

VIRTUAL GUIDE  
Learning unit 1  
Lesson 3

# Introduction to the smart textiles market



Innovative smart textiles & entrepreneurship

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## Introduction to the smart textiles market - Niche markets II

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## Abstract

Smart textiles market is one of the most promising and emerging markets lately. Due to the technological revolution they are experiencing since few decades ago, the possibilities that a traditional textile product could offer in past have increased dramatically.

The combination of classical textiles' concept with several elements such as materials with particular properties, sensors, electrification, and internet are leading textiles to a new era.

This book will provide a necessary contextualisation necessary to understand the potential of smart textiles and which kind of relationship they have and they might have with the commercial market.

Then, it will provide some more deep information of specific markets and show examples about how they are evolving.



## 1. Niche Markets II

### 1.1. Automotive and transportation

Automotive as a niche market is crucial. In 2006 the EU, represented the largest automotive producer in the world with nearly 2 million light commercial vehicles<sup>1</sup>. Nowadays, “Europe continues to be one of the world’s main production regions by accounting for 23% of total vehicle production and 28% of total car output in 2016”.<sup>2</sup>

Regarding automotive and transportation niche markets, it is interesting to underline the fact that smart textiles are an important element able to enlighten cars and any other transportation method making them more efficient (apart from more intelligence).

The applications of smart textiles for automotive and transportation, in fact, target mainly the comfort and security improvements. For example, they can provide seat heaters, airbag sensors, and climate control<sup>3</sup>.

Atria Innovation technological centre, for instance, developed smart fabrics integrated within a car seat that can detect an occupant’s size, weight, temperature, and even mood, counteract fatigue, insulate the occupant from ambient noise, or simply change colour.



Image 9: Smart textile car seats by Atria Innovation<sup>4</sup>

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<sup>1</sup> Boussu, F., Cochrane, C., Lewandowski, M., & Koncar-Ensait, V. (2008). Smart textiles in automotive interiors. *Textile Advances in the Automotive Industry*. Cambridge: Woodhead Publishing, 172-196.

<sup>2</sup> Pavlínek, P. (2020). Restructuring and internationalization of the European automotive industry. *Journal of Economic Geography*, 20(2), 509-541.

<sup>3</sup> Drean, E., Schacher, L., Adolphe, D., & Bauer, F. (2007). Smart textiles for automotive: application to airbag development. In *4th International Workshop on Wearable and Implantable Body Sensor Networks (BSN 2007) March 26–28, 2007 RWTH Aachen University, Germany* (pp. 155-160). Springer Berlin Heidelberg.

<sup>4</sup> <https://www.atriainnovation.com/en/smart-textiles/>

## 1.2. Aerospace

Smart textiles for aerospace can be used in applications to provide enhanced protection and performance. For example, they can be used to create lightweight, durable materials for space suits and spacecraft.

Also, as it is shown in the example, for airplane seats. Stylus developed this product arguing that *“Immobility of passengers is an important problem for long-distance flights, as it can affect the circulatory system and cause a large range of issues, from stiffness, swelling and general discomfort to deep vein thrombosis (DVT) symptoms. In order to avoid these health risks, the UK-based design studio Layer in partnership with Airbus developed a new seat for airplanes. The knitted material used for this type of seat contains a set of sensors used to detect passengers’ weight, movement and temperature. The data is used by an app to adjust the optimum position of the seat so passengers will experience no discomfort during their travel. The lightweight frame of the seat is made of aircraft-grade aluminium and carbon fibre facilitates the adjustments made for the optimum seat position. The seat does not use any type of foam, increasing its level of sustainability.”*<sup>5</sup>



Image 10: Smart textile car seats by Stylus<sup>6</sup>

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<sup>5</sup> <https://www.context-cost.eu/working-groups/wg2-automotive-aeronautics/>

<sup>6</sup> <https://stylus.com/>

### 1.3. Home

Smart fabrics interior furniture open a wide range of possibilities. Smart textiles for home are being developed for use like furnishings, such as curtains, carpets, and upholstery. These fabrics can provide additional functionality, such as temperature regulation and air purification and need to be resistant in time to daily use.

In this case, the functionalities are more related to the comfort and aesthetics rather than other practical applications. But, as long as almost all citizens can become users of this kind of products and technologies and fill their homes with smart textiles, this niche market becomes so relevant. For example, sensors and conductive capacity added in furniture might add the capacity of some elements of the home to enlight or warm themselves after a stimuli.

For instance, we can see Dreamlux company, focused on the development of shiny furniture and fashion.



Image 11: Dreamlux lightning home elements<sup>7</sup>

### 1.4. Architecture

Moving outdoors, the architecture niche market opens a wide range of possibilities within its several stages, from construction, through equipment and finalisation, to complement and adaptation of buildings and structures.

In the early stages of the architecture and construction, several solutions can be provided by smart textiles. Not only electrical ones, but also those which have particular qualities and react to external elements.

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<sup>7</sup> <https://www.dreamlux.it/en/>



An emerging technology dedicated to monitoring both old and new buildings' health is made partially with smart textiles. Humidity, ground movements and many other environmental adversities can damage a building structure. For this reason, Structural Health Monitoring (SHM) has been developed. It is made of textiles with sensing carbon coatings embedded in concrete to detect load changes and prevent damages.



Image 12: SMH example, by CONTEXT<sup>8</sup>

Also, examples of advanced textiles for the construction sector comprise fabrics used for the rehabilitation of buildings, geotextiles for railway, roadway embankments or coastal protection, high performance technical textiles for tensile structures and textiles used in advanced roofing systems. These materials can provide both strengthening, stabilisation and monitoring functions compared to traditional materials. Lenzi Egisto company implemented the following technology in this line.



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<sup>8</sup> <https://www.context-cost.eu/working-groups/wg4-building-living/>

Image 12: AEGIS by Lenzi Egisto<sup>9</sup>

Then, during the enabling of a building, in the process of making it habitable, possibilities of smart textiles also play a significant role. Isolation from both sound and temperature is a basic element in the process of building construction. As it is said in CONTEX WG4 - "State of the art report on smart textiles for building and living" *"the composite materials based on natural fibres offer thermal insulation properties superior to those existing on the market and consequently increase the energy efficiency of the buildings. The composite materials based on natural fibres offer thermal insulation properties superior to those existing on the market and consequently increase the energy efficiency of the buildings"*.



Image 12: Thermal-acoustic insulation RECYCLETHERM KMO by ARCHIEXPO<sup>10</sup>

<sup>9</sup> [Who we are - Lenzi Egisto](#)

<sup>10</sup> [Thermal-acoustic insulation - RECYCLETHERM KMO - Manifattura Maiano - textile / panel / wall \(archiexpo.com\)](#)

And, finally, once the building is fully equipped but it might need some improvement or adaptation to specific circumstances -or even with no building itself- smart textiles keep on contributing to the final stage of this niche market.

Indeed, awning is one of these improvements or added value elements within a building. But, not all kinds of awnings perform the same. Those ones manufactured with smart textiles are able not only to create a space of shadow but also to repel harmful rays of sun letting in the inoffensive ones and even letting penetrate in a wide range of degree the rays of sun according to the interest of the user, which can vary depending on the season.

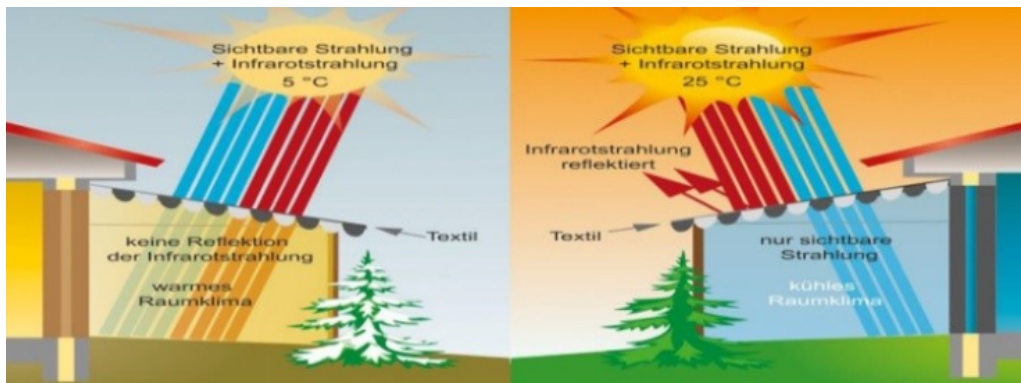


Image 13: Exemplification of solar protection elements in a building<sup>11</sup>

Moreover, we can find different kinds of structures that can act as street furniture and/or protection (mainly from weather conditions) and easily replace hard-concept structures. It is the case of covering structures that go beyond the traditional awning, making it possible to install them in parts of the building never expected before such stadiums and even in public areas.

<sup>11</sup> Next Technology Tecnotessile



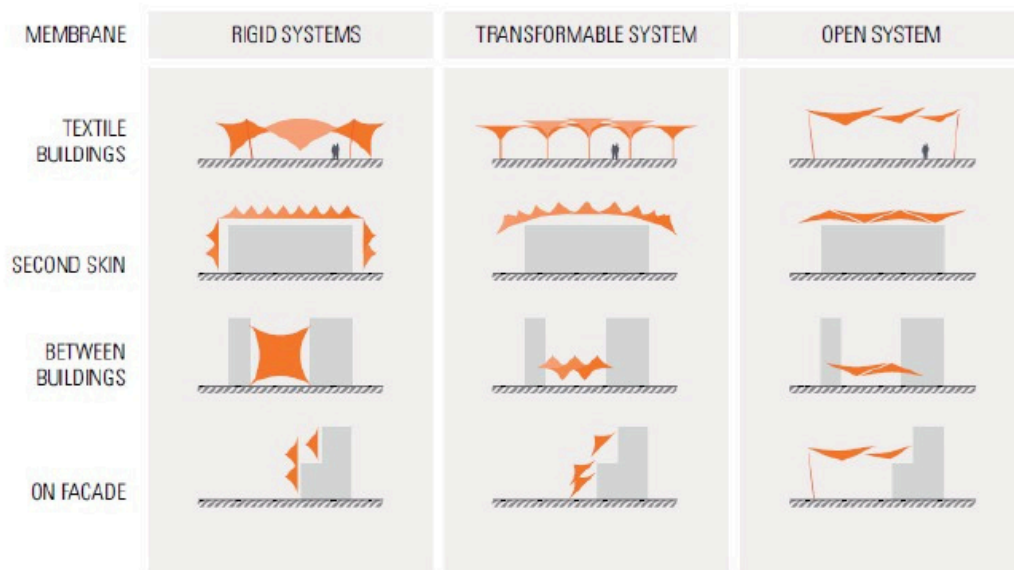


Image 14: Textile possible structures by MDT-TEX Textile Architecture<sup>12</sup>

And, finally, an important element which becomes crucial depending on the part of the world where the building is done, is the prevention and mitigation against earthquakes. In this sense, smart textiles also are able to provide solutions: *“An innovation in earthquake engineering is a curtain of cables anchored to ground to make building earthquake proof: threads made from*

*thermoplastic carbon fibre composite are tied and braided to form a strong flexible rod which is 90% lighter than reinforcement bars and has the same strength. To make earthquake proof buildings these composite rods are tied & secured to the ground and installed around the building.”*



<sup>12</sup> <https://www.mdt-tex.com/en/high-quality-parasols-large-stock-available>

Image 14: Earthquake resistant building strengthened by carbon fibre by Designboom <sup>13</sup>

## 1.5. Agricultural

Also, other utilities can be exploited outdoors if the smart textile is applied in the field and endorsed with specific qualities and intelligence.

In this case, CINPASA and ITP GmbH cooperated to develop a first product demonstrator for agriculture fencing in order to deter animals from walking through and damaging fields and crops. The “e-shepherd” is a game-changer solution that integrates flexible electronics like temperature and moisture sensors and optic fibre sensors within high-grade textile tapes. This product will enable a prompt real-time detection of fencing anomalies.

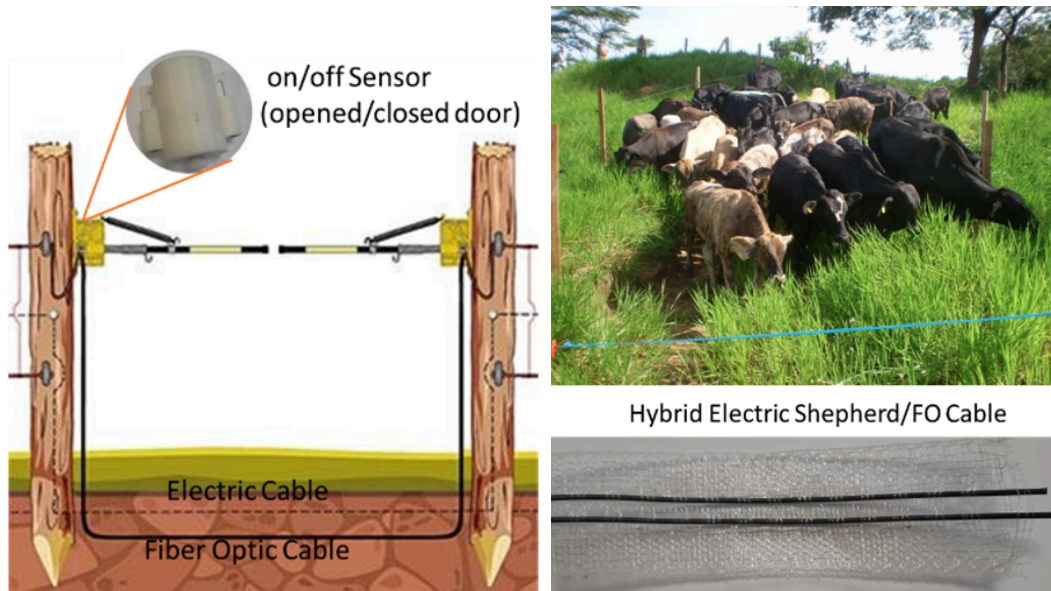


Image 14: Smart-tape prototype for agriculture applications by CINPASA <sup>14</sup>

## 1.6. Others

Other niche markets such as the military are also present. For instance, most of the wearable applications mentioned previously can be integrated within armed forces bodies' indumentary.

<sup>13</sup> [Architecture archives | designboom | architecture & design magazine](#)

<sup>14</sup> <https://clustercollaboration.eu/community-news/cinpasa-e-shepherd-prototype-novel-smart-tape-agriculture-applications>



## Conclusions

In conclusion, smart textiles have a bright future ahead. Ongoing technological revolutions lead to new applications, which at the same time lead to new and emerging niche markets. And the more versatile these innovations are, the more niche markets will appear and consolidate. Smart textiles are poised to transform a wide range of industries and applications.

These smart textiles' new applications and possibilities have been endorsed with, generally thanks to electronic devices and sensors that can revolution the concept of a classical textile product we have had until nowadays, but also specific properties achieved thanks to materials' ones or chemicals.

- The elaboration of smart textiles involve several sectors (electronic+textile+services) and does not forget sustainability aspects.
- Smart textiles need to be wearable comfortably and safety talking. Otherwise, their new applications remain useless.
- Smart textile niche markets can -and do- offer improvements and revolutions in multiple sectors.

## References

M. Kun, C. Chan, S. Ramakrishna, Abhilash Kulkarni, Ketankumar Vadodaria, Textile-based scaffolds for tissue engineering, Author links open overlay panel, <https://www.sciencedirect.com/science/article/abs/pii/B9780081021927000126>

V. Koncar, Woodhead Publishing Series in Textiles, 2016, Pages 1-8, <https://doi.org/10.1016/B978-0-08-100574-3.00001-1>

NOVEMBER 07 2012, Smart textiles: Challenges and opportunities, Kunigunde Cherenack; Liesbeth van Pieterse  
<https://pubs.aip.org/aip/jap/article-abstract/112/9/091301/372800/Smart-textiles-Challenges-and-opportunities?redirectedFrom=fulltext>

### Partnership



#### Project coordinator

TUIASI - Universitatea Tehnica Gheorghe Asachi din Iasi

[www.tuiasi.ro](http://www.tuiasi.ro)



AEI Tèxtils - Agrupació d'Empreses Innovadores Tèxtils

[www.textils.cat](http://www.textils.cat)



CIAPE - Centro pre l'Apprendimento Permanente

[www.ciape.it](http://www.ciape.it)



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