

Textile Futures

Materiality: Smart Textiles and Enhanced Apparel



Seventh Avenue at 27 Street
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Greetings

Barbara Trippeer

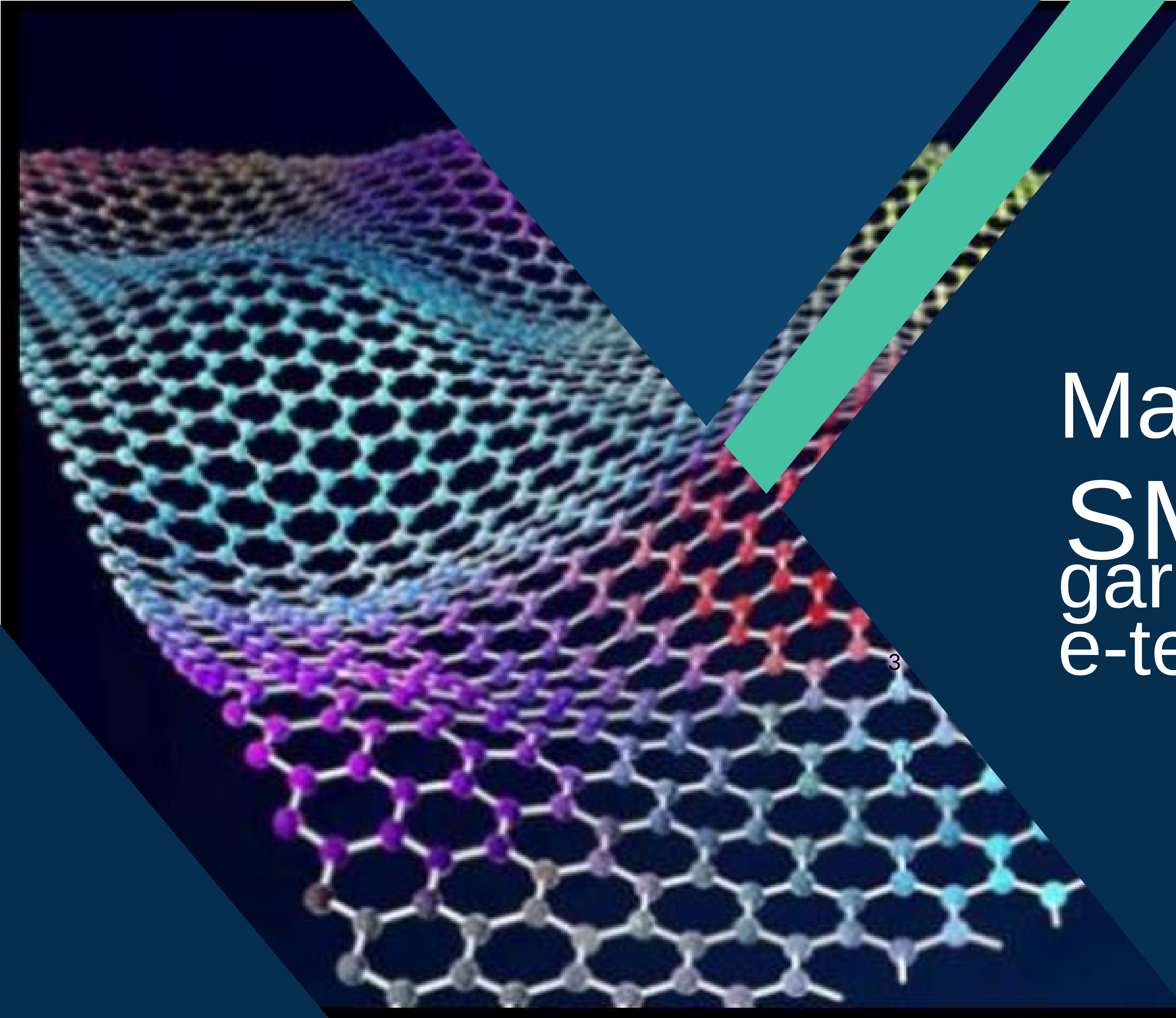
Assistant Professor, Fashion Department,

School of Art and Design,

Fashion Institute of Technology



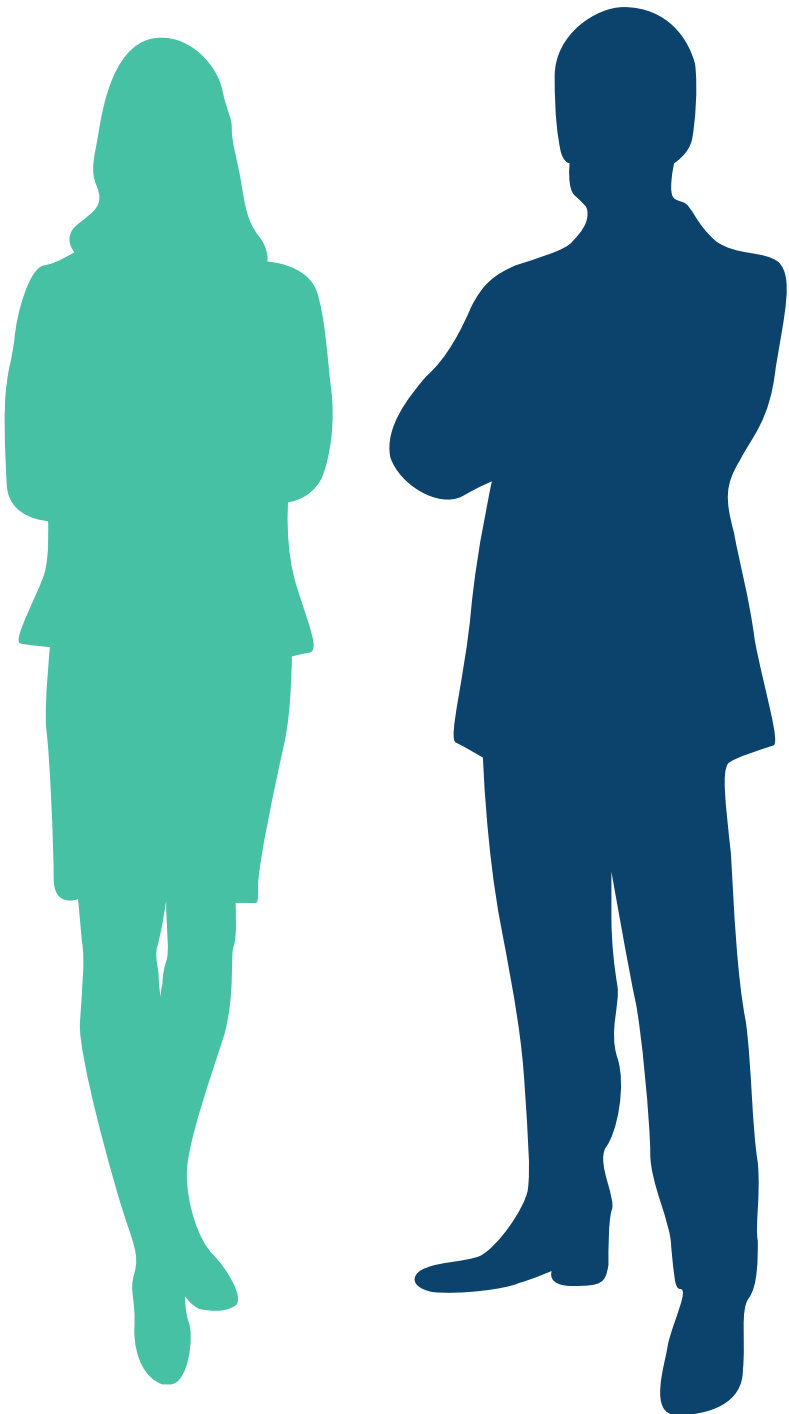
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Materials: SMART garments & e-textiles

Technological Advancement

The Science of Clothing



ENHANCED TECH REVOLUTION

OUTERWEAR

Embedded sensor technology in Outerwear may allow for use in multiple contexts

PULLOVERS

Sensors in the form of wire technology worn closer to the skin, via washable soft wireframes.

BOTTOMS

Hidden pocket sensors may allow for adaptable sensor positioning.

Smart Clothing

Categories and Applications



Military/Industrial



Health/Wellness



Medical



Infotainment

Functional Garments

- Geopositioning
- Environment
- Activity

Activity Monitoring

- Activity Monitors
- Temperature
- Fitness & Heart Rate Monitors

Measuring Vital Signs

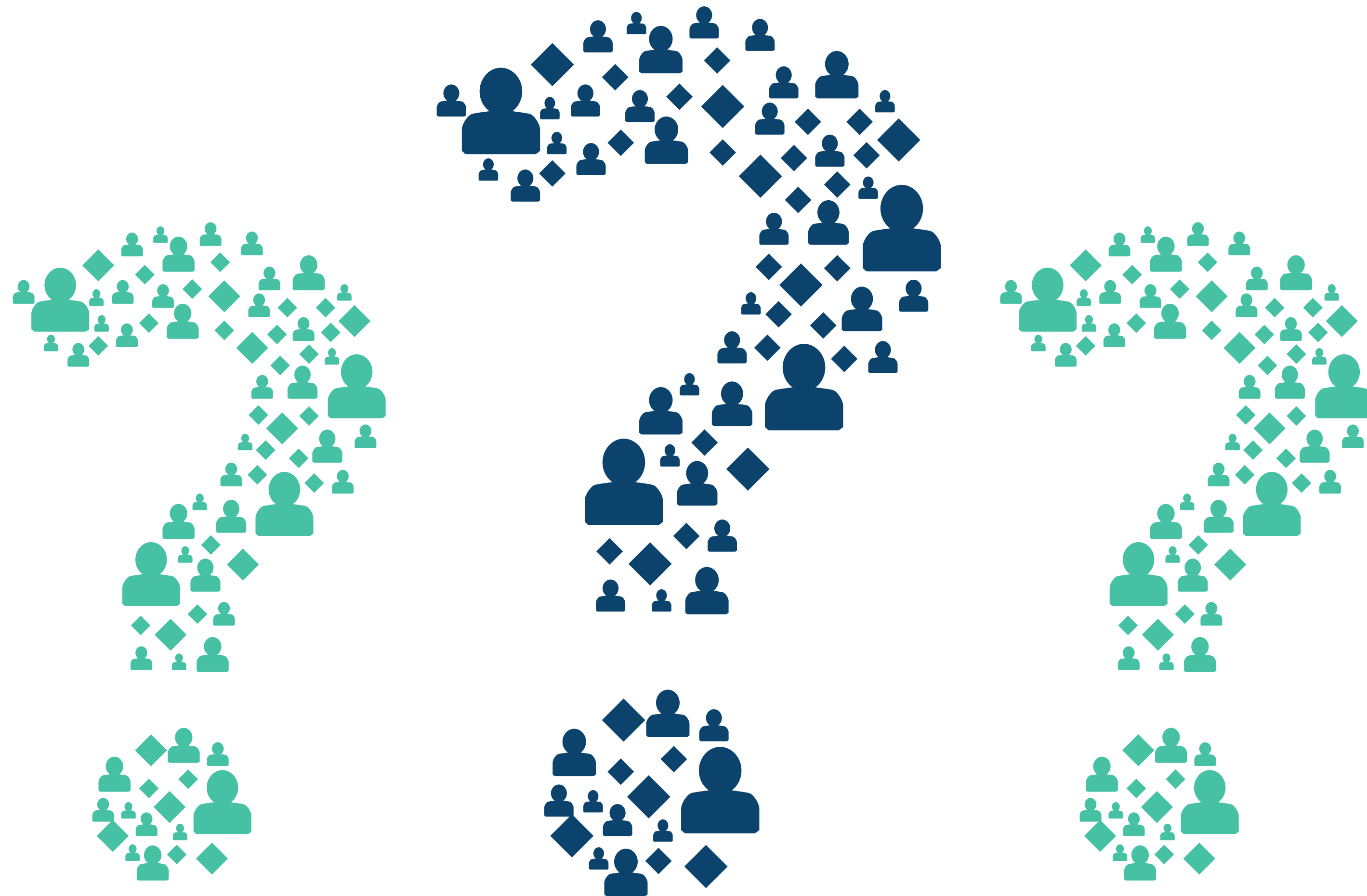
- Blood Pressure Monitors
- Heart Rate
- Blood Pressure
- Respiration
- Body Temperature

Fashion and Entertainment

- Communication Devices
- Light Sensor Displays
- Emotional Connections

Smart Textiles

What are smart textiles?

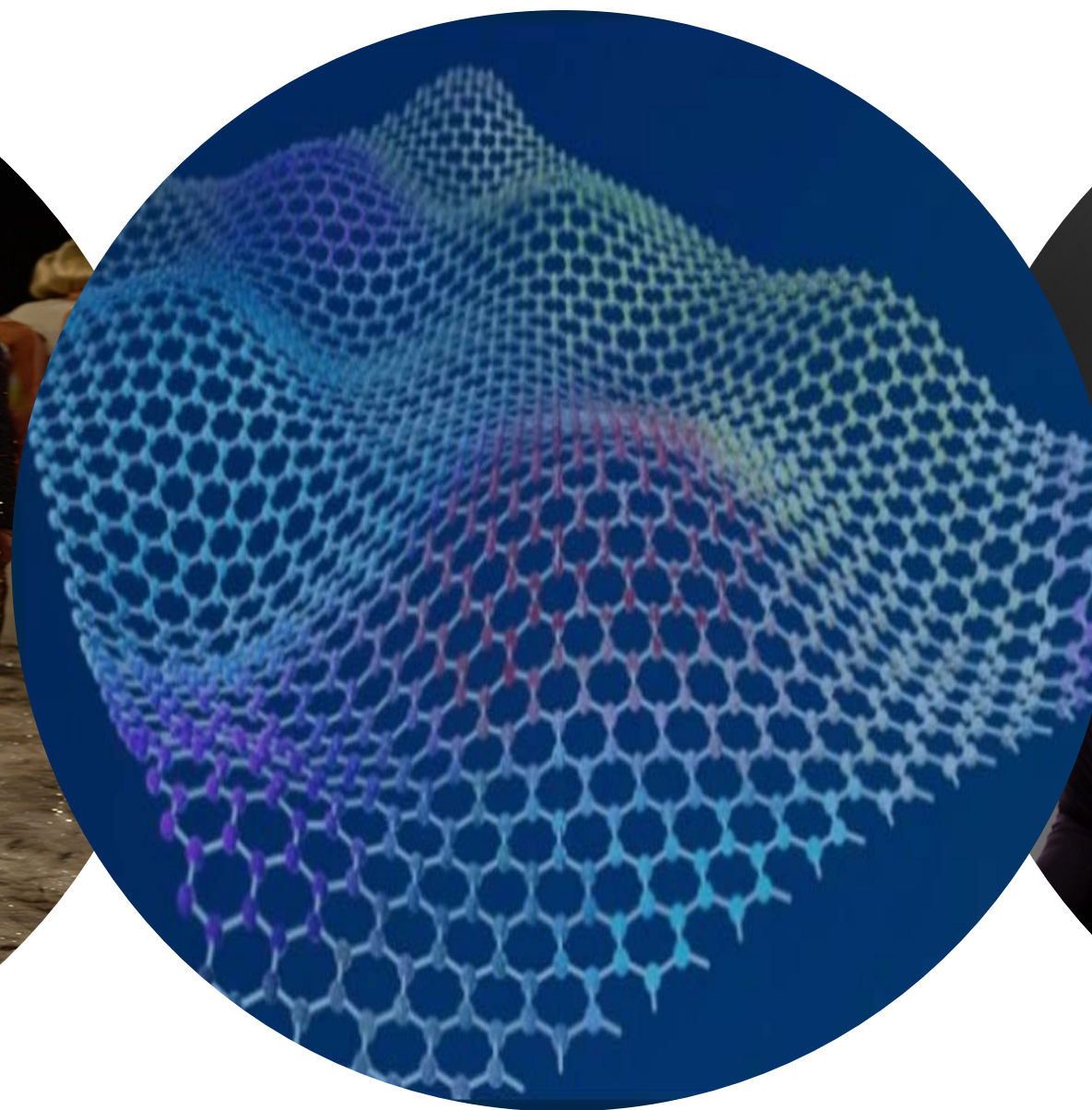


Smart Textiles

Definition and Applications



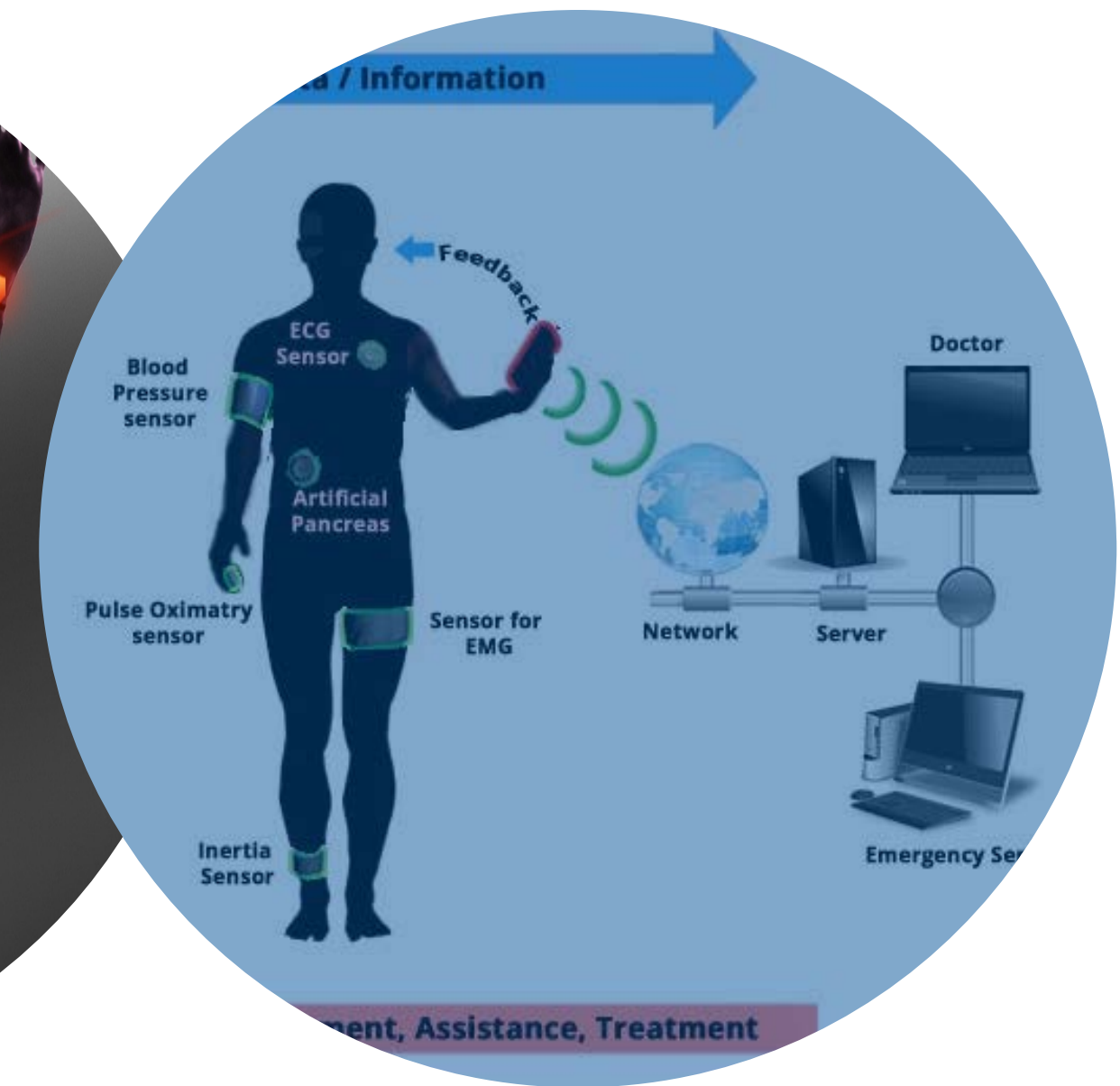
Embedded Circuits
CuteCircuit



Conductive Fibers
Graphene



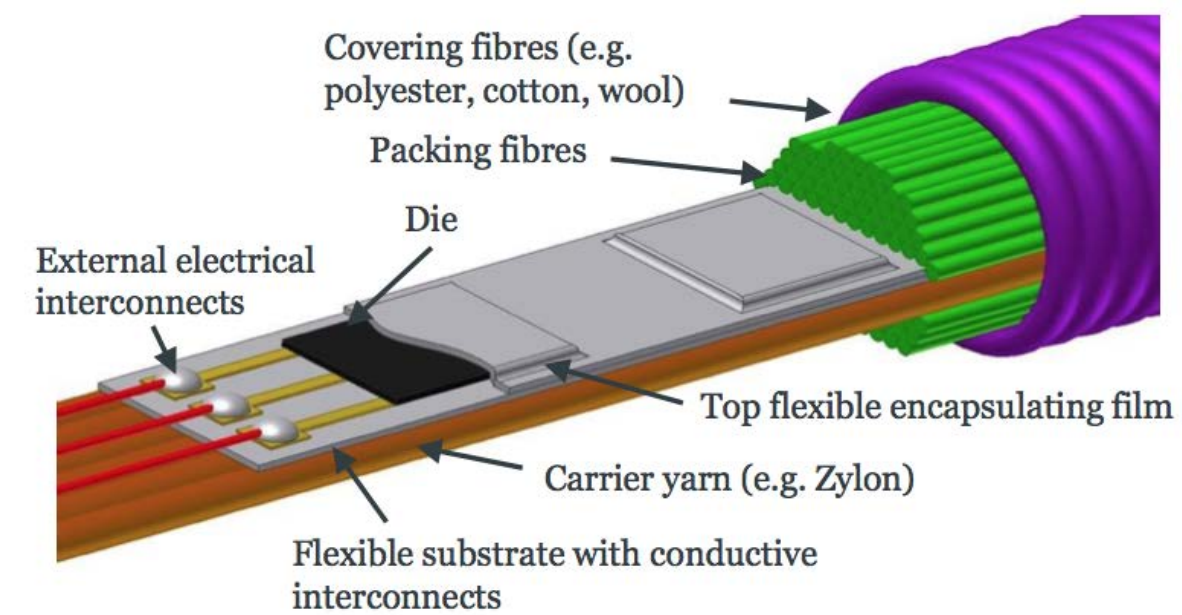
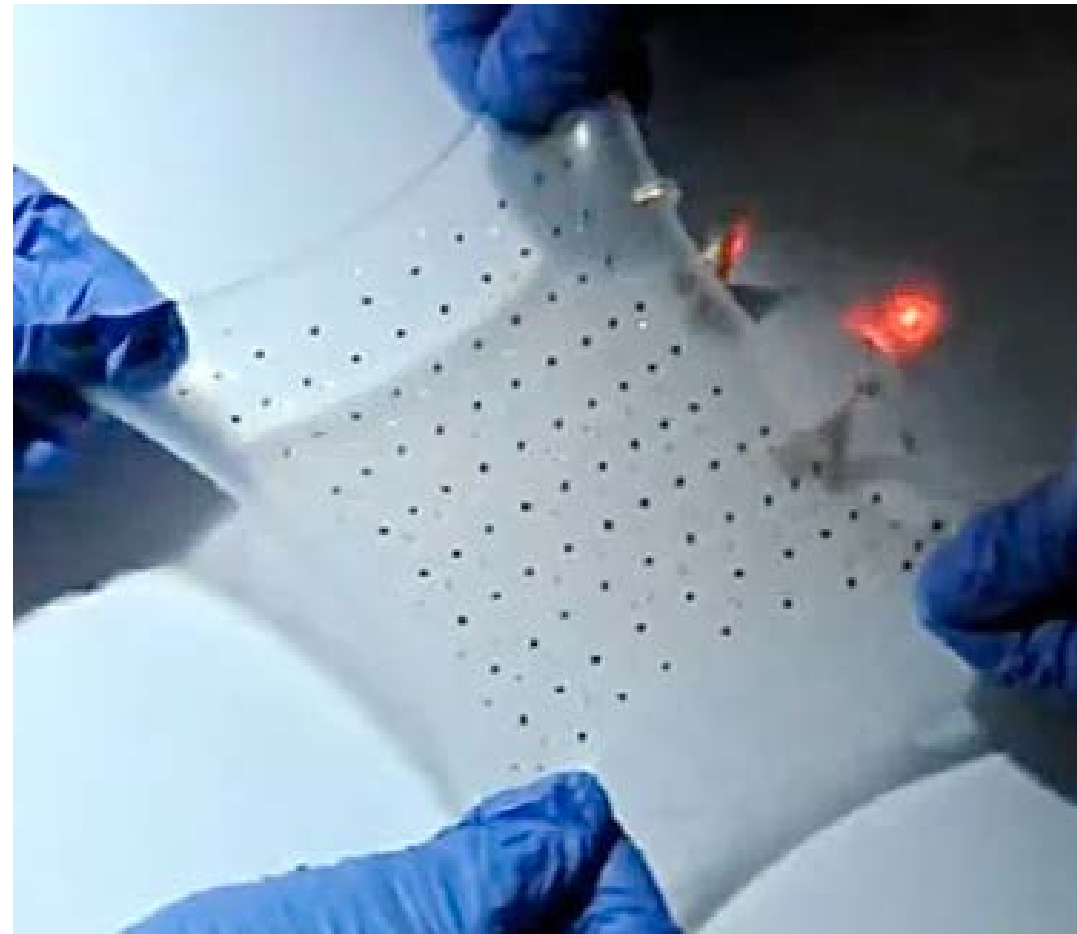
Strategic Sensors
Heddoko



Communication Devices

The embedded technology

- Fiber based
- Stretchable and flexible
- Printed electronic



1. Professor Steve Beeby
Department of Electronics and Computer Science,
University of Southampton

2. Sabri Sansoy
CEO & Robotist, Orchanic

3. Northwestern University, Yonggang
Huang and University of Illinois, John A
Rogers.



EMBEDDED STRATEGIC SENSORS



PACE: 4:48 MIN/KM

HEART RATE: 164 BPM

STEPS: 6815

PACE: 4:41 MIN/KM

HEART RATE: 158 BPM

STEPS: 7383

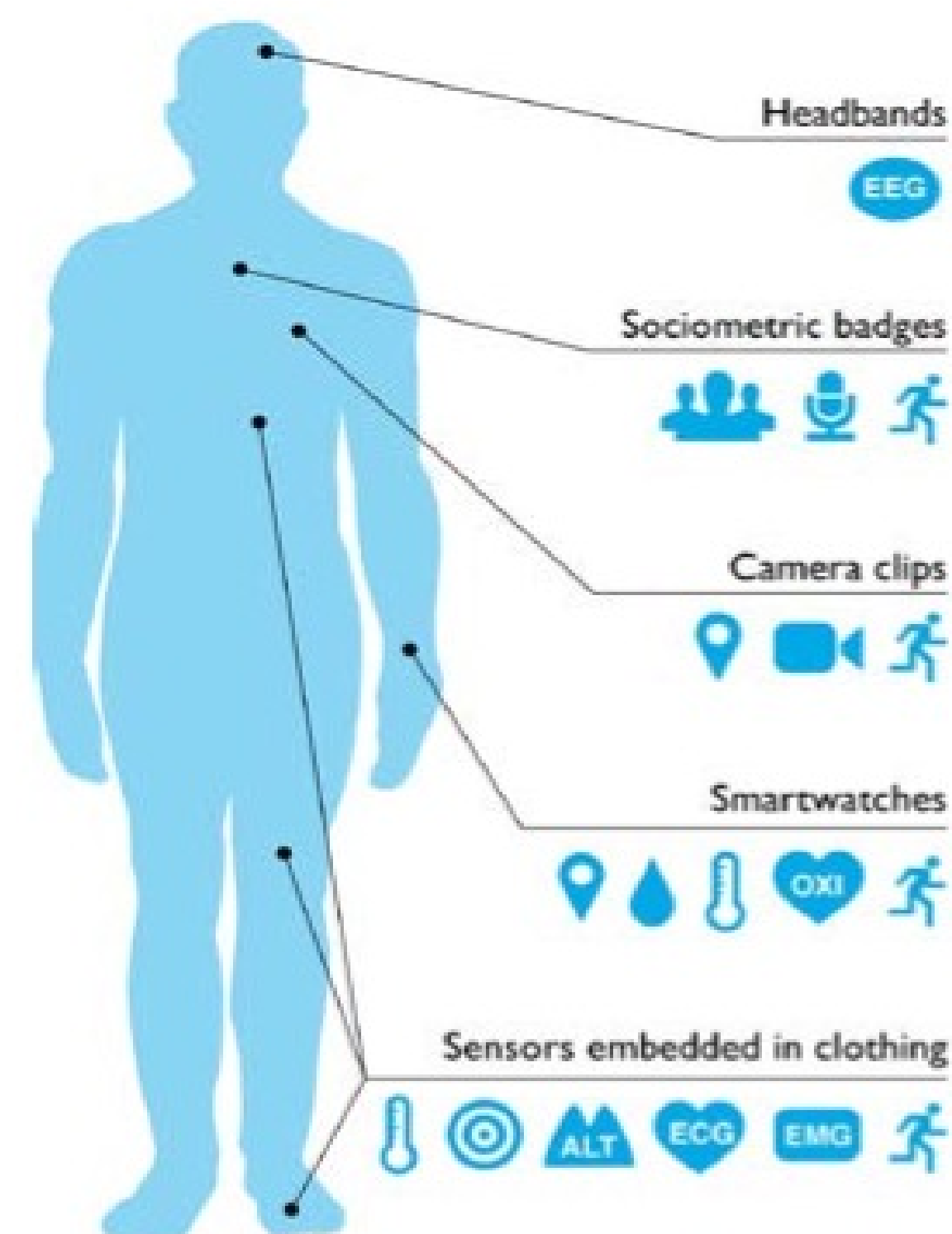
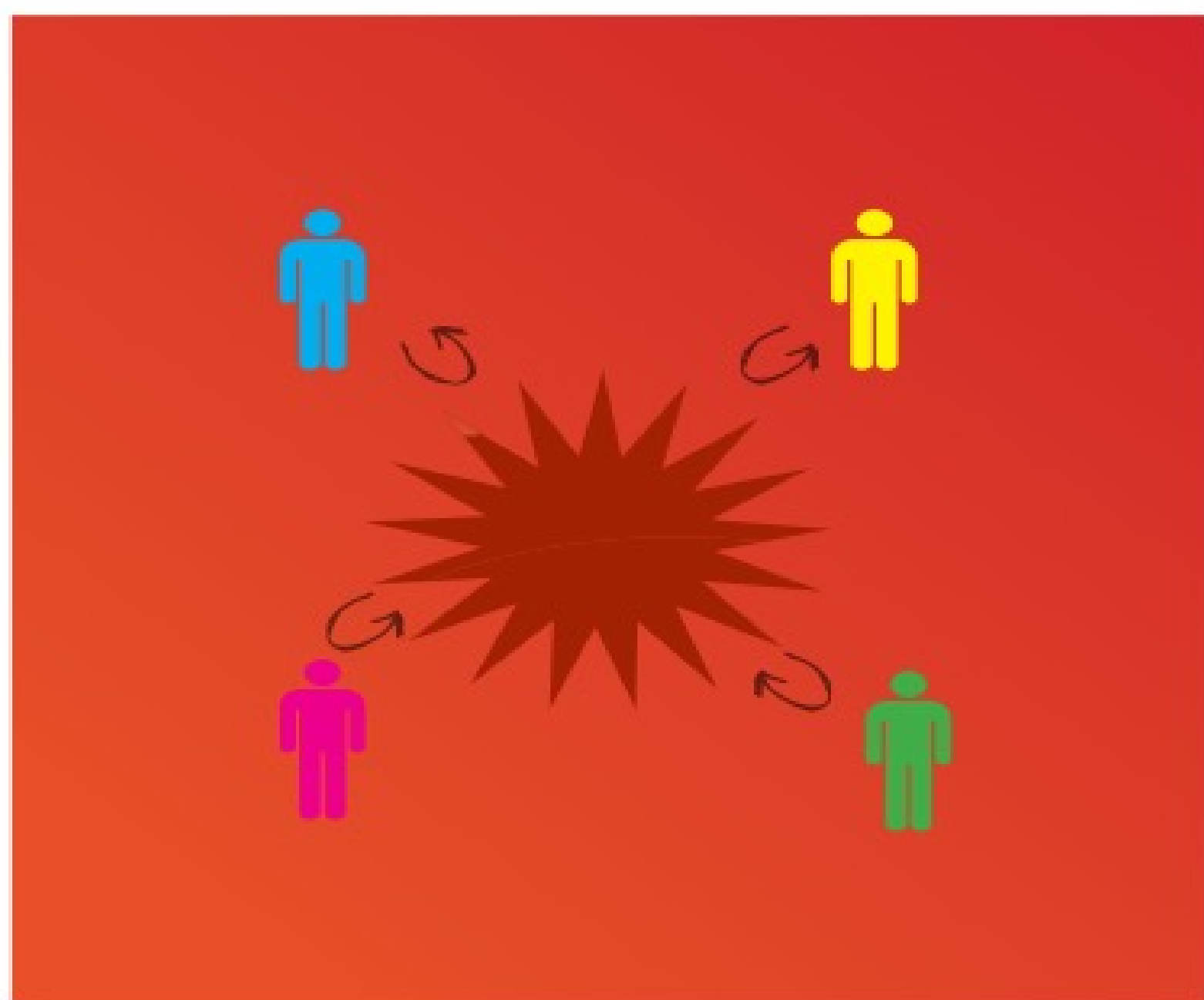
HEXOSKIN

WEARABLE BODY METRICS

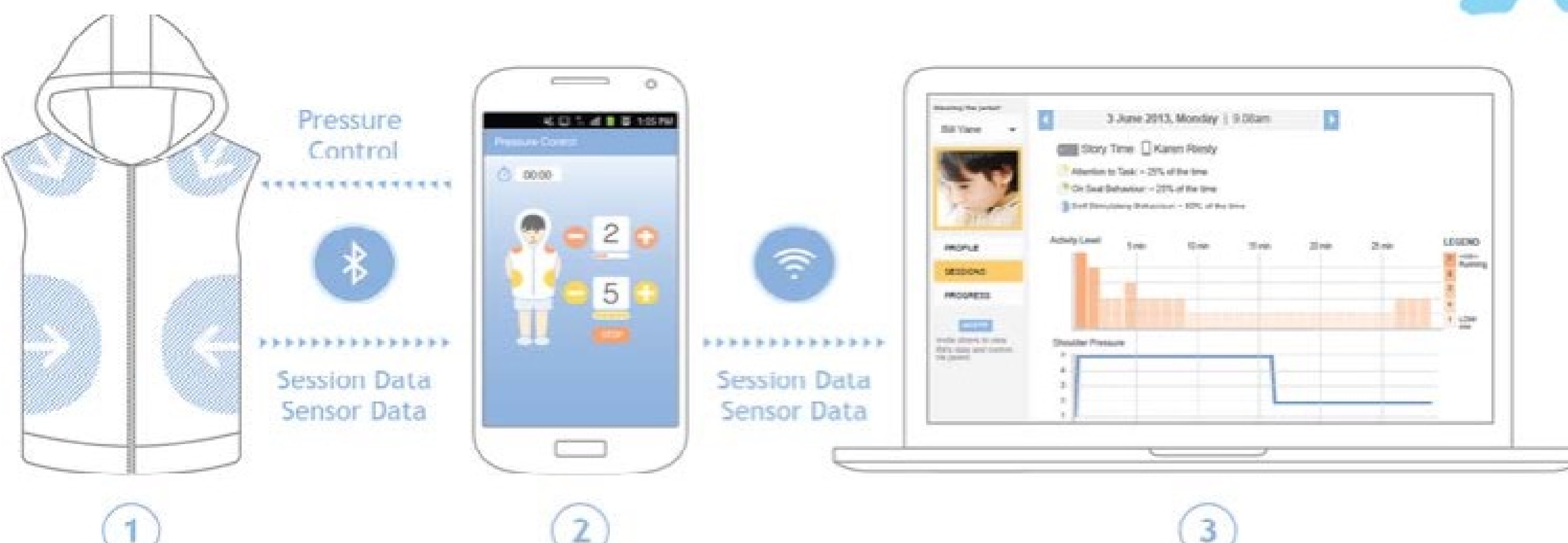
<http://www.hexoskin.com/>

The ultimate running bra





- Accelerometer
- Altimeter
- Digital camera
- Electrocardiogram
- Electromyograph
- Electroencephalogram
- Electrodermograph
- Location GPS
- Microphone
- Oximeter
- Bluetooth proximity
- Pressure
- Thermometer



A man with dark hair, smiling, is shown from the waist up. He is wearing a dark green long-sleeved sweater and holding a white mug in his right hand. He is standing in front of a window with a view of bare trees outside. A vertical thermal overlay is applied to the left side of the image, showing a color gradient from purple (cooler) to yellow and orange (warmer) on the man's left arm and shoulder. The background is split into a white upper half and a dark blue lower half by a diagonal line.

Adaptive Phase Change Materials

<http://www.uniqlo.com/lab/heattech/us/>

MINISTRY OF SUPPLY



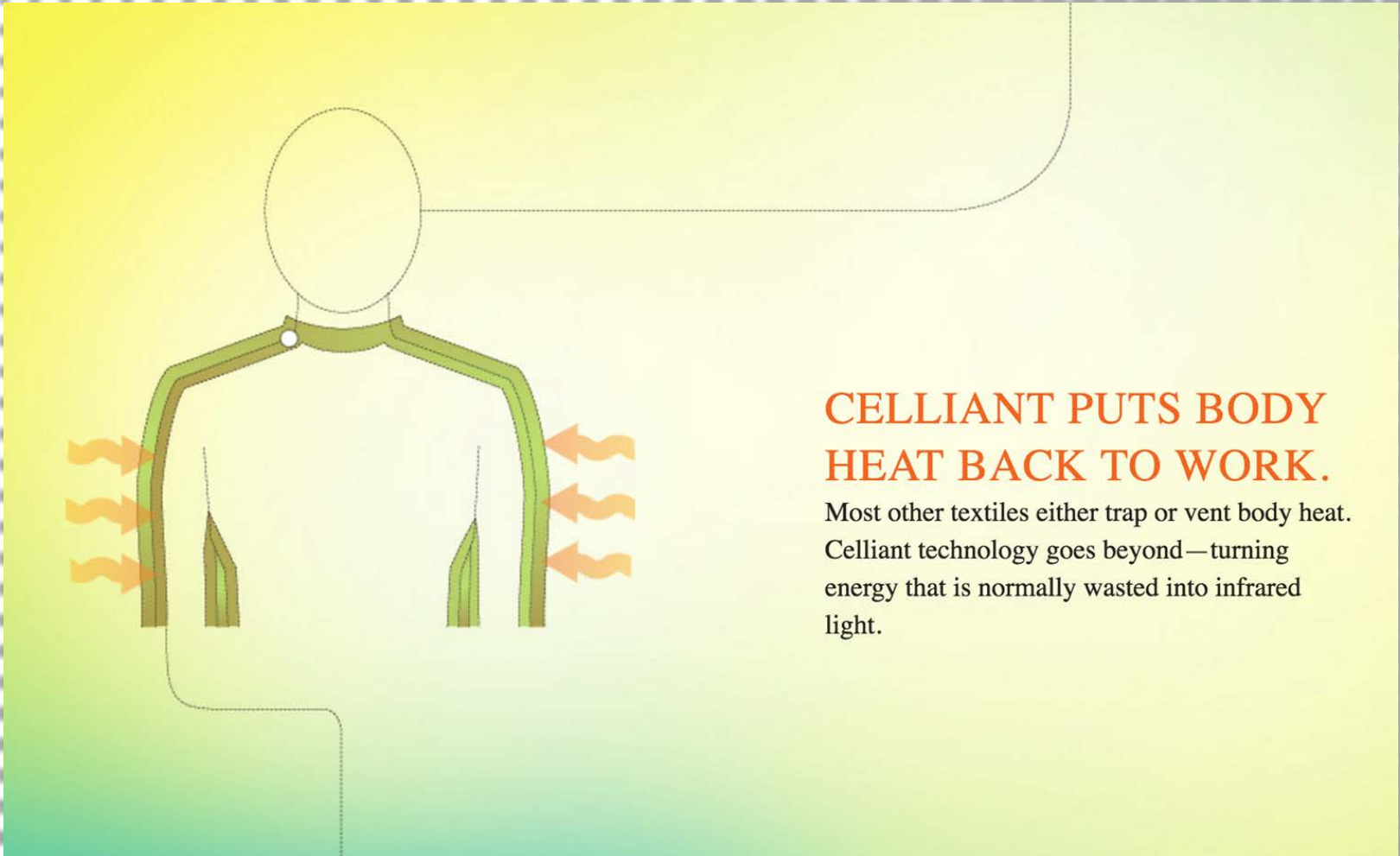
Fabric

Apollo fabric is truly born from space: Made with the same Phase Change Materials NASA invented to control an astronaut's body temperature in spaceflight, this hyper-breathable knit is 14x more breathable than traditional cotton shirting. It regulates your core temperature in real-time, providing you with the confidence to perform all day long.

- 57% PGM-infused Polyester 43% Polyester
- Hyperbreathable
- Phase Change Materials
- Stretch Knit
- Moisture Wicking
- Wrinkle Resistant
- Machine wash, tumble dry
- Safe to dry clean
- Made by Blue Wave in China



ISAORA



CELLIANT PUTS BODY HEAT BACK TO WORK.

Most other textiles either trap or vent body heat. Celliant technology goes beyond—turning energy that is normally wasted into infrared light.

A woman with blonde hair tied back, wearing a white off-the-shoulder top and white shorts, is standing outdoors. She is looking down at a small, circular, blue and white sensor attached to her abdomen. The background shows a city skyline with buildings and a body of water. The image is partially obscured by a dark blue diagonal shape on the right side.

Smart Garments BIOMEDICAL Applications

Seamless Integration





Responsive Physiological

[https://halleyprofita.wordpress.com/projects/
LightWear](https://halleyprofita.wordpress.com/projects/LightWear)

© Microsoft Research

CUTECIRCUIT





HELP COUTURE

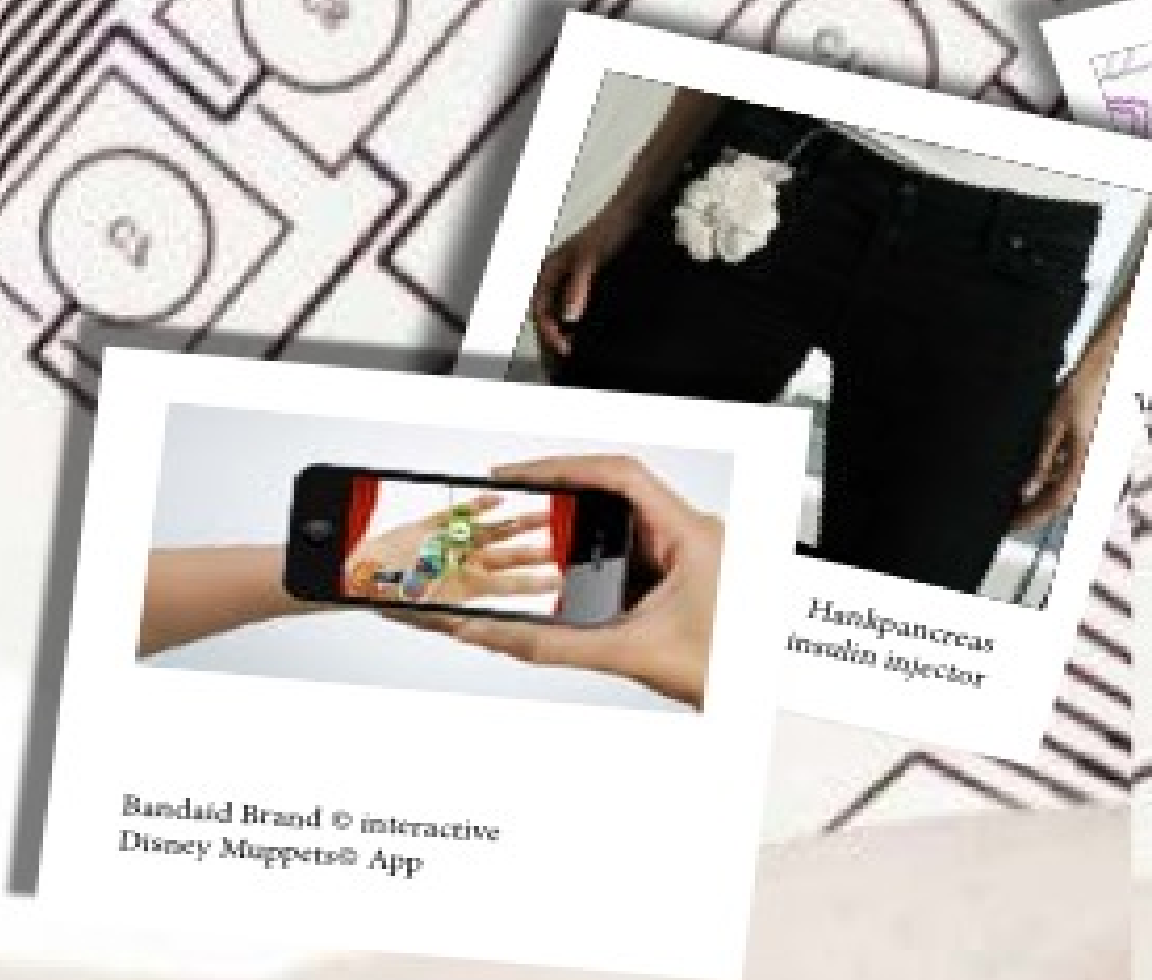
CONNECTED WELL-BEING



Jerry the Bear® glucose monitor



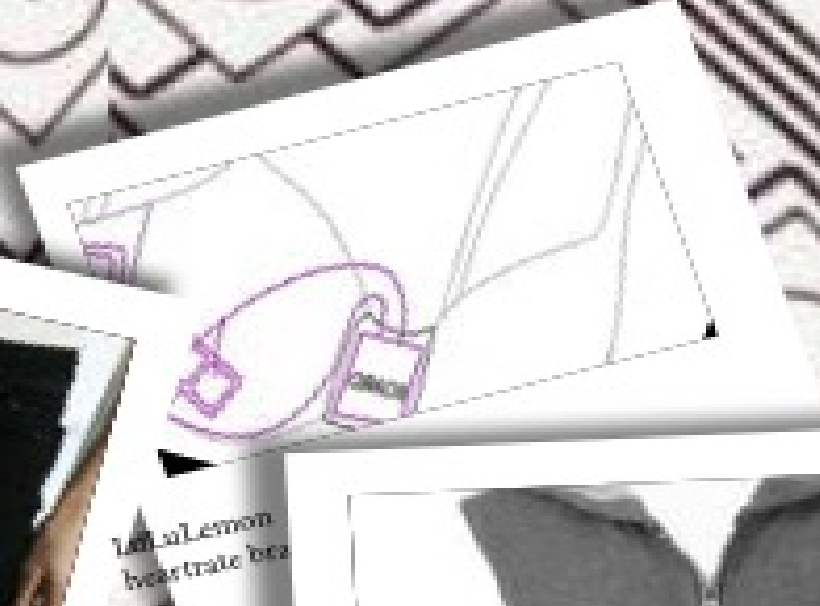
Sensible Baby® smart garment baby monitoring system



Bandaid Brand® interactive Disney Muppets® App



Hankpancreas insulin injector



LeLaLemon brastrafe bra



Squeeze vest® Autism compression pulse garment and monitoring system



Pulse vest® Autism compression pulse garment and monitoring system



Memorycard scarf app

Challenges: Evaluation Gaps of Wearables (E-textile)

- Device weight
- Product and display size
- Battery run-time
- Battery charging (how often, how long)
- Energy harvesting
- Washability
- Toxic/Chemical elements
- Water Resistance
- Mechanical control, display, speech and general operation control, audio feedback controls, touch operated controls
- *Conductive fibers (usually metal based to human sweat)*
- *Stretchability and flexibility*
- *Connectivity between the processor or the electronic component and the fiber or printed circuits*



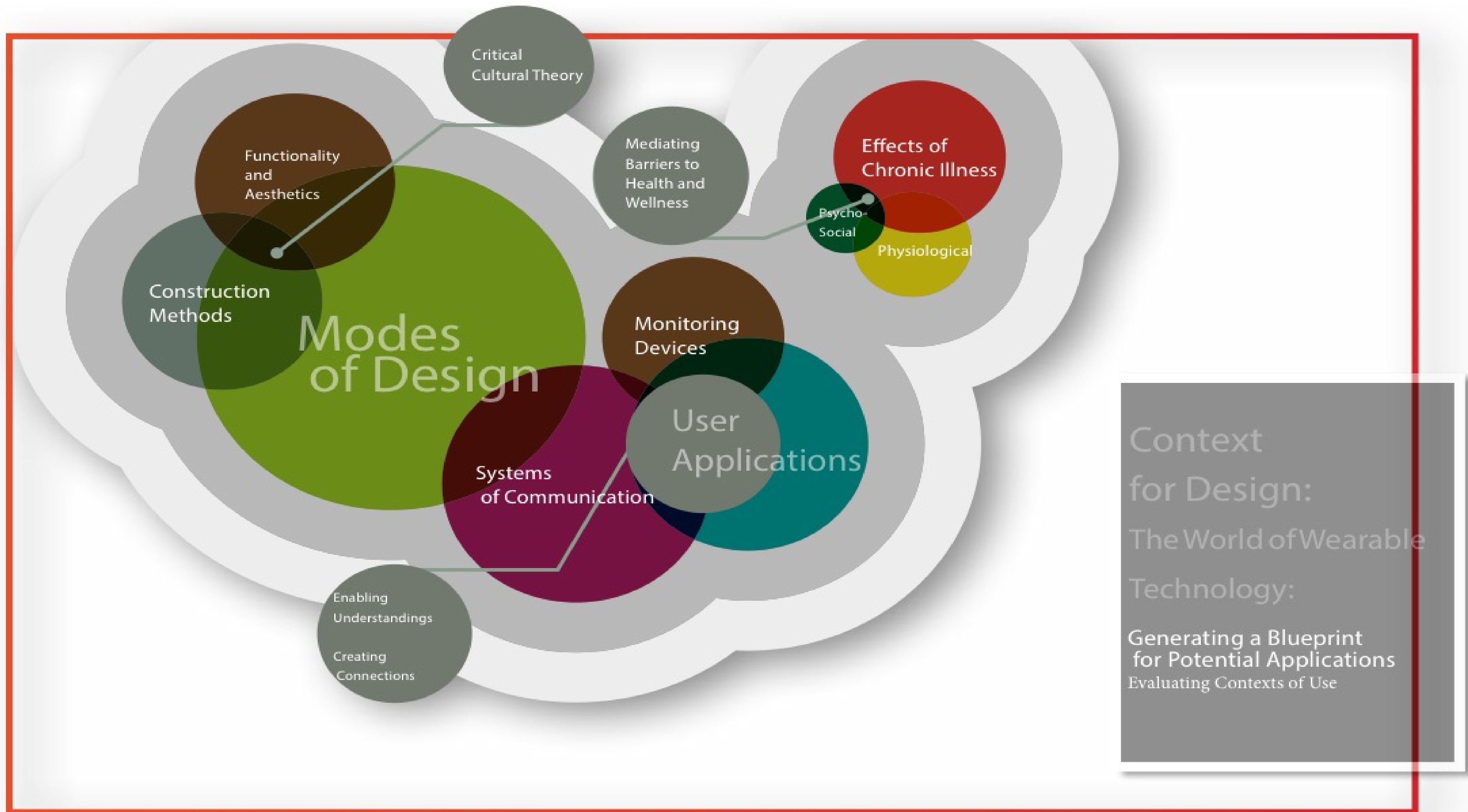


PRIMARY RESEARCH QUESTIONS

How might a patient
want to interact
with these enhanced technologies?

What do they want these products
to do for them,
and
with them?





MULTI-MODAL PLATFORMS

COMMUNICATIONS

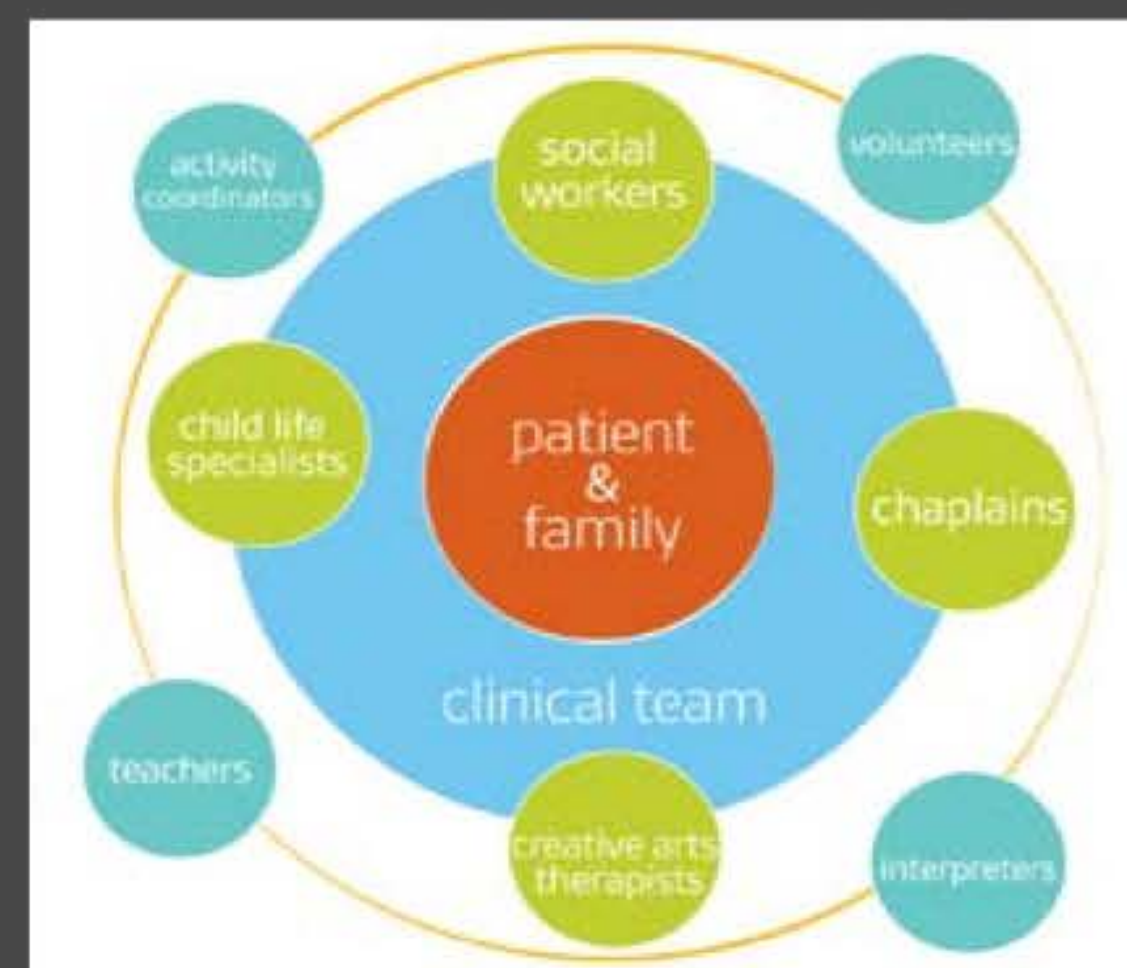


HELP COUTURE™: SMART GARMENTS AS ENABLING TECHNOLOGIES

HELP COUTURE™: SMART GARMENTS AS ENABLING TECHNOLOGIES



EMPOWERING AND ENABLING





THANK YOU
FOR YOUR
TIME and
ATTENTION

Sources

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION



International
Telecommunications
Union



American Association of
Textile Chemists and Colorists
The International Association for Textile Professionals



International
Organization for
Standardization



Standardized Testing

Work in process to create standards for textiles with electronics embedded in them. To offer a roadmap for companies who want to develop e or smart textiles.