Towards Sustainable Smart Textiles

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ABSTRACT

Recent years have seen the rapid growth of smart textiles in the global market. Furthermore, with growing concerns about the environmental impact of the fashion industry and injustices in the global supply chain, there is huge scope for the sustainable smart textiles market.

The group report follows the planned process model in Figure 1 and outlines possible scenarios for smart textiles towards sustainability. The analysis of the sustainability crisis and potential solutions will be sequentially presented in four main segments: **smart textile markets, materials, manufacturing techniques and supply chain.**
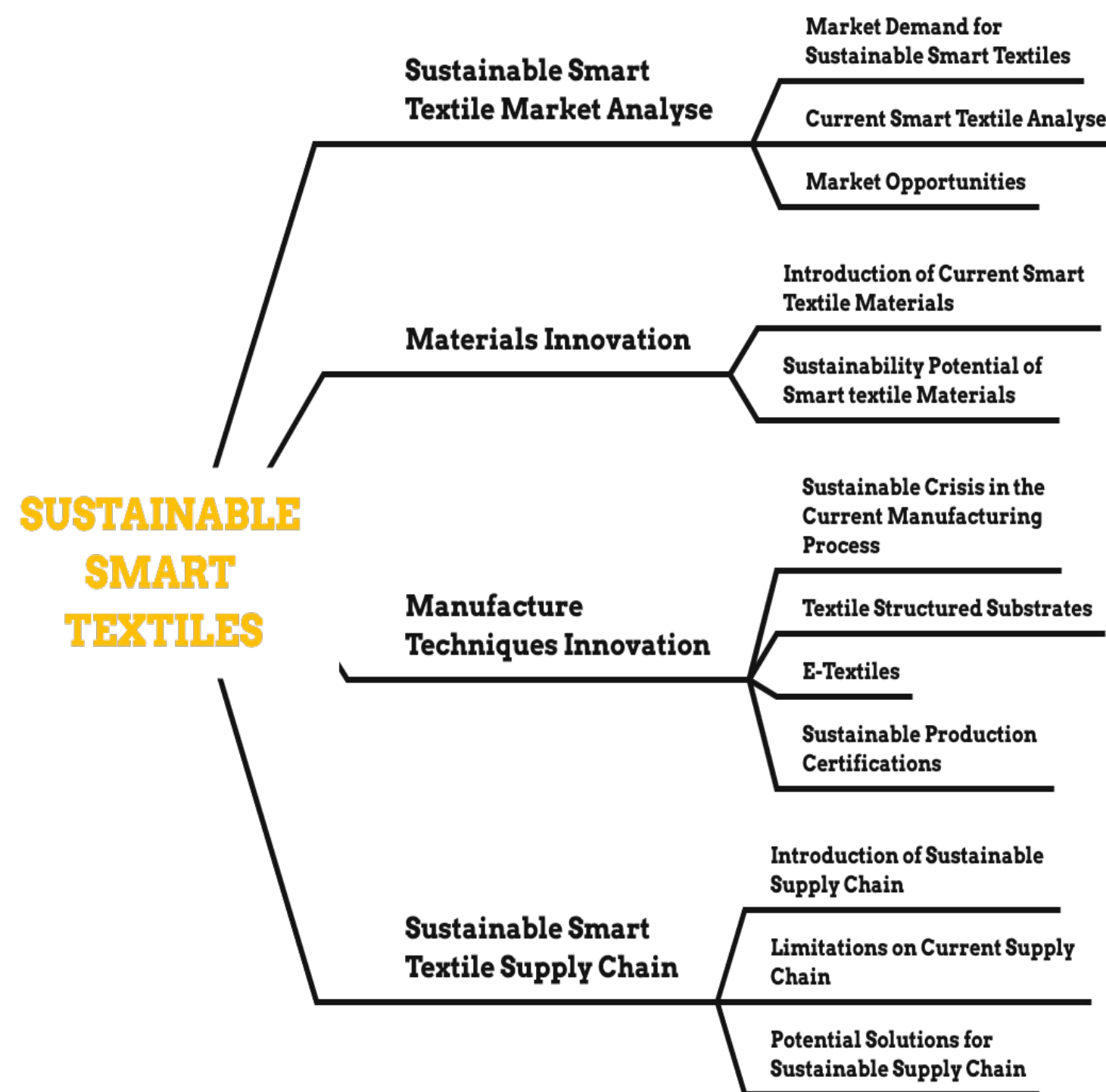
Figure 1. **Process model** of sustainable smart textiles. Created by Author.

HIGHLIGHTS

MARKET ANALYSIS

- Total market value is approximately **£800 to £1.6 billion**.
- Market structure for smart textiles as **Monopolistic Competition.**
- Smart textiles market is dominated by **technology companies, not fashion brands**.
- **North America** is the **main market** with a 36% market share.
- **Asia Pacific** is the **second largest** market for smart textiles and has become the **fastest-growing** region due to its **low labour cost advantage**.
- Fashion brands should actively **collaborate** with technology companies.

Figure 2. Global Smart fabrics Market **growth rate**. Created by Author.

MATERIAL INNOVATION

- Pioneering definition of sustainability: **Functional** and **intrinsic** sustainability.
- Materials Innovation : **Nanomaterials**, **Bio-based materials**, **Biodegradable materials**.
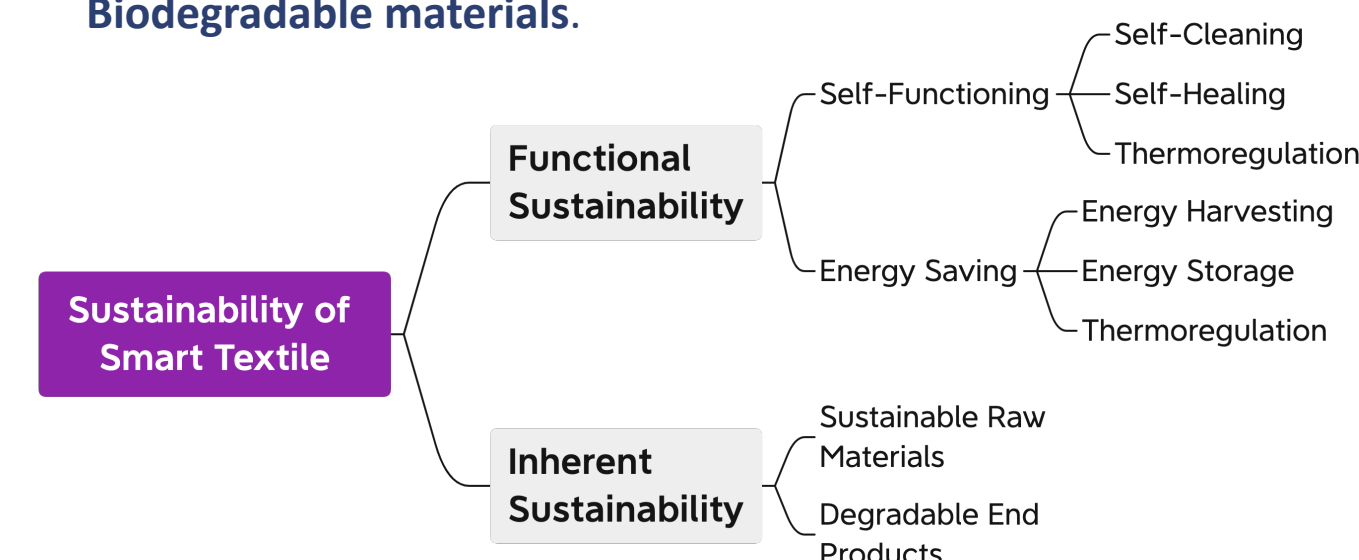

Figure 3. **Pioneering definition** of sustainability of smart textiles. Created by Author.

MANUFACTURING TECHNOLOGY INNOVATION

- Current challenges: **Environmental Pollution & Energy Consumption.**
- Advanced manufacturing technologies: **3D Printing**, **Electrospinning**, **Nanocoating**, **Thermal drawing**, etc.
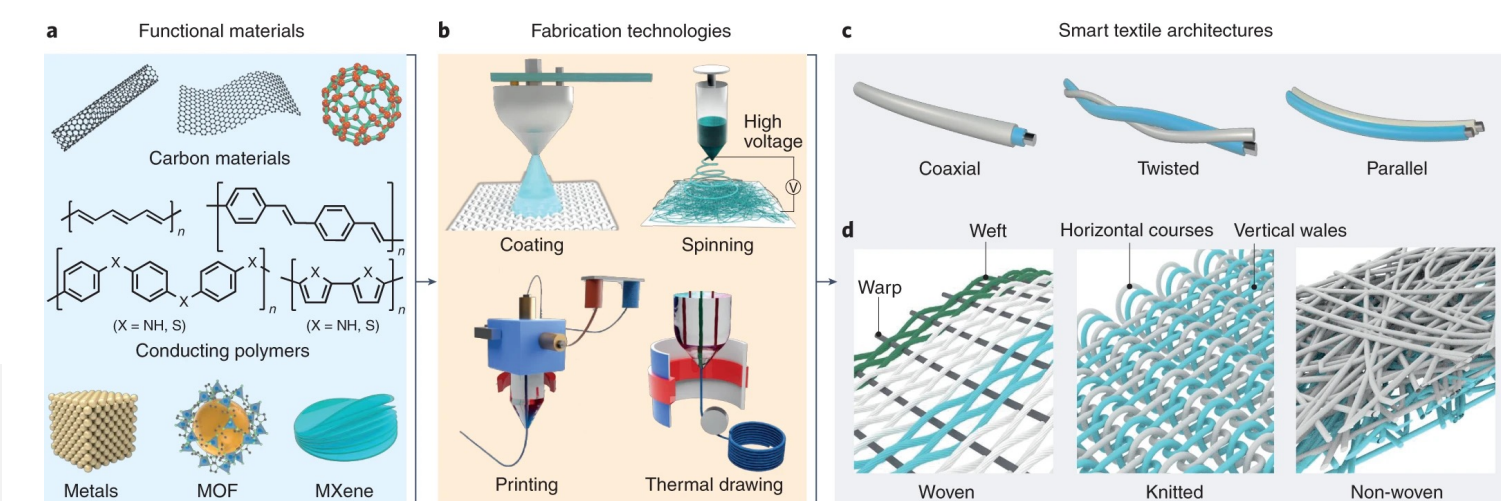- Developing **sustainable production certification.**

Figure. 4. **Fabrication strategies** of smart textiles. Reproduced from Libanori, A. et al. (2022).

SUPPLY CHAIN

- **Limitations**: Traceability, Environmental Friendliness, Warehouse Logistics management.
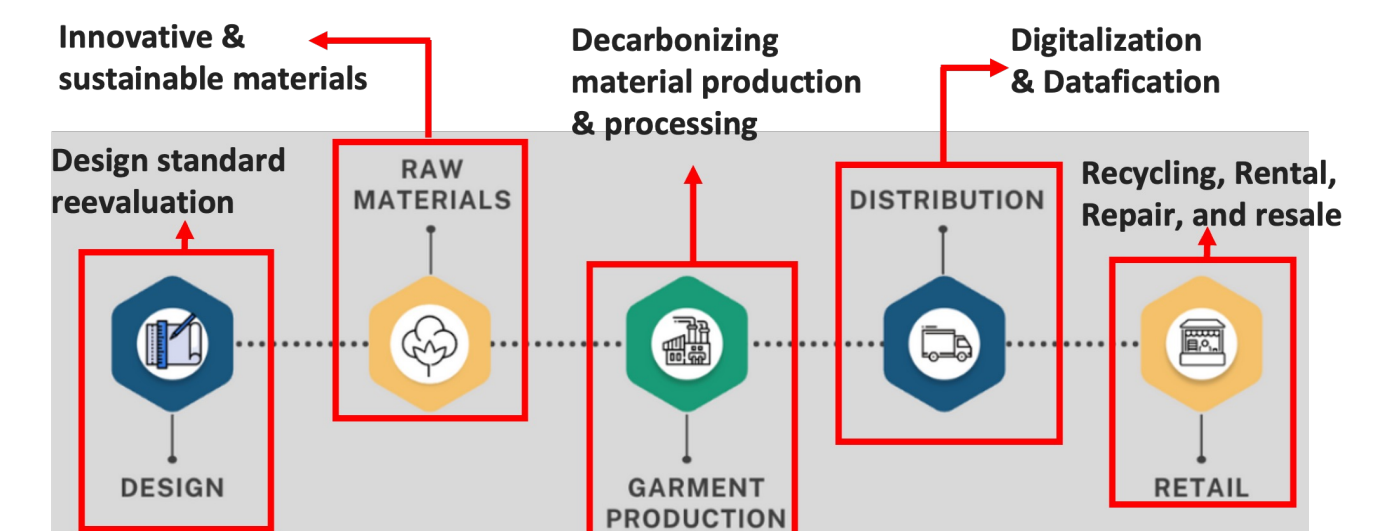- **Potential solutions**: Blockchain Technology & Circular supply chain model.

Fig. 5. **Improvement** in future sustainable supply chain. Created by Author.

CONCLUSION

In summary, it is important to lay out the entire lifecycle of smart textiles in advance. The group report features an in-depth and extensive analysis of **four main segments**, by analysing the **potential markets for smart textiles**, researching **innovative materials**, developing **advanced manufacturing technologies** and increasing transparency in **supply chain**.