

# Future of Supply Chain – Application of Robotics – The Flip Side of It

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**Received** Feb 18, 2023, **Accepted:** Mar 27, 2023, **Published Online:** Apr 30, 2023

**Reviewers:** Anonymous Peer Review

**Citation:** Gupta, C. V. (2023). Future of Supply Chain – Application of Robotics – The Flip Side of It. *International Journal of Supply Chain Management*, 12(2), 1-17, <https://doi.org/10.59160/ijscm.v12i2.6174>

**Abstract**— This research talks about how supply chain management (SCM) is being developed using robotics and process automation and the challenges being faced in the process of transition and whether such transition is desirable. RPA is the mainstay of Intelligent Automation of supply chain operation and management. The top level managers and executives insist on RPA implementation to better serve the customers but at the same time cannot give assurance whether the entire displaced labor will be absorbed. While overall efficiency of the SCM process can be improved through replacement of conventional manual jobs, such as storing, inspecting, sorting, handling, categorizing products, and data entry, the adoption of this cutting-edge technology in areas such as purchase and supply management still remains dubious, unpredictable and still relatively unexplored, leaving considerable scope for further research and experimentation.

**Keywords**— RPA, Robotic, Process, Automation, Robotic Process Automation, Supply Chain, Management, SCM

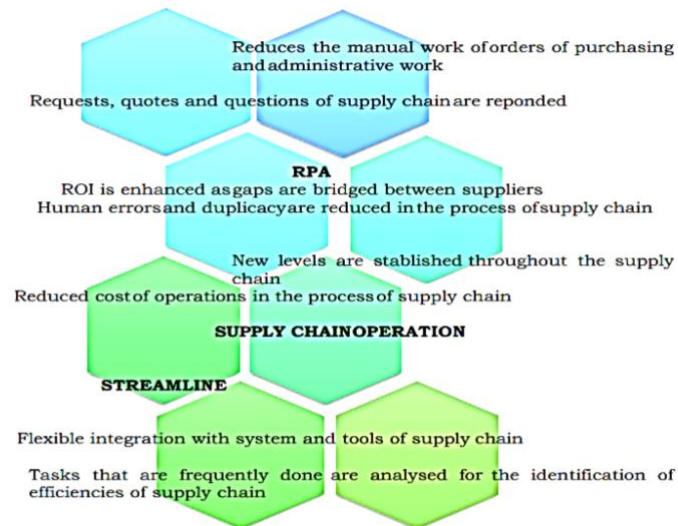
## 1. Introduction

The modern competitive business world is seeing most supply chains fighting for competitive sustenance in the global arena chain because of its growing intricacies in every level of the SC operations [1]. Businesses are moving away from integrated and towards dynamic supply chains [2]. With the change in business environment and arrival of new threats in the form of stoppage of human activity due to the sudden outbreak of contagious disease on a global scale leading to a pandemic, most corporates across the world are looking at new ways to handle their supply chains to ensure that such threats in future would not mean stoppage in

business. It became necessary to reduce human intervention. Additionally with growing worldwide competition across industries, improving supply chain efficiency to build and/ or maintain competitive advantage required automation of daily mundane tasks so that human resource can be better channelized to gain higher productivity and foster innovation.

Of late, business and industries are exhibiting particularly strong interest explicitly in the area of *Robotic Process Automation (RPA)*. RPA amalgamates two aspects of modern technology - robotics, which refers to software agents that act as human beings when it comes to system interactions, and process automation, which involves using management systems for workflow or, more commonly, uses process-aware systems. RPA, essentially, is a comparatively novel technology that comprises of ‘bots’ which are software agents that impersonate or imitate the what the humans do manually, using a wide array of computer applications while carrying out specific jobs involved in a business process [3].

Robotic Process Automation in Supply Chain facilitates automation of manual processes reducing the scope of anomalies and errors to the minimum. Essentially RPA tools are software solutions that reside on virtual servers capable of being implemented and folded up as and when desired[4]. Neither mechanical nor physical robots are involved in RPA that sits at the desk controlling and managing all the administrative and rule-based back-office processing jobs smoothly. No hardware but a software is used for running RPA while it automates similar monotonous everyday work that had been done repetitively over decades, in a novel manner with much higher spontaneity [5].



**Figure 1:** RPA in Supply Chain Management

Taking into consideration the increasingly competitive business environment along with the pressure to rationalize and reduce operational costs to remain viable, it has become imperative to digitalize purchasing and supply management (PSM) [6]. This area usually trails behind other business functions affecting the overall efficiency of the organization which has made it a top priority for investment by organizations [7, 8, 9]. This is the key reason, behind the increased application of advanced digital technology Robotic Process Automation (RPA) in the redesigning, optimization, and automation of procurement processes [10, 11, 12]. But the picture is not all rosy. Our article delves into the flip side of RPA to understand the evils of such advanced digitization of supply chains. Research on RPA (Robotic Process Automation) in supply chain practices is still relatively in early stages [12]. This paper aims to investigate the real-world repercussions and bearing that RPA has on the supply chain functions with the purpose of improving our conceptual understanding of the recently introduced practice of Robotic Process Automation in Supply Chain Management.

## 2. Literature Review

A long chain of tasks including registration of sales, computation of value-added tax, packaging and delivering the product, dispatching an invoice, updating accounts payables, accounts receivables and inventory, and several such vital tasks comprise business processes. Traditionally they have been taken care of by several individual human workers,

but had several issues associated with the performance such as describing and explaining specific duties, roles and responsibilities to individual operators, processing and sharing of information, possibility of human errors including typographic mistakes and transcription inaccuracies, human resource (HR) costs and the pace of the entire process [13]. With the progression of time supply chains have grown immensely in terms of complexities and ambiguity and a vagueness resulting from business dynamics. The complexities are constantly evolving too. In order to get a better trade-off between cost and efficiency the corporates are putting in a lot of efforts and taking initiatives to implement and leverage digital transformation [14].

Robotic Process Automation (RPA) a rule-based digital process automation, has increasingly gained more prominence among the forms of digital transformation, since this progressive technology is capable of automating human behavior and hold a lot of promises for the future. The pace of digital transformation has picked up along with stiffening of competition in the international business arena, traditional business processes and practices are set to undergo a paradigm shift in order to adapt to the changing business dynamics [12]. Nevertheless, there is a dearth of literature on the subject matter due to the fact that adoption of RPA in supply chain management (SCM) is still in its infancy and remains relatively less explored compared to other research topics in both RPA and SCM, especially in the public sector [6].

Presently a significant digital transformation is in progress. With the implementation of digitalization within supply chain processes moving at a fast pace and the degree of competitiveness becoming increasingly intense, conventional supply chain management is undergoing noteworthy transformation in order to get accustomed to this new model. Research on RPA from the purview of a purchaser and on the functions they perform, is still in the nascent stage [15]. This tendency to implementing RPA and power up global industrial operations is growing by leaps and bounds. This indicates that RPA has already gained or is currently gaining a lot of traction and significance in modern enterprises and is gradually becoming a for many companies [16].

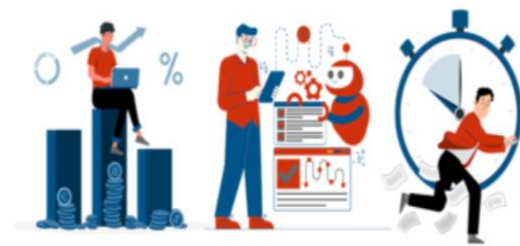
## 2.1 The Good

Automation is becoming a common process adaptation across industries, and this is particularly true in case of supply chain. In fact, innovation, development and advances approaching automation technology in the supply chain industry have the potential to usher in radical changes in the format of the entire supply chain as also software used in supply chain management [17, 18]. Management system for supply chain is a crucial aspect of any business as it helps to nurture a healthy relationship with the company's suppliers, facilitate, enhance and foster company growth, besides ensuring that the flow of stock remains efficient. Tools used in SCM help to automate forecasting, procurement, and management of inventory, offer real-time view on the position of a service lifecycle, or supervise the readiness of a product and its delivery from the warehouse to the end users [17].

Digital transformation (DT) is a key initiative which can be considered to be a conventional strategy adopted by entrepreneurs for overcoming disruption issues across organizations, businesses, and industries. Introducing digital transformation ensures that the companies are able to operate productively and efficiently while maintaining conformity to the regulatory requirements [19]. Robotic Process Automation or RPA is a developing and progressive technology that has the possibility of being utilized for processing such transformation [20]. RPA is a technology that offers precision, speed and efficiency [21] through the automation of interactions between human beings and computers keeping intact the prevailing IT infrastructure of the

organization or enterprise under consideration. This makes it possible to implement RPA faster than any other preceding technologies used in digital transformation [22,23]. RPA can be implemented meaningfully even in industries that are not heavily dependent on software for running their SMC operations [24].

Emergence of computers had already automated several of the tasks that had been traditionally performed by humans. RPA has taken it a step further. Companies and businesses can effectively use RPA for enhancing their digital workforce [19]. Robotic Process automation as the name suggests, utilizes a computer-generated robot (within the industry this is also referred to as 'bot' almost as an endearing term) to carry out simple repetitive tasks bound by a few rules to follow for example, accessing a file, reading its contents and sending an email based on certain previously set rules [13].



**Fig 2:** RPA reduces cost by replacing labor in tedious jobs

In modern business context, freeing up human effort by moving tedious and repetitive tasks becomes more and more relevant as the volume of transactions increase and this is the reason for RPA technology gaining so much traction. Numerous scientific studies have been carried out on this comparatively novel technology and its possible application as well as an extensive category of searches on the utilization of such technology in Supply Chain Management or SCM. What still remains hitherto unexplored and relatively under-researched is the scope for using RPA technology as a basic transactional tool for SCM operations [14].

There is a popular belief that in the future almost everything will be automated, and Robotic Process Automation Technology can be considered as the first step towards this. Most firms use this to automate standard computer functions. The next big

step would be to enliven the vision of connecting RPA to AI (Artificial Intelligence) so as to make effective use of algorithms, a set of processes and procedures, related to Machine Learning (ML) to automate or replicate the role played by human brains for making a vast range of important decisions related to business and commerce in the corporate world. Management research is still taking baby steps regarding the concept of Intelligent Automation (IA) across multiple fields. This could be an important step towards further strengthening business intelligence (BI). Management research is still taking baby steps regarding the concept of Intelligent Automation (IA) across multiple fields leaving considerable scope for future research across multiple domains [25].

Autonomous robots are serving to characterize the structure of future supply chains by helping companies in developing RPA that eventually will help to reduce long-term expenses and costs; offer stability in terms of labor supply and utilization through replacement of human labor and remove the hassles of human capacity planning; decrease error rate thereby boosting labor productivity and increasing labor output; reduce the need for frequent inventory checks, facilitate optimization of picking, sorting and storage of products based on certain parameters and provide greater access to locations that are not only difficult but dangerous too without risking human resource [26]. Other aspects of transition to RPA regime include reproducing work done by human labor through task automation which is driven by requirements pertaining to cost cutting, operational flexibility, increase in output several times over thus optimally utilizing the available resources without compromising on service capability or quality standards [27].

RPA increases the efficiency of the supply chain processes and delves into the myriad intertwined technological elements that are part of supply chain management. Any changes in schedule are delivered efficiently thereby cutting down on delays [28]. SCM can get several benefits and advantages from robotic process automation. These include, faster cycles, superior levels of consistency and reliability of processes, much lower physical labor, low labor-intensive work hence lower effort, better accuracy and higher quality of data, time and human resource better channelized for strategic task, better resource planning, higher resilience and shorter path to achieving value [16]. RPA helps not only to take

care of client requirements but also addresses data consolidation and automation needs of the organization. RPA solutions in SCM enhances rapid scalability by handling almost all back-office processes to increase the speed and quality of product and service deliveries thus freeing up human effort which can be channelized towards providing improved customer service [28].

Supply Chain industry or logistics is a highly complicated industry involving an intricate network of well synchronized processes and practices, which includes order processing, management of inventory, both delivery timetabling and tracking. In the instances of manual performance of every one of these repetitive processes that are high in volume, RPA has the potential to make a lot of difference so far as the future of the industry is concerned. Performing the same boring and tedious task repetitively makes humans prone to errors mostly due to lack of interest as they start taking the work too casually and become careless, leading to delays in completion of tasks thus causing operational inefficiencies. However, Robotic Process Automation or RPA is the promising technology that can significantly alter the manner in which logistics establishments carry out their businesses, through the enhancement of processes accuracy or precision [29]. Unlike process engineering that necessitates significant investment outlay on IT system transformations and entails time consuming process, RPA is run across systems and has the ability to carry out routine processes. For instance, RPA can punch in the details of orders placed with companies that provide third-party logistics services into internal warehouse management system [30].

Even though RPA has garnered a very important place in SCM, and an increasing number of businesses are adopting it in key areas across the value chain to do away with the errors and omissions associated by manual labor, there are several levels of changes that still need to be implemented to realize the full potential of robotic process automation. Such changes would entail big strategic steps and adoption of new strategies for several organizations. There will be numerous challenges as enterprises transition from human dominated operational regime to a regime where most mundane and repetitive works will be performed by enabled machines and robots [16]. Technology will take precedence over humans so far as daily repetitive jobs are concerned. The next sections will show that

it is not all rosy. Several aspects have the possibility of outweighing the perceived benefits of RPA implementation in supply chain operations and management.

## 2.2 The Bad

Nearly every organization, with the purpose of having a flexible, efficient and cost-effective supply chain, has rapidly implemented automation in their supply chain systems. Across various industries viz. manufacturing, retail and healthcare, numerous companies have conventionally reposed faith in technologies like ERP (Enterprise Resource Planning, RFID (Radio Frequency Identification), and CRM (Customer Relationship Management) to name a few since during the initial phase of RPA being employed in supply chain, the virtual robots were not dexterous enough to handle complex scenarios that used to crop up as they were not intellectually efficient to handle different on-ground scenarios. The reason being lack of flexibility and restricted automation. Thus, RPAs could only assist in the automation of those parts of the supply chain that were unambiguous and followed some set of predefined straightforward rules and procedures. Human involvement was vital to keep the supply chain functioning and for handling all exceptions. However, the scenario has changed in the current date, intelligent bots with machine learning qualities and cognitive capabilities has enabled us to make RPA systems resemble humans to a large extent. Combining the mentioned technologies – ML capabilities and cognitive abilities with intelligent bots has made it possible for RPAs to replicate humans to a degree thus paving the way towards automating decision making tasks that are governed by business logic and write instructions for input processing [31].

The hitherto discussed definition and benefits of RPA do not give any hint about any consequences that the workers will face above and beyond the automation of their tasks are. Lacity and Willcocks [32] and Lacity, Willcocks and Craig [33] are frequently quoted in academic and professional literature regarding their contention that RPA will give knowledge workers some amount of freedom from their monotonous tasks and extremely controlled routine so that they can give more focus on more interesting tasks. This positive outlook on the outcome of RPA implementation, in addition to RPA's simplicity, where humans with zero

programming knowledge can start RPA application after a few initial weeks of training, are in all likelihood, the key factors that are driving up the popularity of RPA. It must be noted that RPA is the optimum solution for long drawn out and repetitive processes, but it cannot be the quick fix if the problem or process is not fully understood or the logic itself is flawed. This is the most primary and common error, and it usually ends up with the RPA project failing to achieve its objectives [34]. However, it is a myth that no human supervision will be necessary to run the RPA solution. The truth is, human intervention is necessary for programming RPA bots and feeding them information for automation and managing them [24].

Irrespective of the observable benefits offered by RPA, there are a significant number of companies that often face the issue of failure of RPA projects. Also, the speed of the bot is dictated by the speed of the application which will ultimately decide that performance of right task at the right moment [24]. Owing to the novelty of this emerging technology, it is not uncommon for businesses and corporates to have limited or no knowledge of the existence of serious challenges connected with robotic processes automation of supply chain management. As stated by Forbes, the cause behind more than half (54%) of technology disruptions is inefficient or poor management, where only 3% of disruptions are caused by technical issues [34]. RPA may not after all be able to offer as much flexibility as is being talked about – the slightest alteration in the application of automation may necessitate complete reconfiguration of the bots that will not only be time consuming but also entail additional expenditure, which is not the case where human labor is involved [24, 31].

Notwithstanding the fact that a plethora of RPA vendors and products are currently available in the market, a significant amount of exaggeration and overstatement exist around what exactly RPA signifies or embodies for the corporates, not to mention the uncertainties that shroud the successful application and utilization of this novel technology [3]. Simply put, many are still skeptical about its actual utility despite the instances of successful applications around the world and across industries. A large number of guidelines and structures are available from consultants and vendors to choose from while implementing RPA solutions for SCM. However, all might not provide information all the

time that is unprejudiced or fair. In addition to this there is severe dearth of materials from academic research as such research in the area has started gaining momentum only in recent years [3]. Attempts at RPA without trying to understand the processes is a common shortfall, being witnessed at present. This usually leads to implementation failure as exceptions and alterations are constantly being discovered [34].

A substantial investment outlay along with expenses for preparatory work are necessary for the successful implementation and fruitful utilization of RPA programs in supply chain operations and management [21]. The prerequisite for the successful implementation of RPA in supply chain systems is a well-organized plan, in the absence of which the desired outcome may not happen as expectation tend to mismatch [35]. leading to higher inefficiency in supply chain management, higher cost and a drain on valuable resources along with disgruntled customers. RPA fails vehemently where it is carried out for the wrong process. On ground where there are processes that necessitate taking crucial decisions for each individual case, as in case or redressing customer grievances or addressing specific customer needs. it might be advisable to keep the human factor actively involved. Personal interactions may be needed to keep the customers satisfied and comfortable as it assures them that the producer or the seller cares about what the customers want, treat them as individuals and not just a general batch of buyers. Similarly, if the situation where the automation operates is complex and/ or volatile then it becomes all the more important that the RPA toolkit also possesses additional involvedness or the capacity to handle this and can still turnout the expected results. Only then it can continue to be effective while operating in such complex scenarios and fulfil its promises [34]. Research reveals that majority of customers still prefer to interact with human agents as they believe humans are better placed to understand their specific cases [36].

Majority of the corporates usually define and set certain strategic goals to be achieved which are aligned with the growth targets and other general objectives of the organization such as enhancement of business performance through the implementation of lean supply chain and providing better customer service. Achieving these strategic goals and objectives entail use of various tools by a company, among which RPA is just one. This

necessitates that RPA be always closely knitted with the strategic objectives of the business establishment [37]. During the completion of a process assessment, developing a new automation or to make an existing automation more efficient, we often face the question, Is RPA actually the solution we need? It's a very valid question to ask that needs to be dealt with and clarified before implementation of RPA across SC systems.

Processes which deal with unstructured data do not find RPA to be a suitable solution [38]. Whether fortunate or unfortunate, data in an unstructured format makes up as much as 80% to 90% of the total data that is available to businesses for decision making [39]. A per a survey carried out by Deloitte [40], a merely 18% of businesses exploit and utilize such unstructured data [40]. Hence, in case a company is inclined towards and intends to automate its SC functions and processes that have hitherto been constructed by taking support from upon unstructured data, for instance credit scoring, automation of invoice generation, and resume inspection and quality check, they need to commence sorting and categorization as the first step which is not a task that is within the purview of RPA's capabilities [41].

Multiple vendors offer RPA solution technologies leading to a significantly high uptake that RPA practice has been witnessing. RPA was adopted relatively early compared to other disruptive technologies. Even so this subject has received very little attention in terms of academic studies and literature. Because of this, robotic process automation does not have a robust theoretical groundwork that will present the logic and unbiased reasoning pertaining to adoption, application and development of the technology. This is a key reason why there has been no meaningful initiatives towards achieving a headway in research in the field nor attempts at carrying out advance studies [42].

Since COVID-19 slowed down the flow of goods greater transparency pertaining to sourcing has assumed higher importance with the end users due to reliability concerns which necessitates visibility or accurate identification and collection of data from every link in the supply chain, and disclosure of required details [43]. Bots used in RPA are well placed to handle these requirements within shortest possible time and that too error free.

## 2.3 The Ugly

The nature of robotic process automation technology is disruptive - it automates tasks that though already digital are carried out manually and, in the process, automates entire business processes and subprocesses in a rapid manner [44].

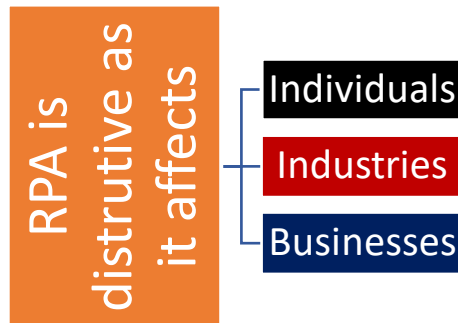


Fig 3: Why RPA technology is disruptive?

The adoption of RPA in Supply Chain functions is of great consequence when it comes to procedures, capacities, efficiencies and the participating professionals. There are two major aspects of the flipside of RPA adoption – 1) is the employees who are apprehensive or agitated about being replaced by automation and 2) the businesses are anxious and apprehensive about the impending change, its management and the expenditure involved in the introduction, implementation and subsequent management of RPA in their business and the huge transformation that it entails [45].

### 2.3.1 Labor Displacement & Dissatisfaction

A key drawback of RPA implementation is that it will displace labor. So, workers are apprehensive of losing their jobs to robots or computers [46]. Once the implementation commences, it is sure to draw a lot of displeasure from the displaced manpower, many of whom will be reluctant and resistant to understand the need for the change – leave alone the willingness to cooperate in the change process. Just like any other radical change RPA will have significant impact on the workers demeanor and in some cases even strong psychological repercussions which can aggrieve the employees as they might feel that suddenly they are of no value to the management or they are being undermined and replaced despite their loyalty towards the institution. A disgruntled employee can cause damage to a

company's reputation. However, there is not much literature on this aspect of the implementation of robotic process automation in supply chain.

There are a large number of literatures that highlight the positive prospects of RPA. However, there is very limited number of studies that reinforce the assertion that robotic process automation will be able to free the knowledge workers from monotonous and tedious tasks so that they are able to work on jobs that are more stimulating and appealing. Following simple logic of the desire to streamline operations and rationalize costs, once tasks become free of knowledge workers, the corporates are most likely to cut down their requirement for number of knowledge workers instead of providing the displaced labor with more interesting jobs, leading to job cut and retrenchment of labor or change policy to not reemploy personnel in positions from which someone is retiring leading to a reduction in number of posts.

Frequently the implementation of robotic process automation tends to intimidate people and they get wary of their new software co-workers. This apprehension is not unreasonable. A large number of people are of the view that RPA bots being significantly faster than their human counterparts at performing tedious regular jobs, they would simply take over the place of regular employees. However, this is not how it happens in real life. Nevertheless, the perceived misconception about the outcome of RPA implementation in SC functions significantly adversely impact the willingness on the part of the employees to co-operate at the time when the RPA implementation is being carried out. This further overstretches the time taken to implement RPA in supply chain the obvious fallout of which is cost escalation. The labor will actually resist the implementation making the managers helpless in the face of impending change. Here rather than being helpful, technology will make managers helpless. This is a serious thing to ponder over – if machines can completely replace humans in the future, it will not have a very pleasant impact on the employment scenario of any country [47].

It has been a big setback on the part of academic literature when it comes to being able to catch-up with the pace of technological development and advances. These literatures also fail to present a set of unambiguous guiding principles pertaining to the boundaries that exist between knowledge work and

regular work, or to methods for clearly identifying and separating knowledge workers from the regular workers. This is the key reason behind the why the residual literary work had been done on the notions of knowledge workers and knowledge work appear to be residual in nature – following the ability of cognitive technologies and data analytics to incessantly enlarge the boundaries and scope for automation of tasks and the potential tasks that can undergo automation [27].

Since the pandemic, the global economy has been reeling under the pressure caused by disruptions of supply chains across industries, with new issues pertaining to the supplies cropping up every now and then throughout the last couple of years [48]. RPA appeared to be an appropriate solution – taking care of work even in the absence of human intervention. It showed that where RPA is implemented work can move on even if workers are completely absent physically, which can actually be threatening to the workforce. Robotics and AI have already been successful in bundling and moving around products all across enormous shipping centers belonging to the online retail behemoth Amazon, in healthcare by being able to diagnose lung cancer with precision that is significantly higher than human doctors, in composing newspaper reports on such subjects as sports for newspapers [49].

The prevailing enterprise systems and applications need not undergo any modification for RPA implementation. RPA interacts with these systems in a manner that is similar to how the company's employees interact with its applications and systems and in the process recreates the physical human interventions that are both accurate and efficient to its highest degree. Theoretically RPA is supposed to channelize the workforce towards tasks that are strategically more meaningful, thus leading to achievement of greater corporate goals. It is supposed to be exciting for the employees as they would be looking forward to do more meaningful tasks and not fear that they would be severed from their livelihood by their employers. Nevertheless, an RPA that is poorly handled or implemented will only aggravate animosity from the inherent fear of losing jobs within the workforce and further spread the discontent and dissatisfaction emanating from organizational transformation that will ultimately impact the bottom line negatively [50, 51].

### 2.3.2 Risk of Information Security

Implementation of RPA can put information and data security at risk. Incidents have been reported in which employees have launched cyberattacks on bots with the purpose of getting access to sensitive corporate data [52]. These are malicious employees aggrieved by losing their regular jobs to RPA bots. Two key threats in this respect are data leakage and theft. Sensitive data that are crucial for the organization, for instance passwords for RPA bot or consumer information that are dealt by RPA, can get exposed and the vulnerability can be exploited by or through an aggrieved employee who can easily compromise the data and open it to attackers in case the security procedures in place are either inappropriate or insufficient [53].

When employees leave and new employees take over, RPA passwords are more often than not exchanged for the purpose of reuse in the future by the new personnel assuming the position. Re-use of password entails huge security risk [54]. A cyber intruder will be able to capture these existing accounts along with passwords, use these accounts to increase privileges, and move across to gain access to confidential data, software, and networks especially when these have been left unused and unsecured for quite some time. In contrast, those users who are in possession of the administrator rights usually retrieve passwords from locations that are defenseless or susceptible. It becomes essential to involve an IT organization to take care of the nitty-gritties of implementation and during strategization of RPA in supply chain which again involves substantial expenditure [55].

### 2.3.3 Change Management

Introducing Robotic Process Automation into an establishment is usually a challenging and stumbling enterprise [30]. Undeniably RPA, as a revolutionary technology, has several upsides. Nevertheless, its successful implementation on a large scale is dependent upon the managers' and the managements' foresight and the ability to oversee and control the change without antagonizing their key resources – human resources [56].

While a large number of companies are reaping the benefits of successful RPA implementation, such as higher efficiency at lower costs and resilience of the supply chain, it has been found by research that a significant percentage (30-50%) of these projects actually fail [57]. Critics usually make the



underlying technology responsible for the failure whereas the real reasons differ [52]. The application of this disruptive technology to supply chain will impact every aspect of business but more specifically labor. While looking at everything from the aspect of labor or assessing the impact of RPA on the workforce, both academicians and entrepreneurs are of the opinion that every company that is unable to create and maintain an ecosystem encompassing both virtual (e.g., robotic) and human resources is likely to be at risk of failing to spot opportunities to enhance efficiency and create engagement which will ultimately result in stagnation, and in the worst case, obsolescence [58].

For exploiting the highest quality of physical and human resources available in various parts of the world and across countries and with the purpose of creating and maintaining their competitive edge through enhancement of efficiency, productivity and cost minimization – supply chains now span across countries. Automation will be perceived by different countries in different manner depending upon their work culture and temperament of the labor, making it more difficult for enterprises to manage change. This is especially true for radical changes such as RPA implementation which will displace labor.

The inherent emotional resistance of people change comes from various factors one of which ‘fear’ is most potent in this case. It emanates from the apprehensions surrounding job security caused by the possibility of retrenchment due to implementation of the novel disruptive technology – RPA. The resistance to change created has the potential to put down an RPA initiative. A survey study showed that majority of the firms studied highlighted that change management is a huge challenge, and the challenges are particularly conspicuous when it comes to corporate and local cultures [50].

#### 2.3.4 *Additional & Maintenance Costs*

It has been generally observed that RPA usually fails in two circumstances: either the management wrongly assesses that process which is undergoing automation to be most suitable for RPA and is disillusioned soon after the commencement of transformation, or the environment in which the resultant automation is functioning is highly dynamic to an extent that was hitherto unexpected or was beyond the anticipated outcome [34].

Whichever may be the case, failure of RPA of the SC or its inadequate automation will entail further significant expenditures.

Since RPA is a technology-driven and technology intensive process there will always be needs for technological upgradation. RPA tools will require a lot of maintenance and continuous development. Which will involve additional costs. The fact that greater effort is needed to be spent on this continuous development and maintenance is not something that is readily or actively talked about or taken into consideration while discussing the necessity or feasibility of RPA in SCM. As a matter of fact, it is contradictory in a certain manner to the key reason behind taking RPA into consideration in the first place – the whole purpose of RPA is to enhance processes efficiency of and bring down the possibility of individual error [34]. Supervising the Bots at various levels is necessary in order to make sure these Bots do not become the cause of concern for making errors, as these errors can lead to bigger SCM problems [59] and may even disrupt the disruption.

#### 2.3.5 *Re-manualization*

It is evident from the foregoing discussion that RPA in supply chain operations and management, every time does not turn out the desired or foretold results and hence may not have the anticipated impact on the supply chain operations and management which invariably leads to withdrawal of certain robots, subsequently, from the employer companies. As a consequence, the labor initially displaced might need to be reinstated – people will have to reassume the robotized tasks, and will have to carry them out manually again. In essence they will replace robots. This is what we call ‘re-manualization’. It is regrettable that corporates appear to be unaware and underinformed about the possibility of re-manualization unless it is happening to them [60],

Irrespective of their size or global presence, there are no E-retailers who have a mythical flawless supply chain [47]. The flaws stem from the growing complexity of the business which comes in tandem with growth and expansion and the growing complexity of the business environment [55]. In case of service industry, where automation has been implemented, glorified robots and rote run such activities as customer service or customer query handling. There is a generalization of the way the

customers are treated. Hence, all customers are treated in a similar manner. A crucial challenge faced by organizations at every step of the RPA implementation is process standardization [55]. In case of the breakdown of the servicing arms "robot", it is not possible to repair them since they have to be reprogrammed totally, which is also not possible – hence cannot happen.

### 3 Methodology

This article uses literature review as the research methodology. Using key words such as RPA, robotic, process, automation, robotic process automation, supply chain, management, SCM, more than 300 literary works were discovered. Since the emphasis on application of robotics in SCM is a comparatively recent phenomenon and picked up momentum over the last 3 decades, we have selected only those scholarly works that are dated not later than the year 2000 which reduced the number of references to 74. These resources are available on public domain and were obtained using the Google search engine and Google Scholar. As a methodology literature review helps to identify written work on the subject matter, scrutinize them to reveal interpretable trend if any, collate existing studies to identify questions that still remain unanswered thereby paving the way for future studies on the same [61]

### 4 The Road Ahead

At present, RPAs are calibrated to perform tasks that are monotonous, rule-based and nonintelligent and do not undergo modification; hence are not able to handle unanticipated scenarios such nor work innovatively since it is necessary to customize the relevant process. Also, tasks and processes are interdependent and usually need input so that they can provide output that will be needed by other tasks and processes as inputs. "However, if RPA is a hammer, the world is not a nail, and often better, safer and more efficient ways exist to accomplish the same ultimate goal" [13].

It is not possible for numerous processes like Quality Control (QC), customer relationship, sales and after sales support or even analysis of customer feedback, to become totally automated due to the very nature of these tasks. To ensure an efficient customer relationship process, RPA can only help assist in retrieving details of previous transactions to include

their preferred brand and other relevant historical data - this helps in presenting better personalized product recommendations [62]. However, the subsequent step which involves understanding and taking of the specific requirement of the clients' needs human intelligence and cannot be entrusted to a bot. For this human intelligence, social behavioral skills, empathy and subtlety in purchase transactions are absolutely necessary [38]. Many customers still prefer dealing with a human sales person and have a one-on-one discussion, in order to try and address the problems they want to get over with that relate to the new product or service that they intend to buy. This is primarily due to the fact that people that people find a human agent would understand their problem viz. a viz a system bot [63].

Organizations, which failed to inculcate the assembly line for faster and innovative ways to deliver finished products failed to survive. They were simply outpaced by competitors who innovated and adapted to changing market conditions. Automation has penetrated all spheres in all industries which inexorably brings us to an identifiable point of failure for all industries on the face of the Earth. A retail outlet which fails to automate customer records on a software platform will ultimately fail. That particular retail concern failing to automate its system of labelling products at the robotic hardware level, is also most likely to eventually fail to keep up with y the fast-paced demand and supply equation. However, retail industry is not unique. Automation influences every industry vertical [64].

The general efficiency of SCM processes can be improved by the use of Robots and Automation. Manual tasks like sorting, handling, classification of products and data entry which were traditionally handled by manual tasks performed by humans can now be done effortlessly by the bots without much time lag thus speeding up the supply process. RPA will continue to bring manifold benefits for SCM and result in faster turnaround time when it comes to delivery of products and services. This will also contribute to the dependability/ consistency, vast reduction in the use of manual effort, improved data consistency and accuracy. In addition, time saved from manual effort can be utilized to make resource planning more flexible thus increasing the value proposition of the enterprise [16].

#### 4.1 Empowerment – Not Unemployment

Rather than taking the place of employees, robotic process automation boosts work and makes the use of staff time thus freed up for focusing employees on tasks that have higher priorities in the strategic parlance [65]. Operation automations within the management of supply chain or SCM is carried on with enhanced evolution with every single fraction of supply chain management being altered by such digital transformation along with the continuous stride towards gaining higher agility, efficiency, and dynamism. In order to be able to perform consistently and achieve performance targets, it becomes imperative for SCM to focus on activities that are considered more valuable and necessary for faster achievement of the set targets and organizational objectives. It is also necessary to automate activities that are considered to be of lower value in order to be able to maintain stable and sustainable supply chain management (SCM) while turning out superior results [16]. It helps in redundancy and contingency planning and is also economical, in the sense that the additional costs are not likely to significantly burden the bottom line [66].

It must be remembered that RPA has to be identified as a tool for employee gratification rather than employee displacement. This has to be the general outlook of the impact that RPA would have on the future of work and employee engagement. Automation is now being increasingly viewed as a mechanism for workers' emancipation and employment creation and not as a forward planner for large-scale unemployment [50]. Digitization and automation can be particularly helpful in tackling the emerging problem of labor shortages arising from and in the aftermath of the COVID19 pandemic [67]. It is now a matter of general understanding that the way forward is a implementation and harmonious co-existence of artificial intelligence (AI), automation and the human touch which will ultimately result in net employment generation

with novel ways of carrying out work efficiently ultimately becoming the norm. Whatever reduction in back-office labor force carrying out regular day-to-day low value corporate functions happens due to displacement caused by RPA implementation, will be more than offset by the scaling up of headcounts engaged in providing superior customer service. RPA ultimately will enable employees to have larger human interactions [50].

#### 4.2 Sustainability

Just like their AI counterparts, RPA needs to be meticulously monitored using human labor. RPA will bring about a role change so far as the human workforce is concerned, shifting it from being merely an executor to an important decision-maker. Human resource will continue to remain irreplaceable and will be necessary to ensure that the organization is able to attain the highest possible level of RPA efficiency through effective monitoring and timely identification and reporting of deviant behavior of robots in order to safeguard the business [68]. The question therefore arises whether RPA will still be able to offer the cost advantage that it promises to deliver? Or the efficiency, since the ultimate reliance is in effective supervision and control using human factor? Since ultimately it will still need human intervention for monitoring. Will supply chains be sustainable in terms of cost-effectiveness post implementation of RPA, if human labor will still be necessary to keep the process running?

It must be realized that it is essential to put sustainability in the forefront of the supply chain in order to ensure that RPA in supply chain delivers the desired benefits to the organization. As organizations become environmentally conscious, adopting green initiatives the supply change becomes an important part of the change. Key stakeholders always pressurize enterprises to move to a lean operational system. Obviously, this requires supply chain transformations which can come from RPA. The emphasis is on sustainable operations and practices. RPA can be most helpful in creating and sustaining such a lean system. Building resilience and sustainability into the supply chain, entails holistic assessment of factors that bear significant risk - raw material access, disruptions,

shifting geopolitical conditions, and environmental impressions [48]. AI, ML, and robotics, can address the problems of electronic waste management helping in rapid recycling and salvaging unique and precious parts for reuse which could save billions of dollars for electronics manufacturers and avoid e-waste pollution.

As supply chain disruptions halt operations, stepping forward to sustainability is eminent and RPA will be crucial in achieving that goal. RPA can be programmed to keep strict vigil on the needs of crucial inputs helping purchasing managers to handle critical suppliers and balance other departmental needs. Entry of new market players significantly affect managers' purchase decisions and priorities pertaining to price and ready product availability leading to the need for appropriate due diligence while onboarding a new supplier. This might make sustainability a secondary concern and suddenly look more complicated, conflicting with real-time problems and solutions. The introduction of RPA here will minimize human bias and make the decision making process much faster [48].

### 4.3 Change Management

In view of the recent supply chain disruption caused by the COVID19 global pandemic, it becomes imperative for companies to develop in-house or get hold of technologies that have the potential to provide better visibility into problems that impact the movement of components and finished goods through the supply chain [43]. It helps in effective change management.

It is obvious that RPA may not be suitable for each and every process, especially where human touch is imperative, and in case of forced application in unsuitable processes, the higher efforts are necessary to develop causing hindrances to desired RPA outcomes [42]. It is necessary to implement RPA gradually over a period of time and not rush things in. In the absence of proper integration with business processes RPA will generate significant project and operational overheads leading to financial challenges [69].

Organizations having technology and innovation at its strategic and cultural core can more readily deploy RPA with much greater ease [70]. Staff personality continues to be a key success factor by creating RPA-conducive culture [71] which fosters interest in technological upgradation and keeping

abreast of recent technologies and accept RPA as a fascinating and futuristic concept [72]. RPA deployment in front-end customer service must be preceded by the readiness to respond to the necessary technical requirements [73]. This will ensure better management of the necessary change making integration easier and faster. This is again facilitated by structured encapsulation and management of data enabling easier access to and utilization of relevant data. There has to be a cohort between transformation of business processes in various departments to ensure RPA runs smoothly through supply chain operations. Inappropriate design or incorrect change management will provide erroneous and difficult to track results and hence difficult to resolve hence all aspects of supply chain development must be built in within the RPA thus ensuring appropriate integration with other tools and platforms and hence smooth operation [69].

## 5 Conclusion

RPA is the mainstay of Intelligent Automation of supply chain operation and management. RPA effortlessly learns and replicates mundane and repetitive transactional tasks carried out by humans for example, invoice processing in bulk, data transfer between parallel systems to hasten the process of information exchange or even in filling up of forms, but this is carried out at a very fast pace and irrespective of the time of the day or night. The necessity to develop and improve supply chain sustainability echoes the mentality of the leadership and is influenced by supply-chain professionals. They are aware of its benefits and insist that their customers associate with environmentally conscious establishments, as it helps in business continuity, cost cutting, boosts firm's reputation and reduce carbon footprint.

To summarize, literature on RPA is scarce, ambiguous and lacks specific case studies on the nature and magnitude of effect of RPA implementation in an organization and its consequences to human and social aspects in particular. Therefore, we see the often repeated yet hitherto unproven claim that knowledge workers will not be affected negatively due to automation implementation by way of replacement or being laid off from their current job. There is lack of proper investigational studies that would delve into the question of whether and in what way automation would more likely complement human effort and increase output in the workplace or would rather

fully replace humans by taking over their jobs. Further detailed study – especially case studies are necessary in this space to ascertain the true nature of RPA transition. For now, we conclude that it is something the companies can't do without but still need to go a long way before fully realizing the potential benefits.

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