Hochschule für
Wirtschaft und Recht Berlin
Berlin School of Economics and Law

Retail Industry

Digital SCOM and Smart Operations

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Retail Industry

Introduction

The retail industry consists of all companies that sell **goods and services** to consumers. There are many different retail sales and store types worldwide, including grocery, convenience, discounts, independents, department stores, DIY, electrical and specialty.

With the introduction of Industry 4.0 in 2010, the retail industry was also introduced to this phenomenon. But **Retail 4.0** is still a relatively novel concept for retailers worldwide.

Source: Har *et al.,* (2022)

Journey from Retail 1.0 - 4.0

Retail 1.0

Department stores started to pop up as mass manufacturing had started.

Retail 2.0

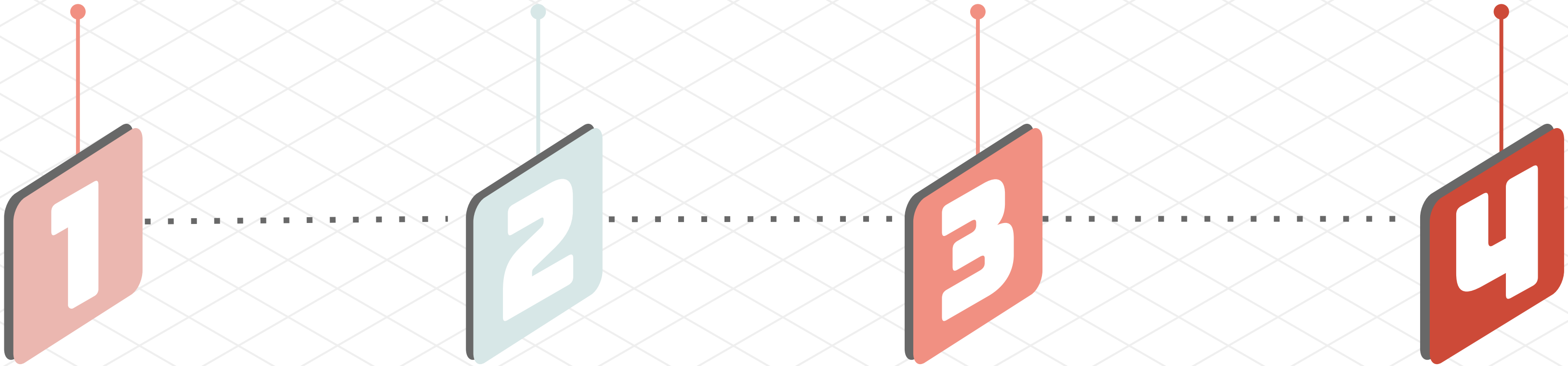
More and more shopping malls opened.

Retail 3.0

Consumers now enjoy online shopping globally through the internet

Retail 4.0

Artificial Intelligence (AI), Big Data Analytical (BDA), and Augmented Reality (AR) influence consumer behaviour.



Source: Har *et al.* (2022)

SCOM Trends and Challenges in the Retail Industry

The CORRIDOR-Model serves as a guiding framework for influence assessment and development of proactive or corrective actions.

- Ivanov *et al.,* (2019)

CORRIDOR Model

Complexity	Overview	Risk	Responsibility	Information	Dynamics	Organization	Re-design
Multichannel retailing, Large number of stores, number of stock keeping units (SKUs) and number of vendors, Sourcing through warehouse or directly to store adds to the complexity. Enhancing Visibility and Data Management by implementing **Implement real-time tracking systems**, **Logistics Partner Integration** etc.	Different players use incompatible data systems or have limited data sharing practices, lack of a universally adopted system for tracking products throughout the supply chain. **Blockchain Integration** and utilize existing **data sharing platforms** can improve supply chain transparency.	Natural Disasters, demand fluctuations, Product Obsolescence, Unethical Labor Practices, Product Recalls. **Supplier Diversification, Demand Forecasting and Inventory Management, Scenario Planning and Risk Assessment** can be adapted to mitigate these risks.	To ensure ethical labour practices, sustainable sourcing and be responsible towards the environment. Corporations must partner with **Sustainable Suppliers**, adopt **Sustainable Packaging** and implement **Responsible End-of-Life Management**	Retail Industry gathers information through ERP Systems, WMS, TMS or by Supplier data and Market Research. This data can be used as viable information by investing in **Data Management Platforms, Embracing Data Integration Tools** and build a **Data Driven Culture**.	The digital initiatives need to be more customer focussed and leverage the data analytics to identify inefficiencies and opportunities. Ensure the technologies that are implemented can integrate with the existing systems to avoid data silos and enable a holistic view of operations.	Internal communication channels must be clear and consistent and employees must be updated with key responsibilities, required skills, and performance expectations for each position regularly. **Culture of Accountability** and **Feedback** must be fostered.	Organization's must evaluate the current supply chain and pinpoint areas where inefficiencies occur. **Scenario Planning** and **Diversification** can be done to achieve Supply Chain preparedness in the future.

Source: Ekinci and Baykasoğlu, (2019), Undralla and Madhusudanan Pillai, (2020), Tang and Tomlin, (2008), Singhry, (2015), Haulder, Kumar and Shiwakoti, (2019), Kache and Seuring, (2017), Proctor and Doukakis, (2003)

SCOR Model-
A comparison of the traditional and the Digital solutions

Traditional Supply Chain

Plan- Supply chain planning process uses information from external and internal operations to balance aggregate demand and supply.

Source- Sourcing practice connects manufacturers with suppliers and is critical for manufacturing firms.

Make- The Make process includes the practices that efficiently transform raw materials into finished goods to meet supply chain demand in a timely manner.

Deliver- This stage is a critical link between the manufacturer and consumers and includes activities such as transportation planning, routing, and delivery scheduling.

Return- This process involves managing the return of defective or excess products and includes activities such as returns processing and reverse logistics.

Source: Zhou et al., (2011)

Effects of Digitalization on SCOM

Plan: Demand forecasting can be improved with machine learning and customer data analysis, leading to more accurate inventory planning. Digitalization allows for better collaboration between retailers and suppliers, optimizing sourcing and procurement.

Source: Digital marketplaces and e-procurement platforms streamline supplier selection and negotiation. Real-time data sharing improves visibility into supplier inventory and production, enabling just-in-time deliveries.

Make: Automation in warehouses and stores can improve efficiency and reduce costs. Inventory management systems with real-time data can optimize stock levels and reduce stockouts.

Deliver: Omnichannel fulfillment allows customers to choose their preferred delivery method (in-store pickup, home delivery, etc.). Last-mile delivery options are becoming more efficient with route optimization software and autonomous vehicles (still under development).

Return: Digital platforms facilitate easier returns and exchanges, improving customer satisfaction. Data from returns can be used to improve product quality and assortment planning.

Source: Carbonneau *et al*., (2008)
Feizabadi, (2020)

Digital solutions facilitating the fundamental SCOR Processes

Demand Forecasting

Machine Learning (ML): ML algorithms analyze vast amounts of sales data, customer behavior, and market trends to predict future demand with greater accuracy.

Advanced Analytics Tools: Retailers leverage data analytics tools to identify buying patterns, seasonality factors, and external influences that can impact demand. This empowers data-driven decisions for promotions, product assortments, and allocation across stores.

- ARIMA/SARIMA - (Autoregressive Integrated Moving Average) WALMART, AMAZON
- Long Short-Term Memory (LSTM) Networks - SEPHORA

Sourcing & Procurement

Digital Marketplaces & E-Procurement Platforms: These online platforms connect retailers with a wider pool of suppliers, facilitating efficient sourcing and competitive negotiations.

Supplier Relationship Management (SRM) Systems: SRM systems foster collaboration between retailers and suppliers. They provide real-time visibility into supplier inventory levels and production schedules, enabling just-in-time deliveries and better planning for potential disruptions.

- Coupa - NESTLE, ESPRIT, ZALANDO
- SAP Ariba - NESTLE, COOP
- Basware SRM system - MACY'S

Inventory Management

Cloud-Based Inventory Management Systems (IMS): Cloud-based IMS offer real-time data on stock levels across warehouses and stores. This allows retailers to dynamically adjust inventory allocation based on demand fluctuations and optimize stock levels.

Radio Frequency Identification (RFID) Technology: RFID tags attached to products provide greater visibility into inventory movement throughout the supply chain. This allows for more accurate stock tracking, reduces shrinkage, and facilitates cycle counting.

- Warehouse Management Systems (WMS) - Target, HOME DEPOT
- RFID - Walmart, ZARA, SEPHORA

Supply chain management

Supply Chain Management (SCM) Software: Integrated SCM software platforms connect all aspects of the supply chain – from planning and procurement to fulfillment and returns. This enhances collaboration between internal departments and external partners.

Data Sharing Platforms: Secure data sharing platforms enable real-time information exchange between retailers, suppliers, and logistics providers. This fosters transparency and facilitates proactive decision-making based on shared data insights.

- Microsoft ONEDRIVE
- BOX - STITCH FIX

Source: Hasan et al., (n.d.), Zhao et al., (2020), Coupa (n.d.), SAP, (n.d.), Box, (2018)

Case examples for fundamental SCOR Processes

Plan-Sephora uses machine learning algorithms like **LSTM** that analyze historical sales data to identify trends and predict future demand for specific products and for identifying users' personality traits based on social network data. Wella is on the verge of digitalization. They still do demand forecasting manually and their data is Excel based.

Source-Nestlé emphasizes efficient spend management. It uses **Coupa** to Streamline supplier discovery, qualification, and negotiation processes. And also to gain insights into spending patterns across various categories and identify cost-saving opportunities. Coupa also electronically manages contracts, tracks performance against agreed-upon terms, and automates contract renewals.

Make- Zara uses **C-design PLM** Software that centralizes product data (designs, specifications, materials) and streamlines collaboration between design teams, suppliers, and manufacturers. This allows for faster design iterations and efficient communication throughout the product development cycle.

Source: Chabbra, H. (2024), shareplm (n.d.), Coupa (n.d.)

Deliver- Amazon uses its own **Amazon Warehousing and Distribution** (AWD) software to manage inventory levels across a vast network of fulfillment centers where they optimize picking and packing processes to ensure fast order fulfillment. When inventory dips below a certain level, Amazon is notified and can move bulk stock from AWD warehouses to fulfillment centers closer to customers. Amazon warehouse in Munich saw a staggering increase in automation as they now use robots for Inbound, Sorting and Outbound processing.

Return- Zalando uses their own **Returns Solution software** called **ZRS** through which customers can initiate returns electronically. This captures return data upfront, including the reason for return, which helps with processing and can provide valuable customer insights.

E-commerce industry also uses **Process mining,** which can enable and accelerate reverse logistics optimization.

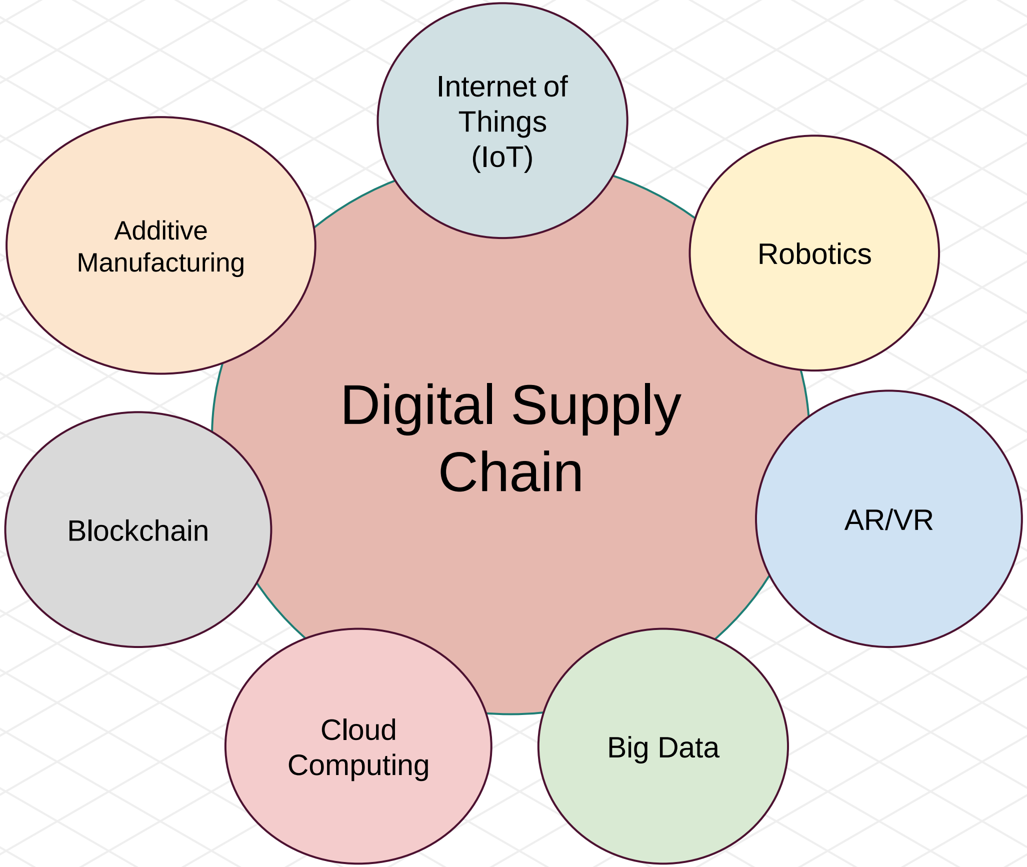
Traditional methods might only track returns up to a certain point. **Process mining** can analyze data from various systems (customer portals, warehouses, etc.) to create a comprehensive picture of the entire reverse logistics flow, revealing bottlenecks and inefficiencies.

Source: sell.amazon.com, (n.d.)
Rakshit, A. (2024)
Zalando Corporate Website, (2023)
Celonis, (n.d.)

Forging Competitive Advantage in the Digital Age:

Using Lean Philosophy

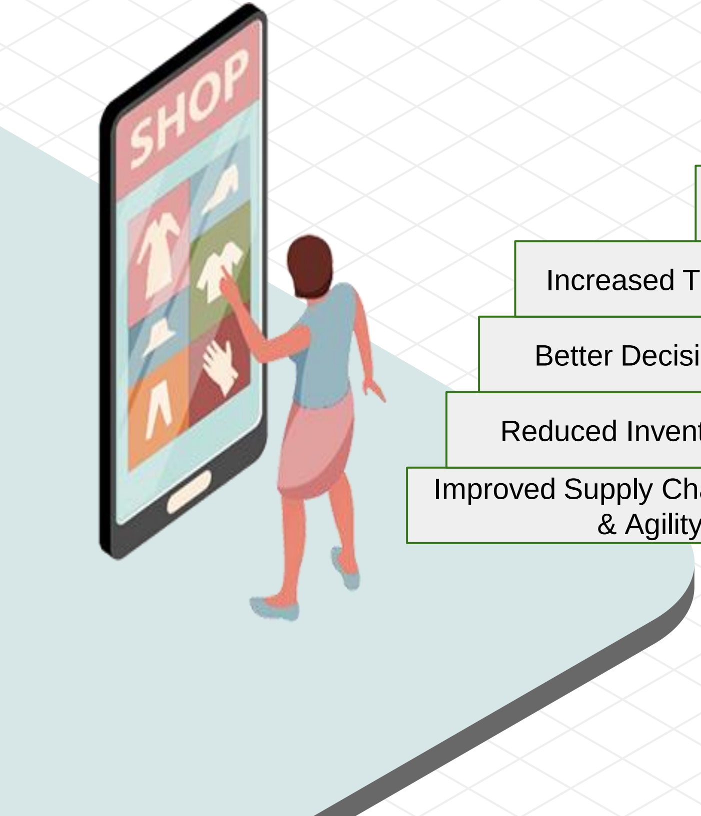
Digital Technologies in Supply Chain



Source: Haddud and Khare , (2020)

Fig 1: Key technologies powering digital supply chain

Competitive Advantage of Digitalizing Supply Chain



Maintaining Competitive Advantage

Increased Transparency

Better Decision-Making

Reduced Inventory Levels

Improved Supply Chain Flexibility & Agility

Potential Benefits of Digitalizing Supply Chain

Higher Sales volume and Profit generation

Reduction of Delivery time

Clear Visibility of Inventory

More Decentralized Warehousing

Better Understanding of Customer’s Requirement

Fig 2: Potential Benefits from Digitalizing Supply Chain

Source: Haddud and Khare, (2020)

Competitive Advantage using 7+x wastes in the Digital Era

1

Transportation:

Reduction of unnecessary movement by optimizing delivery routes using smart technologies

- **IoT Sensors:** Collects real-time data that may be used for identifying, locating, and assessing orders and existing assets using sensors like Global Positioning System (GPS), Geographic Information Systems (GIS), Radio Frequency Identification (RFID)
- **Big Data:** Improves Traceability for better tracking and flow of goods from production to deliver

2

Inventory:

To avoid excess of inventory, the retail industry is gradually shifting towards smart inventory by integrating production-line monitoring and predictive maintenance to increase the efficiency to track inventory levels.

- **Big Data:** Helps in data-driven decision-making, demand forecasting in return maintaining a stable inventory
- **Block Chain:** Helps in establishing improved documentation and communication between distribution centers and retail stores and provide up-to-date inventory record and transactions.
- **RFID and barcoding:** Helps to link the set of inventory data from store shelf to the back stockroom, central warehouses and other stores for full visibility and tracking

Source: Awwad *et al.*, (2018)
Chaterjee, (2019)
Fenik *et al.*, (2020)
Mondol, (2021)
Xu *et al.*, (2020)

Motion and Movement:

Eliminate unnecessary motion and movement of employees inside the warehouse.

3

- **Smart robots:** These helps in locating a product, pick them and place them in designated place or conveyor belt.
- **Automated Guided Vehicles(AGVs), Automated Mobile Robots(AMRs):** AI based automated robots transporting goods within the warehouse.
- **IoT Sensors:** Used on the robots for collecting data to optimize workflow, identify issue in picking process and enhance the robotic functions

Wait time:

Reduction in processing wait time, inventory pick up or order fulfillment by real-time tracking

4

- **Cloud Technologies:** Cloud based Order Management Systems (OMS) offers real-time visibility into order fulfillment process irrespective of location and allows faster processing as all the data is stored in a centralized system. Allows integration of Warehouse Management Systems (WMS) thereby enabling scalability and accessibility.
- **Big Data Analytics:** Used to analyze historical order fulfillment data to predict delays of reason.

Source: Andiyappillai, (2021)
Awwad *et al.*, (2018)
Zhang, (2023)
Har, (2022)

6

Overproduction:

Production planning consider material requirements planning (MRP), enterprise resource planning (ERP), just-in-time manufacturing, and collaborative planning, forecasting, and replenishment to reduce overproduction ahead of demand.

- **Artificial Intelligence (AI):** Analyze historical sales data, customer trends, and real-time market conditions using AI algorithms to predict future demands of products.
- **Big Data:** Collect and analyze vast amounts of data from various sources, including Point-of-sale(POS), social media, inventory management data to identify customer buying patterns, preferences and emerging trends and identifying potential overstocking respectively.
- **Cloud based collaboration:** Used to facilitate communication and data sharing for planning, forecasting, replenishment to reduce overproduction.

7

Overprocessing:

Reduce processing error and increase accuracy by automating data entry and streamlining workflows.

- **AI:** Helps in automating the data entry and order verification by using cloud computing infrastructure, in turn reducing the human errors and processing time.
- **Smart Robots:** Helps in picking and packing of orders during the processing.
- **Cloud Computing:** Cloud-based management system acts as a command center to optimize the entire order fulfillment process and increases collaboration within teams.

Source: Andiyappillai, (2021)
Bueno, (2018)
Awwad, et al., (2018)
Ren, (2019)

8

Defects:

Retail industry faces the most challenges with respect to defects. Reduction of with improved quality control, trainings and innovation in manufacturing techniques.

- **IoT:** Use of sensors to monitor and track factors like temperature, humidity, and vibration during storage and transportation
- **Blockchain:** Helps to maintain a tamper-proof record by tracking and tracing the products from raw materials to retail shelf.
- **3D Printing:** Helps in customized product design and production while reducing the risk of defects with traditional methods. (eg: NewBalance)
- **AR/VR:** Widely used for trainings, virtual testings and visualizations of product, conduct supplier audits with AR.

9

Wasting Resources:

Digitalization helps to reduce the waste in supply chain.

- Optimized inventory Management
- Demand Forecasting
- Improved transportation efficiency
- Reduced paperwork

Source: Ali, (2021)
NewBalance, (2019)
Salah *et al.*, (2020)
Sunny , (2020)

10

➔ **Not meeting customer requirements:**

Use of various digital technologies to meet consumer demands and obtain satisfaction:

- **BigData:** Analyze customer data with reviews and comments to understand and predict real-time customer needs and pricing strategy
- **Cloud-based Product Management Systems(PIM):** Ensures the real-time updates on products to various teams, thereby resulting in quick corrections and streamlined processes.
- **AI powered chatbots:** Personalized suggestions based on past purchase and browse history (eg: Myntra chatbot Maya, mystylist).
- **AR:** Virtual try on for clothes, makeup, furniture etc. (eg: Nykaa, Myntra, Ikea)

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➔ **Resource Utilization:**

The increase in digitalization is creating a major skill gap in supply chain.

- **Data Analytics:** Human machine collaboration by leveraging human judgements alongside data analytics to increase efficiency in decision-making.
- **AR/VR:** Knowledge sharing and trainings to handle and operate new emerging technologies.

Source: Awwad, (2018)
Pitt, (2020)

Walmart Digital Supply Chain

- Alphabots: 95% of orders can be picked under 12 minutes
- Drone delivery
- Automated market fulfillment centers

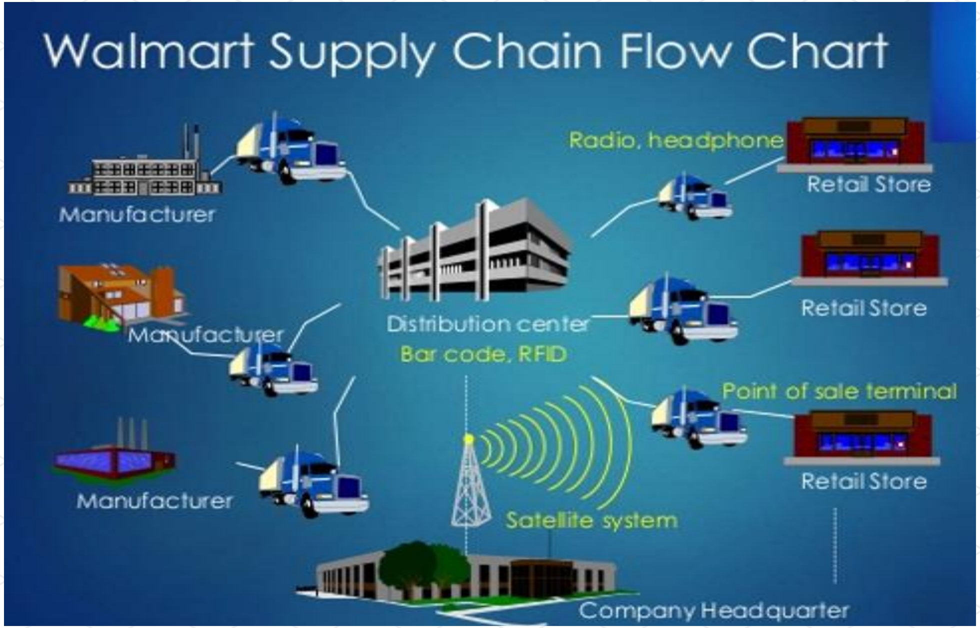

Fig 3: Example of Walmart

Source: Wahab (2017)
Walmart (2020)

Walmart Digital Supply Chain

Source: Walmart (2021)

Transition towards Industry 5.0

Industry 4.0

- **Internet of Things (IoT)**
- **Cyber Physical Systems (CPS)**
- **Digital Platforms**
- **Platform Service Systems (PSS)**
- **Networks**
- **Smart Manufacturing Systems (SMS)**
- **Cloud Manufacturing**
- **Automation and Efficiency**

Industry 5.0

- **Mass customization**
- **Man and machine Collaboration**
- **Cyber-Physical Cognitive Systems**
- **Human centric Systems**
- **Resilient Systems**
- **Adaptive Cognitive Manufacturing Systems**
- **Value Driven**
- **Focus on Sustainability**

Source: Mouritzis (2020)

Fig 4: Industrial 4.0- 5.0

Transition towards Industry 5.0

Industry 5.0 mainly deals with meeting customer requirements with utilization of skill and talents by promoting more skilled jobs.

➢ **Sustainability in center:**
- Focus on building energy efficient stores, sustainable packaging and supply chain transparency.
- Industry 5.0 tend towards provision of greener solutions.

➢ **Human Centric Approach:**
- Industry 5.0 is designed to leverage human creativity to collaborative with machines, which aims to bring back the human touch in supply chain.
- Merger between high speed and accurate machines with critical and cognitive thinking of humans.
- The collaboration aims to increase production in rapid pace.

➢ **Focus on customer needs:**
Customers can opt for personalized and customized products.

Source: Maddikunta, et al., (2022)

Digital SCOR : Success and Failure factors

Success Factors	Failure Factors
● **Demand Forecasting** becomes easier and accurate for companies with the use of Machine learning algorithms and advanced analytics ● **Digital marketplaces and e-procurement platforms** streamline supplier discovery, negotiations, and real-time data sharing for just-in-time deliveries. ● **Cloud-based inventory management systems, RFID technology, and warehouse management** systems provide real-time stock visibility and enable dynamic inventory allocation. ● **Automation in warehouses and stores, smart robots** for picking and packing, and route optimization software improve efficiency and reduce costs. ● **Integrated supply chain management software and data sharing platforms** foster collaboration, transparency, and proactive decision-making across the entire supply chain.	● **Data Silos:** Incompatible data systems or limited data sharing practices among supply chain partners can hinder transparency and collaboration. ● **Skill Gaps**: The increasing digitalization creates a skill gap, requiring investments in training and knowledge sharing for new technologies. ● **Integration Challenges:** Ensuring seamless integration of new digital solutions with existing systems to avoid data silos and enable a holistic view of operations. ● **Change Management:** Fostering a data-driven culture, clear communication channels, and a culture of accountability and feedback within the organization. ● **Cybersecurity Risks:** Increased reliance on digital technologies and data sharing heightens the need for robust cybersecurity measures to protect against potential threats.

SCOM 5.0 Excellence Checklist

To achieve Supply Chain Operations Management (SCOR) excellence in the era of Industry 5.0, organizations should focus on the following key areas:

1. Human-Centric Approach
2. Sustainability
3. Customer-Centricity
4. Digital Transformation
5. Agility and Resilience
6. Collaboration and Integration
7. Data-Driven Decision-Making
8. Cybersecurity and Data Privacy

Thank You

Any Queries?

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