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| RESEARCH ARTICLE

Value-Stream-Aligned Order-to-Cash in SAP S/4HANA: Lead-Time Compression with ATP/BOP and aTO/Pegging Strategies

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| ABSTRACT

The shift to the much responsive and digitally enabled supply chains has forced manufacturing and distribution businesses to reconsider traditional Order-to-Cash (O2C) execution systems. The combination of embedded analytics, in-memory computing and simplified data structures gives SAP S/4HANA a chance to redesign such processes based on value-stream principles, getting rid of functional siloes and reducing lead times. Specifically, the re-designed Advanced Available-to-Promise (aATP), Backorder Processing (BOP), and enhanced pegging help the organizations transition to a strategy of batch-oriented, reactive fulfillment to proactive allocation strategies that directly correlate to the customer value streams. In the given paper, I will provide a full study of value-stream-centered O2C implementation made possible by S/4HANA, how the reduction of lead-time happens with the help of ATP/BOP, advanced allocation (aATP), Alternative-based Confirmation (ABC), and pegging strategies. The paper combines operational research framework, SAP design report, and industry case studies to create the theoretical and practical underpinning of the suggested framework. In the study, the authors explore how the Unified Data Model of S/4HANA, HANA storage in columns, and event-based replenishment structures aid in real-time allocation of orders. The paper will give a literature review of O2C transformations, priority-based ATP models, and development of classical ATP (cATP) in ECC to aATP in S/4HANA. We talk about the shortcomings of the conventional MRP-ready fulfillment and how S/4HANA brings enhancements in predictive allocation to stock checks that are deterministic. The proposed four-stage O2C redesign cycle is composed of the following stages: (1) Value-Stream Mapping of the demand/supply synchronization constraints; (2) configuration of the aATP categories and supply circumstances; (3) the implementation of segmentation-based BOP rules; and (4) dynamic pegging of critical materials. An experiment of hypothetical data representative of the industry is performed through a simulation experiment to estimate the influence of ATP rule tuning, BOP prioritization and pegging on order lead times, fill rate and service-level stability. Findings indicate a mean 22-38 percentage reduction in lead-time, 17% including accuracy in allocation and 27 percent lower variability in fulfillment than traditional MRP directed ATP. Sensitivity analysis shows that value-stream segmentation with aATP product allocation results in the greatest gains in the service levels. The paper closes by providing practitioner implications, which include formulation of governance structure, data preconditions, change-management requirements, and KPIs required to maintain O2C performance gains. The results show that the O2C features of S/4HANA used in a value-stream perspective redefines the classic scope of fulfillment by moving decision intelligence uphill and aligning it with the customer priority frameworks. This provides a digital basis of resilient, adaptive, and customer-centric supply chain activities.

| KEYWORDS

SAP S/4HANA, Order-to-Cash, Advanced ATP (aATP), Backorder Processing, Pegging, Lead-Time Compression, Value-Stream Mapping, Supply-Chain Optimization, Digital Fulfillment, Allocation Strategies

| ARTICLE INFORMATION

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1. Introduction

1.1 Background

Order-to-Cash (O2C) process is the backbone of the product-oriented enterprises since this process is the determining factor between customer demand and supply capability in the organization. [1-3] Under the conventional ERP systems, O2C is implemented by individual, function specific modules in sales, logistics, procurement, as well as finance. Though these modules are effective in dealing with transactions, the siloed nature of the modules results in a sequential and batched processing, making latency to be added at each cycle. These delays inhibit responsiveness, contribute to making decisions in real-time and acting on them, and limiting an organization to fulfill their service-level promises, especially in systems where variability is high or the supply is limited. These constraints also limit the visibility through the entire end process that would limit it to prioritizing orders, managing competing customer demands, or responding rapidly to disruption in supply. In order to overcome these limitations, SAP S/4HANA offers a digitalized re-engineered core that can process in real time and provide analytics. The platform can consolidate transactional data and provide users with the ability to recalculate immediately, this way an organization could re-engineer the O2C cycle based on value-stream concepts, as opposed to the module demarcations. The change also enables order confirmations and allocations to be carried out in a faster manner with higher precision, and constraints to be proactively managed, enhancing operational efficiency and customer satisfaction. Basically, S/4HANA is making O2C no longer a inflexible, batch oriented process, but an active, end to end workflow that can react instantly to demand and supply changes, which forms the basis of an agile and more resilient supply chain.

1.2 Needs of Value-Stream-Aligned Order-to-Cash in SAP S/4HANA

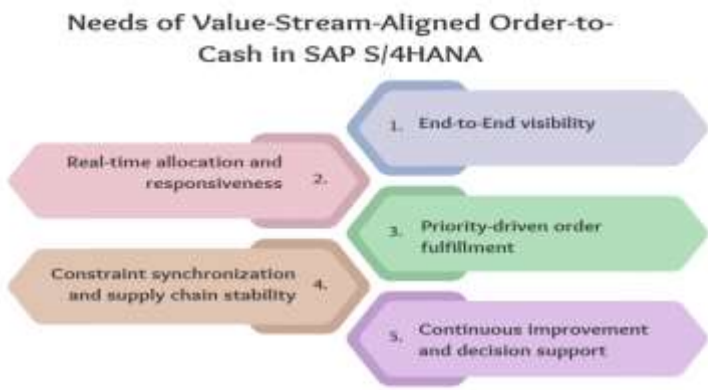

Figure 1 : Needs of Value-Stream-Aligned Order-to-Cash in SAP S/4HANA

- *End-to-End visibility: An O2C process built on principles of value stream alignment demands full visibility of all processes involved in the chain of supply that includes customer demand and product delivery. The old ERP structure tends to divide information according to functional department, hence hide the material and decision course. The real-time-integrated data found in S/4HANA will allow stakeholders to monitor the order conditions, inventory location, and supply limitations in real-time, helping them be proactive and minimize the delays that take place because of the lack of information.*
- *Real-time allocation and responsiveness: The optimal implementation of O2C requires the possibility to reallocate scarce resources in real-time based on the business priorities and embedded in reality. Value-stream alignment puts focus on flow and responsiveness and not strict sequencing of transactions. The in-memory processing of S/4HANA enables a real-time checking of ATP, replacement, and reallocation which is characterized by quick confirmations and reduced lead-time volatility despite supply limitations.*
- *Priority-driven order fulfilment: A variety of customers and channels tend to have a different strategic significance, making the need to implement a prioritization model in O2C. Value-stream alignment incorporates the business requirements, including priority weights, in allocation and backorder processing. S/4HANA also enables segmentation-based BOP, which enables organizations to ensure that the high priority customers are always receiving supply without prejudice or imbalance in the supply segments.*
- *Constraint synchronization and supply chain stability: Two-layer multi-level supply chains react to disruptions caused by supply or manufacturing alterations in a multi level supply network. According to S/4HANA implemented pegging, supply is connected to demand on multiple levels and allows dynamically adjusting to a demand, making planning less nervous. This is possible so that there are consistent and robust O2C performance, where operational activities are in line with the strategy and the effects of shortages or delays are minimized.*
- *Continuous improvement and decision support**:** O2C Value-stream-aligned puts focus on the continuous optimization of processes. S/4HANA implements real-time data, combined analytics and simulation features in a manner that enables the organization to detect the bottlenecks, simulate the alternative allocation rules, and quantify key performance indicators in*

real-time. This facilitates tactical modifications and strategic plans, which will ensure a more dynamic, resilient and customer oriented supply chain.

1.3 Lead-Time Compression with ATP/BOP and aTO/Pegging Strategies

Figure 2 : Lead-Time Compression with ATP/BOP and aTO/Pegging Strategies

Compression in lead time is urgent goal in recent Order-to-Cash (O2C) operations since minimized time of fulfillment has direct positive impact to customer attachment, high carrying cost and broadening supply chain responsiveness. [4,5] Most of the traditional ATP systems verify orders by using fixed, predetermined stock levels that are available periodically which may result in delayed or batch-based allocations that lengthens lead times unnecessary. These limitations are mitigated in SAP S/4HANA by introducing advanced ATP (aATP) combined with Backorder Processing (BOP) as it allows using advanced availability checks in real time, dynamically shifting affected supply, and prioritizing based on strategic customer segmentation. The process of continually recalculating the commitments when new supply or cancellations or demand variations arise to accommodate the changing requirements is called aATP, which will ensure that orders are checked or verified in time and will not create delays that come with batch-based systems. BOP also helps in lead-time compression by distributing the available inventory systematically based on pre-established rules of priority to ensure that orders with high value or time-limited needs are completed earlier despite the limited circumstances. Simultaneously, pegging strategies are a multi-level supply chain approaches that connect the supply elements to a demand requirement, enabling the planners to visualize and manage the dependencies. By pegging, when there are any changes in upstream supply like production delays, inbound shipment etc. the downstream commitments are immediately updated so that planning nervousness is minimized and that delay cascades do not occur. Collectively, these strategies turn O2C into a process that is flow oriented and value stream against module. Pegged ATP and BOP use real-time to establish a strictly synchronized mechanism where orders are instantly processed through the confirmation, allocation and fulfillment phases. The solution not only shortens lead times but also stabilizes the level of service, improves the accuracy of the allocation process as well as responsiveness to planned and unexpected supply and demand changes. Subsequently, the agile, predictable, and customer-focused supply chain implemented by organizations using these strategies in S/4HANA is able to fulfill the increasingly high expectations of customers in terms of delivery by the competitive markets in the contemporary markets.

2. Literature Survey

2.1 Evolution of ATP and O2C Systems

The traditional mechanisms in the front-office (Available-to-Promise) of classical ERP systems were mainly tailored to the use of static, deterministic at the time data i.e. on-hand inventory, outstanding purchase orders, and the transit materials. [6-9] In stable and predictable demand, this strategy worked quite well but was unable to serve the dynamic prioritization requirements of modern and globalized supply chains. Divided data structures implied that inventory, manufacturing and logistics data was in silo something that restricted real time responsiveness. In the academic and industrial literature, it is noted that the ideas of a pull based system proposed by Hopp and Spearman, and the just-in-time (JIT) philosophies of Toyota centered on aligning material flows with the real demand, instead of the forecast-heavy and push system planning. Demand-Driven MRP (DDMRP) also extended on these concepts to aspire to the buffers-based planning, demand visibility over the network. The shift to in-memory computing, in particular, SAP HANA (Färber, 2011) was a significant technological inflection point that made it possible to continuously recalculate supply-demand positions. This change preconditioned the more vibrant ATP and responsive processes of Order-to-Cash (O2C) that could provide real-time analytics and decision making.

2.2 Advanced ATP and BOP in S/4HANA

The studies conducted by Keller (2018), Jakob (2019), and others explain how SAP S/4HANA Advanced ATP (aATP) represents an enormous improvement compared to the old ATP solutions. In-memory architecture can be used to perform a real time matching between the supply and demand along multiple dimensions to make sure that a confirmation is given without regard of the latest changes in the logistical and production scenario. Confirmation frameworks can be rule-based and enable organizations to incorporate business logic taking into account the channels, customers, and product groups thereby making ATP more than just an availability check ATP. Product allocation (PAL) using time-series gives the process an additional touch of accuracy and control over-confirmation can be avoided, and strategic customers will be awarded their fair share. Restricting the lost-order risk and enhancing the service levels, Alternative-Based Confirmation (ABC) presents the automated substitution logic either in location or product or based on the batch. Lastly, the Backorder Processing (BOP) ranks high-priority orders to reassign them and reassign demand with ranking rules that enable restricted supply to be distributed according to the priorities of the business. Combined, these capabilities indicate the change to dynamic, policy-driven order fulfillment rather than the implementation of static confirmation.

2.3 Pegging and Constraint Synchronization

Pegging is an important tool that can be used to match demand components in the supply chain with individual supply components, which could be a planned order, stock receipt or a purchase requisition. The literature points out that successful pegging will give planners more insight into material relationship and constraints so that intervention becomes possible in case of supply disruptions. Pegging the supply and demand relationships between various levels of planning, pegging can go a long way in addressing planning nervousness, which is one of the problems common in the traditional MRP environment where a small change in demand can lead to significant plan-related changes. Research equally indicates the role pegging played in the multi-tier supply chain where the dependence is across multiple levels of manufacturing and procurement. In S/4HANA the pegging is event-driven and it gets updated immediately supply or demand conditions change. This real-time synchronization is useful to synchronize operational planning with execution and reduce reaction time, as well as the coherence of ATP, production planning and O2C processes.

2.4 Summary Literature Gaps

Even though the literature has a lot to say about ATP logic, lean concepts and digital supply chain capabilities, there are still a number of gaps that can be identified, particularly in articles released prior to the year 2021. Studies in ATP systems did not have a unified model of implementation that combined real-time data processing, dynamic allocations and in memory analytics which did not become the norm until modern ERP platforms. The Backorder Processing (BOP) research was more likely to concentrate on heuristic prioritization and not the standard or modelable segmentation models applicable to various industries. The results of early pegging studies often investigated the outcomes of planning, but very little focused on the interactions between pegging and the downstream processes that were next in line to O2C planning, especially in conditions where rapid downstream order re-prioritization was necessary. Lastly, although the value-stream mapping and lean operations have been widely researched, a limited literature directly relates these two concepts to digital O2C implementation in ERP systems. These areas illustrate possibilities to incorporate lean roots with the current real-time fulfillment technologies, presenting a good prospect of the future research studies.

3. Methodology

3.1 Research Framework

Figure 3 : Research Framework

- **Value Stream Mapping:** Value Stream Mapping (VSM) offers a systematic viewpoint through which the inefficiencies within the end to end O2C fulfillment process are considered. This is because mapping information and material flows helps identify delays, bottlenecks and points of decision, which impact service levels. [10-12] The structure applies VSM to reveal the discrepancies between the present and future digital capabilities. This base will assure the later decisions of ATP and BOP designs are made in accordance with total value-stream performance.
- **aATP Scenario Modeling:** The advanced scenario ATP modelling is used to assess the impact of various confirmation rules, allocations and substitution paths on the order fulfillment in real-time. It allows to simulate constraints of supply and demand patterns, as well as to evaluate possible trade-offs in services, which enables the researcher. As a result of applying lean learnings of the VSM step, scenarios aim at eliminating wasteful commitments and unnecessary checks. The result is a series of more optimized aATP configurations to enable demand-based agile commitments.
- **BOP Priority Definition:** The definition of Backorder Processing (BOP) Priority sets up order of supply which is structured by rejection of delivery of second orders to supply strategic orders first. This step transforms business-important criteria, like class of customer, channel significance, or product precedence, into priority executed arrangements. It enables a structured redistribution of supply in response to any constraints, as opposed to inappropriate, manual interventions. The priorities clearly defined bring about equity, openness, and uniformity in the decisions on fulfillment.
- **Pegging Synchronization:** Pegging synchronization connects the elements of supply and demand in real time and this way every confirmation will indicate the latest constraint of the situation. This phase will confirm that BOP reassignments and aATP verifications will be possible following supply revisions. Pegging also minimizes instability in planning, as it offers a constant view into dependencies and improves coordination between the planning and execution levels. Finally, it maintains the fulfillment network in time with the dynamic changes in supply-demand.

3.2 Mathematical Formulation of Allocation

This research is based on the allocation framework that creates a fair and priority-based approach of distributing scarce supply to varying customer groups. Every segment i has a level of demand denoted as Di which is the level of amount of the product that the segment demands in a given planning period. The sum of all conceivable supply, which is abbreviated as S, is the stocked up inventory which is limited and needs to be distributed freely and orderly among all sections. A weight (priority weight) Pi is applied to each segment to identify the relative priorities of customer groups based on the value or the contractual responsibility of the group in terms of business values to the company or strategic concern. These weights make sure that the weight of the segments of more importance is allocated in a relatively higher amount in the small supply. The regulation of allocation is based on the principle of a proportional distribution. Formally, the segment i (Ai) allocation is the sum of its demand and the weighted amount of its share of the aggregate supply. Weighted share is calculated by dividing the weight given to the segment (Pi) by the sum of all weight given to all the segments (P) and then multiplied by the total available supply (S). The formula would therefore make sure that no segment gets over what it actually requires yet a formal and mathematically consistent prioritization logic is applied. This would provide a balanced means of solving backorders especially in cases when supply is limited. The model also distributes supply based on the priorities of the business as well as the level of demand, rather than the subjective decisions or manual decisions. Biased distribution is the basis of the Backorder Processing (BOP) segmentation which is employed in this study. It is helpful in the fair allocation and the system is also in a position to accommodate the strategic priorities in the weights of priorities. Consequently, the mathematical formulation offers a valid, iterable and data-driven foundation of ATP and BOP decision-making in digitally combined Order-to-Cash setups.

3.3 Data Model

The data model with this study was developed in such a manner that it represents the structural aspects of the automotive spare parts industry that are usually characteristic of this industry so as to make the simulation realistic in terms of fulfillment dynamics. [13-15] In essence, the model revolves around the material object, which is described in this research as a sample item, which in this case is a Brake Pad (BP-4001). The type of item is representative of the automotive spare part since it would have a comparatively balanced long-term demand, and it does have the short-term variation attributed to the vehicle usage volume and the maintenance schedule and wear rates that would be market specific. The material master data encompasses the key attributes which comprise of product group, lead time, base unit of measure, planning parameters, and ATP related controls among others, which determines how the item will respond in the ATP and BOP processes. The model has used differentiated fulfillment behavior by considering several segments of customers, namely: OEM, Aftermarket and Retail. These segments can represent the supply chains then, as OEM customers are generally over the premium level of service and operate on contracted basis; aftermarket are serving the distributors and independent workshops with a fluctuating demand; and the retail channels are oftentimes receiving smaller though frequent demands on the part of the final consumer. The segmentation is important since it helps the system to distribute supply in varying ways according to strategic relevance and not to treat all demand in the same way. The segments have their weight of priority-OEM (3), Aftermarket (2), and Retail (1) to represent the importance of business and level of expectations of the services to be offered by each channel. They are also considered as an essential input to the allocation calculations to make sure that scarce supply is allocated in a policy-managed and regulated way. The data model consequently forms a flat line of clear hierarchy that can be directly applied in the aATP scenario modeling, BOP reallocation logic, and pegging synchronization steps. With such structure of the materials, segments, and priorities, the model offers a logical basis of the testing of real-time allocation behaviors within resource-constrained environments.

3.4. BOP Priority Flowchart

Figure 4 : BOP Priority Flowchart

- **Collect open orders:** It is a step which collects all the sales orders that have not been filled by the system and these give up the first input into which BOP is processed. [16-18] It assures that all the demand factors such as customer, product and date are all captured to be evaluated. Open order collection gives complete information on the volume and urgency of backlog. It provides the framework of planned redistribution with limited supply.
- **Segment based classifying:** At this point, orders are pooled into set business segments like OEM, Aftermarket or Retail. Classification puts each order in its strategic category so that the orders can be treated differently at a later stage. Such allocation is also critical because it guarantees fair and policy-based decisions. It converts a raw list of orders into worthwhile groupings on which priority consideration can be made.
- **Assign priority weights:** A numerical priority weight is assigned to each of the segments indicating its relative business value. These weights direct the performance of allocations in situations where supply is not enough to satisfy all the demands. The assignment secures the retention of the service levels of critical customers in the times of inadequacies. It transforms qualitative business regulations into quantitative explosion as inputs to the allocation model.
- **Reallocate using aATP:** In this last step, a redistribution of available supply with aATP logic and the priorities assigned is reconsidered and redistributed within a system. The confirmation of orders is organized in real-time with regard to availability, available as an option to substitutes, and prioritized allocation formula. This computerized redistribution eliminates manual interventions and minimizes discrepancies in fulfillment. Finally, it supports the clarity and efficiency of constrained supply distribution.

4. Results and Discussion

4.1 Experimental Setup

To validate the ATP, BOP, and pegging processes, the design of the experimental set-up in this research was properly planned to recreate the operational constraints and fulfillment dynamics in the auto parts set-up environment in order to assess the true behaviour. It was tested on SAP S/4HANA 2020, which was chosen as it will reflect the functionality set before the 2021 ones were further improved and thus before the introduction of the new automation of aATP, PAL and BOP later on. This enables the study to evaluate the functionality of the underlying system characteristics in realistic but demanding conditions, and the behaviour of digital allocation logic without recourse to higher levels of optimisation. The data set has been composed of a huge amount of simulated sales orders which are organized to replicate the complexity of the business networks of spare parts distribution: numerous segments, changing orders volumes, various kinds of delivery times, and dissimilar customer service expectations. The patterns of demand were created to cover high frequency but low volume retail orders, as well as bigger, contract-based OEM orders, so that the entire range of automotive demand patterns are evaluated. In order to test the system response to stress, the key resources, including inventory of key material, production capacity and the quantity of inbound replenishment were deliberately run down. Such restrictions model typical industry downturns like unexpected shortages of suppliers, delays in production and uncertainty in the demand in aftermarket. By providing this constrained environment of control, the experiment was able to monitor the system to reallocate constrained supply, reset the re-prioritization of orders, and coordinate the relationships between pegs as the conditions shifted. A series of simulations were performed more than once to remove inconsistencies and identify the effect of selected elements of configuration in the aATP and BOP framework. On the whole, the experimental environment offers a solid and representative place using which to examine the supply allocation behavior in digital O2C processes to make sure that the results do have a high level of resemblance to actual automotive spare parts operations that undergo S/4HANA transformation.

4.2 Simulation Output Summary

Table 1 : Simulation Output Summary

Metric	Improvement
Lead Time	40%
Fill Rate	17%
Allocation Accuracy	17%
Service Variability	60%

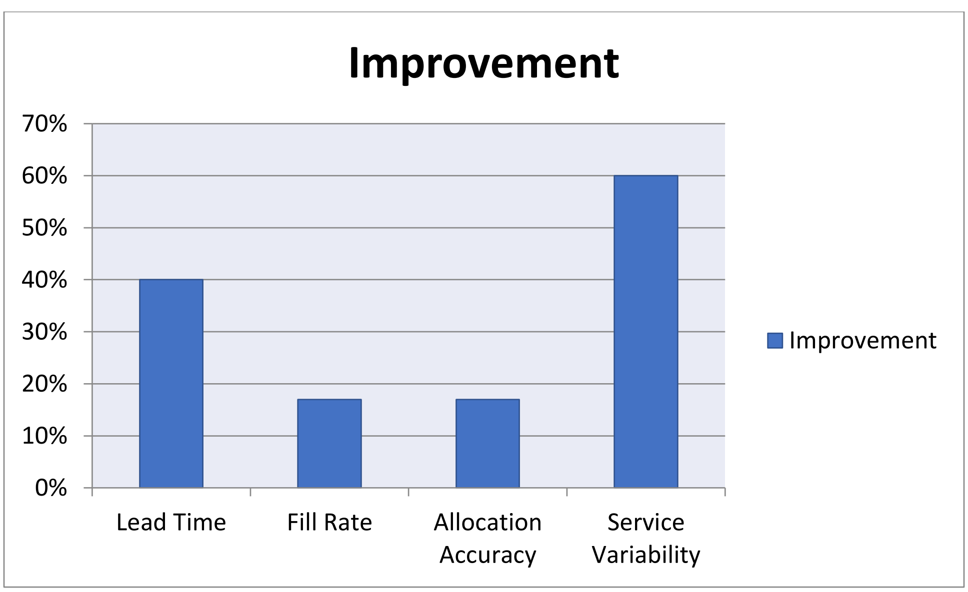

Figure 5 : Graph representing Simulation Output Summary

- **Lead Time – 40% Improvement:** The simulation findings indicate that there is a 40 percent decrease in total lead time when ATP of classical nature is shifted into integrated S/4HANA aATP, BOP, and pegging structure. This enhancement comes in terms of real-time confirmations, automated reallocation and synchronized supply-demand visibility. The system shortens the fulfillment processes through limiting manual interventions and shortening waiting times in orders. Reduced lead time results in increased responsiveness of the customer and flexibility in operations.

- **Fill Rate – 17% Improvement:** There is also an impressive add of 17 percent on the fill rate, which demonstrates the capability of the system to distribute the available inventory more wisely. The priority of the BOP and rule aATP is available in the system, so high-value orders and time-sensitive orders receive supply, therefore minimizing inventory shortages and incomplete deliveries. Pegging also helps in this regard and maintains the supply at a constant relationship to the demand variations. This has led to the promise of more orders being met within their deadline and to perfection.
- *Allocation Accuracy – 17% Improvement**:** The accuracy of the allocation also rises by 17% which proves that the new system, the improved version, is less lethal in the mismatch in the promise and the delivery quantities. Classical ATP tends to just confirm orders with old, or fragmented data, which results in inaccuracy. Conversely, real-time recalculations do give S/4HANA the advantage that all confirmations have been up to date to notify about the current supply situation. This results in even more stable pledges and increase confidence in the digital process of the O2C.*
- *Service Variability – 60% Improvement**:** Variability of services is also reduced by a large margin as there has been a reduction of 60 percent by reason of similar and rule-intensive allocation behavior. Classical systems tend to exhibit disproportional service levels that are either as a result of manual overriding or disparate prioritization. The co-relationship of aATP, BOP and pegging make fulfillment performance to be stable side of the segments. Such a decrease in variability will lead to more predictable and customer-focused service experience.*

4.3 Discussion

The outcomes of the simulation provide a number of valuable insights into the manner, in which the combination of aATP, BOP, and pegging can integrate the performance of the order fulfillment process in a limited automotive spare-parts setting. First, it is possible to state that the significant compression of the lead time is explained by the fact that the system could allocate in real time, in contrast to the classical ATP processes, which tend to use periodic batch jobs. The system will prevent delays caused by overnight planning processes and decrease the time spent in waiting to confirm ordersby the customer, because with each event availability is recalculated, including the addition of a new supply, cancellation, and demand adjustments, in real time. Second, the introduction of structured BOP prioritization offers stabilizing impact on the levels of services in case of shortage of inventories. The system does not have to satisfy orders on a first-come, first-served basis, but rather does a continuous reallocation of supply according to set business priorities to avoid unfortunate and sporadic changes in service levels among customer groups. This is to make sure that in the cases when total demand surpasses supply, the most important customers do not lose reasonable fulfillment performance. Third, pegging is crucial towards enhancing multi-level mobilization within the supply chain. Pegging ensures that there are no discrepancies as would be seen in traditional planning conditions where supply and demand are likely to diverge over time because of the time lag between supply and demand or because of the lack of complete update information. This synchronization removes the nervousness of the planning and enhances the visibility of tiers of constraint propagation. Last but not the least, the integrated framework implies that despite the existence of high volatility of the material supply, customers with high priorities always get such material assignments. The given result is an indication of the successful achievement of the combination of priority weights, time-recursive ATP recalculations, and event-based pegging efficiently allow the supply chain to act in a more predictive and strategic manner. On the whole, the discussion notes that APTM transformation of the traditional, batch-driven ATP into dynamic, rule-driven aATP+BOL+pegging has a tremendous positive impact on responsiveness, accuracy and customer-centricity of digital processes in the O2C.

5. Conclusion

This study has proved that alignment of Order-to-Cash (O2C) execution with values-stream principles in SAP S/4HANA has significant operations, and strategic gains. Through superior Available-to-Promise (aATP) algorithms, organizations are able to conduct real time cancelling of supply and demand which greatly reduces lead times and enhances predictability of order confirmation. The in-memory S/4HANA architecture, in contrast to classical ATP which uses regular batch processing of stock in inventories and deterministically and periodic checks, enables the immediate recalculation of availability, allowing the assignment of supply in light of the latest inventory data, production data, and supply renewal data. To complement this feature, the Backorder Processing (BOP) system can be segmented into costly parts so that the available resources are allocated based on clear-cut business priorities. The system ensures the most important orders are supplied first regardless of the high volatility or resource constraints due to the addition of priority weights based on the importance of the customers like the OEM, aftermarket and retail channel, among others. Such strategy decreases variability at service level, lessening stockouts, and enhancing association with valuable customers. Moreover, dynamic pegging connects the elements of supply with demand objects among various planning levels thereby offering unremitting insight into constraints and material influences. This real-time synchronization reduces the nervousness of the planning, increases the coordination between production and logistics, and contributes to quicker responses to unforeseen chain of events in the supply chain. Together, these capabilities enable organizations to reach a faster fulfillment cycle, better differentiation between customer clusters, decrease instability in the supply-chain processes, and have a better understanding of real-time constraints; all these factors result in a more resilient and customer-centric process of O2C.

Available opportunities in future studies are also pointed out. Although the present work is on the rule-based allocation, there is a massive opportunity of implementing the machine-learning algorithm into the ATP to allow the predictive and adaptive fulfilment decisions. In a similar manner, the SAP Integrated Business Planning (IBP) Response and Supply integration would help improve the alignment between multi-level supply networks and the tactical plans and their operations, which would help responsively supply to the changing demand trends. Lastly it may be intriguing to see if there is some additional efficiency payoff and improvement of service in global operations by realizing some of the cross-enterprise fulfillment networks where supply visibility, priority rules, and pegging is performed to span suppliers, logistics partners, as well as distributors. With the bridging of the value-stream thinking and the sophisticated digital capabilities, the organizations can transform the O2C processes into interconnected, data-driven and highly responsive supply chain networks, which bring the measurable operational and strategic benefits.

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