Challenges and opportunities for smart textiles

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CHALLENGES AND OPPORTUNITIES FOR SMART TEXTILES

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Overview

Smart textiles are able to sense and respond to changes in their environment.

Smart textiles are thriving while tackling some tough challenges that yet to meet in order to achieve reliable, performant and manufacturable smart textiles.

Integration of complex heterogeneous technologies, comfort, washability and regulatory frameworks are among the key challenges.
Overview

According to Smart Textiles Market report (2023), “the global smart textiles market size reached **US$ 3.8 Billion in 2022**.

Looking forward, the market to reach **US$ 15.9 Billion by 2028**, exhibiting a growth rate **Compound annual growth rate of 26.94% during 2022-2028**”
Overview

The smart textile sector is projected to **drive the market even further** along with technological advancements and extensive research and development (R&D) activities at various stakeholder's level.

Source: Jun Chen Lab/UCLA.
CHALLENGES FOR SMART TEXTILES
Challenges

The challenges facing for smart textiles can be divided into three main groups, as follows;

- Challenges related to **user experience**.
- Challenges related to **technology**.
- Challenges related to **critical factors**.
Challenges related to user experience

The challenges facing for smart textiles related to **user experience** are as follows;

- **Comfort** issues and user friendliness.
- **Design** restrictions.
- System life-time and poor **usability**.
- **Unstable functionality** and Maintenance.
- Complex **installation-uninstallation**.
- Washability
- Complex **data collection and management** system.
- Incoherent **value propositions**.

Source: [https://hal.science/hal-02868900](https://hal.science/hal-02868900)
The challenges facing for smart textiles related to technology are as follows:

- **Integration** and miniaturization techniques.
- Mechanical environment.
- Washability and fragile interconnection.
- Power **supplies and wiring**.
- User friendly **product development**.
- Designer friendly **technologies and tools**.
- End user engagement and **usability testing**.
- Pre-series **market testing**.

https://leverageedu.com/blog/textile-design-courses/
Challenges related to technology

Excessive wiring

Poor comfort

Fragile interconnectivity
Challenges related to critical factors

The challenges facing for smart textiles related to critical factors are as follows;

- **Standards and testing** methods.
- **Regulatory** framework.
- **Market** requirement and **business model**.
- **Sustainable** service model, compliance and life cycle.
- Trends, education and **awareness**.
- **Effective cooperation** between ecosystem actors.
- Automated **manufacturing process**.
OPPORTUNITIES FOR SMART TEXTILES
Significant progress has been made in developing smart textiles recently and this area has received widespread support from both the research and commercial actors. Highest expectations of smart textiles opportunities are expected on the following applications:

- Healthcare and fitness.
- Infotainment and wearable electronics.
- Fashion.
- Wellness and sports.
- Automotive, transport, agro, and telecommunications.
- Construction, security/defense and geo-textiles.
- Energy and architecture.
- Home and interior textiles.
Opportunities in terms of application area: Example

INSITEX concept overview

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Summary

• Smart textiles are in discussion for about **20 years and yet few commercial products** are on the market due to key challenges related to user experience, technologies and critical factors.

• Challenges need to be addressed to ensure that smart textiles will successfully **transition from research laboratories to industrial applications**.

• **Fast, easy and reliable Integration techniques are the key** to low-cost smart textiles which will help build a more sustainable business model.

• The key factors **driving the growth of the market includes** the emerging trend of miniaturization of electronics, increasing integration of smart textiles with wearable devices, monitor muscle vibrations, regulate body temperatures and provide protection from various hazards **in defense, sports and healthcare**.
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