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THE IMPACT OF DIGITALIZATION ON SUPPLY CHAIN SUSTAINABILITY

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Abstract:
The rapid growth of technology has led to advances in the supply chain and, in particular, the digital supply chain. As the century unfolds, we are seeing a more joined up supply chain, with efficient, robust and technologically advanced systems integration. The supply chain exists to streamline the processes involved in procurement and as a way of increasing efficiencies business-wide. Not only will efficiency remain at the heart of the supply chain, but with digitalisation enabling high levels of connectivity, we'll see greater transparency and collaboration across different departments. In addition to ensuring the security of valuable information assets, companies also have the challenge of achieving an appropriate level of sustainability, while pioneering and advancing the digital supply chain overall.

Key Words: Supply Chain management, Digitalization, Benefits, Challenges

Introduction:

Supply chain transformation is the addition and integration of technology to improve supply chain performance. Although the term can extend to any overhaul of supply chain management (SCM) practices and processes, it is typically linked to the digitization of supply chains, specifically. Supply chain transformations consist of two main parts: digital investments and transformation management. Digital investments are the specific technology and equipment assets that are to be adopted in the transformation. Transformation management refers to the use and implementation of digital assets. Successful transformation management processes should include:

- A strategic vision with clear, quantifiable long-term goals. This plan should allow for flexibility, as technology moves very fast.
- Structured governance, preferably with centralized oversight of digital implementation.
- A culture that is customer-obsessed, data-informed and innovative.

A 2017 McKinsey study found that average supply chain digitization levels were relatively low when compared with other business areas. On average, aggressive digital supply chain transformation efforts correlated with the largest boost in annual growth of earnings before interest and taxes, amongst business areas undergoing digital transformation.

Evolution of Supply Chain Capabilities:

Supply chain management has evolved significantly in the last century. Initially, the main concern was to streamline and improve the simple, labor-intensive processes. In today's landscape, supply chain management largely refers to the engineering and use of complex global networks and technologies. Supply chain innovations in the 1940s and '50s focused on mechanization, material handling and the organization of warehouse layouts. The use of pallets was adopted on a widespread basis, as was the concept of "unit load"-- the principle that moving large quantities of items together brings down handling costs while making it easier and more flexible, as opposed to shipping each item individually. Innovations introduced in the 1960s and 1970s included moving time-dependent shipments from railways and trains to trucks, warehousing and the introduction of supply chain research into academia. Furthermore, this time frame introduced the first use of computers into supply chain processes. The computerization of supply chain data and processes led to changes in record-keeping, transactions, logistics planning, managing inventory levels, shipment routing and material requirements planning (MRP) systems. In the 1980s, supply chain technology advances included map-based interfaces, flexible spreadsheets as well as optimization algorithms and models. In this decade, supply chain processes and logistics began to grow significantly more complex and sophisticated, and companies began to invest in hiring employees who specialized in logistics.

In the 1990s, enterprise resource planning (ERP) systems emerged; by 2000, most large enterprises had adopted an ERP system. The introduction of ERP systems led to improvements in data handling and created awareness for detailed integration needs that led to the creation of Advanced Planning and Scheduling (APS) software. From the 2000s onward, computer technology began to evolve at a rate far faster than it could be adopted into supply chain management practices. With this rapid expansion, as well as higher fulfilment standards created in the era of online e-commerce, companies began to incorporate these new and emerging technologies into their supply chain practices. In this era of digital supply chain transformation, companies

started to integrate technologies such as Blockchain, augmented and virtual reality, artificial intelligence, 3D printing, robots, drones, self-driving cars and IoT devices.

Literature Review:

Digitalization has started to gain considerable attention from organizations all over the world, as it brings superior benefits to a wide range of companies. Digitalization in the supply chain enables the maximal use of digital technologies to plan and execute transactions, communications, and actions (Sanders & Swink, 2020). Those digital technologies in the supply chain generally include big data analytics (BDA), advanced manufacturing technologies with sensors, decentralized agent-driven control, advanced robotics, augmented reality, advanced tracking and tracing technologies, and additive manufacturing/3D printing (Ivanov et al., 2019).

Objectives of Study:

- To understand the impact of digitalization on supply chain efficiency.
- To highlight the benefits and emerging changes in supply chain due to digital transformation.

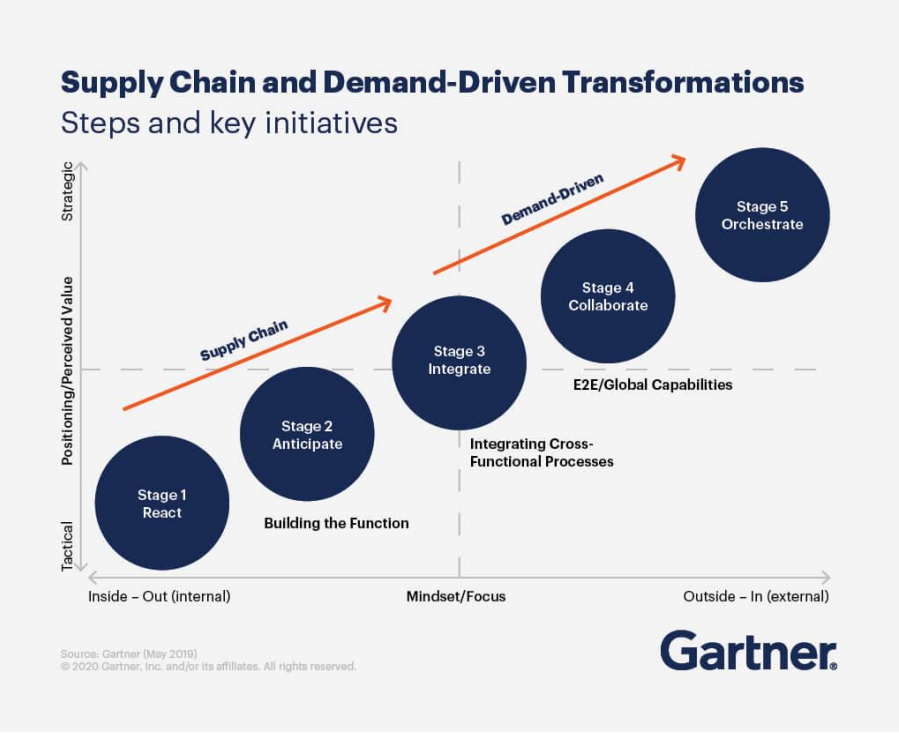
Research Methodology:

As per the requirements of the study descriptive nature is being adopted in research design. The research study is totally based on descriptive nature. Secondary source and published articles were extensively used for the collection of data. Distinctively used sources were various web articles.

Supply Chain Capabilities to Consider:

The most widespread technologies implemented in supply chain transformations are:

- **Virtual Reality (VR)** -- for specific use cases, as opposed to broader one-size adoption. It can help with functions such as interactive visualization capabilities, enabling presences to collaborate from different physical locations, data capture and high-fidelity virtual environments (such as for employee training in high-risk scenarios).
- **Augmented Reality (AR)** -- smart glasses with AR functionality can help guide workers through warehouses to pick items in an efficient manner that reduces human error. Workers on site can access information such as schematics, workflows, instructions or charts to help aid decision-making.
- **Block Chain (BC)** -- creates transparency in transactions to build trust between businesses, gives permission-based security access, can be used for smart contracts, offers tracking of deliveries and shipments in real time, better asset and order management through a digital ledger system.
- **Artificial Intelligence (AI)** -- can boost warehouse efficiency, help with systematic inventory management, help analyze workplace safety data to identify risks, offer better customer service with lower cost through chatbots, accelerate warehouse procedures, reduce operational costs through automation and help supply chains respond to disruption.



- **3D Printing** -- provides better inventory management, less obsolete products, faster production times, digital files can be used for on-demand printing, higher levels of responsiveness, fewer suppliers and a local supply that results in less transport and more simple logistics.

- **Autonomous Mobile Robots (AMRs)** -- can aid warehouse workers with picking optimization, fleet management.
- **Drones** -- can move small items efficiently within distribution centers, eliminate the need for equipment such as forklifts and make quick deliveries.
- **Autonomous Vehicles** -- self-driving cars and trucks in the supply chain can reduce the density of warehouse networks, lower transportation costs and improve safety by reducing human driving error.
- **IoT devices** -- smart sensors, cloud systems and analytics can create better inventory control, monitor product conditions throughout shipping, manage warehouses, synchronize routes by arrival times, log/track delivery vehicle conditions, simplify on boarding processes for suppliers, control project schedules and lower operating costs.

Benefits and Challenges of a Supply Chain Transformation:

Undergoing a supply chain transformation can come with specific benefits and drawbacks. Benefits of a supply chain transformation include:

- Improved lead times, ability to satisfy customer demands.
- Typically result in quick, measurable results.
- Better ability to meet current and long-term goals.
- Greater control over supply chain functions, capabilities and processes.
- More visibility of sales, inventory and overall supply chain.
- Better service level
- The supply chain is better integrated and aligned with overarching business goals.
- Data-driven processes can reduce damages, minimize delays, optimize demand planning and improve overall inventory management.

Challenges and Drawbacks of Undergoing a Supply Chain Transformation Can Include:

- Potential resistance within the organization.
- Steep learning curves.
- Siloed decision-making can interfere with coordination.
- Potentially high costs for customizable technology systems.

Conclusion:

Supply chains are extremely complex organisms, and no company has yet succeeded in building one that's truly digital. Indeed, many of the applications required are not yet widely used. But this will change radically over the next five to 10 years, with different industries implementing DSC at varying speeds. Companies that get there first will gain a difficult-to-challenge advantage in the race to Industry 4.0, and will be able to set, or at least influence, technical standards for their particular industry. The advantage will by no means be limited to the greater efficiencies. With its ability to cut costs and timescales, digitalisation is the answer to many supply chain pain points. Digitalisation will invariably heighten efficiency as systems are updated and integrated, making life easier for everyone involved in the supply chain.

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