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Original Article

Automated Returns Management and Reverse Logistics in SAP

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Abstract:

Modern supply chains are significantly influenced by reverse logistics and returns management. The snowball effect that has resulted from the proliferation of online purchasing and the ease with which customers can request returns has compelled businesses and their customers to ensure that they have well-organized and automated return systems. This article is about returns management and reverse logistics with computers in a SAP environment--the subject however is restricted to these three SAP functionalities: SAP S/4HANA EWM and CRM toolsetne Mechanism for Returns: Using such SAP technologies (not yet fully automated) as processing credit memos or changing inventory, managing reverse logistics and permission Continuing Return Material Authorizations (RMA)--this report on how electronic technology has introduced new concepts into returns management looks at past difficulties and changing technologies in the future.It describes some of the benefits of automation in SAP, and how happy customers will purchase more products from you while also reducing your staff's workload. These benefits include improved operational efficiency--no longer having to return items cross country-andespecially lower costs The action returns automation policies was brought to the institutions which pioneered it together leverage points.

Keywords:

SAP, Returns Management, Reverse Logistics, Automation, S/4HANA, EWM, CRM, RMA, Supply Chain, ERP, Inventory Management, Customer Satisfaction.

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1. Introduction

1.1. Background

It's conventional for enterprises to shift to supply chains which are centred on clients and emphasise service quality, timeliness, and flexibility. And this is particularly so for returns, which have became an increasingly vital part of the world's daily commerce as operations for ecommerce continue to boom. Traditional, brick-and-mortar systemscum-labor-intensive and flexibility bereft--fall short of what's wanted in the modern world of work. Hence, companies have taken up innovative return management systems that are quick, accurate and cheap to operate—and which also satisfy the consumer's requirements. A good return process means satisfied customers, effective inventory management, and lower costs for reverse logistics. To modernize supply chains and stay current with business trends, we must be able to rely on automated systems like SAP.

1.2. Need for Automation in Returns Management

The sheer volume of product returns is making manual returns management increasingly untenable. That is especially so is this on in sectors like retail, electronics and e-commerce. In response to the complicated nature of the question, we propose that automation should be the answer. Automation is indeed called for:

Whether we look at it encompasses the sorts of questions automation run-time operation has on returns when evolved from an era in which most everyone picked out their purchases offline to how every policy in online shopping just becomes more liberal with every day. The volume of returns soars proportionately, leading to problems with handling them expediently within manual systems--delays, mistakes, and disgruntled patrons Automation is the solution to all these difficulties. It processes a large quantity of data automatically without the user's input, ensuring that a profit is on average obtained 4-6 working days into generation of return shipping labels From the perspective of the consumer, automation is also quite beneficial. Fast return service provided by modern robots lets people know intuitively when their purchases have been received back and at that moment--while still with total certainty over whether money will be refunded in entirety or just partially refunded something sells for less than the same item Costs may fluctuate slightly from one place to another due differences in local charges, however this also should not vary greatly between regions worldwide.

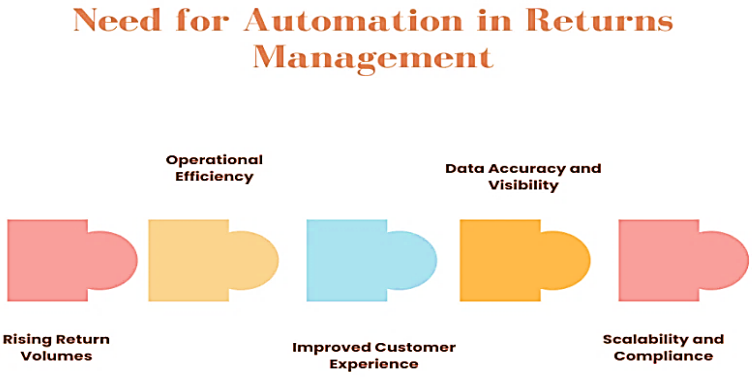

Figure 1. Need for Automation in Returns Management

Since various departments—orders, warehouses and accounting—have been integrated into one system, operational efficiency will be enhanced when automation becomes the norm. This streamlined process not only saves time but also reduces labor and administrative costs.

On the other hand, from the perspective of customers, automation ensures that multiple return possibilities are quick and simple. Customers may inquire on their return status in real-time, which increases satisfaction with our assurance guarantees of cash returns by 100% Automation also leads to increased data accuracy and transparency in handling returns. For instance, quick flashes of real-time working reports at the panel allow companies plug into a variety of return patterns and zero in on each node as necessary in order to liquidate That transparency is good news fore reverse logistics, inventory control and financial reconciliation.

At last, the return process of businesses grows more complex as they expand. To meet the developing business demands–such as adding a completely new range back in line for release Automated methods can be expanded and refined. Furthermore, compliance with warranty statutes and regulations is help by automation using rules-based workflows combined with audit trails, which make it possible to ensure timely return is achieved in harmony with policy.

1.3. Automated Returns Management and Reverse Logistics in SAP

In the complex area of returns management, involving direct and reverse logistics, SAP provides tools to automate and optimise the process for any corporation looking to improve its supply-chain efficiency. SAP S/4HANA is its most fundamental element: this much has been proven as it connects with old systems in ways that are nothing short of miraculous (e.g., Sales and Distribution [SD], Extended Warehouse Management [EWM], and Customer Relationship Management [CRM]). Automation begins with the return order itself, which may be created in any of two ways: either by customer service representatives using SAP CRM, or simply by filtering the SD module. This initialisation starts off a string of activities automatically that culminates in validation for things like original sales order and warranty period to come back. What's more an order will also be authorized in some fashion at this stage. After an existing Authorization is approved via the Return Material Authorization (RMA) process, the physical logistics, that is, Goods Receipt and Quality inspection, are handled via the SAP EWM module.

Inspected products will be automatically classified based on the inspection results, and the proper action, which may include restocking, repair, or disposal, will be taken. This systematic processing minimizes mistakes while utilizing returned stocks to the best advantage. Additionally, the SAP Finance (FI) modules automatically generate credit memos based on inspection results, simplifying the refunding process and ensuring accurate reconciliation of financial accounts. The automation of SAP also encompasses real-time reports and analytics, which provide insight into patterns of returns, volumes, root causes, and financial consequences. These insights enable companies to refine their return policies, improve product quality, and reduce the rate of returns in the future. Besides, it is integrated with third-party logistics providers and compliance functionalities that assist organizations in facilitating regulatory requirements and honoring the service-level agreements. In general, automated returns management in SAP helps convert the historically cumbersome process into a strategic capability that contributes to cost savings, customer satisfaction, and business adaptability.

2. Literature Survey

2.1. Returns Management: Traditional vs. Automated Systems

Historically, returns management has been perceived as a cost center, a process that fails to generate value and is primarily focused on damage control. Individuals continued to utilize manual systems, resulting in workflows reliant on paper, disconnected databases, and prolonged approval processes. [5–9] These issues frequently resulted in inefficiency, including delays in refunds, inability to ascertain the current status of returns, and dissatisfied clients. However, the emergence of automated processes and digital technologies has altered this perception. Recent literature highlights the shift in company perceptions on returns, viewing them not solely as logistical obstacles but as strategic opportunities that can improve customer experience and foster long-term relationships. Automation enables real-time product tracking, analysis, and seamless coordination of all processes and departments. This simplifies the returns process for customers. This development examines the broader shift toward customer-oriented supply chain approaches.

2.2. Reverse Logistics in Supply Chain Literature

Reverse logistics is a crucial practice within the current supply chain, as it involves handling products when the end user returns them to the manufacturer or distributor, with the aim of either returning, repairing, recycling, or discarding them. As elucidated in groundbreaking research by Rogers and Tibben-Lembke (2001), reverse logistics can prove exceptionally beneficial in terms of lowering costs, decreasing environmental footprint, and improving the overall quality of the service. The literature clarifies that reverse logistics does not only consist of backend operations, but it is an essential element of a sustainable and circular supply chain model. A strong reverse logistics system involves the strict coordination of all stakeholders, reliable IT infrastructure, and safe policies to ensure that returned goods are handled within the shortest time possible in a responsible manner that benefits all stakeholders involved. Reverse logistics has become a recent buzzword in the academic literature and industry as companies put more pressure on each other to reach sustainability goals.

2.3. Role of SAP in Return and Reverse Logistics

SAP has become the most popular enterprise resource planning (ERP) system used by enterprises to manage complex logistics, including the reverse logistics process and item return procedures. Various scholarly and commercial publications highlight how SAP products, such as Sales and Distribution (SD), Materials Management (MM), and Extended Warehouse Management (EWM), facilitate end-to-end processes associated with returns. The modules allow enterprises to automate return authorization, follow up on inbound shipments, handle returned stocks, and credit the customers, all in a single platform. With the integration capability of SAP, organizations are able to attain increased visibility, minimize manual errors, and enhance turnaround on returns. Besides, the analytics tools being offered by SAP can allow organizations to keep the products returning in trend, therefore, making informed decisions on how to reduce the returns, as well as improving the quality of its products in future.

2.4. Existing Research Gaps

On the one hand, a considerable amount has already been written on the topic of reverse logistics and its significance to the supply chain. On the other hand, there are not many articles that actually grasp the micromechanics of introducing the management of returns into enterprise systems, such as SAP. Unfortunately, most pre-existing studies are more inclined towards the theoretical realization or conceptual model of reverse logistics, and it is often found that the detailed issues and the advantages of adopting automated returns procedures in a real-life setting of an ERP-based environment of a business can be ignored. This gap highlights the need for case studies and empirical research focused on the establishment of SAP companies to manage returns, the challenges faced

by organizations in this process, and the best practices that can be used within this framework. Bridging this gap would enhance the literature and provide firms with valuable insights on optimizing corporate software solutions for improved returns management.

3. Methodology

3.1. Research Design

This study employs a mixed-methods research methodology, incorporating both qualitative and quantitative procedures to attain a thorough understanding of automated returns processing within SAP systems. The qualitative aspect is based on a case-study technique that enables a thorough analysis of how companies adopt and adapt SAP modules for managing returns and reverse logistics operations. Empirical data was gathered via surveys distributed to firms employing SAP ERP, SAP S4 HANA, and several logistics modules. [10-13] The research encompassed interviews with supply chain managers, IT experts, and additional operational staff, pinpointing implementation obstacles, success determinants, and optimal practices. This type of knowledge will be nuanced, contingent upon the context, and not solely quantifiable.

A quantitative simulation model was developed in conjunction with qualitative study to assess the impact of automating returns processing on operations and finances. The model compares traditional manual returns processing methods with automated SAP-driven methods, focusing on performance metrics like time, effort, cost, and customer satisfaction. The scenarios reproduced were based on actual data from case studies. By using the corresponding sensitivity analysis, return volume, product complexity and delays in processing all had an effect on overall performance. The synthesis in this paper of both case studies (Vankataraman et al.SAP) and numerical simulations fills a gap in literature onreturns management and offers some practical suggestions for people working in the area. In the digital sphere, beginning with SAP's own system for analyze consumer behavior patterns as measured by system data resulting from returns--to see whether or not specified software design ideas arewanted by individual customers. Such a method of test completes with guarantee the results and sufficiently sure, willsoever.

3.2. SAP Modules Considered

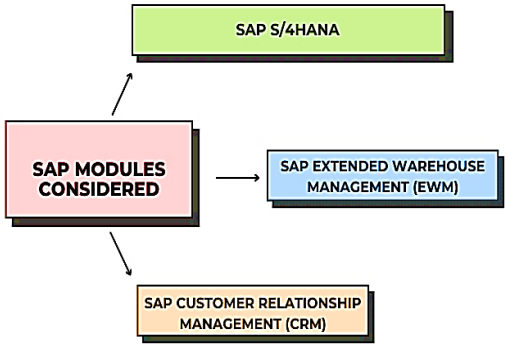

Figure 2. SAP Modules Considered

3.2.1. SAP S/4HANA

Utilizing SAP S/4HANA as the primary ERP system for managing sales orders and processing returns, it simplifies processes such as sales orders approval return approval and credit memos. The result is less time wasted creating these kinds of documents: errors too can be reduced due to improved accuracy in pricing and other list entry functions that must be done in company procedures or a rekeying of information from one system into another because it can't handle the complexity S/4HANA does. Also adding costs, but the added labor necessary adds only marginally to the final price of either product — this goes back as credit within six months, if not sooner, for the salesman using that bonus! It can produce data as sophisticated than native storage systems like it--currently on a par with the IBM 370 mainframe in speed terms--but doesn't cost anything near that platinum. Its advanced data architecture enables faster transaction processing is an aid to tracking return trends for businesses, identifying areas needing improvement, and generally improving efficiency. When you use a warehouse management system (WMS) such as SAP EWM, it is very important for companies dealing with online sales that parts has been (or not shipped; but have been claimed) returned or complaints made. This can be done efficiently and effectively only by using WMS because doing so will minimize the chance of mislaid items being identified and returned.

3.2.2. SAP Extended Warehouse Management (EWM)

For tracking returned goods and managing their movement SAP EWM is absolutely crucial. This includes inbounds and outbounds, putaways and picks, etc. The performance consultants believe that when a warehouse takes into consideration sales, storage, repairs on products for resale or claiming insurance after natural disasters strike their community area has to be employed, though there are also potential disadvantages which cannot be disregarded. When combined with SAP S/4HANA EWM It ensures that transactions are carried out between the warehouse management system and the enterprise resource planning system as smoothly as possible.

3.2.3. SAP Customer Relationship Management (CRM)

SAP CRM also plays a pivotal role in the customer-facing end of return management which is for example handling requests in sales units to provide returns or for repairs information that will be sent back to consumers. It can create return orders, monitor the status of returns and handle communication with the customer. Tasks like this get significantly boosted by SAP CRM--not only do they offer tickets and feedback collection services for service tickets of food level but also greater convenience in the ProcessingInstallation process. As a result the overall customer experience is improved: using transparent procedures means your returns get better care faster.

3.3. Return Management Process in SAP

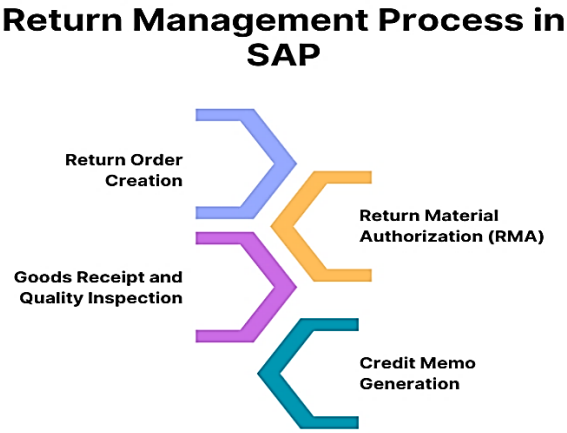

Figure 3. Return Management Process in SAP

3.3.1.Return Order Creation

Return process stage starts once a customer creates a return, and this can be generated either through SAP Customer Relationship Management (CRM) or simply [14-18] using the SAP Sales and Distribution (SD) module. In CRM, customers can request the return of items by using service agents or self-service portals. In SD, return orders are generated based on the initial sales order or sales invoice, allowing important details, such as material details, prices, and customer details, to be automatically filled by SAP. This makes the process more accurate and faster, with traceability throughout the sales and returns life cycle.

3.3.2. Return Material Authorization (RMA)

When a return order is made, SAP assigns a Return Material Authorization (RMA) that serves as an authoritative sanction to the return order. The RMA is directly connected to the reference sales document. With the help of the specified connection, the system can perform automated checks of the main criteria, including a valid warranty, adherence to the return window, and customer accessibility. Such a system-based validation eliminates unauthentic or fraudulent returns, lessening prospective losses and administrative expenses. The RMA can also serve as a tracking reference for the next steps in the return process.

3.3.3. Goods Receipt and Quality Inspection

Upon receiving the returned item at the warehouse, it is processed by the SAP Extended Warehouse Management (EWM) module. In this case, physical receipts generated by warehouse personnel trigger the quality checking process. SAP EWM allows for defining configurable inspection strategies to determine where a returned product should be restocked, whether it needs repair,

refurbishment, or recycling. Such assessments are recorded in the system, and according to the result, relevant actions on inventory are activated, including transfers to quality racks or scrap bins.

3.3.4.Credit Memo Generation

After a commerce is successfully inspected, the financial entailment of the refund is automatically done by SAP. According to the pre-determined business norms and the result of the inspections, the system offers a credit memo to the customer, which is attached to the initial billing document. This credit memo will synchronize the customer account in the financial module on a time basis. Manual errors are eliminated in this step, as only automation is supposed to be used to expedite the refund process, thereby increasing customer satisfaction and financial transparency.

3.4. Flowchart of the Process

3.4.1. Customer Request

When a customer makes a return request, typically due to product defects, improper delivery, or dissatisfaction, the return process is initiated. This can also be done through customer service means in SAP CRM or through self-service portals, integrating the SAP environment. Expediting this request with precision is essential for maintaining customer trust and facilitating the successful return of the item.

3.4.2. Return Order

When a return request comes in, the SAP Sales and Distribution (SD) module makes a return order. This document is the official guide for processing returns. It includes information like the original sales order, product ID, amount, and more. This client request is fulfilled without affecting the traceability or consistency of the rest of the order, since the return order is linked to the customer's original request.

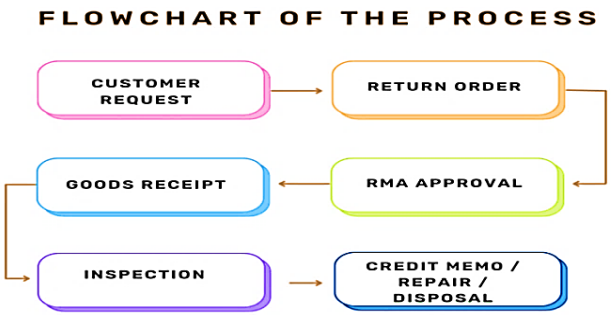

Figure 4. Flowchart of the Process

3.4.3. RMA Approval

Upon the generation of the order of the returns, SAP will generate a Return Material Authorization (RMA) that will need to be authorized after which the actual physical returns will ensue. In this phase, the system performs automated validations on warranty, return window, and customer status to establish the process for returns. By approving the RMA, only acceptable returns will be accepted, hence protecting the business against unwarranted losses.

3.4.4. Goods Receipt

Once it passes the RMA, the customer reships the item, and the warehouse records the transaction in SAP Extended Warehouse Management (EWM). The step of goods receipt creates an important record of information, including the date and condition of delivery, as well as the amount received. First, this move requires the returned goods to be officially reintroduced into the supply chain to promote further consideration and analysis.

3.4.5. Inspection

Upon arrival, the goods are examined to determine their condition; hence, a quality inspection is conducted. Such an assessment assists in identifying the following actions, which may include replenishing the product, repairing it, or discarding it. Using SAP EWM, close inspection criteria can be applied to ensure that any result is explicitly noted concerning the final decision.

3.4.6. Credit Memo / Repair / Disposal

Depending on the result of the inspection, SAP executes one of the following actions: a credit memo to the customer, commences a repair operation, or disposes of the item. In the case of a product that can be restocked or one that satisfies the definition of a return policy, a credit memo is issued as an automatic output and added to the customer's finance account. The objects that require repair are passed to the corresponding service station. In cases where the product cannot be salvaged, they are marked with a signal for environmentally clean disposal.

4. Results and Discussion

4.1. Simulation Setup

To consider the influence of automated returns processing on operations, a simulation model was created based on the structure of a mid-sized retail company that implements SAP S/4HANA. The simulation was designed to replicate real-life return processes, encompassing order processing, inventory management, inspections, and reconciliation actions. To compare and contrast the two scenarios, two scenarios were developed: pre-automation (manual or semi-automated processes) and post-automation (fully integrated automation based on SAP). The process of returns management in the pre-automation setting involved high levels of manual input, including generating return orders, approving returns as eligible, conducting quality checks on the returns, and performing financial reconciliation. Entries of data were being done on separate systems and spreadsheets, causing delays, high error rates, and varied customer experiences. This scenario represented the way businesses used to work prior to the adoption of SAP's automated business processes, highlighting deficiencies or flaws in the time cycle usage, as well as the presence of labour and client satisfaction measures.

The second scenario was based on post-automation that utilized all modules of the SAP S/4HANA that were fully implemented: SD to handle return orders, EWM to manage the warehouse, and FI to create a credit memo. Such tasks as RMA approval, real-time data validation, goods receipt logging, and financial settlements became subject to automation. The overall integration of SAP modules would ensure that there was no duplication of data and that a significant amount of data flow was consistent across different departments. To model fluctuating operational conditions, the simulation took into consideration business rules, system limitations and fluctuations in the volume of returns. The key performance indicators (KPIs) of the processing period (return cycle time), processing cost (processing cost), customer refund time (customer refund time), and accuracy (return accuracy) were recorded in both scenarios. The objective was achieved by several iterations of the simulation to account for fluctuations in workload and return quantities, enabling a comprehensive comparison examination. This configuration functioned as a concise protocol for assessing the advantages of automation. This information could then enhance operations and customer service via digital transformations utilizing SAP within the context of reverse logistics.

4.2. Observations

Table 1. Observations

Metric	Pre-Automation (%)	Post-Automation (%)
Average Return Cycle Time	100%	33%
Cost per Return	100%	43%
Customer Satisfaction	100%	125%

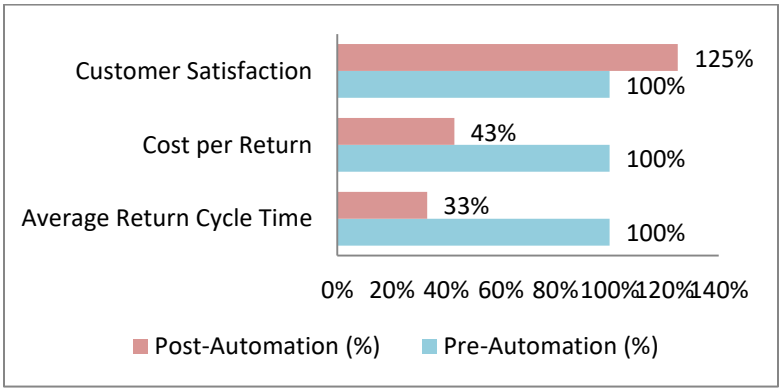

Figure 5. Graph Representing Observations

4.2.1. Average Return Cycle Time

The average cycle control was established at 100 percent and regarded as the baseline in the absence of automation. The use of automation in SAP S/4HANA and its associated modules reduced the cycle time to merely 33% of its previous duration. A 67% decrease of this magnitude unequivocally indicates that the automation of the entire returns process, encompassing order creation to resolution, has diminished human labor, enhanced interdepartmental collaboration, and facilitated real-time data accessibility. This facilitated problem resolution for customers and enhanced organizational efficiency.

4.2.2. Cost per Return

Automation also dramatically increased the cost per return. The manual setting entailed human labour and monotonous tasks involved in all processes of the business, including accepting return orders and checking products, as well as crediting, whose cost was presented in cents. After automation, the cost was reduced by 43%, resulting in a 57% savings. This improvement is made possible by the removal of unnecessary workflows, a reduction in the number of errors that need to be redone, and more efficient handling in the warehouses. SAP also had automated business processes to enable faster throughput, and hence, the routine process did not require dedicated resources.

4.2.3. Customer Satisfaction

The response of customer satisfaction was very remarkable, and it registered a significant rise of 25 percent above the baseline (of 100 percent) to 125 percent after automation. This 25% increase means that the customer experience is improved due to faster processing of returns and refunds, as well as enhanced communication and interaction at all stages of the returns process. The customers felt supported and more certain due to the SAP CRM, which provides up-to-date information to the service team and awareness of the return status. The key factor in this procedure was that improvement in operations led to enhanced brand loyalty and satisfied customer feedback, indicating that the improvements made in operations had a direct effect on the quality of services.

4.3. Benefits of Automation

4.3.1 Faster Processing

Among the short-term and most effective effects of automation in return management, one could note a substantial decrease in time spent on processing. SAP automated workflows also eliminate manual tasks that can be performed redundantly, such as data entry, return verification, and department liaison. To illustrate this with a specific example, in the past, certain operations that could be accomplished within several days, such as approving returns and issuing credit, could now also be managed within several hours due to the integration of real-time systems. Such fast-tracking not only helps streamline the processes but also enhances the customer experience, offering more quick-fix solutions and refunds.

4.3.2. Cost Savings

Automation significantly reduces expenses by mitigating human error, decreasing administrative costs, and optimizing resource utilization. By minimizing manual touchpoints, firms can reallocate personnel to more important tasks, reduce labor costs, and mitigate the risk of financial discrepancies. Integrated modules facilitate SAP-based operations within the storage facility and finance processes, thereby reducing rework and delays. All these efficiencies translate into reduced logistics and other operations costs per return, directly affecting the bottom line.

4.3.3. Data Visibility

One of the greatest benefits of the automated SAP systems is that they provide better information visibility on real-time dashboarding and analytics. Key performance indicators, such as the volume of returns, the outcomes of an inspection, and the schedule of customer refunds, can be tracked by decision-makers in real-time. Such transparency facilitates the identification of bottlenecks in the processes, monitoring the causes of returns, and adjusting policies accordingly. The enhanced visibility enables businesses to make more informed decisions based on data, make more accurate predictions of demand, and continually develop their return strategy to become more efficient and reactive.

4.4. Challenges Encountered

Although the advantages of automating returns management with SAP were material, the implementation phase was not smooth either. The main challenges were in the preliminary configuration and personalization of the SAP modules to match the organizational processes regarding the flow of returns. Even though SAP S/4HANA has a comprehensive framework with mechanisms for handling returns, customizing the system to support individual business rules, product categories, customer policies, and return

conditions took a considerable amount of time and required skilled technical work. Designing return order templates, inspecting criteria configuration, and autotriggering credit memo were time-consuming and required thorough organization of teams involved, including IT, supply chain management and SAP consultants. Further, the assurance of user adoption and training of the employees to utilize the new system effectively contributed to the original complexity, especially among the teams that are used to manual or legacy systems. The other major issue was the integration of SAP and third-party logistics (3PL) partners.

Mid-sized retail stores rely on third-party services for storage, transport, and reverse logistics. The technical challenge was to ensure smooth data flow between SAP and these partners' IT systems using custom connections or middleware. Issues with synchronization, such as incompatible data structures, inconsistent inventory management systems, and slow real-time updates, made it difficult to trust return transactions. To address these issues, more testing, interface development, and collaboration with other groups were necessary to offer regular communication and contract support levels. This deployment proved successful, although it underscored the significance of effective change management, clear project planning, and ensuring the scalability of the system architecture. Addressing these issues from the project's inception allowed for the mitigation of long-term complications, such as the drawbacks of automation, which encompass increased expenses, prolonged turnover, and diminished customer service.

5. Conclusion and Future Work

The paper explores the use of SAP modules like S/4HANA, EWM, and CRM in automated returns management and reverse shipping to improve modern supply chains. The results show improved operational efficiency, shorter cycle times, lower costs, faster turnaround times, and increased customer satisfaction due to faster turnaround times and improved visibility. With this approach, the total time that the materials are at rest is reduced which means better response time and faster delivery of orders for both partners.The speeding or smoothing is in the whole process; if it were not, 「it would be hard to get a different result.」 By automating tasks, giving businesses real-time analytics, and letting data move between departments, SAP helps them make fewer mistakes and do less overtime.This is very important for businesses that sell things both online and offline, since reverse transportation can be steeply expensive.SAP can be a powerful business system that aids companies in digital transformation by streamlining both returns and logistics. However, it requires planning, organization, and continuous improvement. Research suggests that companies should focus on end-to-end integration with third-party logistics providers, as outsourcing processing of returned items can lead to delays and data breaches. This will ensure the best possible use of SAP for all stakeholders.

Collaboration between SAP and other systems can improve real-time movements, inventory control, and returns experiences. Employees working with SAP return modules should have up-to-date knowledge and training to maximize efficiency. AI and machine learning can help predict refund likelihood, product issues, and potentially incorrect cancellations. Future exploration could explore these areas further, allowing for more innovative solutions in the field of returns. Keeping employees updated and learning new skills can lead to better results and reduced time spent on work. Businesses might be able to make better plans with the help of prediction models. This would let them change how they handle customers and their stock. One more thing that stops blockchain technology from being used in reverse transportation is SAP. Blockchain can keep safe records of deals that are sent back, which will build trust and make sure that rules are followed in controlled markets. The changes that are happening now can also make automatic return systems more open, simpler to measure, and more common. This will make the next generation of supply chain management useful.

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