

Automation of Supply Chain Management for Healthcare

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Abstract. Nowadays, the need for systematic deliverance of the healthcare sector is much sought-after. Such, that a simple delay in restocking of certain medicines or supplies could create unrest among the mass, and result in the loss of healthcare facilities for many. Robotic Process Automation (RPA) is a software technology that can create, deploy, and manage bots that emulate certain human actions interacting with digital systems and software. Robotic Process Automation is one of the technologies that can be used to carry out the smooth sailing of the supply chain process. This paper will describe how RPA technology can be used to emulate the various processes in the supply chain management for a healthcare entity, such as checking inventory, reading and comparing vendor quotations, and finalizing a supply vendor.

Keywords: Robotic Process Automation, Supply Chain Management, Inventory Management

1 Introduction

The supply chain of a pharmaceutical entity is the means through which medicines and medical supplies are manufactured and made available to the patients. The traditional Supply Chain of the Healthcare industry involves raw material suppliers who supply raw material to the manufacturers for drug generation, packaging, and supplying to the distributors. The manufacturer maintains an inventory of drugs for smooth operations. The hospital's pharmacy or a retail pharmacy places an order to a distributor for stocking and restocking their inventory, based on the daily requirement.

In a healthcare environment, inventory refers to the medications and all the medical supplies used in its daily operation. A healthcare entity is required to ensure an adequate stock of medicines and medical supplies are available at all times to better serve the needs of their patients. An effective inventory management process should also contribute to the profitability of the entity. There

are two goals of an efficient inventory management process. The first is to ensure medications are available whenever the patients need them. Optimal efforts should be made to always keep the medications used in stock and restock them before they go out-of-stock or get outdated and damaged. The second goal is to contribute to the overall profitability of the entity. The focus should be on being of service to the patients while also keeping the purchase costs of the medications at a minimum.

Robotic Process Automation is a business process automation technology that allows an individual or an organization to define a set of instructions for a software robots or 'bots' to perform. These bots mimic the way humans interact with software to perform high-volume, repeatable tasks. With the help of RPA, we can automate repetitive tasks such as checking inventory and reordering supplies and decisive processes such as reading and comparing vendor quotations and finalizing a supply vendor. This automation incorporated within the system will make it less prone to errors as well as less time-consuming.

Blue Prism is an RPA Tool that provides a virtual workforce to the organizations. It helps organizations to automate manual, repetitive, and rule-based business processes in an agile and cost-effective manner. It includes drag and drop support to automate the tasks. Some features of Blue Prism include:

- 1) It is platform-independent so that it can be used on any platform.
- 2) It contains robust features like load balancing, data encryption, and end-to-end auditing. Thus, every change is audited.
- 3) Blue Prism also supports automation of codes written in Mainframe, Java, Windows applications, and even web-based applications.
- 4) It supports all major cloud platforms, like Microsoft Azure and Amazon AWS. So, users can manage most of the tasks centrally.

Some advantages of the RPA include:

Cost Savings:- RPA helps organizations to save a huge amount of cost as it is typically cheaper than hiring an employee to perform the same set of tasks. **Less Error:-** It works on standard logic and does not get bored, distracted, or tired. Hence, the probability of making errors reduces to a great extent, which means less re-work and an enhanced reputation for efficiency.

Faster Processing:- It works faster than human employees as computer software does not need breaks, food, rest, etc., and can perform repetitive operations tirelessly. With RPA, processing time becomes predictable and consistent, which ensures high-quality customer service across the operations.

The organisation of this paper from hereafter is as follows: Section 2 contains the Literature Survey done and Section 3 presents the Objectives of the proposed system. Then Section 4 describes the Existing System Architecture, methods and the solution to that is shown in the Proposed System Architecture in Section 5. Section 6 contains Conclusion and Section 7 has Acknowledgment.

2 Literature Review

In this paper [5], the author study aims at the current state of Robotic Process Automation and also recognizes the scientific and industrial literature existing gaps. Here author introduces 54 primary studies analysis which defines the RPA's current state of art. And specifies how these primary studies were selected based on systematic review. Also, the author reviews 14 commercial RPA tools based on 48 functionalities defined. The conclusion of the study is that certain phases except the Analysis phase are covered in majority of the tools and how the shortage of automation in such a phase reflects the technological solutions. Based on this, the author has described some challenges and future directions.

The [6] case study describes how software bots can change our daily life and how the Supply Chain Management process can be impacted once the concept of Robotics comes into the picture. This study describes the different home usecases and day-to-day chores where robotic automation can be used. The author also discusses how RPA has the ability to change the supply chain procedure and eliminate the way of retailing, transporting, and warehousing goods. Process standardization, IT support, the flexibility of the solution, stakeholder expectations, and employee engagement are some of the challenges that might come in the future while implementing RPA in the field of the supply chain.

In this literature [7], the author has given a detailed overview of Robotic Process Automation (RPA). As a result of its increasing popularity, several sectors such as HR, Manufacturing & Retail, Telecom, Healthcare, Insurance, Travel and logistic, Banking & financial services, Government & Infrastructure have started using RPA. RPA tools offer four phases of deployment: i) Assisted Automation, ii) Unassisted Automation, iii) Cognitive RPA, and iv) Autonomous RPA. The author has given a detailed comparison of the three major RPA tools - Automation Anywhere, Blue Prism, and UiPath, out of which UiPath is the most popular tool. Decreasing turn-around-time up to 80%,-30% cost reduction, less time consumption of routine tasks, and proper maintenance of system logs for ISO and auditing purposes are a few of the benefits RPA offers.

In the [8] case study, we reviewed the process model regarding how software testing automation allows us to accomplish the testing process in a faster way than compared to the traditional software testing process. This study differentiates Selenium web Driver and Work Fusion, which are the two methodologies of the software test automation with the new RPA based method. This study recommends combining the test scripts written in different programming languages with the RPA solution for performance improvement, less usage of resources, and making the tests more efficient, reliable, and accurate.

RPA has proven itself to be capable of performing and completing high volume processes which consist of redundant as well as tedious steps. In the research [9], RPA is used to automate the repetitive task of filling out and reading Google forms and input the information filled out in the form, onto a spreadsheet, for educational workshops. Since the software bots follow the exact steps and instructions given

to them initially, RPA can effectively perform redundant tasks repetitively without leaving any room for human error.

3 Objectives

1. Maintaining adequate stock of medications-

Ensuring there is adequate stock of medications available in the inventory is one of the prime motivations behind the need for efficient management of inventory. The quantity of any given medicine in the inventory should neither be too much that it expires before being sold and nor too little that it's unavailable when needed.

2. Minimizing the occurrence of unavailability of medications-

The occurrence of situations where the stock of the required medication isn't available or the medicines in stock are expired should be minimized to decrease the impact on patient care.

3. Reduction of cost of maintaining an inventory-

The goal of the system is to decrease the carrying costs of maintaining and updating the inventory while keeping the process smooth and efficient so that it benefits the healthcare organization as well as helps cater to the customers better.

4. Limiting the use of resources for purchasing tasks

An efficient inventory management system should ensure that minimal resources such as time and human efforts are spent on ordering medications. These resources can be saved or put to better use elsewhere in the system.

5. To contribute to the overall profitability of the healthcare organization

The goal is to decrease the total costs to the pharmacy and health care organization by focusing on purchasing products with the lowest price, thus resulting in a profit to the organization. This can be achieved by selecting a vendor that helps keep the acquisition costs as low as reasonably possible.

4 Existing System Architecture

The existing supply chain management framework has mostly relied on the personnel or a group of people handling the system. Also, none of them have a clear idea for the entire product journey as the process flow and teams are isolated. The processes of vendor selection and management of inventory are handled manually. Here, personnel responsible for Vendor Selection reads all the quotations received from the various vendors and compares them based on single or multiple criteria. The vendor with the best offer is selected, and the personnel updates it on the dashboard.

Another personnel responsible for Inventory Management carries out the tasks of checking the inventory and keeping track of the quantities of the items in stock to determine what medicines or products to order. When the quantity

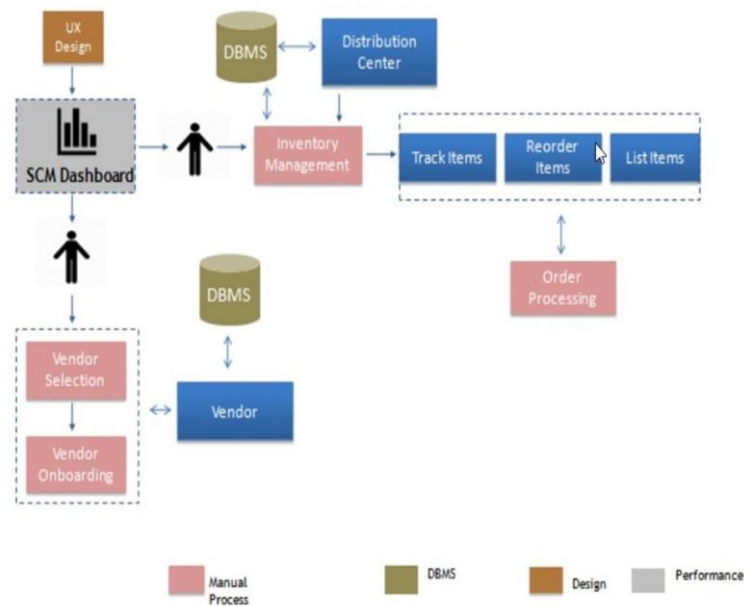


Fig.1. Existing System Architecture.

of a product falls below a specified threshold, the personnel manually add it to the list of products to be restocked. Upon receiving the order from the vendor, this personnel again updates the quantity of the item in the database.

One of the drawbacks of such a system is that it's more vulnerable to human errors. The team members need to make multiple phone calls or scan through the long email threads to get the desired information which results in ongoing inefficiencies. A minor mistake or negligence by the person handling the system could affect both- the enterprise and its patients/customers. Also not all the incorrectness are being captured and fixed in a timely manner. Another drawback of the current system is that it's time-consuming. Certain processes, such as checking inventory, reading and comparing vendor quotations, and finalizing a supply vendor require more attention to details. Thus, the execution of such tasks takes more time when carried out by a human. Instead of spending hours doing repetitive tasks it can be automated for greater accuracy and ability.

Fig 1. is about the Existing System Architecture of the Supply Chain Management.

5 Proposed System Architecture

We propose a novel system where software bots will be programmed to carry out processes such as vendor selection, vendor onboarding, inventory management, and order processing which were previously carried out manually. In other words, the repetitive and time-consuming processes of the Supply Chain Management will be automated with the help of Robotic Process Automation (RPA). The incorporation of this automation within the system will make it less prone to errors as well as less time-consuming. Thus, this new proposed system will lead to increased productivity and throughput.

With the help of RPA platform, we create a centralized location to connect all systems which can help the team members to access the required information. So team members can easily get real-time data and overcomes the disadvantage of the existing system of searching for a particular data from the record book.

The vendor selection and onboarding processes will take place when the tenure current supplier terminates. The vendor selection procedure compares the quotations given by several candidate vendors and selects the deal with the best terms. The onboarding process will finalize the vendor selected, and make changes in the system and database accordingly.

The inventory management and order processing procedures of the system are executed on a daily basis. The inventory management automation keeps a track of the pharmacy's inventory. When the available quantity of any medical product goes below its threshold value, the system will send an email to the supplier regarding the restocking of supplies.

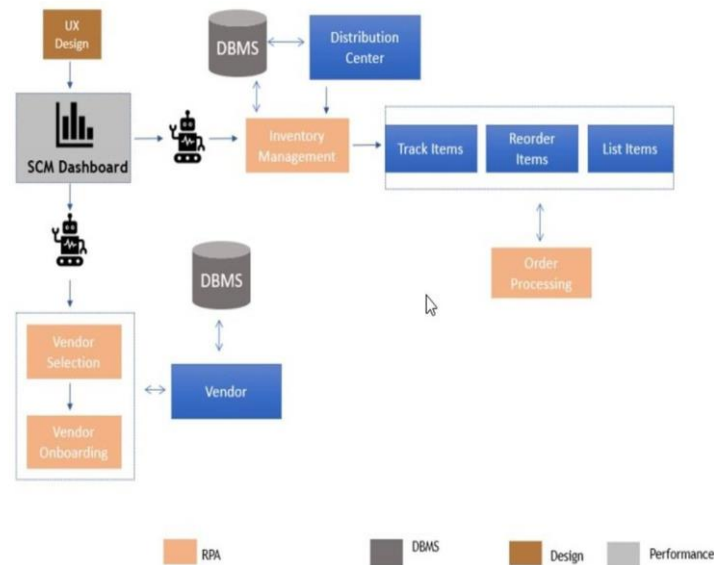


Fig.2. Proposed System Architecture.

Upon receiving an 'Order Confirmed' or 'Order Delivered' email from the supplier, the order processing automation will make the necessary changes in the inventory database. The automation minimizes the time, effort, waste and labor cost and maximizes the productivity and financial improvements.

Conclusion

The existing supply chain framework has a lot of shortcomings and we believe these are mainly because of the human management of processes. So, we have proposed a novel supply chain management framework in the healthcare sector, using Robotic Process Automation. By programming BOTs to automate certain processes in a system which were previously handled manually, we can overcome the several shortcomings in the supply chain management system, such as frequent human errors, excess delay, inaccuracies, etc. Automating the key processes, such as Vendor Selection, Vendor Onboarding, Inventory Management and Order Processing with the help of RPA Tool, can help us make the system more reliable and easier to implement.

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