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# Agile Supply Chain Management

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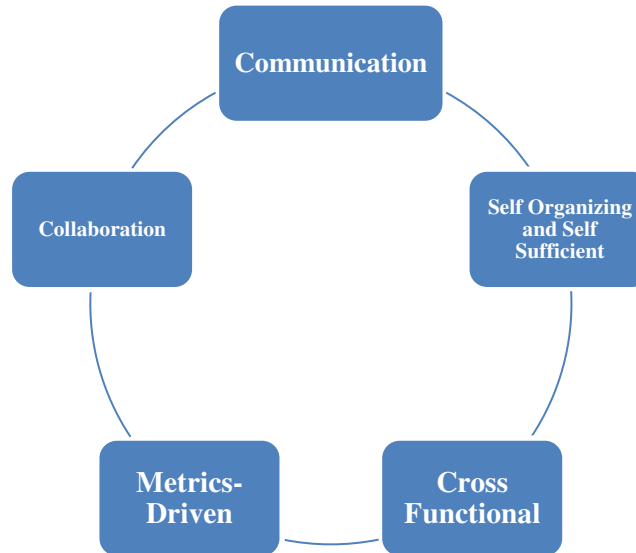
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**ABSTRACT:** With the effect of change and globalization, businesses are trying to establish their competitive advantage in many different areas and to make it sustainable. This situation highlights their performance and efficiency in using the resources they have. In particular, the supply chain covers the entire process, distribution, and even recycling of the product. Effective supply chain management indicates effective business performance, further increasing the interest in the supply chain. Flexible, fast, and timely responsiveness to make the necessary moves in the industrial environment causes companies to review their supply chain structures constantly. The issue of Agility, which first emerged at the stage of determining the appropriate production strategy in line with the requirements of the period, is an issue that is frequently discussed in terms of its relationship with the supply chain both in academic circles and in management practice (Gligor and Holcomb, 2012). Globally expanding activity areas, unpredictable industrial environment and customer expectations highlight the "it's not the big that eat the small ... it's the fast that eat the slow" approach as Jennings and Haughton (2002) stated. An agile supply chain within this particular setting enables the business to effectively address unexpected events both internally and externally, thereby enhancing its operational efficiency and adaptability. The agile supply chain has been extensively analyzed about the necessity of an integrated supply chain to mitigate uncertainties and enhance organizational effectiveness. Initially, a theoretical framework has been established in the literature concerning agile supply chains. Subsequently, the fundamental components essential for an agile supply chain have been deliberated upon. Furthermore, the factors influencing the selection of an agile supply chain tailored to specific products and market demands have been elucidated. The beneficial outcomes derived from implementing an agile supply chain have been succinctly outlined based on various studies and reports. Upon reviewing the supply chain practices adopted by businesses, it is evident that these practices play a crucial role in achieving sustainable competitive advantages and optimizing performance levels.

## I. THE CONCEPT OF AGILE SUPPLY CHAIN

In line with the trends of globalization and socio-economic advancements, the growth of the Asian market and production capabilities, particularly in comparison to the declining production shares of Western nations, notably the USA, necessitates a reevaluation of current production methodologies. In response to this need, academic circles have called for a comprehensive report to be prepared. As a result, the "21st Century Manufacturing Enterprise Strategy" report was compiled by the Iacocca Institute (Yusuf, Sarhadi, and Gunasekaran 1999). This report delves into the conditions and challenges of the era, highlighting agile manufacturing as the key to success in the new century, especially in light of the diminishing competitive edge of US manufacturing vis-à-vis Asian and other markets (Kidd 1995; Nagel, 1992). The concept of agility, as outlined in this manufacturing approach, is defined by Nagel and Bhargava (1994) as the ability to cater to customer needs, swiftly adapt to evolving market demands, thrive in competitive environments marked by unforeseen changes, and sustain continuous growth. Sharifi and Zang (1999) define agility as the ability to respond effectively to unforeseen challenges and threats, viewing them as opportunities. Furthermore, organizations can utilize their resources promptly and adaptably to address both proactive and reactive responses to emerging opportunities and challenges within the internal and external environment (Li et al., 2008). Originally conceptualized as a capability, agility has evolved into a management philosophy. The market's uncertainty, changing customer expectations, and the growing demand for personalized products have made production flexibility and agility essential. Agile manufacturing, unlike other production models, refers to an organization's capacity to adapt to changes in its internal and external environment, as well as market expectations, through a comprehensive structure (Nagel, 1992). This shift in paradigm, originating from the production process, extends beyond production itself and becomes a fundamental characteristic of the entire organization. It is no longer limited to production, but rather permeates every aspect of the organization, leading to the emergence of the term "organizational agility" in the literature (Dove, 1994). This ability to respond to change in a timely manner also has an impact on procurement processes. Agility in procurement is defined as the ability to swiftly identify and respond to opportunities and expectations within the industrial environment, within a network (Ismail and Sharifi, 2006). The concept of agility and the development of the Agile supply chain have progressed in parallel. While studies on the agile supply chain explore various variables, it is evident that similar elements are emphasized in the definitions of an agile supply chain.

Supply chain agility (SCA) is the strategic ability of a supply chain to rapidly detect and adapt to internal and external shifts, through proactive or reactive actions, by utilizing capabilities within and between organizations in an efficient way that ensures profitability.



**Figure1: Elements of an agile supply chain**

Agile teams can enhance their effectiveness by reflecting on their communication methods and making necessary adjustments. Collaboration towards a common goal is essential within the team. Self-sufficiency and self-organization are key for agile teams to achieve significant outcomes. Each team member should have the ability to plan their tasks, while the team as a whole should be able to schedule meetings independently. Utilizing result-oriented approaches is crucial for agile teams, and various analytical tools can be used to evaluate project success. Sharing and monitoring relevant agile metrics can aid in tracking progress. Cross-functional teams often have the authority to make decisions at a lower level, granting them full control over project management from inception to completion.



**Figure 2: Characteristics of Agile supply chain**

“Accurate information” comes first among these features expressed in Figure 2. Agility in the supply chain requires the use of relevant and timely information for making decisions. Encourage your team to collect and promptly share

accurate data, reducing the time it takes to respond. “**Comprehensive Control**” comes second among these features expressed in Figure 2. It is crucial to have a comprehensive understanding of the entire supply chain, including its essential components and inputs, in order to provide an optimal customer experience. “**Rapid Decision Making**” comes third among these features expressed in Figure 2. While unexpected disruptions are bound to happen, establishing efficient processes and technology that enable quick decision-making is vital for developing an agile supply chain. This allows for swift responses to unforeseen events and the ability to take advantage of new opportunities despite uncertainties which involves interpreting market signals to determine actual demand.<sup>1324132</sup> “**Process Integration**” comes fourth among these features expressed in Figure 2, which involves aligning business processes to promote collaboration among supply chain stakeholders and facilitate the sharing of information. Hence, the supply chain offers the necessary speed and adaptability. “**Market Sensitive**” comes fifth among these features in Figure 2. It is crucial for companies to assess the presence and extent of these attributes in their agile supply chain. By conducting a logical and unbiased analysis, they can actively contribute to the favorable outcomes of their business through an agile supply chain.

## II. METHODOLOGY

### A. Supply Chain Agility

Agility involves effectively and flexibly meeting unique customer demands. Flexibility plays a crucial role in providing an agile response across the supply chain. In today's manufacturing landscape, this may require the ability to produce and deliver goods in both large and small quantities, minimizing downtime associated with equipment and product changeovers, which are key aspects of lean manufacturing. Agility also necessitates adaptable staff members who are cross-trained and capable of performing various tasks as needed, especially during the COVID-19 pandemic. Product development and design should also focus on streamlining assembly processes to facilitate the quick conversion of raw materials into finished products. In addition to industry-specific capabilities, the entire supply chain must be responsive to meet the demands of an agile market. The term "short" is often used in reference to supply chains that involve minimal or no intermediaries. Delivery and distribution points should be strategically located, and there should be transparent and frequent information sharing among companies.

A well-known example of agile industry transformation is exercised by Dell in its direct-to-consumer business model. The computer maker holds inventories of parts such as hard drives, processors, memory storage media, monitors, speakers, and a host of other supplies at each of the company's three assembly plants in the U.S.

### B. Methodology for agile supply chain

The methodology for obtaining the agile supply chains is discussed under the following four viewpoints:

1. Agile Planning
2. Manufacturing and supply chain systems
3. Utilization of technology
4. Manpower planning

#### 1. Agile Planning

Agile planning offers teams a structured framework for effectively managing projects. This approach enables teams to maintain flexibility and adaptability in the face of changes, ensuring a customer-centric focus while continually improving processes through experiential learning.

#### 2. Manufacturing and supply chain systems

"Agile supply chains adhere to a "pull" system, which operates according to demand. This approach maintains a lean inventory and promotes shared responsibility among all staff through transparent com13

#### 3. Utilization of technology

Businesses that have adopted agile technologies have acquired valuable insights, operated at a faster pace, and forged more robust connections with their clientele.

#### 4. Manpower planning

The overall count of personnel engaged in a company or accessible for a specific project task or duty.



### III. INFORMATION TECHNOLOGY ASPECTS IN AN AGILE SUPPLY CHAIN

IT is widely recognized as the central nervous system of manufacturing and supply chain operations, serving as the pathway towards enhancing cost-effectiveness and time efficiency (Banerjee, 2013).

There have been numerous studies conducted to explore and demonstrate the impact of information technology (IT) on supply chain management. These researches have found that IT has greatly influenced and enhanced every aspect of the supply chain, including information sharing, communication, networking, coordination, integration, retrieval, transmission, utilization, analysis, processing, and even error reduction. The use of internet-enabled IT has proven to be a powerful tool in transforming manufacturing and supply chains into agile businesses. The introduction of enterprise resource planning (ERP) and supply chain planning (SCP) software has revolutionized supply chain management, particularly in the retail sector. ERP integrates essential corporate functions such as manufacturing, finance, human resources, materials management, sales, and distribution, while SCP automates material planning, scheduling, and production planning processes. IT has a wide range of applications that impact various aspects of the retail supply chain, including business process automation in areas such as purchasing, ordering, manufacturing, shipping, as well as automation, data processing, analytics, reporting, communication, and storage. IT also automates supply chain and demand planning processes using advanced operations research and analytical techniques. Today, IT plays a crucial role in warehouse management, transportation management, logistics network optimization, and more, all contributing to the agility of the supply chain. These various aspects collectively contribute to the evolution of an agile supply chain. Technology enables cross-training of employees, which is an important aspect of agility.

Similarly, integrated supply chain management, both in terms of departmental integration and vertical integration, facilitates the smooth and efficient transfer of information, further enhancing agility.

### IV. CHALLENGES FACED IN AN AGILE SUPPLY CHAIN

In the modern era, all types of supply chains are susceptible to risks and unforeseen circumstances. The agile supply chain, however, is exceptionally well-equipped to handle such eventualities. While the agile supply chain effectively mitigates many of these risks and capitalizes on opportunities, there are still certain areas that pose challenges and concerns for its operations. These areas include:

**1. Cost Fluctuation:** Numerous decisions within a flexible supply chain are made with regards to cost implications. Therefore, the fluctuation in costs plays a crucial role in the overall adaptability of the supply chain.

**2. People's agility:** Within an agile supply chain, it is crucial for members of the supply chain to consistently be prepared to acquire new skills, assume different roles, and take on additional responsibilities. If individuals are unwilling or lack the necessary capabilities to embrace new challenges, it poses a significant obstacle for the entire supply chain.

**3. Geopolitical Factors:** Various factors such as updated regulations, trade barriers, taxation, currency fluctuations, environmental catastrophes, security issues, visa problems, terrorism, civil unrest, political instability, poor governance, and changing trade paths pose significant threats to a flexible supply chain.

**4. Humans/Manager Dependent:** Agile teams primarily rely on technology for virtual collaboration, yet human interaction remains a crucial component. However, this reliance on both technology and human interaction can introduce vulnerabilities in the supply chain.

The majority of challenges and risks in the agile supply chain appear to stem from either human factors or geopolitical issues. This indicates that even a flexible supply chain is susceptible to vulnerabilities, highlighting the crucial role that the team plays in ensuring its success.

### V. RESULT

In the ever-changing world of business, it is crucial for organizations to be able to adapt quickly and effectively to competition and evolving customer expectations. Traditional production methods have focused on mass production of standardized products, but there is now a growing demand for personalized and cost-effective business and supply chain processes. This shift towards agility has had a significant impact on organizations and the industry as a whole. The supply chain process, which plays a vital role in production, has also had to adapt to meet these new requirements. Competition now extends beyond individual businesses to their supply chains, creating a defense mechanism against uncertainty and fostering adaptability. A flexible supply chain is essential for customer satisfaction, profitability, and overall organizational performance. In today's business landscape, enterprises must reassess their organizational



philosophies and supply chain models to meet increasing customer expectations and product diversity. By updating production systems and adopting an agile supply chain model, organizations can gain a sustainable competitive advantage. This not only benefits the organization itself but also enhances the agility of the integrated systems within the value chain, enabling timely responses to unexpected demands and changes. Embracing the concept of an agile supply chain provides businesses and future managers with a proactive risk management advantage, preparing them for uncertain futures and personalized customer expectations.

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