

Editorial

From Global to Glocal: Digital Transformation for Reshoring More Agile, Resilient, and Sustainable Supply Chains

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1. Background

The world is currently undergoing an unprecedented period of global disruption, marked by the COVID-19 pandemic, the ongoing war in Ukraine, and escalating geopolitical tensions. These disruptions have significantly impacted global supply chains, revealing their inherent vulnerabilities and challenging the traditional model of relying on distant, often unstable, production hubs. Consequently, companies are increasingly considering reshoring or nearshoring their operations, bringing production closer to home to enhance resilience, reduce risk, and improve sustainability [1].

This editorial concludes this Special Issue, where ten articles explore the relationship between manufacturing and value chains. The articles can be viewed on this page: https://www.mdpi.com/journal/sustainability/special_issues/glocal_supplychain (accessed on 30 January 2024).

2. The Reshoring Imperative

The remoteness of supply markets has become a critical factor in supply chain vulnerability. Ongoing disruptions have underscored the inefficiencies and potential risks associated with extensive reliance on distant suppliers. For example, the pandemic disrupted supply chains across all industries, leading to shortages of critical components and production delays. The ongoing war in Ukraine has further exacerbated these disruptions, with sanctions and supply chain interruptions affecting various industries, including energy, agriculture, and manufacturing [2].

In response to these challenges, reshoring has emerged as a strategic imperative for many companies. Reshoring involves bringing production back home or to neighboring countries, reducing dependence on distant suppliers, and mitigating the risks associated with global disruptions [3]. Several factors are driving this trend, including the following:

- **Increased Resilience:** Reshoring reduces reliance on distant suppliers, making supply chains more resilient to disruptions caused by natural disasters, political instability, and other unforeseen events.
- **Reduced Transportation Costs and Lower CO₂ Production:** Closer proximity to production sources can significantly reduce transportation costs, improving profitability and efficiency and reducing CO₂ emissions.
- **Enhanced Quality Control:** Reshoring enables businesses to maintain greater control over quality standards and ensure consistent product quality.
- **Improved Labor Relations:** Reshoring can foster stronger labor relations and improve employee morale, as workers may have greater job security and better working conditions.



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3. The Role of Digital Transformation

While reshoring offers significant benefits regarding resilience and efficiency, it also presents challenges in integrating and managing dispersed production facilities. This is where digital transformation can play a critical role [4]. Digital technologies can facilitate the seamless integration of reshoring operations, enabling real-time data sharing, collaborative decision-making, and optimized supply chain management [5]. Reshoring offers significant benefits in terms of resilience and efficiency, but it also brings challenges for managing distributed production facilities. This is where digital transformation, particularly in line with the principles of Industry 5.0, becomes crucial [6]. Industry 5.0, the next phase of the industrial revolution, focuses on integrating physical and digital technologies to enhance human capabilities and promote collaboration and sustainability in production. This concept aligns seamlessly with the challenges and opportunities of reshoring. Leveraging Industry 5.0 technologies, such as artificial intelligence (AI), the Internet of Things (IoT), and augmented reality (AR), can play a central role in the success of reshoring. These technologies enhance visibility and traceability through IoT sensors and AI analytics, providing real-time insights into the status of materials, equipment, and products throughout the supply chain. This increased visibility enables proactive identification and mitigation of potential disruptions, ensuring the smooth flow of goods and materials. In addition, AI and robotics can automate repetitive tasks such as order processing, inventory management, and quality control, improving overall efficiency and freeing up human resources for more strategic activities.

Data integration from multiple sources enables real-time collaboration between stakeholders, promoting more informed decision-making in supply chain planning and execution. Adopting Industry 5.0 principles synergizes with reshoring efforts, significantly increasing their effectiveness and resilience. Companies can build more agile, sustainable, and competitive supply chains by leveraging digital technologies to optimize operations, reduce risk, and enhance collaboration. This convergence represents a paradigm shift in business operations, paving the way for a more connected, resilient, and sustainable global manufacturing landscape. The convergence of reshoring and Industry 5.0 embodies a symbiotic relationship shaping the future of manufacturing.

4. A Paradigm Shift towards Glocalization

Rather than a simple reversal of globalization, the reshoring trend represents a shift towards a more glocal approach to supply chain management. Glocalization is about balancing the benefits of global reach with the need for local responsiveness and resilience. It is about finding the right balance between global efficiency and local adaptability. Digital transformation is essential to enable this glocal approach. By leveraging digital technologies, companies can optimize their global supply chains while maintaining local flexibility and responsiveness. This allows them to adapt to changing market conditions, meet local customer demands, and navigate the complexities of the global business environment [7].

Reshoring offers a multi-faceted approach to environmental sustainability [8]. One notable benefit is the significant reduction in transport emissions achieved by shortening the distance goods travel, resulting in lower fuel consumption and greenhouse gas emissions. For example, reshoring manufacturing from China to the United States has the potential to reduce transport emissions by up to 50%. A key aspect of reshoring is shortening supply chains and eliminating the need for long-distance transportation, particularly by air and sea—known for their high carbon intensity. Companies can significantly reduce their overall carbon footprint by opting for local suppliers and distributors. In addition, reshoring facilitates more efficient inventory management practices, reducing the need for extensive warehousing facilities and minimizing the transportation of excess inventory. This streamlined approach not only improves operational efficiency but also contributes to a significant reduction in emissions.

The emphasis on locally sourced raw materials and components in reshoring operations also helps to reduce transport emissions [9]. Materials transported over shorter

distances inherently lowered carbon emissions while supporting local economies and fostering a more sustainable supply chain. Furthermore, the reshoring phenomenon often coincides with adopting sustainable manufacturing practices. Companies can integrate measures, such as renewable energy, energy-efficient processes, and waste reduction initiatives, as they return to local production. Together, these practices help reduce the overall environmental impact of manufacturing operations. Beyond the direct environmental benefits, reshoring plays a role in promoting sustainable consumption patterns. As consumers become more aware of the lower environmental footprint associated with locally produced goods, they are likely to make more conscious choices in line with sustainable practices. This ripple effect contributes to a broader shift towards environmentally responsible consumer behavior, reinforcing the holistic impact of reshoring on sustainability.

Reshoring is emerging as a catalyst for significant contributions to local economies, with the power to create jobs, drive economic growth, and strengthen community resilience [10]. By bringing production back home or to nearby regions, reshoring significantly reduces dependence on distant and often unstable production centers. Creating employment opportunities stands out as one of the most direct and tangible benefits of reshoring. As companies move production back home, they open up new employment opportunities for local workers, particularly in areas that have previously suffered job losses due to offshoring or other factors. However, the positive effects go beyond job creation and include a broader stimulation of economic growth within local communities. The infusion of additional jobs and spending power translates into increased revenues and expansion opportunities for local businesses, fostering a virtuous cycle of economic growth. This, in turn, sustains the creation of more jobs and diverse opportunities within the community. In addition, reshoring plays a key role in building community resilience by strengthening the local economy and diversifying the industrial base. This strategic shift makes communities less dependent on a single industry or employer, making them more adaptable to economic shocks or disruptions. The diversification inherent in reshoring contributes to the overall robustness of local economies, enhancing their ability to withstand unforeseen challenges and promoting sustainable development.

Reshoring is a growing strategy for strengthening national security, particularly in critical industries such as defense, healthcare, and energy, by minimizing reliance on foreign suppliers [11]. Bringing production closer to home through reshoring makes it less vulnerable to disruptions caused by geopolitical conflicts, natural disasters, or unforeseen events. Reducing dependence on foreign suppliers is a key aspect of the impact of reshoring. Companies that choose to reshore can strategically reduce their reliance on suppliers from countries with unstable political or economic environments. This supplier diversification serves as a proactive measure to reduce the risk of supply chain disruptions in times of conflict or crisis. Reshoring also contributes to the development of more resilient supply chains. The proximity of domestic production facilities to the point of consumption enables companies to respond quickly to disruptions and adapt to changing market conditions. This increased agility results from reduced transportation times and costs associated with domestic production. In the defense industry, reshoring plays a critical role in ensuring a consistent supply of crucial components and materials, even in the face of conflict or sanctions. This reduced reliance on foreign suppliers significantly improves national defense capabilities and strengthens security measures. Similarly, reshoring in the healthcare sector, particularly in producing pharmaceuticals and medical devices, ensures a stable supply of essential healthcare products, especially in times of crisis. This proactive measure not only safeguards public health but also contributes to overall well-being. Reshoring energy production also reduces dependence on imported energy sources, which are particularly vulnerable to geopolitical disruptions. This strategic move enhances national energy security by reducing exposure to price fluctuations and ensuring a more stable and secure energy supply for the nation. In essence, reshoring is emerging as a multi-faceted approach to strengthening national security in critical sectors, promoting resilience and sustainability in the face of multiple challenges.

The reshoring trend is not a simple reversal of globalization but a shift towards a more global approach to supply chain management [12]. Globalization is about balancing the benefits of global reach with the need for local responsiveness and resilience [13]. The global disruptions of recent years have highlighted the need for a more global approach to supply chain management. As the world becomes increasingly interconnected, companies must be able to respond quickly to changing market conditions and adapt to local needs. By adopting a global approach, companies can build the agility and resilience they need to succeed in the years ahead [14]. It is a change that needs to reach even the youngest to achieve a sustainable community [15].

The ongoing global disruption has highlighted the need for a more resilient and sustainable approach to supply chain management. Reshoring and digital transformation are key components of this new paradigm. Companies can build more agile, adaptable, and sustainable supply chains by reshoring production to closer and more reliable sources and leveraging digital technologies to improve efficiency and resilience. This shift towards globalization will be essential to meet the challenges of the future and ensure long-term success in the global marketplace.

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