# ISB CTO

## Week 12: Digitisation of the Value Chain

Before discussing supply chain and value chain, and how data is playing an important role in our decision-making process, let's understand and place business analytics in perspective. Then, we will delve deeper into how analytics plays an important role in the supply chain, and vice versa.

When we think about business analytics, we first need to deal with data. The data analytics process involves many different steps, and we must start by obtaining the raw data and cleaning it. However, the real focus, especially in the supply chain and value chain, is on how to derive meaning from the data and create business value from it.

The first step is to visualise the supply chain data, which is covered in exploratory data analysis. For example, when looking at inventory data, we aim to understand how the inventory is distributed across different warehouses and what types of products are stored in these warehouses. When examining supply chain demand data, we may want to analyse how demand varies across different states and countries. Therefore, we use visualisation to become familiar with the insights that the data provides.

In supply chain and value chain discussions, confirmatory data analysis is of great importance. For instance, if we suspect that a supply chain partner is underperforming, we must verify this belief by collecting the right data and conducting thorough analytics.

### Unstructured Data: Challenges and Opportunities

The future of analytics lies in handling unstructured data, such as images, videos, and text. While we excel at working with numerical data, we are still emerging in dealing with images, videos, and text. Text analytics is an area where we have made significant progress, as it involves data from reviews, social media, and sometimes internal notes analysed within the supply chain domain.

Additionally, we are now receiving a substantial amount of facial recognition data and data related to how customers are responding in the supply chain, particularly in the form of videos. We anticipate a growing presence of such data in the supply chain domain as we increasingly adopt newer technologies like blockchain and install cameras everywhere. This shift is set to transform the shape of supply chain operations.

Once we comprehend all these data analytics, we must consider how to translate them into business decisions.

## Understanding Supply Chain and Value Chain

When we think of a supply chain, it essentially deals with various processes. We need to consider the input, which is raw material, and the output, comprising our goods and services. However, between these endpoints, we also have resources that aid in transformation and are intertwined with processes.

Inputs are integral as they accompany the product, making them crucial for the supply chain. But we shouldn't overlook the significance of resources, as they form a part of

the overall cost of the supply chain. Data plays a pivotal role in addressing the different aspects of the supply chain: input, resources, and output. Supply chain management involves comprehensive management with a strong focus on analytics and optimisation.

Over the last five to ten years, we've witnessed a transformation in supply chain management, largely due to the emergence of substantial new data.

- Taking a value chain perspective, we need to recognise that each process should add value to the preceding activities.
- Identifying and eliminating unnecessary costs or steps is crucial, and data is the key to this understanding.
- It's essential to distinguish between supply chain and value chain, as they have distinct characteristics.

In supply chain management,

- We begin with procuring raw materials.
- Then we progress through logistics, assembly, production, sales, marketing, distribution, delivery, and customer support.

This approach applies to a wide range of tangible supply chains, from car manufacturers to service supply chains. The same principles can be seen in the airline industry or even in the way universities structure their courses. Everything, including a simple activity like getting a haircut, can be seen as a service supply chain that needs careful consideration. Although service supply chains share commonalities with traditional supply chains in terms of data usage, one significant difference lies in the variability of processes.

On the other hand, from the value chain perspective

- We begin with the customer's needs,
- This is followed by driving innovation, planning, development, training, and after-sales services

While supply chain and value chain are not identical, they are closely linked. They differ in their approaches but complement each other. When considering the digital component, a holistic view is crucial to enhance processes in both supply chain and value chain management. The fundamental distinction lies in how they start,

- Supply chain management primarily focussed on operational improvements and utilising data for that purpose,
- Value chain management emphasises on improving business processes and enhancing customer service through data utilisation.

Supply chain and value chain management are central to various businesses, whether we think of companies like Amazon or more traditional corporations like Honda and General Motors. These concepts are intricately connected with different aspects of businesses, encompassing marketing, information systems, finance, accounting, human resources, and more. Regardless of the industry, adopting a holistic view is essential for navigating the evolving business landscape.

## The Importance of Data in Supply Chain Management

One of the problems we have seen over decades in the supply chain management is that we try to look at it in silos. We try to improve different small components of the supply chain rather than improving it holistically. Supply chain is not just about one player; it involves many players. We have to deal with our suppliers, suppliers of suppliers, and sometimes our customers and customers of customers.

Let us now look at some well-known companies and their supply chains

- **Dell** began with a pull method, which means they would produce components when there was demand. To run such a supply chain effectively, a deep understanding of inventory needs for different parts is required. This led to a push for data analytics, the collection of various data types, and the use of concepts like AI and machine learning to optimise their supply chain.
- Traditional companies like car manufacturers, e.g., **Toyota**, have well-defined supply chains. Parts like nuts, bolts, tires, and components for car assembly are clearly defined as inputs. Heavy machinery aids in car production. However, when dealing with more intangible domains, managing data becomes more challenging.
- **Delta Airlines** is a service supply chain, that means the output is not a physical product but a service – moving people from one place to another. Determining the inputs and resources becomes complicated, blurring the lines between them, making analytics utilisation challenging.
- **Google's s**upply chain is very complex. In other words, defining the output is complex. Google's customers can be the users of its search results, but the revenue comes from advertisers. This creates a puzzle, as users indirectly benefit advertisers. In this supply chain, space for ads is critical and generated for each user. Data at the individual level becomes crucial for ad targeting, and Google's key resource is its algorithms.

### Intangible Supply Chains

Moving towards more intangible and service supply chains, data requirements become more critical due to high process variability. Reducing variability is essential, as it affects business outcomes. This context underscores the importance of data analysis in supply chain management.

Considering non-traditional supply chains, such as education at ISB, challenges arise in defining input, output, and resources. The students' knowledge gained after education is the output, while the knowledge they bring in is the input. Faculty and facilities serve as resources. Supply chain management principles apply, but the perspective and culture need adaptation.

When dealing with intangible supply chains, especially from a data perspective, shifting one's perspective and culture is essential to manage them effectively

### Supply Chain Management: Challenges and Opportunities

If we consider a basic supply chain consisting of one supplier, one wholesaler, one distributor, and one retailer, it's apparent that even a seemingly simple supply chain can be quite complex. The movement of items from one place to another may require various transportation modes and extensive information transfer.

- To prepare for future supply chains and maintain agility and competitiveness, we must understand the nuances involved, avoid blind spots, and create value. This necessitates a shift in mindset towards embracing change and learning from past successes and failures.
- When dealing with multiple suppliers across the globe, restricting data sharing led to inefficiencies in the supply chain. Safety issues, budget overruns, and operational disparities emerged due to limited data sharing. The ultimate goal is to find a balance where data can be shared with supply chain partners without compromising strategic interests.

### The Role of Analytics in Supply Chain

One of the primary reasons for the emphasis on analytics and supply chain disruptions is the substantial cost involved. Utilising data and analytics can significantly impact this cost and transform the supply chain and value chain, not only for individual companies but for society as a whole.

Logistics costs vary globally, with the US ranging from 7% to 9% of GDP and India's logistics costs accounting for 13% to 14% of GDP. This variation results from a combination of factors, including product types, infrastructure, efficiency, data usage, and analytics.

While the supply chain and value chain analytics field may not always be perceived as glamorous or high-tech, it holds immense potential. Overcoming challenges related to understanding, data availability, and bureaucracy is crucial to harnessing the potential of supply chain analytics and delivering value to society.

## Key Drivers of Supply Chains

Supply chains are influenced by various drivers, including transportation, inventory, facilities, and information. Data plays a substantial role in optimising these drivers, and modern supply chains rely heavily on analytics to remain competitive.

Companies like Amazon and Walmart leverage data to a significant extent. In the service sector, data-driven approaches are crucial. Executives and businesses must embrace data analytics to stay competitive and efficient in today's supply chain landscape.

Supply chains must strike a balance between efficiency and responsiveness.

- Efficiency aims to reduce costs
- Responsiveness focuses on quick and effective responses to customer demands.

- To balance efficiency and responsiveness, supply chains must consider product design. Products designed with flexibility in mind can enhance responsiveness.

For example, during the early days of the COVID-19 pandemic, the shortage of toilet paper highlighted the inefficiencies in the supply chain. A lack of modularity in product design made it challenging to adapt to changes in demand, leading to disruptions.

The toilet paper supply chain was characterised by inefficiency because of its product stability and the absence of a modular design. The surge in household demand and the drop in commercial demand during the pandemic revealed the lack of substitutability in product design.

This is how supply chains can address these issues:

- The supply chain needs to transfer information more rapidly from retailers to manufacturers, increase transparency, and take a holistic view.
- The focus should be on modular product designs that allow quick adaptation to changing demands.
- The initial costs may seem high, but the long-term benefits of efficient supply chains outweigh the investments.

**The Impact of Data in Supply Chain Management**

Efficiency and responsiveness are essential in supply chains. Data is the linchpin that can improve both dimensions. The surge in data collection in the late 90s and early 2000s, coupled with the adoption of ERP systems and sensor technologies, marked a turning point in the supply chain analytics landscape.

- **RFID tags** revolutionised supply chain data. Unlike barcodes, RFID tags transmit information, making them invaluable in the retail industry and warehouses. They have enhanced visibility and tracking, enabling better decision-making.
- **Blockchain technology** has ushered in a wealth of data in supply chain management, fostering transparency and security. The data-rich environment has led to improved decision-making and applications.

## Supply Chain Analytics

It can be divided into three key categories:

- Descriptive Analytics: Visualisation and data description, often fuelled by GPS and RFID data.
- Predictive Analytics: Demand forecasting at various levels, requiring network design, capacity planning, and production planning.
- Prescriptive Analytics: Focus on finding actionable business decisions and creating value from data.

While supply chain analytics have made significant strides, there is room for growth, particularly in prescriptive analytics. Society needs to harness the full potential of data to enhance supply chain decision-making.

### Techniques in Supply Chain Analytics

- To effectively manage supply chains, techniques such as moving averages and time series methods are employed, taking into account data collected over time.
- Prescriptive analytics relies on applications like mixed-integer programming and game theory, offering advanced insights into decision-making processes.

### Real-World Examples

- **HP** used supply chain analytics to decide which products to focus on. They considered not only profitability but also examined the entire supply chain for a comprehensive perspective.
- **Coca-Cola** utilised analytics for fleet planning, optimising how they manage and plan their delivery fleet.
- **Procter and Gamble** excels in multi-echelon inventory management, a complex task that requires innovative algorithms and thinking processes.
- **Waste Management Inc**, a major waste management company, harnessed data analytics to streamline vehicle routing, ensuring efficient utilisation.

## Reverse Supply Chain

There's a growing emphasis on reverse supply chain management, a significant component of overall supply chain costs. Data plays a crucial role in sharing information across partners in this context. Let us look at some examples

- **UPS** used RFID data to challenge the convention that left is always the right way. They leveraged analytics to create new rules and improve routing.
- **Harrah's Entertainment**, one of the world's largest casinos, pioneered data-driven customisation. They predicted pain points, used data to personalise services, and fine-tuned marketing initiatives through analytics.