

Revolutionizing Supply Chain with Cloud Based Applications

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Abstract The cloud technologies along with Machine Learning are now challenging the paradigm of transactions by improving existing or enabling new capabilities in all the business domains. Cloud has already proven to be a game changer in various business scenarios. This paper explores various benefits and use cases of cloud applications and Machine Learning in supply chain management and discusses considerations while moving Supply Chain Management Processes to the cloud.

Keywords Supply Chain, Business Transformation, Cloud, Machine Learning

1. Introduction

Supply chain management plays an important role in the business growth of any industry. Nowadays, businesses are not competing, it's the supply chains that are competing. It is the reason companies are now shifting their focus on transforming supply chain management through technological advancements. Cloud computing is one such evolving technology that businesses are continuously adapting to enhance overall efficiency. Cloud computing induces a large-scale transformation in the traditional supply chain, making it more innovative and dynamic. This paper explores various benefits and strategies, a cloud-based solution along with Machine learning can make a major impact on supply chain management of an organization.

2. Value of Cloud and Machine Learning in Supply Chain

In today's fast paced, highly competitive global environment, circumstances are deriving the demand for a more effective model of delivering services to customers. The number of partners and suppliers that collaborate to deliver a product or service is very high in supply chain industry. The supply chains of today are highly fragmented with silos of information that make it nearly impossible to share information with trading partners. Businesses need technology platforms that empower them to visualize a product in every stage of its lifecycle, in real time, from raw

materials through delivery to end customer. Management must be able to make quick decisions to re-route shipments, locate containers, and collaborate with suppliers to meet customer demand based on the data and machine learning algorithms.

Businesses need to communicate and share data with their entire trade network. To do this, you need solutions that go beyond the four walls of your business, allow you to track and trace products, shipments, and orders, and make it easy to share massive amounts of information across an entire global trade network. In other words, you need the cloud!

3. Cloud Versus Legacy Applications

Traditional on-premise enterprise software solutions, either custom-built or packaged software, are often referred to as legacy applications. Legacy applications are not at all bad, in fact they may provide a powerful solution and rich features. But in a fast-changing supply chain, too often the legacy software addresses outdated business challenges. These applications are difficult to maintain and keep pace with business demand and typically require custom programming to make them do what you want and need to run your business. The older the system, the more susceptible it is to disruption when modified. Legacy systems [7] limit themselves in terms of data collection which is a key to apply machine algorithms.

The value of modern cloud-based solutions is that they are architected from the ground up to be highly configurable in anticipation of business change. The need for collaboration and the system's interoperability are now recognized as table stakes for success in the global supply chain. Users can facilitate on-demand changes in customer business rules, readily introduce new transport event messages with trading partners, enable rich reporting and data visualization, and

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other important capabilities that constrain legacy systems. And when software modification is needed, studies show that solutions built with modern SaaS technologies can be quickly modified for less than 20% of the cost to modify a legacy application.

4. Benefits of Cloud Based Applications and Machine Learning

4.1. Intelligence and Automation

Previously, analysis of data gathering required both a data entry clerk and a person to conduct data analysis. The cloud, in conjunction with the Internet of Things, has enabled rapid collection of data from various resources and analysis of this data. As a result, businesses can eradicate these former “human” positions in favour a service that performs the same results one an exponentially faster scale. Data sets have become huge. Machine learning can be used to predict patterns in this gigantic data sets. Ultimately, this allows the business to make better decisions for how daily activities behave. Automatic orders and supplies based on triggers are some of the examples machine learning can help automate the supply chain.

4.2. Integration of Multiple Business Platforms

As more businesses have accessed supply chain management providers, a great deal of platforms have been created to facilitate this change. Unfortunately, many of these platforms do not coexist well with one another. The use of cloud technology enables multiple platforms to work with one another through a series of standardized protocols. Therefore, the previously existing digital boundaries between rapid communication and order fulfillment become non-existent. An example of such technology is Service oriented Architecture [10] where in various platforms communicate each other via web services. Webservices act as a black box to the consumer of that feature. For example, shipping address verification webservices can be used by order fulfilment company without having to understand the intricacies of address styles for all countries.

4.3. Real Time Visibility

These days, various actions happen at the same time. Often a times, the number of occurrences is too many to keep up with, resulting to an overload of information. However, cloud computing can ensure you stay up to date with happenings in the supply chain. For example, its super critical to screen a customer before an order is booked to make sure, you can ship the product to that country based on government regulations. Another example is ability to track products in real time.

Combining machine learning with advanced analytics, IoT sensors [8,9], and real-time monitoring can provide end-to-end visibility across various supply chains.

4.4. Adjusting to Market Volatilities

Manufacturing is no stranger to the damaging effects of market volatility. Less than a decade ago, the US saw the worst economic collapse since the Great Depression, and supply chain management providers must always be wary of how resources will be used in the event of a collapse. The use of cloud technology provides a buffer against market volatility. Essentially, partnerships between a supply chain management provider and a cloud host are subject to renegotiation, or even cancelation, if the market suddenly declines. As a result, the supply chain entity can minimize associated costs with the collapse and maintain service at competitive rates.

4.5. Visual Pattern Recognition

Machine learning [2,7] excels at visual pattern recognition, opening many potential applications in physical inspection and maintenance of physical assets across an entire supply chain network. Designed using algorithms that quickly seek put comparable patterns in multiple data sets, machine learning is also proving to be very effective at automating inbound quality inspection throughout logistics hubs, isolating product shipments with damage and wear. For example, using machine learning on top of cloud-based data, it can be easily identified if a shipping container or product were damaged, classify it by damage time, and recommend the best corrective action to repair the assets.

4.6. Forecasting Demand

Forecasting demand for new products including the causal factors that most drive new sales is an area machine learning is being applied to today with strong results. From the pragmatic approaches of asking channel partners, indirect and direct sales teams how many of a new product they will sell to using advanced statistical models, there is a wide variation in how companies forecast demand for a next-generation product. Machine learning [2] is proving to be valuable considering causal factors that influence demand yet had not been known of before.

4.7. Enhanced Scalability

Cloud based solutions help with the ease of scaling supply chain operations as needed. Whether you have an increased number of staff or customer base, cloud computing can help with the scaling of supply chain operations in a very efficient and affordable manner. In periods of high demand, supply chain can easily be scaled to cater for your needs.

4.8. No Geographic Boundaries

In close relation to integration of systems, cloud technologies remove physical and political boundaries from the supply chain management perspective. Since many cloud hosts rely on common practices for accessing, storage, and retrieval of cloud data, the same information may be altered from any place on the globe.

4.9. Enhanced Security Measures

Since cloud hosts must abide by strict government and public perception standards for maintaining privacy, such as medical and financial data, cloud technology brings state-of-the-art security measures [11] and practices to the forefront of supply chain management. Interconnectedness allows for massive security monitoring and implementation across all cloud-based digital planes while still maintaining communication and enhancing the flow of business practices.

4.10. Break-neck Speed

The speed with which companies can now perform supply chain operations and activities because of the efficiency provided by cloud is another benefit. The proactive identification and prediction of opportunities and risks will ensure that companies swing to action. Also, there is enhanced responsiveness to increase demand or the other things.

4.11. Cost Optimization

The greatest benefit of cloud technology on supply chain management providers is reduced operational costs. Throughout the supply chain, cloud technology can reduce the number of workers needed to perform specific tasks. For example, the cloud could be used to automatically generate a report of needed product at a specific warehouse, trigger the respective shipment, and account for the product when received at the destination. As a result of minimizing human-input within the order processing, those employees may be then reassigned to other physical aspects of the supply chain. Additionally, supply chain management providers reap the benefits of lower security, IT, data analysis, and more.

5. Considerations for Adopting Cloud Computing in Supply Chain

5.1. Taking a Strategic Approach

A strategic approach to implementation is always the key to success. This should recognize that not all supply chain processes are suitable candidates for migration to the cloud. Two categories of process may prove to be unsuited to cloud computing. First, complex and/or unique processes that require a heavy degree of customized processing are less likely to be delivered as cloud computing-based services initially. And second, processes that require heavy integration with either a physical flow or with other information systems—particularly those requiring ultrafast response times—are currently not well-suited to cloud. So which capabilities should be considered for deployment in the cloud—and how best to get underway? Companies are flocking in ever-increasing numbers to cloud's "everything-as-a-service" promise. But it is important to recognize that a reliance on traditional, in-house IT systems

and applications still exists. What has emerged is a more complex hybrid-technology landscape—one in which multiple emerging technologies must be assimilated with legacy systems. To transition effectively and manage in this hybrid world, organizations need deep knowledge, experience and insights into both cloud and legacy technologies. Moreover, they need the know-how, solutions, assets and implementation firepower to take optimal advantage of the unique opportunities that a hybrid model provides.

5.2. Prioritizing Business-Functions

5.2.1. Cloud for Sourcing and Procurement

This business function is a good candidate to move in cloud in the beginning, largely because of the rapid implementation, low cost and innovation provided by SaaS solutions. This can act as a quick win to gain ROI and adding significant business value to stakeholders.

5.2.2. Cloud for Manufacturing

On-premise is the dominant software delivery model for manufacturing management. However, there are alternative delivery models for software supporting environmental, health and safety activities, quality management, and business intelligence. This business function provides various avenues to move into cloud from a sub process perspective.

5.2.3. Cloud for Logistics

Cloud computing is rapidly maturing to support collaborative transportation management solutions (TMS) along with other aspects of transportation management, such as sourcing of network capacity, robust visibility and event management and ancillary functions, including freight pay and audit. These capabilities allow companies to "close the loop" on procure-to-pay processes and verify that improved performance can be delivered in carrier selection, track/pay/audit and spend analytics. In addition, SaaS solutions provide a central repository of global trade content that can be accessed on demand.

5.2.4. Cloud for Supply Chain Planning

Although levels of adoption in this segment are low, especially in large enterprises, the supply chain planning (SCP) market is expected to grow rapidly as current concerns—such as data security and ERP/cloud integration—are overcome. However, this can be a large success to enterprise, if implemented along with Machine learning solutions.

5.3. Understanding Organization Impact

As we have seen, cloud computing has the potential to create great value for supply chain organizations in every industry. At the same time, however, it is important to recognize how the centrifugal force of cloud computing

pushes greater IT power out to the entire business. Accordingly, more and more non-IT groups within an organization are now involved in IT purchasing decisions. According to a 2012 Everest Group study,⁵ 64 percent of stakeholders involved in cloud-solution purchases were from outside the IT function.

5.3.1. Architecture

In order to manage complex solution designs that may include combinations of managed cloud, virtual private cloud, private cloud and public cloud, a business architecture capability is required—one that pools resources and provides knowledge across key business functions and delivery needs of the organization.

5.3.2. Delivery

The service delivery environment today is highly complex in part because the architectural environment is more complex—a hybrid of legacy and cloud computing technologies. In response to that complexity, there is a growing need for management skills outside the traditional sweet spot of IT managers. These skills will need to span service integration, an informed buying capability, contract facilitation and monitoring, and vendor development.

5.3.3. Value

A value-creation function—which in some cases is an actual responsibility, akin to a program management office—works in concert with the business to assess and realize value from an IT initiative, drive innovation and provide an enhanced level of insight for stakeholders.

6. Use Cases

6.1. Shipping Container Company Moves to Oracle Cloud

In 2019, a leading intermodal container lessor company executed a cloud-first strategy to reduce costs, improve technology agility and scalability, use Machine learning to gain customer insight and enhance customer experience to become #1 in the container business. Prior this transformation, company was already processing approximately 13 million lease transactions a month from the legacy system, and it was taking approximately 10 days to close month end periods and thus impacting their overall supply chain processes along with revenue recognition. The firm worked with leading cloud implementation vendor to support the migration using Oracle Sourcing and Procurement cloud, Oracle Inventory Cloud and Oracle Financials cloud subscription. The firm leverages Oracle Business Intelligence cloud service, to chunk through millions of records to identify patterns through inbuilt statistical models, forecasting demand and able to raise a purchase order/maintenance service etc. with their depots

using automation in advance. With much improved system performance and ability to increase horsepower in cloud as needed, their month end process completes in less than 48 hours. The client quickly experienced the positive effects of this migration by avoiding an incremental outlay of around \$14M in costs that would have accrued had they continued to manage these transactions on premise. The client is experiencing capital cost savings, improved capacity, much higher speed and better customer and Depot experience and has gained significant optimization in supply chain processes.

6.2. Global Medical Devices Business Transformation

For a Large Global Medical Devices company, adherence to global trade regulations, with customer screening upfront were impediment to their business growth. Following an assessment exercise with a private consulting firm, it understood that transitioning to the cloud would be essential in meeting these challenges as developing these regulations in a legacy inhouse tool and to maintain them in an ever changing environment would be a nightmare. The firm started their cloud journey with an ERP Supply Chain Cloud [6] vendor selection and transformation project with the goal of realizing synergy targets through streamlining their SCM processes. The company chose Oracle Global Trade Management and Address verification Cloud Application and built integration with their inhouse Order management tool using Integration Platform As A Service (iPAAS) [16]. By layering trade data and milestones over the physical flow of goods, Global Trade Management helped gain unparalleled visibility and control over both orders and shipments to ensure adherence to global trade regulations. GTM helps them to screen customers and manage cross border trade. It also, increased their working capital utilization by ensuring that good started moving quickly and, since this is a cloud subscription service, customer did not have to invest large capital upfront and was able to realize ROI immediately along with streamlined supply chain processes. The success and speed of the transformation was paramount to the success of their operations.

6.3. Leading Provider of Plumbing and HVAC supplies Distributor Reinvents

A leading UK provider chose Oracle Cloud SCM because the integrated components of and the roadmap for Oracle's cloud-based application suite aligned with the stock forecasting, distribution management, procurement, and inventory management outcomes. They further needed to improve their customer service by streamlining supply chain processes across the enterprise. As supplier risk management becomes an increased priority for procurement, they were behind when it comes to using a modern solution. Implementing an automated solution that provides insights to enable real-time, data-driven decision making and increased supplier collaboration was critical to mitigate risk and create a strategic path. Implementing Oracle Cloud

SCM [6] has improved its on-time/in-full delivery helping boost company revenue by millions of pounds and reduced the onboarding/off-boarding suppliers using collaborative cloud platforms. The company now has a single view of inventory across its distribution network, as well as automated planned orders, which previously were manually processed three times a day. It has also automated supply and demand forecasting, helping it to forecast demand using multiple statistical models in Supply chain Planning cloud service leveraging out of the box provided solution models.

7. Conclusions

As thoroughly discussed, the concept of cloud computing and Machine Learning can be effectively used in the field of supply chain management facilitating the collaboration among the supply chain stakeholders through the integration of supply chain activities and predictive analysis. Therefore, now it's time to adopt the new collaborative thinking in supply chain management and enjoy the numerous benefits it offers such as real-time visibility, flexibility, and sustainability.

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