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Optimising supply chains in an unpredictable world with InterSystems Supply Chain Orchestrator



In the fast-paced and increasingly globalised world of supply chain management, timely and unified data is the lifeblood that keeps operations flowing smoothly. Gone are the days when businesses could rely on intuition and guesswork to manage their supply chains. Today, success hinges on the ability to gather, analyse, and act upon data in real-time. In this paper, we will explore the critical role that timely and unified data play in supply chain management and how it drives efficiency, resilience, and competitive advantage.

Introduction

Supply chain management (SCM) is the lifeblood of modern business, serving as the backbone that connects manufacturers, suppliers, distributors, retailers, and customers. In recent years, the landscape of supply chain management has evolved rapidly, presenting a myriad of challenges for businesses worldwide. These challenges, exacerbated by factors like globalisation, technological advancements, and unforeseen disruptions such as the COVID-19 pandemic, have forced companies to re-evaluate their strategies and adapt to survive in this dynamic environment. In this paper, we will explore the biggest challenges faced by supply chain management today and the role and importance of data in meeting those challenges.

We think this paper will be of interest and relevance CSCOs (Chief Supply Chain Officers), CIOs and CDOs (Chief Data Officers) in both traditional supply chain management and logistics services suppliers as well organisations with complex supply chains who are looking to understand how to overcome the challenges of providing timely, relevant, and high-quality data to optimise operations and improve customer experience. In it we will look at the importance of data in helping organisations to optimise their supply chains and keep pace with changes in their industry. We will consider the challenges and barriers preventing them from using their data to greatest effect. In the context of those challenges and barriers, we will consider how InterSystems Supply Chain Orchestrator solution, powered by InterSystems IRIS, addresses and solves the problems.

In this paper, we will explore the biggest challenges faced by supply chain management today and the role and importance of data in meeting those challenges.

Navigating the complex landscape: The biggest challenges for Supply Chain Management today

The COVID-19 pandemic exposed the vulnerability of global supply chains. Supply chains that were optimised for efficiency were ill-equipped to handle sudden disruptions. Building resilience into the supply chain is now a top priority for businesses. This involves diversifying suppliers, improving collaboration and integrated communications with partners, creating buffer inventories, and having contingency plans in place to respond swiftly to unforeseen events such as natural disasters, geopolitical conflicts, or health crises.

Maturity Models have been used extensively to show the characteristics of the most mature supply chains. *Figure 1* shows a maturity model from InterSystems.

Others can be found from analyst firms like IDC and Gartner, while most major consultancies carry out supply chain assessments that rely on underpinning maturity models in some form. Research from these firms suggest that only small percentages of organisations are at the most or the least mature levels. For example, a January 2023 white paper from IDC, sponsored by Opentext Corporation looked to two specific area of maturity: one in Business to Business (B2B) integration and the other in supply chain resiliency. In the former, only 9% of companies surveyed were at the most immature or the most mature stages of B2B integration. The figures for supply chain resiliency showed that 7% of respondents were at the most immature level while 6% were at the most mature.

In both cases a significant majority of respondents were making progress towards mature integrated and resilient supply chains. But clearly much still needs to be done. Let's look at the some of the individual pressures and challenges that need to be addressed.

Globalisation and complexity

One of the most prominent challenges in modern supply chain management is the globalisation of markets. Companies now source materials and products from all over the world, creating even more complex webs of suppliers and partners than in the past. Managing this global network effectively can be a logistical nightmare. Differences in time zones, languages, regulations, and cultures can lead to misunderstandings, delays, and increased costs. Navigating these complexities while maintaining efficiency is a continuous struggle.

Supply Chain Digital Transformation

DIGITAL MATURITY PROGRESSION

Initial State Disparate data sources

 Disparate
 Defined Strategy,

 data sources
 KPIs and Roadmap

 Inconsistent
 Validated

 metrics & targets
 Validated

 Multiple
 Aligned

 business partners
 Surtees

Level 0 Foundational Architecture, Connectivity

Customer & Connectivity Competitor Insight, Strategic Alignment Business architecture

> Data governance and integration

Systems rationalization and alignment Cloud, IoT platform infrastructure

Level 2

Visibility, Automation, Smart Assets Smart warehouse and smart logistics

Operational efficiency and waste reduction

Supply chain visibility Supply chain risk analytics and orchestration Predictive, adaptive control tower

Level 3

Advanced simulation and automated

Supply chain collaboration and integrated business

decision making

Predictive, Autonomous,

Adaptive

planning



Business Outcomes

Coherent strategy, metrics, goals Designed,

tailored customer experience

Industry-leading quality

Recognized innovator, early adopter Cost and service

advantaged

Additionally, the rise of e-commerce has transformed consumer expectations, with demands for faster, cheaper, and more convenient delivery options. It has also broadened the geographic reach of products and services resulting in the need to restructure physical logistics infrastructure. Meeting these demands while maintaining profitability is a significant challenge. Last-mile delivery, in particular, poses logistical and cost challenges. Several companies, including Amazon, Alphabet, Fedex, DHL and UPS have been experimenting with last-mile delivery using drones or autonomous vehicles in recent years as they explore innovative ways to enhance the efficiency and speed of their delivery operations in both dense urban and remote rural locations.

Supply chain visibility

In an era where information is abundant, it may come as a surprise that many supply chains still suffer from a lack of transparency and real-time visibility. In a 2021 Oxford Economics survey of over 1,000 senior supply chain executives, on Accenture's behalf, around 60% said their organisations struggled to easily access real-time data, make sense of the data they collect and use those insights to take action. This lack of visibility hampers decision-making and makes it difficult to identify issues or inefficiencies early on. Technologies like Cloud, the Internet of Things (IoT) and blockchain are being increasingly adopted to address this challenge by providing real-time data and traceability throughout the supply chain.

This lack of visibility has a particular impact on Inventory Management. Balancing inventory levels is a perpetual challenge for supply chain managers. On one hand, holding excess inventory ties up capital and increases storage costs. On the other hand, insufficient inventory can lead to stockouts and customer dissatisfaction. Optimising inventory management to strike the right balance is a complex task, made even more difficult by fluctuations in demand and supply disruptions. As a result, we are seeing companies with leading supply chain capabilities, like Proctor and Gamble, Toyota, Apple and Zara adapt their strategies, sometimes moving to a more, "just-in-case" stockholding model, or diversifying their supplier base or even re-balancing their whole manufacturing model to reduce the length of supply chains.

Cost pressures

Competitive pressures often force companies to continually seek ways to reduce costs within their supply chains. This drive for cost reduction can sometimes compromise quality, reliability, or ethical standards. Striking a balance between cost efficiency, maintaining high standards and meeting customer expectations is a persistent challenge.

Nowhere is this more apparent than with Transportation Costs and Sustainability. Transportation costs are a significant component of supply chain expenses. Rising fuel prices, congestion, and capacity constraints can lead to cost overruns. Moreover, the growing emphasis on sustainability requires supply chain managers to consider the environmental impact of their transportation choices. This includes reducing emissions, adopting green transportation methods, and optimising routes to minimise carbon footprints.

Regulatory compliance

Supply chains must adhere to a myriad of regulations and standards, which can vary significantly by region and industry. Ensuring compliance with these regulations is not only a legal requirement but also crucial for maintaining reputation and customer trust. Staying abreast of changing regulations and ensuring that the entire supply chain complies is a continuous challenge.

And so...

Supply chain managers must constantly evolve and innovate to stay competitive. While these challenges may seem daunting, they also present opportunities for companies to differentiate themselves through efficient, sustainable, and customer-centric supply chain practices. Those who can navigate these challenges successfully will be wellpositioned for success in the ever-evolving world of supply chain management. But to do that they need to master and increasingly large, diverse and complex set of data.

The importance of timely and accurate data in Supply Chain Management

n the fast-paced and increasingly globalised world of supply chain management, timely and unified data is the lifeblood that keeps operations flowing smoothly. Gone are the days when businesses could rely on intuition and guesswork to manage their supply chains. Today, success hinges on the ability to gather, analyse, and act upon data in real-time. Those who can harness the power of timely and unified data in supply chain management gain a significant competitive advantage. In this paper, we will explore the critical role that timely and unified data play in supply chain management and how it drives efficiency, resilience, and competitive advantage.

Data is the backbone of efficient and effective supply chain management. In an era characterised by global connectivity, increasing customer expectations, and the ever-present risk of disruptions, businesses that prioritise data-driven decision-making are better equipped to adapt and thrive. The importance of data in supply chain management cannot be overstated; it enables enhanced decision-making, improved forecasting, better inventory management, supplier performance monitoring, and risk mitigation. Moreover, it contributes to cost reduction, resource allocation, and ultimately, competitive advantage. To remain competitive and resilient in today's market, businesses need to invest in the collection, analysis, and utilisation of timely and unified data throughout their supply chains.

In today's highly competitive business environment, by making data-driven decisions, businesses can outmanoeuvre competitors by delivering products faster, more reliably, and at lower costs. This not only helps in retaining existing customers but also in attracting new ones.

It's one thing to talk about making data-driven decisions, it is quite another to ensure the availability and quality of that data. The advancement of SCM capabilities in the past few years have brought numerous data challenges that organisations must overcome to fully realise the potential benefits of data in their supply chain processes. Let's have a look at some of those challenges and the ways in which they can be overcome.

Data integration and fragmentation

One of the foremost challenges in SCM is data integration. Organisations often gather data from various sources such as suppliers, manufacturers, distributors, and retailers. These data sources may use different formats, standards, and technologies, making it challenging to integrate them seamlessly. Fragmented data can lead to inaccuracies, delays in decision-making, and inefficiencies in the supply chain.

Implementing robust data integration tools and platforms that can unify data from diverse sources and ensure data quality is crucial. Additionally, adopting common data standards and communication protocols can help improve data compatibility across the supply chain.

Data accuracy and quality

Data accuracy and quality are paramount in SCM, as decisions based on inaccurate or incomplete data can have significant consequences. Inaccurate inventory levels, demand forecasts, or supplier information can lead to stockouts, overstocking, and disruptions in the supply chain.

Organisations really need to establish data governance practices to maintain data accuracy and quality. This includes data validation, data cleansing, and regular data audits. Leveraging technologies like artificial intelligence (AI) and machine learning (ML) can also help identify and rectify data anomalies in real-time.

Data security and privacy

With the increasing reliance on digital technologies and data-driven decision-making, supply chains are becoming more vulnerable to cyber threats. Data breaches and cyberattacks can disrupt operations, compromise sensitive information, and damage brand reputation. Supply chain managers must invest in robust cybersecurity measures to protect their systems and data.

Robust cybersecurity measures, such as encryption, multi-factor authentication, and regular security audits, are essential to safeguard supply chain data. Compliance with data privacy regulations, such as the General Data Protection Regulation (GDPR) in Europe, is also crucial to protect customer and partner data.

Data volume and scalability

The sheer volume of data generated in the supply chain can be overwhelming. With the proliferation of IoT devices, sensors, and real-time tracking systems, organisations must contend with massive amounts of data that can strain their existing infrastructure and analytics capabilities.

Adopting scalable data storage and processing solutions, such as modern cloud-based platforms and big data technologies, can help manage the volume of data. Additionally, leveraging advanced analytics and predictive modelling can help organisations derive valuable insights from large datasets.

Data visibility and transparency

Supply chain stakeholders require real-time visibility into the movement of goods and information throughout the supply chain. Achieving this visibility can be challenging due to the complexity of supply chain networks and the siloed nature of data within organisations.

Implementing supply chain visibility solutions, such as track-and-trace technologies and collaborative platforms, can enhance transparency and enable stakeholders to monitor the status of shipments, inventory levels, and order fulfilment in real time.

Data analytics and predictive insights

While organisations collect vast amounts of data, deriving actionable insights from it remains a challenge. Many organisations struggle to leverage advanced analytics and predictive modelling to optimise their supply chain processes.

Investing in data analytics capabilities and talent is crucial for extracting valuable insights from supply chain data. Machine learning algorithms can help predict demand, optimise inventory levels, and identify areas for process improvement. Organisations should also foster a datadriven culture to encourage data-driven decision-making at all levels.

Data ownership and collaboration

Data in supply chains often involves multiple stakeholders, including suppliers, manufacturers, distributors, and retailers. Determining data ownership and fostering collaboration among these parties can be challenging, leading to data silos and inefficiencies.

It is important to establish clear data ownership agreements and foster collaboration through datasharing platforms and standards can improve data flow and collaboration among supply chain partners. Creating incentives for data sharing and joint analytics efforts can further promote collaboration.

Conclusion

Data challenges in supply chain management are a complex and evolving issue in today's business landscape. However, by addressing these challenges with the right strategies and technologies, organisations can unlock the full potential of data to optimise their supply chain operations, enhance customer satisfaction, reduce costs, and gain a competitive advantage in the marketplace. As supply chains continue to evolve and become increasingly digital, mastering these data challenges will be crucial for future success. In an era characterised by global connectivity, increasing customer expectations, and the ever-present risk of disruptions, businesses that prioritise data-driven decision-making are better equipped to adapt and thrive.

Solution: InterSystems Supply Chain Orchestrator

What is it?

 upply Chain Orchestrator is a solution that has been designed specifically to enable supply chain leaders and their teams to take full advantage of a comprehensive view of end-to-end supply chain data, from within their own enterprise, from suppliers, from logistics carriers and from customers. Data from all these sources are ingested into a supply chain specific, canonical data model (CDM) that includes API and Adaptors. This approach simplifies and speeds up the task of integrating data that doesn't always adhere to industry norms and taxonomies, into rationalised, normalised unified data for ease of analysis by the underpinning data platform. Additionally, it utilises what InterSystems calls, a smart data fabric (see Figure 2). Unlike existing data fabric tools, this Smart Data Fabric is a fully integrated solution that takes the data fabric approach one step further by embedding a wide range of analytics capabilities, including data exploration, business intelligence, natural language processing, and machine learning directly within the fabric, making it faster and easier for organisations to gain new insights and power intelligent predictive and prescriptive services and applications. This is described by InterSystems as the 'last mile' of analytics and positioned as an essential capability for generating real value from analytics technology. We are inclined to agree.

Supply Chain Orchestrator comes with analytics cubes preconfigured with a variety of supply chain specific topics such as sales orders, shipments, purchase orders, inventory etc. All of these are easily configurable with no coding required and facilitate the development of business outcome based KPIs.

The underpinning capabilities for the Supply Chain Orchestrator solution are founded on InterSystems IRIS Data Platform – introduced in 2018 as a single, unified platform that is the evolution of the company's Caché database, Ensemble interoperability platform, and its various analytics offerings. InterSystems IRIS is available for on-premises, cloud-based, and hybrid deployments, with Kubernetes support included.

The major elements of InterSystems IRIS include a horizontally and vertically scalable, multi-model, transactional-analytic database with full ACID compliance and immediate consistency; scalable and distributed application server(s); a Visual Studio Code-based development environment supporting several languages; a business process layer equipped with a rules engine, workflow and process orchestration; specific capabilities to support self-service-enabled analytics on structured or unstructured data; integration with streaming environments such as Apache Kafka; and on-demand access to data across multiple data sources via a data fabric architecture.



InterSystems Smart Data Fabric

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A connective thread to enable supply chain operational excellence

How does it work?

InterSystems IRIS stores data in multi-dimensional arrays. It supports relational, object (with full persistence, polymorphism, inheritance, and so forth, and with no requirement for object-relational mappings), document, and multi-dimensional models, and you can implement any number of these within the same environment, with full interoperability across these projections, and without any duplication of data. Note that you can read an array either vertically or horizontally, which means that you only need to store data once to support both transactions and analytics. This is a major differentiator for InterSystems.

InterSystems IRIS scales to accommodate large workloads and data sets on commodity hardware, with both database and application servers scaling out horizontally. Application code is decoupled from the persistence of data, which allows application servers to scale horizontally, independently of the number of shard servers, and to distribute workloads automatically, thereby supporting both performance and consistency. The environment is configured so that nodes are designated as query, transactional or hybrid servers, in order to cater for different workload resource requirements. Data ingestion can be parallelised directly to each shard server, providing high-performance ingestion for streaming data, and analytic queries can be pushed down to partitioned or sharded data tables, further increasing performance and resource efficiency. The software can also make direct use of graphics processors for pipelining and so forth.

Analytics capabilities provided by InterSystems IRIS include a new IntegratedML feature that allows you to create and use predictive models using automated SQL functions; support for PMML (Predictive Modelling Markup Language) and a server side Python runtime engine that allows native execution of predictive models; and a connector for leveraging Apache Spark-based machine learning and predictive models within the InterSystems IRIS environment (with parallel operations and high-speed connections from each of the shard servers into a Spark cluster). 'Adaptive Analytics' is another new feature that allows you to expose analytic data only once, in such a way that it can serve multiple use cases simultaneously. This is accomplished using a 'virtual cube' data model, an alternative to the OLAP cube, that can be assembled using a drag and drop interface and deployed to various business intelligence and visualisation tools, such as Tableau, Power BI, and Qlik (supported via an ODBC interface).

On that note, to facilitate the embedding of realtime business intelligence into operational applications, InterSystems IRIS includes a designer for creating dashboards; an analysis component, that can be employed by business users to explore and display relevant data; and an architect component, used to define your data model. For unstructured data, InterSystems IRIS includes natural language capabilities, and it supports Apache UIMA (Unified Information Management Architecture).

InterSystems IRIS provides several language options for development purposes. Apps that run on the platform directly can leverage SQL, Python, or ObjectScript (an in-house programming language) while external applications can also use Java, .Net or Node.js. Access to Embedded Python is a recent development and is a significant step forward in terms of access to trained developers (Python is more commonly used than ObjectScript) and programming libraries, without needing to sacrifice the performance, security, scalability and other benefits of an embedded approach. Notably, Python can run in the kernel directly on the data and is considered a 'full peer' to ObjectScript, meaning that the two can essentially be treated as interchangeable and cross-compatible within InterSystems IRIS.

Why should you care?

InterSystems Supply Chain Orchestrator offers, not only the ability to provide powerful analytics, on a public cloud or on-premises, using data from existing systems, but also as an underlying transactional platform for newly developed microservices-based applications to run on. InterSystems has a number of publicly available reference cases, like SPAR Austria, a member of SPAR, the world's largest food retailer consortium, which is a €4 billion company with more than 800 outlets and 600 SPAR merchants in Austria. SPAR Austria initially developed a complete warehouse management system utilising the InterSystems data platform for SPAR stores across Eastern Europe. This has now been extended to 1400 stores in Austria and is planned to be rolled out into Italy as well.

While SPAR used the IRIS data platform to develop, very rapidly, new custom applications, UST, a leading digital transformation solutions company required a different approach. It has integrated its Optum solution, based on SAP/Hana, with Supply Chain Orchestrator to deliver an Azure cloud-based Optimisation-as-a-Service that achieves enhanced supply chain orchestration and gains end-to-end visibility.

Such a hybrid real-time platform offers the opportunity to develop quickly new use cases to meet the never-normal environment of the 2020s. We consider the underlying InterSystems IRIS platform to be highly performant and scalable. It is, for instance, quite capable of processing transactions, indexing incoming data, and performing analytics on both real-time data and non-real-time data (that is, historical data and reference data) at scale and in real-time.

The platform also takes pains to make sure its analytics are not just highly effective in theory, but easy to build, access and use in practice. You can see this in practice with the specifically supply chain focused canonical data model and analytics cubes.

The bottom line

Recent developments to InterSystems IRIS, the development of a smart data fabric and introduction of InterSystems Supply Chain Orchestrator solution make for a compelling hybrid transactional/analytic offering for the management and optimisation of supply chains.

About the author

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Paul has had a 40-year career in industry that started in logistics with a variety of operational management roles. For the last 33 years he has worked in the IT industry, mostly in sales and marketing, covering everything from mainframes to personal computers, development tools to specific industry applications, IT services and outsourcing. In the last few years he has been a keen commentator and analyst of the data centre and cloud world. Until recently he was also a non-executive director in an NHS Clinical Commissioning Group.

Paul has a deep knowledge and understanding about the IT services market and is particularly interested in the impact of Cloud, Software Defined infrastructure, OpenStack, the Open Compute Project and new data centre models on both business users and IT vendors. His mix of business and IT experience, allied to a passionate belief in customer focus and "grown-up" marketing, has given him a particular capability in understanding and articulating the business benefits of technology. This enables him to advise businesses on the impact and benefits of particular technologies and services, and to help IT vendors position and promote their offerings more effectively.

Bloor overview

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