

Modular Course C: Design Engineering

UNIT C2: Digital Manufacturing Technologies

LC2.1 - Digital Manufacturing Technologies and
processes



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DISHOLEA | Improving the digital
skills of workforce in Shoe and
Leather goods Industry in Jordan and
Palestine | GA 101129194



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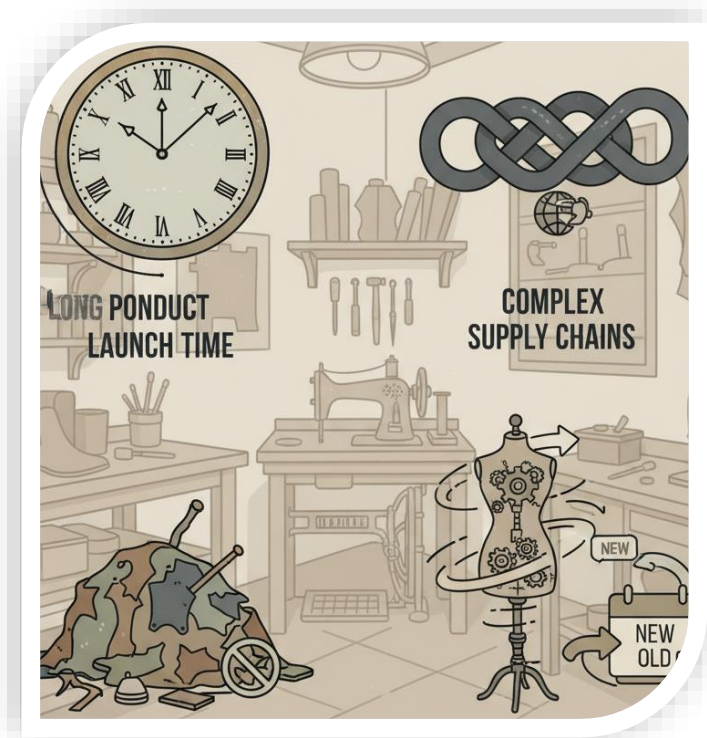
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 - Industry 4.0 and Digital Transformation
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 - Digital Design and Manufacturing Integration
 - Rapid Prototyping and Virtual Samples

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Traditional Approach

It takes many months for a new model to be introduced to the market

In traditional shoe production processes, it took quite a long time to bring a new model to the market. Often, this process could take months or even up to 18 months.



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Traditional Approach

Complex supply chains, high material waste

Sourcing raw materials such as leather, fabric, and rubber from different geographies required working with multiple contract manufacturers. This made production planning difficult and increased costs.



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Traditional Approach

Rapid change of fashion trends

In today's market, where fashion trends change very quickly, such long production cycles made it difficult for companies to adapt to the market, and sometimes caused the trend to fall behind when they launched the new model



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Industry 4.0 and Digital Transformation

- The technological revolution brought about by Industry 4.0 has initiated a transformation in the footwear industry.
- Industry 4.0 actually refers to the fourth industrial revolution. After the steam power, electricity and automation revolutions, this is now the era of digitalization and smart systems. Industry 4.0 has ushered in an unprecedented transformation in the footwear industry.



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Industry 4.0 and Digital Transformation

- This transformation; automation systems, robotics applications, digital design tools, and integrating 3D printing into manufacturing processes
- No longer do machines perform mere mechanical tasks; Thanks to sensors, artificial intelligence algorithms and digital twins, they are turning into systems that collect, analyze and make decisions on their own.



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Industry 4.0 and Digital Transformation

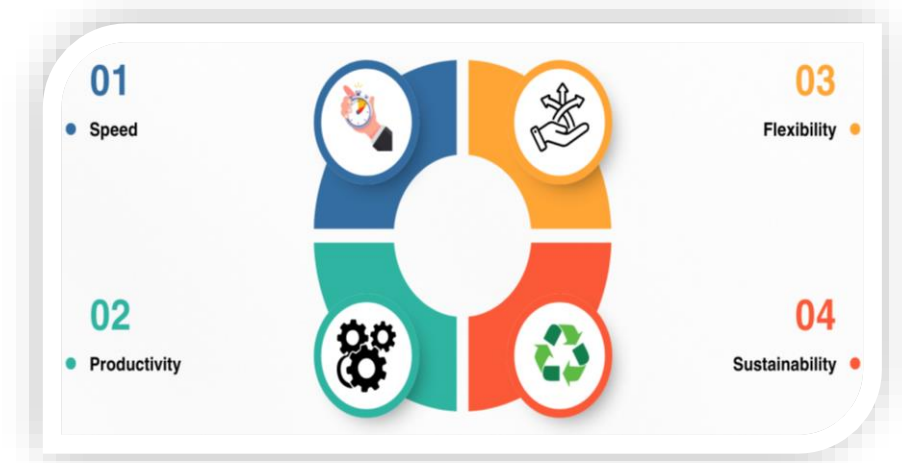
- The goal is to transform traditional manufacturing processes into more intelligent, flexible, and data-driven systems
- This shortens time-to-market, increases personalization, and makes resource use more efficient. For shoe manufacturers, it's not just about cost and speed advantages; it also means customer-oriented and sustainable production.



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• Why Digitalization? Key Motivations

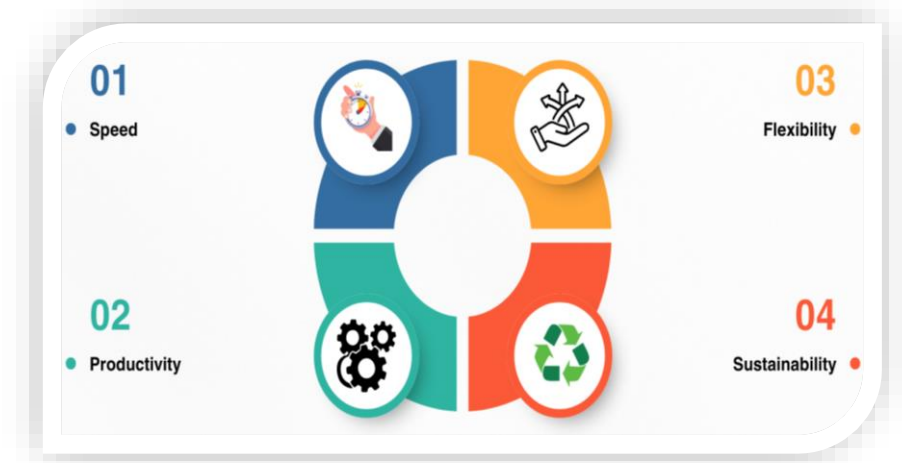
- **Speed:** Reduce time-to-market for new products
- Thanks to digital design and production tools, the time to market for a new product is dramatically shortened. The process, which used to take months, can now be reduced to weeks or even days.



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• Why Digitalization? Key Motivations

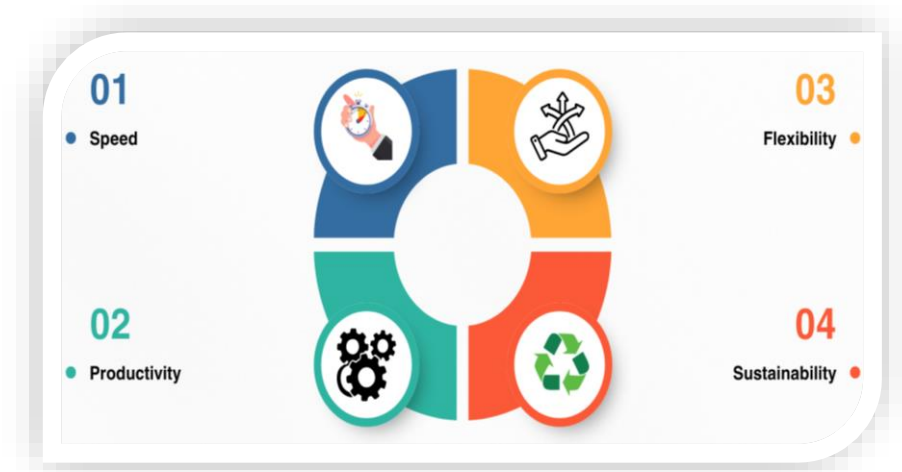
- **Efficiency:** Reducing operational costs, minimizing error rate, and increasing production speed.
- Automation systems and digital manufacturing reduce operational costs. The error rate decreases; the production speed increases. This provides a competitive advantage.



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• Why Digitalization? Key Motivations

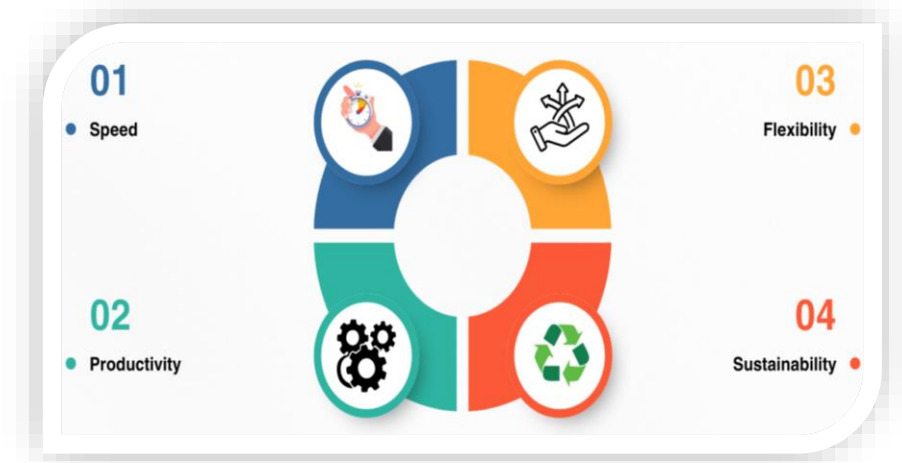
- **Flexibility:** Ability to respond more easily to changing consumer demands and fast fashion trends.
- Fashion trends change very quickly, consumer expectations can change instantly. Thanks to digitalization, manufacturers can respond quickly to this change, and small series or tailor-made production become economical.



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• Why Digitalization? Key Motivations

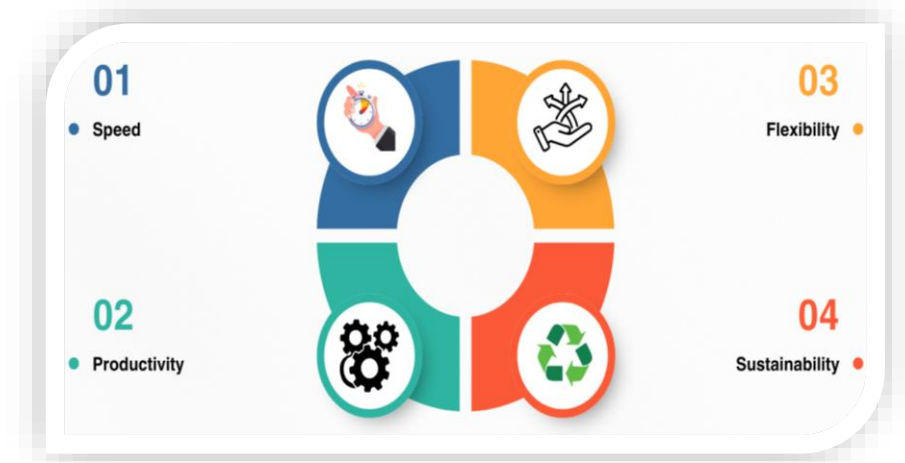
- **Sustainability:** Reducing material waste, minimizing environmental impact, and contributing to the circular economy
- Digital manufacturing reduces material waste, reduces carbon footprint, and contributes to the circular economy. Thus, both the environment wins and the brand image is strengthened.



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• Why Digitalization? Key Motivations

In short, speed, efficiency, flexibility and sustainability; they are the strongest drivers of digitalization.



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- **Digital Design and Manufacturing Integration**

- Computer-Aided Design (CAD) and Manufacturing (CAM) systems bring shoe design to the virtual environment.
- They find easier movement opportunities in the virtual environment.



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- **Digital Design and Manufacturing Integration**
- 3D programs offer designers unlimited creative freedom.
- The virtual environment is now a design universe where there are no boundaries for designers.



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- **Digital Design and Manufacturing Integration**

- Designers can digitally test complex geometries and materials before creating a physical prototype.
- New materials or different surface textures can be tested more economically and faster without producing physical prototypes.



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- **Digital Design and Manufacturing Integration**

- This speeds up the design cycle and detects errors at an early stage
- An error can be noticed on the screen before it goes into production. Thus, both time loss and costs are greatly reduced.

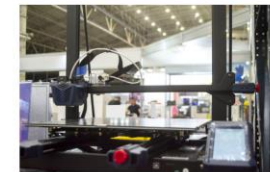


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- **Rapid Prototyping and Virtual Samples**

3D printing accelerates the prototyping process by replacing traditional sample production.

- 3D printing technology is greatly speeding up the prototyping process, replacing traditional sample production. Sample preparation, which used to take days or weeks, can now be completed in a single day.

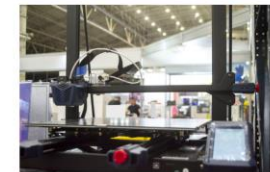


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- **Rapid Prototyping and Virtual Samples**

Complex designs can be turned into prototypes in a day instead of days with 3D printing.

- Even complex designs can be easily brought to life with 3D printers. This allows designers to experiment with bolder, more innovative forms.



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- **Rapid Prototyping and Virtual Samples**

Certifying virtual samples digitally minimizes the number of physical samples and therefore material waste.

- Additionally, the ability to validate virtual samples digitally reduces the need for physical prototypes. This not only saves time but also minimizes material waste, contributing to sustainable production.

