

Digital and Green Manufacturing: Cultivating Growth Opportunities for Industry

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IDEAM Cluster

Innovation | Collaboration | Growth

IDEAM Cluster is an innovative national industry cluster located in the heart of the Mid-West region of Ireland supporting businesses to collaborate, innovate and grow. We aim to prepare those organisations for opportunities in digitalisation and green transition of manufacturing. The core needs of SMEs are at the heart of our cluster strategy acting as a 'one-stop-shop' to ignite the exponential growth of manufacturing SMEs. Our core vision is to unlock new collaborative opportunities for our members by working together and building trust.

IDEAM brings together industry, academia, government and society to represent the needs of the digital engineering and advanced manufacturing ecosystem in Ireland. Our mission is to support SMEs with their smart manufacturing journey. At an economic level, the impact of the IDEAM Cluster will be the retention and attraction of 2,000 jobs and support more than 100+ advanced manufacturing SMEs.

Digital

Green

Digital and green manufacturing are two important trends that are transforming the manufacturing industry. Digital manufacturing refers to the use of digital technologies such as artificial intelligence, machine learning, and the Internet of Things (IoT) to optimise the manufacturing process. Green manufacturing, on the other hand, focuses on reducing the environmental impact of manufacturing through the use of sustainable and eco-friendly practices.

Digital manufacturing offers many benefits, including improved efficiency, quality, and productivity. By collecting and analysing data from various sources in real-time, manufacturers can make data-driven decisions that optimise the entire manufacturing process, from design to production. Additionally, digital manufacturing can enable better supply chain management, predictive maintenance, and overall cost reduction.

Green manufacturing, on the other hand, focuses on reducing the environmental impact of manufacturing through the use of sustainable and eco-friendly practices. By implementing energy-efficient lighting and HVAC systems, recycling and waste reduction programs, and using renewable energy sources such as solar or wind power, manufacturers can reduce their carbon footprint and minimize the use of harmful chemicals and materials.

Overall, digital and green manufacturing are important trends that are transforming the manufacturing industry. By adopting these practices, manufacturers can improve sustainability, efficiency, and productivity, while also reducing costs and improving their reputation among consumers.

Industry Learnings

Green Manufacturing Practices

- Using renewable energy sources such as solar or wind power
- Implementing recycling and waste reduction programs
- Using environmentally friendly materials and processes
- Implementing energy-efficient lighting and HVAC systems
- Reducing water usage through water conservation practices
- Implementing sustainable supply chain practices such as sourcing locally and using eco-friendly transportation.

Factories of the Future

- Advanced data analytics and machine learning tools to improve efficiency, quality, and productivity ______
- Collaborative robots and autonomous vehicles that can work alongside human workers to improve safety and productivity
- Connected factories with IoT sensors that can monitor and optimize production in real-time- 3D printing and other additive manufacturing techniques to create complex and customized parts
- Augmented reality (AR) and virtual reality (VR) tools to improve training, maintenance, and troubleshooting.

Global Manufacturing

Global manufacturing refers to the production of goods in different parts of the world, often with the aim of taking advantage of differences in labour costs, access to resources, and other factors. The global manufacturing sector is diverse, with many different industries and products being produced around the world.

- Increasing use of automation, robotics, and other technologies to improve efficiency
- Rise of additive manufacturing (3D printing) and other new production techniques
- Growth of supply chains that span multiple countries and regions
- Increasing importance of sustainability and environmental concerns in manufacturing Emergence of new markets in developing countries, particularly in Asia and Africa.



Global manufacturing offers many advantages for companies, including access to new markets, lower labour costs, and the ability to take advantage of specialized expertise or resources in different regions. However, there are also challenges associated with global manufacturing, including managing complex supply chains, ensuring quality and consistency across different locations, and navigating different legal and regulatory environments.

Manufacturing in Ireland

Manufacturing statistics in Ireland and globally show some similarities and differences. Manufacturing output: According to the Central Statistics Office, manufacturing output in Ireland increased by 11.1% in 2020. Globally, the manufacturing sector is also growing, with global manufacturing output expected to increase by 4.1% in 2021. Employment: The manufacturing sector in Ireland employs over 250,000 people, accounting for 11.7% of total employment.

Manufacturing sector in Ireland employs over 250,000 people



Ireland ranks 12th out of 23 countries in terms of Industry 4.0 adoption

Globally, the manufacturing sector employs around 330 million people. **Productivity:** According to Eurostat, Ireland's manufacturing productivity was 27% higher than the EU average in 2018. Globally, manufacturing productivity varies widely depending on factors such as technology adoption and labor costs. **Exports:** The manufacturing sector in Ireland is highly export-oriented, with over 90% of output sold abroad. Globally, the manufacturing sector accounts for around 80% of world merchandise trade. **Industry 4.0 adoption:** According to a study by PwC, Ireland ranks 12th out of 23 countries in terms of Industry 4.0 adoption. Globally, Industry 4.0 technologies are becoming increasingly important for manufacturers to remain competitive.

Manufacturing in Ireland

Manufacturing is an important sector in Ireland, contributing significantly to the country's economy. Ireland is home to a wide range of manufacturing industries, including pharmaceuticals, medical devices, electronics, food and beverages, and more.

A highly skilled and educated workforce Favorable corporate tax rates and government incentives for foreign investment Access to the European market A strong culture of innovation and entrepreneurship A stable political and economic environment.

The pharmaceutical industry is one of the largest manufacturing sectors in Ireland, with many multinational pharmaceutical companies having operations in the country. Ireland is also a major producer of medical devices, with over 300 medical device companies operating in the country. Additionally, Ireland has a strong food and beverage industry, with many well-known brands such as Guinness, Baileys, and Kerrygold. Overall, manufacturing in Ireland offers many advantages for companies looking to expand their operations, with a skilled workforce, favorable tax rates, and access to the European market being key factors in the country's success in this sector.

Importance of Clusters to Manufacturing

Industry clusters play an important role in the manufacturing sector by bringing together businesses that share similar interests, specialisations, and resources. Industry clusters can facilitate collaboration, innovation, and knowledge-sharing among businesses, leading to increased productivity, competitiveness, and growth. Some of the key benefits of industry clusters for manufacturing include:

- Access to specialised resources: Industry clusters often have access to specialised resources such as specialised equipment, research facilities, and skilled labour. By sharing these resources, businesses can reduce costs and improve efficiency.
- Collaboration and knowledge-sharing: Industry clusters facilitate collaboration and knowledge-sharing among businesses, enabling them to learn from each other, share best practices, and develop new ideas and technologies.
- Increased competitiveness: By working together, businesses in industry clusters can improve their competitiveness by pooling resources, reducing costs, and developing new products and services that meet the needs of their customers.
- Innovation: Industry clusters can foster innovation by creating an environment that encourages experimentation, creativity, and risk-taking. By working together, businesses can develop new products and technologies that drive growth and competitiveness.

Industry clusters are important to manufacturing because they help businesses to overcome the challenges of competition, innovation, and resource constraints. By working together, businesses can achieve economies of scale, reduce costs, and improve their competitiveness, ultimately driving growth and economic development in their region.



Bringing manufacturing SMEs and manufacturing MNEs (Multinational Enterprises) closer together can create numerous benefits for both parties.

1. Collaboration: Encouraging collaboration between SMEs and MNEs can lead to knowledge-sharing, technology transfer, and access to new markets. MNEs can provide SMEs with access to their global supply chains, while SMEs can offer MNEs agility and flexibility.

2. Networking: Facilitating networking opportunities between SMEs and MNEs can help to build relationships and foster partnerships. This can be achieved through events, trade shows, and industry associations.

3. Capacity-building: Investing in capacity-building programs can help SMEs to develop the skills and capabilities needed to work with MNEs. This can include training in supply chain management, quality control, and other areas.

4. Government Support: Governments can play a role in bringing SMEs and MNEs closer together by providing incentives and support programmes. This can include tax breaks, grants, and subsidies for research and development.

5. Joint Ventures: SMEs and MNEs can form joint ventures to collaborate on specific projects or enter new markets. This can provide SMEs with access to the resources and expertise of MNEs while allowing MNEs to benefit from the agility and innovation of SMEs.

By bringing manufacturing SMEs and MNEs closer together, both parties can benefit from increased innovation, competitiveness, and growth.

Gaps and Challenges in Manufacturing

There are several gaps in manufacturing that exist in the industry today.

Skills Gap: There is a significant shortage of skilled labor in the manufacturing industry today. Many manufacturers are finding it difficult to find workers with the necessary skills to operate complex machinery and perform specialised tasks.

- Digitalisation Gap: The manufacturing industry has been slow to adopt digital technologies, such as automation, data analytics, and artificial intelligence. As a result, many manufacturers are missing out on the benefits of improved efficiency and productivity.
- Sustainability Gap: Many manufacturers are still using outdated and inefficient processes that contribute to environmental degradation. There is a need for more sustainable manufacturing processes that minimise waste and reduce greenhouse gas emissions.
- Supply Chain Gap: Globalisation has made supply chains more complex, and manufacturers are finding it challenging to manage their supply chains effectively. There is a need for better collaboration and communication between manufacturers and their suppliers.

Innovation Gap: Many manufacturers are still relying on traditional manufacturing processes and are not investing in research and development. There is a need for more innovation in the industry to drive growth and competitiveness.

Closing these gaps will require a concerted effort by manufacturers, policymakers, and other stakeholders. It will involve investing in education and training programmes, adopting digital technologies, and promoting sustainable and innovative manufacturing practices.

Challenges

Manufacturing SMEs (Small and Medium Enterprises) face various challenges that can impact their growth and sustainability. Some of the common challenges faced by manufacturing SMEs include:

(1) Lack of access to finance - SMEs often struggle to secure funding to purchase equipment, raw materials, and other resources required for manufacturing operations.

(2) Limited market access - SMEs may face challenges in accessing markets due to limited resources, competition from larger firms, and lack of marketing expertise.

(3) Skilled labor shortage - Manufacturing SMEs often struggle to find and retain skilled labor due to the competition from larger firms and the high cost of training.

(4) Technology adoption - SMEs may lack the resources to invest in modern technology, which can lead to inefficiencies and reduce their competitiveness.
(5) Regulatory compliance - SMEs may struggle to comply with regulations, such as environmental regulations, which can lead to fines and other legal issues.

(6) Supply chain disruptions - Manufacturing SMEs may face disruptions in their supply chain due to factors such as natural disasters, geopolitical tensions, and economic instability.

These challenges can impact the growth and sustainability of manufacturing SMEs, but with proper planning and support, they can be overcome.

Manufacturing Needs

Manufacturing in Ireland has seen significant growth in recent years, but there are still areas that need attention to support its continued success. Like many countries, Ireland faces a shortage of skilled labour in the manufacturing sector. There is a need for more training programs and apprenticeships to develop the necessary skills and expertise for the industry. Innovation is critical to the success of the manufacturing sector. Ireland needs to continue invest in research and development to drive innovation and to competitiveness in the industry. The quality of *infrastructure*, such as roads, ports, and airports, is essential to the success of the manufacturing sector. Ireland needs to invest in infrastructure to support the growth of manufacturing. The regulatory environment in Ireland needs to be supportive of the manufacturing industry. There is a need for clear and predictable regulations that promote innovation and growth. The COVID-19 pandemic has highlighted the importance of supply chain resilience. Ireland needs to continue to invest in supply chain management to ensure the sector can withstand disruptions and continue to operate efficiently. Sustainability is becoming increasingly important in the manufacturing sector. Ireland needs to continue to promote sustainable manufacturing practices to minimize the environmental impact of the industry.

By addressing these needs, Ireland can continue to build a strong and competitive manufacturing sector that contributes to the country's economic growth and job creation.

Conclusion

Manufacturing is a critical sector that plays a vital role in the global economy. From producing goods that people use every day, to driving innovation and creating jobs, manufacturing is a cornerstone of modern society. Over the years, manufacturing has undergone significant changes, transformed by advancements in technology and globalisation. As a result, manufacturing has become more efficient, more connected, and more sustainable, with an increasing focus on automation, digitalisation, and sustainability.

Looking ahead, the future of manufacturing is expected to be shaped by continued innovation and technological advancements, as well as a growing focus on sustainability and social responsibility. Manufacturers will need to adapt to changing market conditions, consumer needs, and regulatory requirements, while also investing in new technologies, fostering innovation, and developing a highly skilled workforce.

Despite the challenges, manufacturing remains a vital sector that will continue to drive economic growth, create jobs, and improve people's lives for years to come.



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