

# context

1st CONFERENCE

# Textiles in sports and wearables

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# Textiles in sports and wearables

## Smart and functional textile market

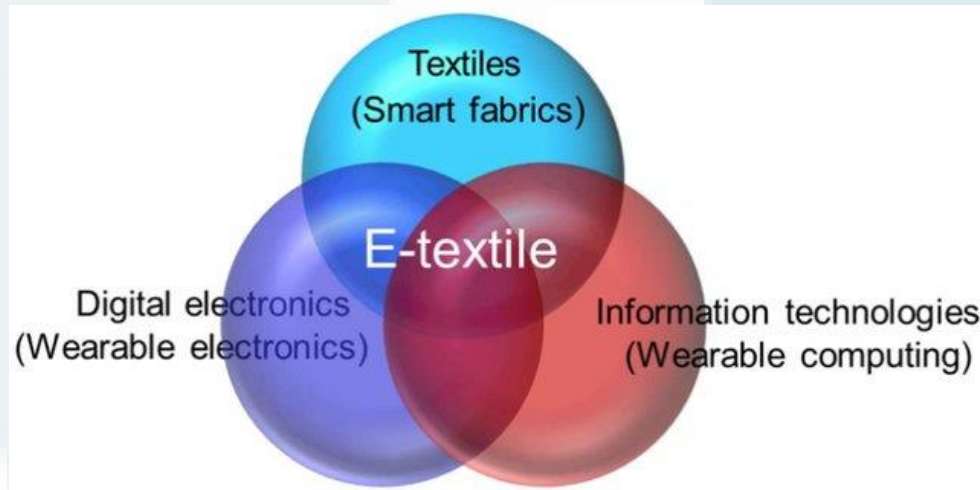
### Why smart textiles in sport?

- close fitting sportswear ideal base for embedding sensors
- potential for accurate sensing helps eliminating noise
- improve performance
- reduce injury
- safety
- fun
- market potential
- .....

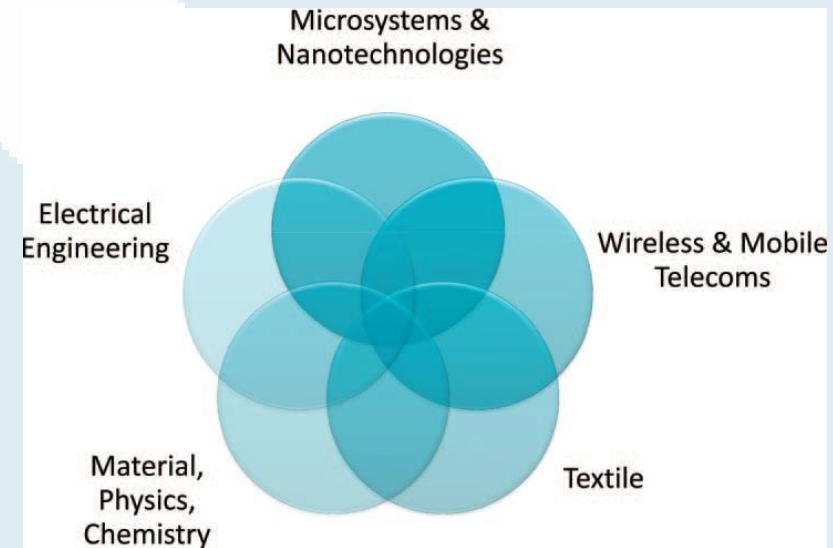
# Textiles in sports and wearables

Smart and functional textile market

Very multidisciplinary domain



K. Mondal Inventions, 2018, 3, 23; doi:10.3390



A. Schwarz et al., *Textile Progress* Vol. 42(2), 2010, 99–180.

# Textiles in sports and wearables

## Market potential

### Estimates (2016):

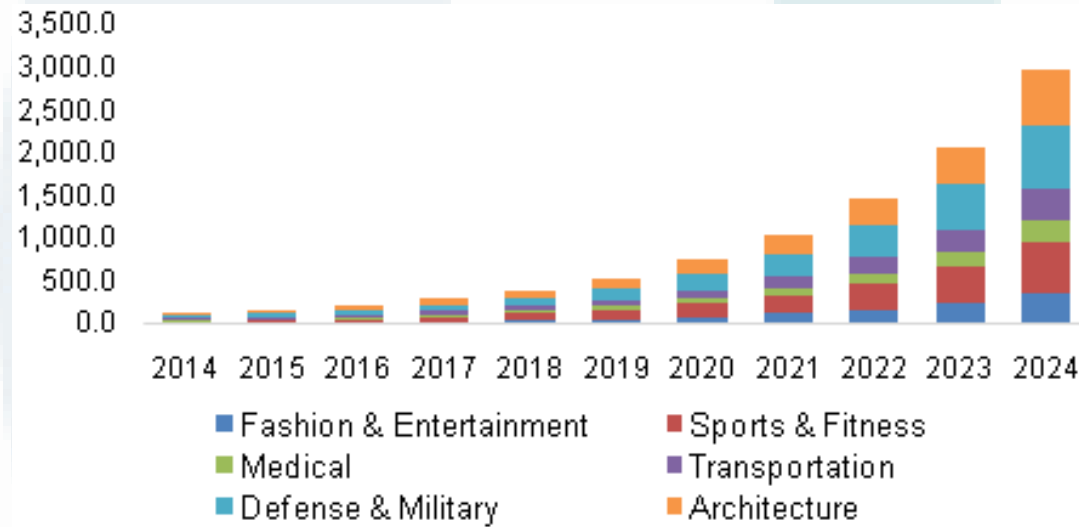
- 1.8 billion US\$ in 2021 (smart and functional like antimicrobial) <sup>1</sup>
- 134 million US\$ of sensors in smart textiles for sports, mostly pressure sensors <sup>1</sup>
- Medical 55,5%, percentage in sport, fitness, military, architecture, ... not given % <sup>1</sup>
  
- From 700 US\$ in 2014 to 7.73 billion US\$ in 2023 <sup>2</sup>
- Market share 30% Europe, 40% North America <sup>2</sup>
- Growth in sports and fitness 2015 to 2023 forecasted 33.1 % <sup>2</sup>
- Healthcare 18,5%, military and defense 28%, percentage sport and fitness not given <sup>2</sup>

1. <http://www.newelectronics.co.uk/electronics-technology/while-smart-textiles-for-wearables-remains-in-its-infancy-its-potential-is-huge/119045/> published 11 May 2016
2. TMR (2016) Smart Textile Market - Global Industry (will reach US\$7.73 billion by 2023) Analysis, Size, Share, Growth, Trends and Forecast 2015 - 2023: TMR", published 29 September 2016, <https://globenewswire.com/news-release/2016/09/29/875784/0/en/Smart-Textile-Market-Global-Industry-will-reach-US-7-73-bn-by-2023-Analysis-Size-Share-Growth-Trends-and-Forecast-2015-2023-TMR.html>

# Textiles in sports and wearables

## Market potential

More estimates (for Europe 2014-2024 in million US\$ (2015)):



3. <https://www.grandviewresearch.com/industry-analysis/smart-textiles-industry> January 2015

- Smart fabrics and smart textiles 544,7 million US\$ in 2015 globally <sup>3</sup>
- Market share Europe more than 30% <sup>3</sup>
- Growth in sports and fitness 2014 to 2024 forecasted 35 % <sup>3</sup>
- In 2015 passive smart textile to dominate the product segment <sup>3</sup>
- Future smart fabrics possess the ability to react to stimuli generated from electrical, thermal, chemical, mechanical, and magnetic sources <sup>3</sup>
- R&D activities in intelligent textiles (including EU supported) help revitalizing industry <sup>3</sup>

# Textiles in sports and wearables

## Market potential

- Market drives smart and functional textiles in sport and fitness
  - decreasing manufacturing costs of electronic components and fabrics along with the miniaturization of electronics are expected to drive the market over the forecast period <sup>3</sup>
  - Increasing demand of heart rate monitors, motion sensors and step counters because of awareness about healthcare and personal wellbeing <sup>1</sup>
  - Increased performance of athletes <sup>1</sup>
  - Developments/innovations are applicable in other sectors as well (military, automotive, entertainment, rehabilitation, ....) <sup>1,3</sup>
  - Nowadays driven by innovative start-ups, SMEs as well as companies like Nike, Adidas, Wacker Chemie, DuPont, Google, Microsoft, ..... <sup>1,2,3,4</sup>
  - Important role collaboration of industries with universities and research institutes <sup>2,3</sup>
  - Innovations and technological developments (see next slide)

4. ITMA 2019 <https://www.itma.com/media/the-itma-blog/blog/2018/11/29/towards-a-moore-s-law-for-fibres-with-soft-hardware> 29 November 2019

# Textiles in sports and wearables

## Technology

- Market driven by innovations in (conductive) materials (polymers, inks, coatings), advanced fibers or yarns, nanotechnology, .....
- Smaller more powerful sensors, actuators, ..., driven by IoT
- From putting things in yarns and fabrics, and attaching sensors, batteries and interconnections towards next generation smart textiles (fully integrated, not visible)
- Progress in printing (digital printing, like inkjet, 3D printing, Chromojet, ...) and braiding facilitates next generation of smart and functional fabrics
- 3D Body scanning for individualized smart garment (integration of production)
- High number of potential smart functions:  
e.g. EMG, ECG, movement sensors / capture, GPS, humidity sensors, temperatures sensor, accelerometer, heating and cooling systems, display i.e. as warning systems in traffic, UV-blocking or warning, antimicrobial, odor control, water repellent, color change, energy production, energy storage, communication, antistatic.....

# Textiles in sports and wearables

## Examples

- Nike Adapt BB launched 15 January 2019



Available: mid-February

Today: shoe lace tension via App, pressure sensor

Contains: a microcontroller, 505 mAh battery, gyroscope, accelerometer, Bluetooth module, motor, lighting, pressure sensor, capacitive touch sensor, temperature sensor and wireless charging coil.

All technology packed in the shoe makes it can easily update it to adjust tension itself, count steps, follow fitness ...

Similar products:

Nike Hyper Adapt (Dec. 2016)

Puma Autodisc (2015)





# Textiles in sports and wearables

## Examples

- Hövding textile airbag for cyclists, launched 2011 (updated 2015)



Accelerometers detect unusual movement.

# Textiles in sports and wearables

## Examples

Wacker Chemie (EAP), Leap Technology Technology, Ohmatex



movement / motion capture

## Sensoria



heart rate



pressure

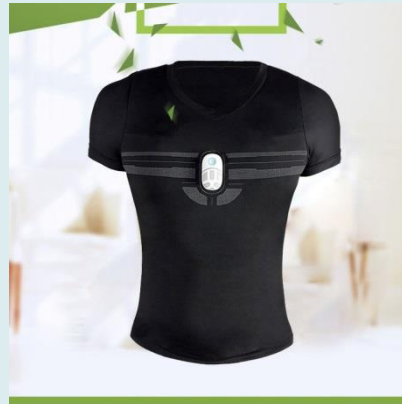
## Hexoskin



heart rate and breathing



traffic safety



gps and heart rate

# Textiles in sports and wearables

- Final remarks
  - Today more wearables in the market (see the examples) than true smart textiles for sports



- Important (emerging) domain, not yet mature, strong potential
- Reliability
  - Washability
  - Battery /energy
  - Accuracy sensors
  - ....
- Textile aspect (not stiff, breathability, ....)
- Standardization
- Potential for industrial production, economy of production
- Need for technological progress

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