

# POST-COVID TRENDS IN MANUFACTURING SECTOR AND ITS IMPLICATIONS FOR BUSINESSES AND POLICYMAKERS

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## Original research



## ABSTRACT

*The post-COVID changes in the manufacturing sector are examined in this overview along with its commercial and policy-related ramifications. The manufacturing industry has been significantly impacted by the COVID-19 epidemic, which has resulted in supply chain interruptions, a workforce shortage, and decreased consumer demand. The manufacturing industry is currently dealing with a fresh set of issues and trends that will probably influence its future as the world starts to recover from the pandemic. Some of these issues include reshoring, automation, digitalization, and sustainability initiatives. The post-COVID tendencies in the manufacturing sector highlight the importance of adaptability, innovation, and flexibility in the face of changing market conditions. Organizations have the opportunity to improve operations, reduce costs, and boost competitiveness thanks to these trends. Governments now have the chance to promote domestic production, develop technical innovation, and improve the sustainability of the industry.*

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## 1. INTRODUCTION

The COVID-19 pandemic has had a significant impact on the global economy, upsetting many firms' supply networks and corporate operations. Particularly the manufacturing industry has been greatly impacted by the pandemic, with many factories closing or reducing productivity as a result of lockdowns and social isolation measures (Mohapatra et al., 2022). As the world starts to recover from the pandemic, the industrial sector is currently adjusting to a new set of trends and problems that are anticipated to have an impact on its future. Reshoring is the technique of bringing manufacturing operations back home, and automation, which could increase productivity and cut costs, is another. Other trends include digitalization, which entails utilizing digital technologies like cloud computing and the Internet of Things (IoT), and sustainability programs, which seek to lessen the environmental impact of manufacturing activities (Cai &

Luo, 2020). Industrial industry developments and changes have a significant impact on businesses and decision-makers. To stay adaptable and competitive in the face of shifting market conditions, manufacturers will need to make these changes and developments (Okorie et al., 2020). In order to boost regional production, encourage technological innovation, and enhance sustainability in the manufacturing sector, policymakers will also need to consider these trends and changes (Korsgaard et al., 2020). The goal of this analysis is to look at the post-COVID changes in the industrial sector and how they affect businesses and decision-makers. The study seeks to give businesses and policymakers with comprehensive analyses and recommendations that will help them in their attempts to deal with the new normal in the manufacturing industry by studying these trends and changes.

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## **2. IMPACT OF COVID-19 ON THE MANUFACTURING SECTOR**

The COVID-19 pandemic has had a substantial negative impact on the manufacturing sector, leading to significant supply chain disruptions on a global scale, a labor shortage, and decreased consumer demand. Over 50% of businesses reported supply chain disruptions and nearly 80% of manufacturers reported a negative financial impact from the pandemic (Ardolino et al., 2022). Many manufacturers have had to rethink their operations as a result of these disruptions, which have caused a decline in productivity and income.

The interruption of international supply lines was one of the biggest disruptions to the manufacturing sector. Worldwide shortages of raw materials and finished goods are a result of the pandemic's impact on suppliers and manufacturers. Because of this, it has been challenging for manufacturers to stick to their production schedules and satisfy client demand (Butt, 2021). In order to reduce disruptions, several manufacturers have had to modify their supply chains by extending their local sourcing or finding new suppliers.

In addition to affecting the supply chain, the pandemic has resulted in a labor shortage. Manufacturers have struggled to sustain output levels as a result of numerous employees getting sick or being unable to work due to quarantine restrictions (Telukdarie et al., 2020). Furthermore, because firms are compelled to minimize the number of employees on the manufacturing floor, social distancing regulations have made it challenging for them to operate at full capacity. In order to streamline their operations and decrease their dependency on human labor, many firms were forced to change their manufacturing processes by implementing new technologies and practices.

The fall in consumer demand for non-essential items is the pandemic's additional significant barrier. Because many people work from home and avoid social connections, there is a considerable decline in demand for goods like apparel, luxury goods, and electronics. Producers have been forced to reevaluate their product lines and prioritize the development of needs including personal protective equipment (PPE), medical supplies, and food and beverage products. Numerous firms have altered their operational practices as a result of these difficulties (Tan & Abdul-Samad, 2022). While some have turned their attention to manufacturing demands, others have implemented new techniques and technology to boost productivity and cut costs. For instance, a number of businesses have embraced automation technologies to boost production efficiency and lower their reliance on labor-intensive manual work. To reduce interruptions and improve business resilience in the face of approaching disasters, others have implemented innovative supply chain management systems (Cai & Luo, 2020). As a result of supply chain interruptions, labor scarcity, and a drop in consumer demand, the COVID-19 pandemic has had a substantial

impact on the manufacturing industry. Manufacturers must adapt their business practices and deploy new technology and procedures to address these challenges and boost production and resiliency (Kumar et al., 2020). While the pandemic has posed substantial issues for the manufacturing sector, it has also given manufacturers a chance to reevaluate their processes and implement new technologies and strategies to boost their sustainability and competitiveness.

## **3. POST-COVID TRENDS IN THE MANUFACTURING SECTOR**

The manufacturing industry is currently dealing with a fresh set of issues and trends that will probably influence its future as the world starts to recover from the pandemic. These trends include, among others:

### **3.1 Reshoring**

Due to the weaknesses of global supply networks being revealed by the COVID-19 outbreak, several firms are rethinking their reliance on offshore production. Reshoring, or bringing production back home to domestic markets, is a growing trend, especially in the US and Europe (Barbieri et al., 2020). Reshoring enables businesses to strengthen the resilience of their supply chains while reducing their reliance on overseas vendors.

In the wake of the pandemic, 64% of companies in the U.S. and Europe are considering reshoring or nearshoring, according to a survey by the international management consulting firm Kearney (Dikler, 2021). Reduced supply chain risks and more adaptability in the face of shifting market conditions are the driving forces behind this development. Manufacturers can increase their sustainability by reshoring by lowering their carbon footprint and giving back to the community.

### **3.2 Automation**

The manufacturing sector has seen a rise in automation as businesses look for ways to cut labor expenses and boost efficiency. This trend has been accelerated by COVID-19 pandemic because automation enables businesses to continue social exclusionary behaviors while also lowering costs, boosting output, and enhancing safety (Chernoff & Warman, 2023).

Manufacturers may gain a lot from automation, such as more productivity, better precision, and lower labor expenses. Manufacturers can enable their employees to concentrate on more difficult and value-added jobs by automating repetitive and routine processes. This can enhance output and quality while lowering the possibility of human error (Gappmaier et al., 2023).

Additionally, automation can improve safety in the manufacturing sector by decreasing the number of operations that require humans to conduct hazardous or physically taxing activities. This can lower the risk of production downtime due to personnel shortages and

assist manufacturers protect their workforce from illness and injury (Chryssolouris et al., 2023).

According to a Deloitte (2020) report (*Deloitte Annual Report*, 2020), the pandemic has accelerated the introduction of automated technologies across a number of manufacturing industries. In the years following COVID, this tendency is anticipated to persist as manufacturers work to improve their competitiveness and resilience.

Automation is a technology that is often compared to robotics, artificial intelligence. And the Internet of Things (IoT). It has the potential to assist manufacturers in streamlining their operations. Reducing costs. And increasing flexibility. For example AI can be employed to effectively manage production schedules and identify opportunities for cost savings. Meanwhile. Robotics can be utilized to automate assembly and packing tasks. The IoT enables manufacturers to monitor their equipment and production processes in real time. Allowing them to detect issues earlier and respond swiftly (Chryssolouris et al., 2023).

The imperative to lower costs increase productivity levels and enhance safety precautions is steering the adoption of automation within the manufacturing sector. The ongoing impact of COVID 19 has proven instrumental in expediting this trajectory as manufacturers increasingly harness advanced technologies like robotics and artificial intelligence (AI) alongside Internet of Things (IoT) applications for optimization purposes amid heightened competition. As the industrial domain charts new territories moving forward. Automation is poised to assume an even more prominent role.

### **3.3 Digitalization**

The COVID 19 pandemic has highlighted the significance of digitization in the manufacturing industry. Utilizing new technologies has enabled businesses to enhance their operations and effectively communicate with consumers resulting in various advantages such as increased visibility in the supply chain shorter lead times and improved customer satisfaction. This transformation brings numerous benefits for manufacturers (Ardolino, Bacchetti, Dolgui, et al., 2022). Including the ability to provide customized experiences and improve communication with customers. Digital tools offer opportunities for manufacturers to implement online ordering systems, real time shipment tracking, and automated customer support. Enhancing customer retention and satisfaction ultimately drives sales and boosts profitability. Through digitization. Manufacturers can streamline their processes and enhance agility to reduce lead times. By utilizing digital technology to automate and streamline production processes. Manufacturers can significantly reduce the time it takes to produce goods and deliver them to customers. The ability to swiftly respond to market demands and consumer needs provides a competitive edge. Furthermore digitization has notably

enhanced supply chain transparency (Sharma et al., 2023).

Manufacturers can have more visibility into their supply chain and spot possible hazards or bottlenecks by employing digital technologies to maintain inventories, monitor supplier performance, and analyze data. This can enhance their capacity to control inventory levels and guarantee prompt product delivery to clients. Many manufacturers have stepped up their attempts to implement digitalization in reaction to the pandemic. In response to the pandemic, 70% of manufacturers increased their digitalization efforts (Krzywdzinski et al., 2022). The desire to improve operational efficiency, reduce costs, and boost customer happiness is what is driving this trend.

Manufacturers can assist in achieving these goals by utilizing digitalization technologies such as cloud computing, big data analytics, and digital twins. By giving manufacturers scalable and adaptable computing resources, cloud computing enables companies to quickly adjust to shifting business needs. Large amounts of data can be analyzed by manufacturers using big data analytics to find trends and insights that can help them run their businesses more efficiently. Manufacturers can replicate and improve their production processes by using digital twins to make virtual copies of physical assets (Szalavetz, 2022).

The COVID-19 epidemic has, in conclusion, shown the significance of digitalization in the manufacturing sector. Digitalization can help manufacturers by boosting customer satisfaction, cutting down on lead times, and enhancing supply chain visibility (Gamal et al., 2022). Manufacturers may improve their competitiveness and build a more adaptable and resilient company by embracing digitalization technologies like cloud computing, big data analytics, and digital twins.

### **3.4 Sustainability**

The COVID-19 pandemic has raised people's understanding of how crucial sustainability is for the manufacturing sector. Companies are looking for ways to lessen their carbon footprint while keeping their social obligations as they become more aware of how their operations affect the environment. Companies can decrease costs related to waste and inefficient resource usage, improve their reputation, and meet regulatory requirements with the aid of sustainability programs. enhancing their competitiveness.

In a Price Waterhouse and Coopers (PwC) survey of CEOs in the manufacturing sector, 79% of respondents said that sustainability is important for the future success of their business (Lazaroiu et al., 2021). The need to reduce carbon emissions, safeguard natural resources, and include stakeholders is what is driving this movement. To accomplish these goals, manufacturers are implementing sustainable practices including circularity, renewable energy, and social responsibility.

As a sustainability strategy, circularity aims to reduce waste by extending the life of materials and products. Designing items that can be easily recycled or reused, employing recycled materials in production, and putting in place closed-loop processes that reduce waste are all part of this. Manufacturers can lessen their environmental effect, save natural resources, and rely less on virgin materials by adopting circularity (Eslami et al., 2019).

Manufacturers are using renewable energy as another environmental tool to lessen their carbon footprint. This entails running their operations on renewable energy sources including solar, wind, and hydropower. Manufacturers may lower their energy costs, cut their greenhouse gas emissions, and improve their image as socially responsible businesses by switching to renewable energy (Franciosi et al., 2020).

Manufacturers are embracing social responsibility as a third sustainability measure to uphold their moral and social duties. In order to do this, they must make sure that their operations are carried out in a way that respects human rights, helps local communities, and encourages diversity and inclusion. Manufacturers can improve their brand, draw in new clients, and cultivate enduring connections with stakeholders by exhibiting social responsibility.

As a result of the COVID-19 pandemic, the manufacturing sector is now more conscious of the value of sustainability. To lessen their environmental impact, improve their reputation, and adhere to regulatory requirements, businesses are using sustainability initiatives like circularity, renewable energy, and social responsibility. Manufacturers may boost their competitiveness, draw in new clients, and contribute to a more sustainable future for all by adopting sustainability.

### **3.5 Implications for Businesses and Policymakers**

Businesses and decision-makers are being significantly impacted by the post-COVID changes in the manufacturing industry. These modifications serve to remind businesses of the importance of adaptability and flexibility in the face of changing market conditions. Manufacturers will need to be able to quickly alter their production and supply chain strategies in response to interruptions in supply networks and changes in demand patterns in order to remain competitive (Dean et al., 2021).

In addition, policymakers are essential in determining how the industrial sector will develop in the future. Governments can accelerate the trend toward reshoring by promoting domestic production and investing in the infrastructure required to support manufacturing (Cooke et al., 2021). Two cutting-edge technologies, automation and digitization, can boost productivity while assisting

industries in competing on the worldwide market. Governments can contribute to the development of a more resilient manufacturing sector that is better equipped to react to shifting market conditions by investing in these technologies.

Legislators can also encourage sustainable practices in the manufacturing sector by establishing regulations and financial incentives that encourage businesses to lessen their environmental effect and uphold social responsibility (Ali, 2022). Governments can enact legislation requiring the pricing of carbon or offer tax advantages to businesses that employ sustainable business methods, which can help to persuade manufacturers to adopt more environmentally friendly procedures (Bai et al., 2021).

Overall, the post-COVID modifications to the industrial sector emphasize the significance of adaptability, innovation, and flexibility in the face of shifting market conditions. To stay competitive, manufacturers and decision-makers must be able to adjust to these changes, and governments must invest in and propose measures that will promote the growth of a more resilient and sustainable manufacturing sector.

## **4. CONCLUSION**

The manufacturing industry has been significantly impacted by the COVID-19 pandemic, which has resulted in supply chain interruptions, a workforce shortage, and decreased consumer demand. The manufacturing industry is currently dealing with a fresh set of issues and trends that will probably influence its future as the world starts to recover from the pandemic. Reshoring, automation, digitalization, and sustainability measures are some of these themes. The manufacturing industry's post-COVID tendencies emphasize the value of flexibility, adaptability, and innovation in the face of shifting market dynamics. These trends provide organizations the chance to strengthen their operations, cut expenses, and increase their competitiveness. These trends offer an opportunity for governments to support local manufacturing, advance technical innovation, and enhance manufacturing sustainability. Future studies might concentrate on how these developments affect certain manufacturing sectors, like the automobile, aerospace, and electronics industries. Research might also look into how new technologies, like the Internet of Things and artificial intelligence, will affect how the manufacturing industry develops in the future.

### **Conflict of Interest**

No conflict of interest was declared by the authors.

## References:

- Ali, H. S. (2022). The role of firm innovativeness in the time of Covid-19 crisis: Evidence from Chinese manufacturing firms. *Asian Journal of Technology Innovation*, 30(3), 689–714. DOI: 10.1080/19761597.2021.1976063
- Ardolino, M., Bacchetti, A., Dolgui, A., Franchini, G., Ivanov, D., & Nair, A. (2022). The impacts of digital technologies on coping with the COVID-19 pandemic in the manufacturing industry: a systematic literature review. *International Journal of Production Research*, 1–24. DOI: 10.1080/00207543.2022.2127960
- Ardolino, M., Bacchetti, A., & Ivanov, D. (2022). Analysis of the COVID-19 pandemic's impacts on manufacturing: a systematic literature review and future research agenda. *Operations Management Research*, 15(1), 551–566. DOI: 10.1007/s12063-021-00225-9
- Bai, C., Quayson, M., & Sarkis, J. (2021). COVID-19 pandemic digitization lessons for sustainable development of micro-and small- enterprises. *Sustainable Production and Consumption*, 27, 1989–2001. DOI: 10.1016/j.spc.2021.04.035
- Barbieri, P., Boffelli, A., Elia, S., Fratocchi, L., Kalchschmidt, M., & Samson, D. (2020). What can we learn about reshoring after Covid-19? *Operations Management Research*, 13(3), 131–136. DOI: 10.1007/s12063-020-00160-1
- Butt, A. S. (2021). Mitigating the effects of COVID-19: an exploratory case study of the countermeasures taken by the manufacturing industry. *Journal of Business & Industrial Marketing*, (in Press). DOI: 10.1108/JBIM-04-2021-0236
- Cai, M., & Luo, J. (2020). Influence of COVID-19 on Manufacturing Industry and Corresponding Countermeasures from Supply Chain Perspective. *Journal of Shanghai Jiaotong University (Science)*, 25(4), 409–416. DOI: 10.1007/s12204-020-2206-z
- Chernoff, A., & Warman, C. (2023). COVID-19 and implications for automation. *Applied Economics*, 55(17), 1939–1957. DOI: 10.1080/00036846.2022.2100870
- Chrysosolouris, G., Alexopoulos, K., & Arkouli, Z. (2023). Artificial Intelligence in Manufacturing Equipment, Automation, and Robots, 436, 41–78. DOI: 10.1007/978-3-031-21828-6\_3
- Cooke, S. J., Soroye, P., Brooks, J. L., Clarke, J., Jeanson, A. L., Berberi, A., Piczak, M. L., Reid, C. H., Desforges, J. E., Guay, J. D., Drake, A. K., Jardine, A. M., Ethier, J. P., Keefe, H. E., Medd, A. M., Edwards, B. P. M., Reeve, C., Perkovic, A., Frempong-Manso, A., ... Bennett, J. R. (2021). Ten considerations for conservation policy makers for the post-COVID-19 transition. *Environmental Reviews*, 29(2), 111–118. DOI: 10.1139/er-2021-0014
- Dean, M., Rainnie, A., Stanford, J., & Nahum, D. (2021). Industrial policy-making after COVID-19: Manufacturing, innovation and sustainability. *The Economic and Labour Relations Review*, 32(2), 283–303. DOI: 10.1177/10353046211014755
- Deloitte (2020). Annual report. [https://www2.deloitte.com/content/dam/Deloitte/dk/Documents/about-deloitte/Impact\\_Report\\_20\\_21\\_web.pdf](https://www2.deloitte.com/content/dam/Deloitte/dk/Documents/about-deloitte/Impact_Report_20_21_web.pdf)
- Dikler, J. (2021). Reshoring: An Overview, Recent Trends, and Predictions for the Future. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3916557
- Eslami, Y., Dassisti, M., Lezoche, M., & Panetto, H. (2019). A survey on sustainability in manufacturing organisations: dimensions and future insights. *International Journal of Production Research*, 57(15–16), 5194–5214. DOI: 10.1080/00207543.2018.1544723
- Franciosi, C., Voisin, A., Miranda, S., Riemma, S., & Iung, B. (2020). Measuring maintenance impacts on sustainability of manufacturing industries: from a systematic literature review to a framework proposal. *Journal of Cleaner Production*, 260, 121065. DOI: 10.1016/j.jclepro.2020.121065
- Gamal, A., Abdel-Basset, M., & Chakraborty, R. K. (2022). Intelligent model for contemporary supply chain barriers in manufacturing sectors under the impact of the COVID-19 pandemic. *Expert Systems with Applications*, 205, 117711. DOI: 10.1016/j.eswa.2022.117711
- Gappmaier, P., Reichenbach, S., & Kromoser, B. (2023). Automated production process for structure-optimised concrete elements. In A. Ilki, D. Çavunt, & Y. S. Çavunt (Eds.), *Building for the Future: Durable, Sustainable, Resilient* (Vol. 350, pp. 1577–1585). Springer Nature Switzerland. DOI: 10.1007/978-3-031-32511-3\_161
- Korsgaard, S., Hunt, R. A., Townsend, D. M., & Ingstrup, M. B. (2020). COVID-19 and the importance of space in entrepreneurship research and policy. *International Small Business Journal*, 38(8), 697–710. DOI: 10.1177/0266242620963942
- Krzywdzinski, M., Butollo, F., Flemming, J., Gerber, C., Wandjo, D., Delicat, N., Herzog, L., Bovenschulte, M., & Nerger, M. (2022). The Growing Gap Between Pioneers and Laggards: Digitalization, automation, and organizational change in the wake of the COVID-19-crisis in Germany. *Weizenbaum Series*, 1–19.
- Kumar, A., Luthra, S., Mangla, S. K., & Kazançoğlu, Y. (2020). COVID-19 impact on sustainable production and operations management. *Sustainable Operations and Computers*, 1, 1–7. DOI:10.1016/j.susoc.2020.06.001

- Lazaroiu G., Klieštík T., & Novák A. (2021). Internet of Things Smart Devices, Industrial Artificial Intelligence, and Real-Time Sensor Networks in Sustainable Cyber-Physical Production Systems. *Journal of Self-Governance and Management Economics*, 9(1), 20–30.
- Mohapatra, B., Tripathy, S., Singhal, D., & Saha, R. (2022). Significance of digital technology in manufacturing sectors: Examination of key factors during Covid-19. *Research in Transportation Economics*, 93, 101134. DOI:10.1016/j.retrec.2021.101134
- Okorie, O., Subramoniam, R., Charnley, F., Patsavellas, J., Widdifield, D., & Salonitis, K. (2020). Manufacturing in the Time of COVID-19: An Assessment of Barriers and Enablers. *IEEE Engineering Management Review*, 48(3), 167–175. DOI:10.1109/EMR.2020.3012112
- Sharma, M., Raut, R. D., Sehrawat, R., & Ishizaka, A. (2023). Digitalisation of manufacturing operations: The influential role of organisational, social, environmental, and technological impediments. *Expert Systems with Applications*, 211, 118501. DOI:10.1016/j.eswa.2022.118501
- Szalavetz, A. (2022). The digitalisation of manufacturing and blurring industry boundaries. *CIRP Journal of Manufacturing Science and Technology*, 37, 332–343. DOI: 10.1016/j.cirpj.2022.02.015
- Tan, C. K. L., & Abdul-Samad, Z. (2022). A study of the impact of COVID-19 on construction workforce productivity in Malaysia. *International Journal of Productivity and Performance Management*, (In Press). DOI:10.1108/IJPPM-07-2021-0421
- Telukdarie, A., Munsamy, M., & Mohlala, P. (2020). Analysis of the Impact of COVID-19 on the Food and Beverages Manufacturing Sector. *Sustainability*, 12(22), 9331. DOI:10.3390/su12229331

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