all required data for process completion in multiple related databases.

3.2.9 Log4j:

Logging is used to log different information like errors, explicit messages sent by the Robots and other environment-specific information.

4 System Implementation

Account closure robotics process process automation system is designed and implemented using Java SE, Selenium, PostgreSQL and Batch Executor tool. In subsequent section we list different system requirement and algorithm used for implementation.

4.1 Requirements

4.1.1 Hardware Requirement:

System : dual core or above.

Hard Disk : 160 GB

RAM : 4 GB

Monitor : Any

Mouse : Any.

Keyboard : 110 keys enhanced

4.1.2 Software Requirement:

O/S : Windows XP/7.

Language : Java.

Library : Selenium.

IDE : Eclipse- Mars

4.2 Algorithm

Account closure robotics process automation is desired to serve fully automatic functionality using robots . It includes the following steps.

4.2.1 Validations before start:

Initiation and termination are critical steps in rpa platforms, below steps are performed for validations while initiation of robot before every request to processed.

```
void startUp()
{
while (getSystemTime()<=getstopTime())
{
try{
if (recordsPresent()&& !isBankHoliday()
{
login(url, uid, pass);
if (finDown)
{
selectCore();
if (locked)
{
readDBforPending();
logout();
}
}else
{
itExption = "Internet Explorer cannot display the webpage of Finacle for Robot Id: "+robotID;
```

```

driver.close();
killDriver();
}
}
} catch (Exception e)
{
e.getMessage();
}
}
}
}
}
}

```

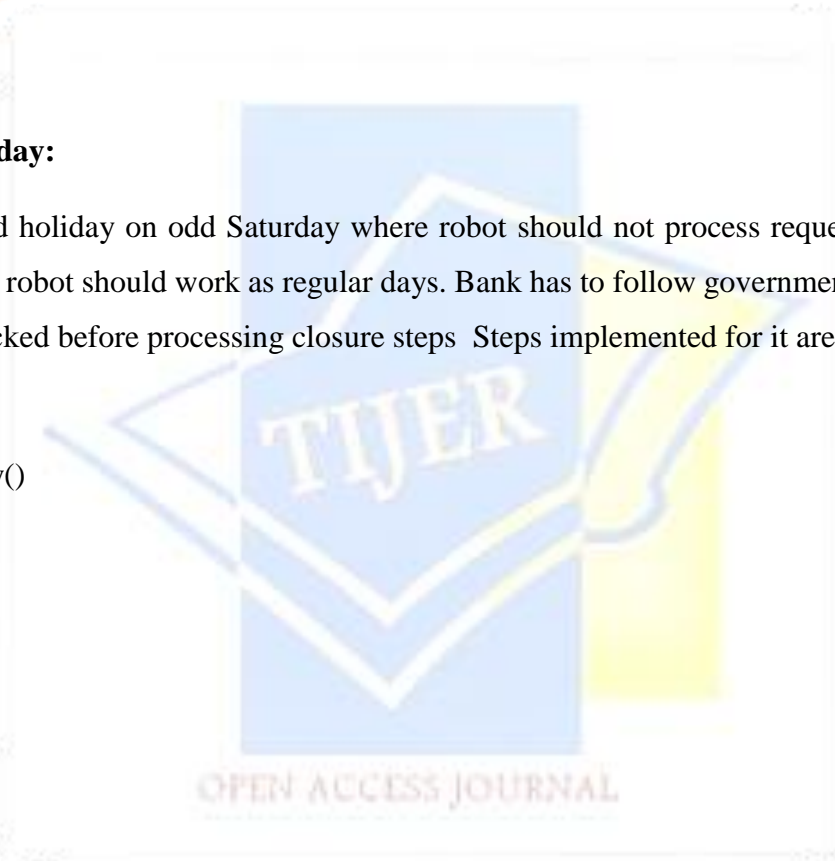
4.2.2 Check for holiday:

Banks has fixed holiday on odd Saturday where robot should not process request and transactions for day, For even Saturday robot should work as regular days. Bank has to follow government holidays like Diwali, Eid etc. It must be checked before processing closure steps Steps implemented for it are as given below.

```

boolean isBankHoliday()
{
boolean holiday=false;
if(isGovtHoliday())
{
holiday=true;
return holiday;
}
if(getOddSaturday())
{
holiday=true;
return holiday;
}
return holiday;
}
}

```



```
boolean isGovtHoliday()  
{  
try  
{  
Date dt= new Date();  
Class.forName(driver).newInstance();  
Connection con=DriverManager.getConnection(conUrl,user,pass);  
Statement stat=con.createStatement();  
String sqlQuery="Select hldy_dt from holiday_list";  
ResultSet rst=stat.executeQuery(sqlQuery);  
while(rst.next())  
{  
if(date.equals(rst.getString(1)))  
{  
isHoliday=true;  
return isHoliday;  
}  
}  
rst.close();  
stat.close();  
con.close();  
}  
catch(Exception e)  
{  
e.getMessage();  
}  
return isHoliday;  
}  
}
```

```
boolean getOddSaturday(Date date)
```

```
{  
Calendar cal = Calendar.getInstance();
```

cal.setTime(date);

```

if((cal.get(Calendar.MONTH)==Calendar.JANUARY ||cal.get(Calendar.MONTH)==Calendar.FEBRUARY
||cal.get(Calendar.MONTH)==Calendar.MARCH
||cal.get(Calendar.MONTH)==Calendar.APRIL
||cal.get(Calendar.MONTH)==Calendar.MAY
||cal.get(Calendar.MONTH)==Calendar.JUNE
||cal.get(Calendar.MONTH)==Calendar.JULY
||cal.get(Calendar.MONTH)== Calendar.AUGUST
||cal.get(Calendar.MONTH)==Calendar.SEPTEMBER
||cal.get(Calendar.MONTH)==Calendar.OCTOBER
||cal.get(Calendar.MONTH)==Calendar.NOVEMBER
||cal.get(Calendar.MONTH)==Calendar.DECEMBER)
&&((cal.get(Calendar.DAY_OF_WEEK_IN_MONTH)==2)
||(cal.get(Calendar.DAY_OF_WEEK_IN_MONTH)== 4))
&&(cal.get(Calendar.DAY_OF_WEEK)==Calendar.SATURDAY))
{
return true;
}
return false;
}

```

4.3 Screenshot:

Robotic process automation for account closure process is designed and implemented using Java and automation libraries. In this section different outputs are discussed.

1 Reading and responding cases for closure:

```

1 <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
2 <envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
3 <header>
4 <!--Optional-->
5 <!--Optional-->
6 <!--Optional-->
7 <!--Optional-->
8 <!--Optional-->
9 <!--Optional-->
10 <!--Optional-->
11 <!--Optional-->
12 <!--Optional-->
13 <!--Optional-->
14 <!--Optional-->
15 <!--Optional-->
16 <!--Optional-->
17 <!--Optional-->
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39 <!--Optional-->
40 <!--Optional-->
41 <!--Optional-->
42 <!--Optional-->
43 <!--Optional-->
44 <!--Optional-->
45 </envelope>

```

Figure.4.1: Read request in I-leverage (1).

```

1 <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
2 <envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
3 <header>
4 <!--Optional-->
5 <!--Optional-->
6 <!--Optional-->
7 <!--Optional-->
8 <!--Optional-->
9 <!--Optional-->
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38 <!--Optional-->
39 <!--Optional-->
40 <!--Optional-->
41 <!--Optional-->
42 <!--Optional-->
43 <!--Optional-->
44 <!--Optional-->
45 </envelope>

```

Figure.4.2: Read request in I-leverage (2).

Above screens shows working of read robot while reading all required fields for closure process as provided by customer. It includes fields customer name, cust id, account number, account type, transfer to, remarks, account opening date etc.

```

1 <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
2 <envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
3 <header>
4 <!--Optional-->
5 <!--Optional-->
6 <!--Optional-->
7 <!--Optional-->
8 <!--Optional-->
9 <!--Optional-->
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43 <!--Optional-->
44 <!--Optional-->
45 </envelope>

```

Figure.4.3: Response in I-leverage

In above screen shows closure response to be updated for customer after processing case, It is case dependant as in above screen it is showing account closed successfully without any error hence responding with closure remarks, remark text to sent decision is taken on final outcome in finacle robot which is updated in table by finacle robot. Response is given according to scenario and table is updated as per it. Some scenarios like incorrect account number has to returned with hold remark and processed once request is updated with correct account details.

2 Request processing for closure steps:

```

1 <soapenv:Body>
2 <api:save>
3 <!--Optional:-->
4 <api:saveContent>
5 <!--Optional:-->
6 <api:saveContent>
7 <!--Optional:-->
8 <api:saveContent>
9 <!--Optional:-->
10 <api:saveContent>
11 <!--Optional:-->
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93 <!--Optional:-->
94 <api:saveContent>
95 <!--Optional:-->
96 <api:saveContent>
97 <!--Optional:-->
98 <api:saveContent>
99 <!--Optional:-->
100 <api:saveContent>

```

Figure. 4.4: Accessing closure application .

Screen shows finacle robots logins to application by entering credentials and access core for loading of processing menu.

```

1 <?xml version="1.0" encoding="UTF-8" ?>
2 <Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
3 <Header>
4 <!--Optional:-->
5 <!--Optional:-->
6 <!--Optional:-->
7 <!--Optional:-->
8 <!--Optional:-->
9 <!--Optional:-->
10 <!--Optional:-->
11 <!--Optional:-->
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100 <!--Optional:-->

```

Figure. 4.5: Accessing closure branch SOL.

Screen shows robots switching to closure branch by entering SOL id captured from request in ileverage, at the same time its validates provided sol in closure application

3 *Performing closure steps:*

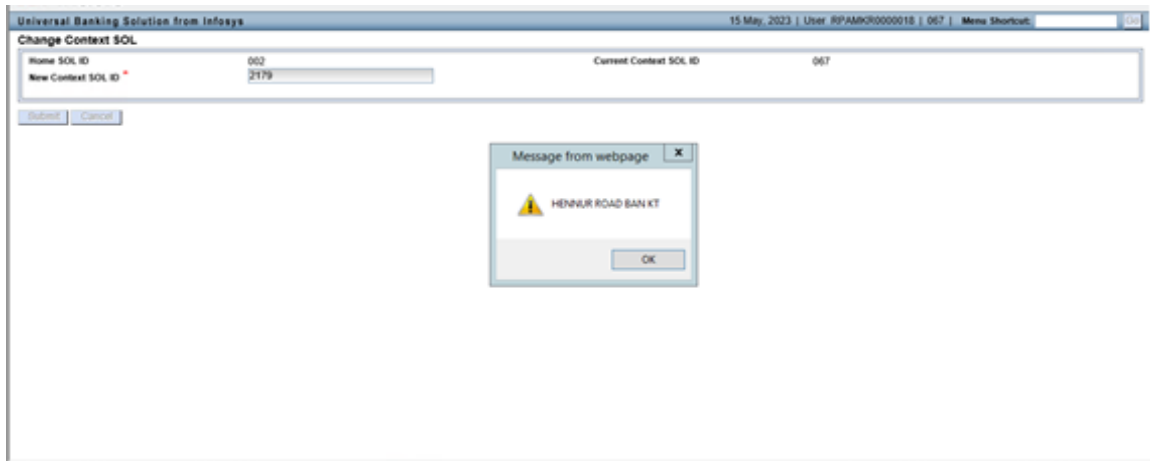


Figure. 4.6: Menu for closure steps. (1)

Robot enters all required details in test boxes, selects defined drop downs and click tab twice to get customer name and sol id, account no for transfer to once it is populated on screen robot validates these with request details if everything ok then clicks on go button for further steps of closure.

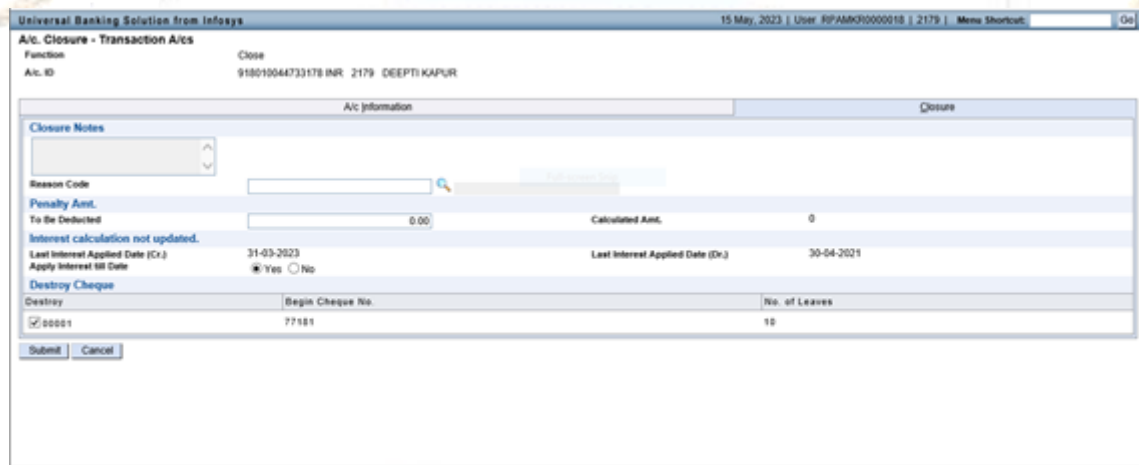
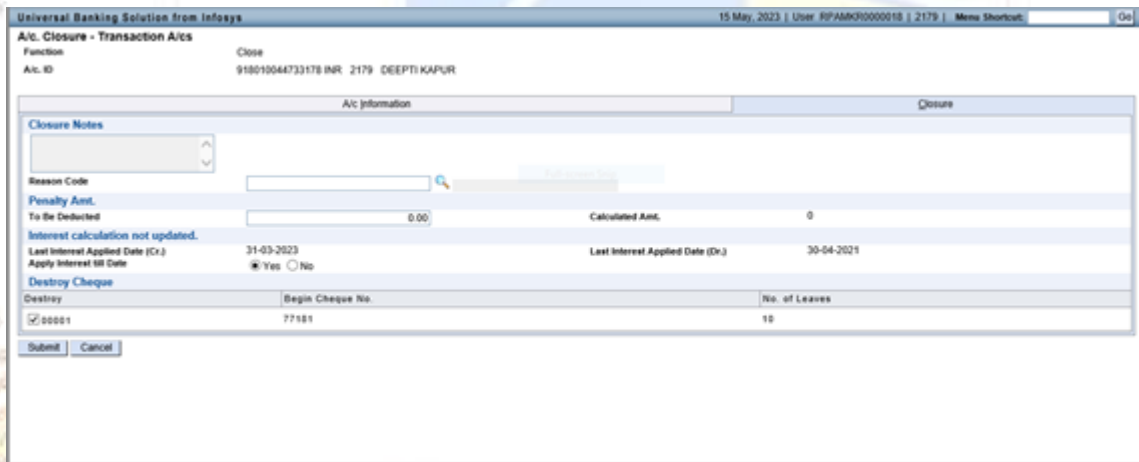


Figure. 4.7: Menu for closure steps. (2).

When closure fees is present need to check account balance which should be greater or equal to closure fees, If Lien or freeze is present for account it should be removed before closure steps. When no closure, Lien and deferred charges present click on submit button.

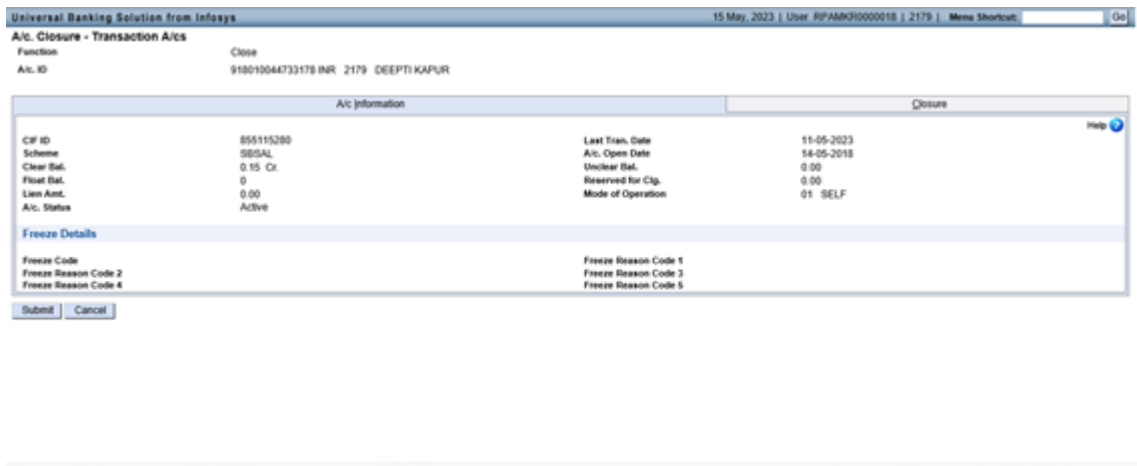


Figure.4.8: Menu for closure steps. (3).

If no closure fees, deferred charges and lien present on submitting last screen above appears where reason provided in leverage has to be selected under closure reason, all working checks has to be destroyed for closing account and need to click on submit button. It then gives closure status as shown in figure 4.8. If Account has balance after closure it must be transferred to provided account by using HTM menu.

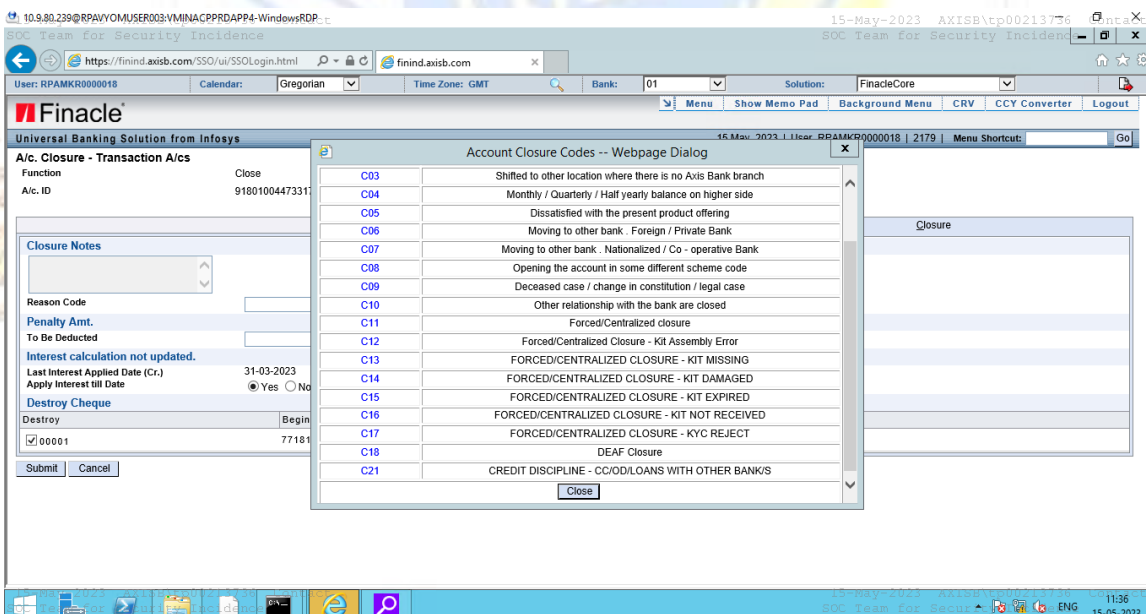


Figure.4.9: Menu for closure steps. (4).

4 **Transfer of Balance:**

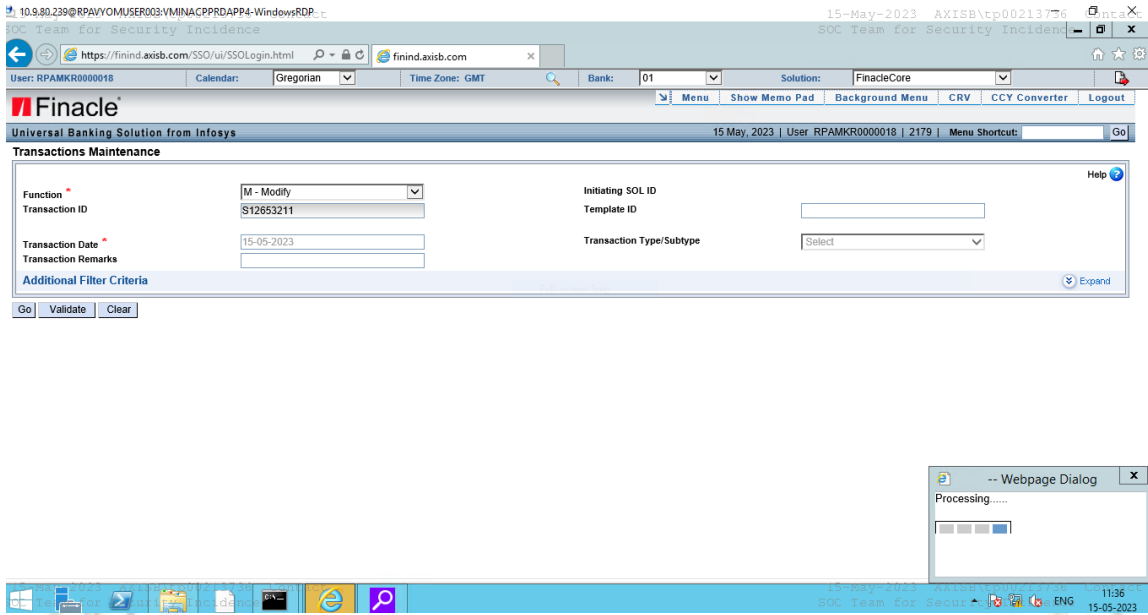
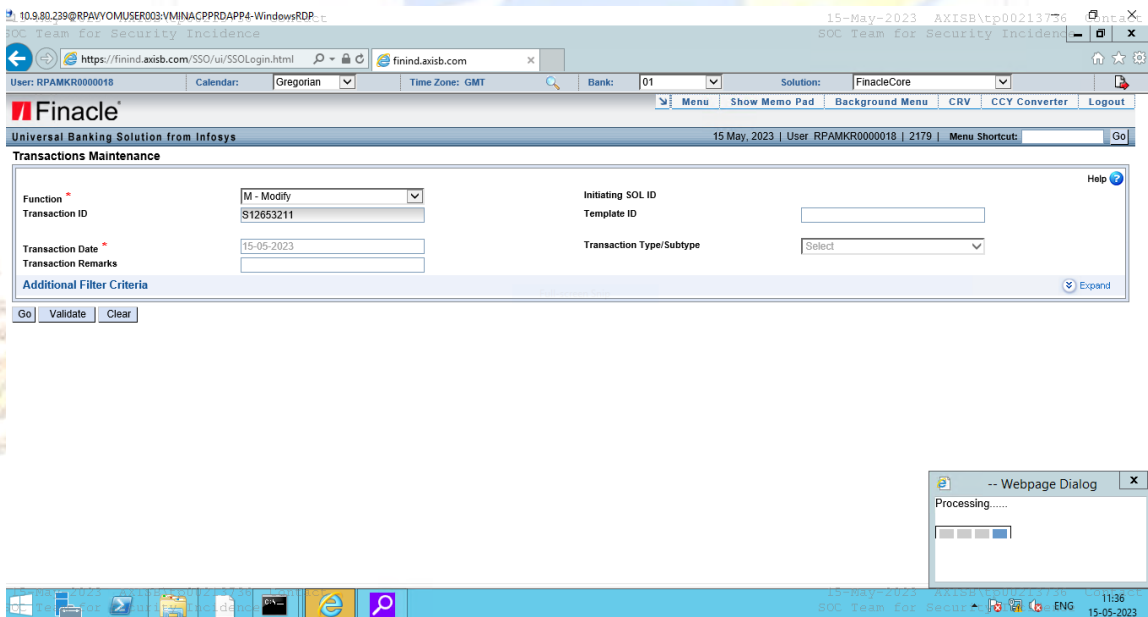


Figure.4.10: Transfer of balance (1).

Once account is closed all the customer balance should be credited to customers branch or it should be transferred to provided account number or to given DD information.



5 Result Analysis

It is worth noting that RPA's ability to wring substantial process improvements from legacy systems, often at relatively low cost, can undermine the business case for large-scale replacement of systems or enterprise application integration initiatives

While the RPA market today is still small, the technology is gaining traction as a cost-effective alternative to traditional systems integration and is projected to become a \$5 billion market globally by 2020, with a CAGR of over 60 percent.¹⁰ According to one analysis, as many as a third of global enterprises are actively using bots within their IT and finance and accounting processes, with about a quarter adopting RPA within procurement and HR processes.¹¹ Some enterprises are deploying this software at scale, automating dozens of processes with hundreds of bots, setting up robotic centers of excellence, and appointing a senior executive as "head of robotic automation."

Financial Institutions like Banking, Broking etc... Receives several request to deactivate the accounts on a monthly basis. Sometimes, the accounts can also be closed if the client does not equip the proofs required for operating the account. Considering the high volume of data handled by the institution every month and the checklist they need to comply, so the scope for human error also increases.

With our RPA solution on Account Closure Process, our broking client can send automated notice to the customers asking them to update the required proofs. It can also process the account closure requests in the rule-based form in short duration with 100% accuracy. Our solution is programmed to cover special scenarios as well such as closing an account due to failure in KYC agreement. So, this makes it easier for our client to focus on functions that are less tedious and require more human intelligence.

5.1 Comparison between RPA and traditional human workers :

RPA refers to the use of a "preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management."

RPA is suitable for automating the grunt work of retrieving emails (for simplicity, retrieval is based on the email's subject), downloading the attachments (i.e. invoices) into a defined folder, and create the bills in the accounting software and ruled based processes for example consider below comparison of human and rpa robot

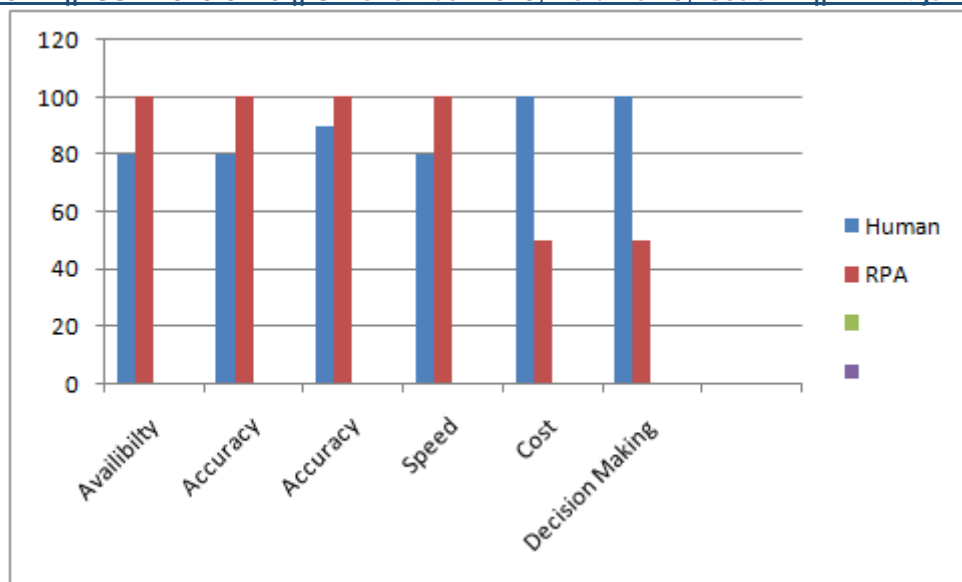


Figure.5.1: Comparison between RPA and traditional human worker

From the Fig.5.1 it is clear that ruled based system will provide more benefits if rpa is used for it rather that traditional human worker.

6 Conclusion and Future Scope

Implementation of robotics process automation process is designed and implemented for account closure process using java and automation library softwares

Most of the organizations are already implementing the RPA technology, as it optimizes the cost and frees the other resources. It is a cost-effective technique and also has non-financial benefits such as it consists of more accurate and consistent processes, which are less prone to errors.

6.1 Conclusion

With the rapidly changing customer requirements and the ever-increasing industrial developments, the organizations are considering different approaches in which they can accomplish the maximum number of processes and while consuming a minimum amount of time. This leads the organizations to the technology of RPA. RPA is considered a software tool that imitates the human action which performs tasks that are repetitive in nature and does not add much value to the organization. The tasks can be as simple as copying and pasting data from one place to another, recovering information from the system or merging various sets of data. The primary advantages of RPA are; reduction in expenses, increasing throughput time, increasing efficiency and increasing productivity. Account closure gives advantages to bank as workers can now focus to more important human dobale task

6.2 Future Scope

In this thesis we proposed and implemented system that secures RPA by means of scope.

- Robotic Process Automation is the newest solution to automate business processes across enterprises using software robots. They carry out mundane and repetitive tasks and allow human workforce to accomplish more creative assignments.
- RPA will impregnate a wide segment of our daily life in the next decade, with huge implications across various industries. However, as much as the predictions for the evolution of technology are largely consistent, some opinions are deeply divided on how advances in RPA will impact the economic and employment picture over the next decade. Some have painted a future in which significant numbers of both blue and white-collar jobs are destroyed by automation. On the contrary, many expect that technology will not take away more jobs than it creates in the next decade.
- RPA can have an impact on individual work systems and firms. Individuals will reflect and act according to the methods and behaviors that are believed to be most effective and efficient for the organization.
- RPA has the potential to change the way boring work and repetitive tasks are. Automated technology that employs a large-scale workforce for regular and repetitive tasks as well as high transaction tasks, potentially to increase capabilities, save money and time. Improved spirit of work, the most appropriate task and process for automation is usually the heaviest and least enjoyable and relieved employees of them can further refocus on rewards and higher value activities.

The key areas in banking that can be benefitted from RPA.

- Reporting
- Compliance
- Cyber Risk and Resilience
- sourcing and procurement
- Accounting and Administration
- Securities operations

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