Improving Supply Chain Management Through Robotic Process Automation

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Abstract

The automation of tasks in supply chain management (SCM) is evolving rapidly; every segment of SCM is influenced by digital change and the necessity to become more agile, efficient, and adaptable. To regularly achieve strong performance, supply chain management (SCM) needs to concentrate on higher-value tasks that yield substantial outcomes. Automating routine, lower-value tasks is crucial for the ongoing effectiveness and sustainability of supply chain management (SCM) while also enhancing results. By utilizing software robots, errors arising from manual handling of SCM functions can be eliminated. These robots can prevent downtime by keeping a record of actions taken. Operating 24 hours a day, 7 days a week, software robots can be deployed swiftly as they function on the current systems already in use in SCM. Robotic Process Automation (RPA) can be easily trained by users to carry out repetitive structured activities that engage simultaneously with various computer systems. The article explores RPA's definition, its advantages in SCM, its implementation in SCM, along with an example of RPA's effectiveness in supply chain management.

Keywords: Robotization of Business Processes1; Robotic Process Automation (RPA)2; Software Robots3; RPA in SCM4; RPA Solutions5; Intelligent Process Automation6; Informatic Solutions in SCM7

Introduction

Technological advancements are perpetually progressing, leading to the creation of novel products and prospects [1]. Within the realm of digital transformation, automation and robotics are not recent technological innovations. In recent times, robotic process automation (RPA) has garnered significant attention regarding its potential effect on Supply Chain Management (SCM) through automation efforts. The MHI Annual Industry Report (2019) [2] indicated that, in the upcoming decade, Robotics and Automation are projected to influence SCM significantly, with an estimate of 87%. The implementation of Robots and Automation can enhance the efficiency of SCM activities by superseding conventional manual operations, including sorting, inspecting, storing, handling, classifying items, and entering data. According to a survey included in the Annual Industry Report, MHI reported that in 2019, the adoption rate of this technology was at 34%, with projections suggesting an increase to 53% within two years and 73% over the next five years. A driving force behind SCM's adoption of RPA and engagement with software robots is the need to execute non-value-added tasks more efficiently while minimizing response times [3]. The MHI Annual Industry Report (2020) identified that organizations aiming to digitalize their SCM processes sought to enhance data accuracy throughout the payment claim cycle, aiming to replace erroneous manual tasks with automated solutions. This would allow employees to concentrate on more valuable endeavors. The adoption of RPA has led to considerable enhancements in data accuracy, resulting in a reduction of manual data entry tasks by 65% to 80% [7]. RPA provides numerous advantages for SCM, such as accelerated cycles, enhanced process reliability and consistency, decreased manual workload, improved data quality and precision, the redirection of time to strategic initiatives, increased flexibility in resource planning, and a shorter path to achieving value. At the same time, software robots are anticipated to present challenges in delivering added value in the future, while also creating opportunities for new forms of value [8].

Within academic literature, numerous studies define, explain, and characterize RPA. However, there is no universally accepted definition of RPA.

Fedor Kanakov and Igor Prokhorov have asserted that “RPA is a contemporary and innovative technology enabling organizations to substantially enhance operational efficiency by substituting human labor with software robots, thereby reallocating and liberating human resources from monotonous, routine tasks to more intricate and engaging responsibilities, which will enhance value” [9]. The IEEE Corporate Advisory Group characterizes RPA as “the application of a pre-established software instance that employs predetermined activities to autonomously execute a combination of processes, activities, transactions, and tasks across one or more software platforms to yield a result; or a service” [10]. Madoka et al. describe RPA as “an emerging category of business process automation technology grounded in the concept of software robots or Artificial Intelligence (AI) workers” [11]. UiPath defines RPA as “a technology enabling anyone to set up computer software or a 'robot' to emulate and integrate the actions of a human interacting with a computer to accomplish tasks” [12]. SAP SE describes RPA as “the implementation of technology to automatically capture and execute applications and processes using software robots” and “the digital transformation of processes through the automation of tasks and actions that do not provide additional value” [13]. Van der Aalst et al. characterize RPA as “a broad term for tools that interact with other computer systems' interfaces in a manner akin to human operation” [14]. Based on the various descriptions and definitions of RPA found in scholarly literature, RPA can be summarized as a technology that facilitates process automation through a series of pre-set activities intended to supplant routine and repetitive tasks executed by human resources.

The article examines the concept of Robotic Process Automation (RPA); the initial section outlines the advantages of RPA in Supply Chain Management (SCM); the second section discusses the implementation of RPA within SCM; finally, several examples highlighting the applicability of RPA in SCM are presented. The article concludes with the key takeaways regarding the application of RPA in SCM.

Benefits of RPA In Supply Chain Management

RPA presents numerous advantages not only in general areas but also specifically within Supply Chain Management (SCM), aiming to streamline automation by utilizing software robots that interact with user interfaces instead of directly engaging with application code. Furthermore, RPA can assist in managing SCM by addressing systemic automation issues rooted in repetitive tasks. The key advantages of RPA technology, as noted by Buccowich, include precision, enhanced employee morale, increased productivity, reliability, uniformity, non-invasive technology, compliance, and a minimal technical entry threshold. Alisha Asquith and Graeme Horsman also identified additional benefits of RPA, including coherence, cost efficiency, compatibility, scheduling efficiency, and the necessity for good organization and consistency.

Some significant advantages of RPA in SCM:

a. Precision: RPA can dramatically enhance the accuracy of SCM processes, as it is less vulnerable to operational mistakes. Any robot that has been adequately programmed and whose functionalities have been tested and confirmed will execute tasks with consistent reliability. If any alterations in the variables occur, they will result in the inability to complete a process, notifying the user of substantial errors, indicating that the expected process has not been fulfilled.

b. Uniformity: RPA is capable of automating any rule-based, repetitive SCM business process with exceptional accuracy at a very high speed. Robots are restricted to executing pre-set commands; unexpected variations in load are not permissible. This factor is crucial as it permits verification of all outcomes.

c. Compliance: RPA "robots" adhere to compliance regulations through a sequence of actions. If an organization has established policies or standards that need to be abided by when performing tasks, RPA technology can ensure alignment with those standards. It can also maintain a history of audit trails documenting actions performed. RPA facilitates quicker identification of issues and enables organizations to

meet stricter compliance requirements. In the SCM context, this entails that upon completion, the actions executed by a robot can be evaluated to identify new elements contributing to successful business enhancement.

d. Compatibility: A robot must engage with the components of an interface, but its ability to do so hinges on how that interface is programmed. Compatibility can present a barrier to RPA implementation in SCM, where assessing the implications of adoption can be challenging due to a lack of available data. Automation decreases the duration of tasks and enhances productivity, allowing SCM organizations to transition to RPA-compatible platforms.

e. Programming duration: Prior to RPA delivering procedural advantages, the necessary functionalities must be programmed. This requires that an organization has the relevant in-house expertise as well as the capability to pinpoint suitable areas for robot deployment.

f. The necessity for effective organization and uniformity: RPA is inherently procedural, thus any SCM must facilitate effective and consistent organization within their digital frameworks. If the file paths and naming protocols of the pertinent material do not adhere to established standards, it becomes increasingly challenging for robots to be programmed in a manner that enables tasks to be executed repeatedly without procedural mistakes. Consequently, a significant focus is directed towards identifying and executing sound organizational practices.

Utilizing RPA in Supply Chain Management

In supply chain management, particularly within the retail sector, numerous manual processes persist as companies seek technological advancements to enhance precision and efficiency. The deployment of software robots can streamline a variety of retail operations, such as delivering customer service. Instances highlighting the effectiveness of RPA in SCM include monitoring orders and furnishing required updates to customers at scheduled intervals. Moreover, automating customer feedback collection contributes to heightened customer satisfaction. Streamlined automation facilitates return handling, inventory adjustments, and the customer lending process. Additionally, it can optimize numerous manual accounting functions, encompassing debts, receivables, reconciliations, financial closings, and record-keeping. RPA is also applicable in diverse analytical tasks, such as campaign evaluations and consumer behavior assessments. Furthermore, RPA can mechanize the gathering of planning data, data cleansing, simulation execution, exception identification, and the communication of planning information to relevant stakeholders.

In logistics and supply chain, RPA is instrumental in overseeing inventory operations, tracking shipment details, and engaging with customers or suppliers through predefined triggers. RPA provides opportunities to automate several applications in inventory management, merchandise oversight, and supplier administration. In logistics, RPA can streamline transport management, delivering effective surveillance of goods during transit. Additionally, RPA can yield crucial insights regarding carriers and insurance providers based on statistical analyses. In manufacturing, the constant pursuit of technologies aims to enhance processing speeds, scalability, and ease manufacturing tasks. Software robots can assist the manufacturing sector across different functions. RPA enhances the effective management of information sourced from the Bill of Materials data, which includes raw materials, components, and subcomponents used to create new products. It can also address low-priority customer inquiries by assembling requisite data from multiple channels and enabling automatic email interactions with customers. Automation of Enterprise Resource Planning (ERP) can generate numerous reports, covering areas like debts, receivables, pricing, etc. RPA can also facilitate task automation across ERP functionalities, extending to inventory administration, supplier oversight, customer relations, debts, accounts receivables, and General Ledger operations. RPA can aid in digitizing and transitioning data from legacy data repositories into an ERP framework with remarkable accuracy.

RPA can furnish comprehensive metrics on SCM operations, revealing successful task completions, identifying process bottlenecks, and highlighting potential exceptions. This invaluable insight can assist in refining production processes. Figure 1 illustrates the usability of RPA in SCM from 2016 to 2020. In 2017, there was a 5. 71% increase in the utilization of this technology compared to 2016. However, in 2018, the usage fell by 8. 11% relative to 2017. Similarly, in 2019, there was a decline of 5. 88% compared to the previous year (2018). Conversely, in 2020, usage rebounded with a rise of 21. 88% in comparison to 2019. Overall, when looking at the four-year span from 2016 to 2020, the growth rate for automation and robotics technology reflected an increase of 11. 43%.

Example of use of RPA in SCM

The deployment of automated software agents within supply chain management necessitates an expensive initial analysis of user tasks, conducted by monitoring their actions, particularly since this becomes impractical when dealing with numerous processes or by scrutinizing potentially outdated process documentation. To uncover potential automation opportunities for tasks that transcend simple repetitive functions, one must leverage both structured and unstructured data derived from procedural documentation. Numerous studies have attempted to pinpoint automation tasks through textual analyses, yet their scope often remains limited to specific business sectors, such as generating utility bills. Identifying automation-ready tasks addresses merely a fraction of the challenge; these findings must be enhanced through the integration of Artificial Intelligence models, designed to facilitate various automated functions. Often, in supply chain management, the emphasis of robotic process automation is placed on automating discrete tasks rather than entire workflows. While this strategy can add significant value, it also poses the risk of falling short of anticipated outcomes. A key hurdle in opting to deploy software robots lies in recognizing and analyzing the processes suitable for automation. This strategy cultivates a deeper understanding of how software robots interact with other tools focused on process management, including process extraction and discovery, design, integration, and monitoring.

Conclusion

Organizations have the opportunity to implement RPA in supply chain management (SCM) to achieve various goals, including enhanced process performance, increased efficiency, greater scalability, improved audibility, enhanced security, greater convenience, and regulatory compliance. It is essential for these organizations to weigh the benefits and drawbacks of RPA implementation, as the process can be quite intricate. The two examples presented illustrate how intelligent RPA (iRPA) can execute certain routine and repetitive functions within SCM. Nevertheless, effective implementation demands meticulous planning within SCM to ensure the digital landscape is conducive to its application. Furthermore, iRPA has the potential to transform organizational interactions in SCM. RPA's role is becoming increasingly prominent in various businesses and across significant facets of the value chain. Most critically, RPA has significantly reduced numerous manual processes in SCM; however, achieving the full advantages of RPA necessitates various changes that will drive many organizations to embrace new strategies. Additionally, businesses will need to adapt their operational methods due to the shift from human workers to technology-driven machines and robots. The global industrial landscape, influenced by RPA, is witnessing an exponential growth trend, indicating that RPA is already a focal point for many businesses or is on the path to becoming one. All the preceding points, supported by the scenarios described, suggest that RPA can provide substantial benefits for the advancement of SCM.

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