The business of wearable electronics

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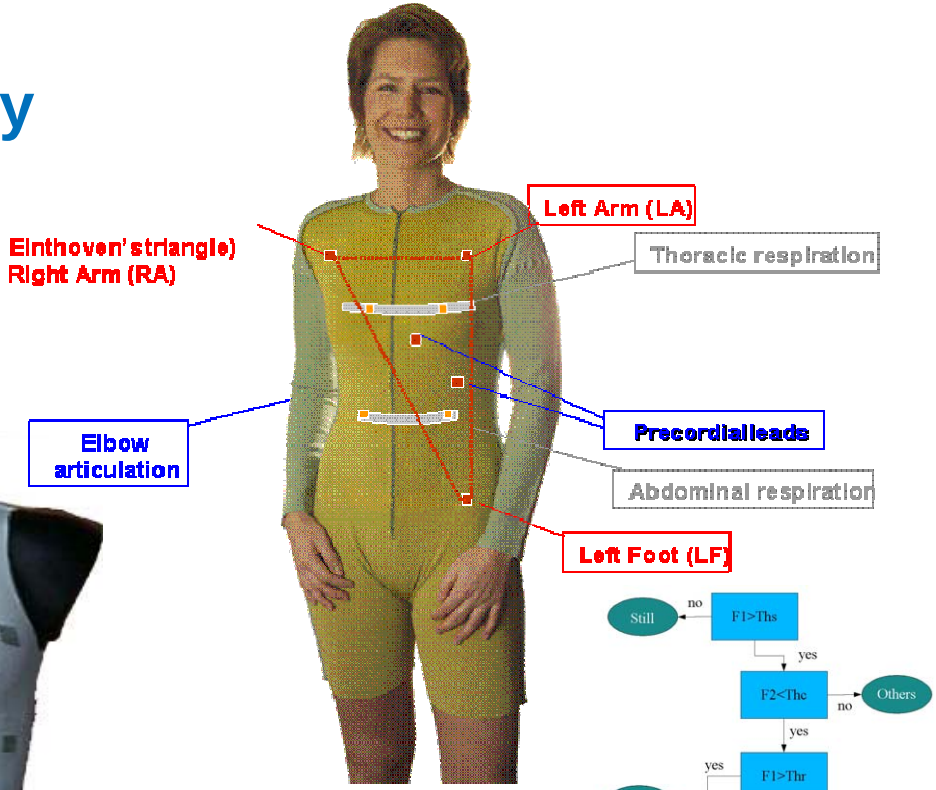
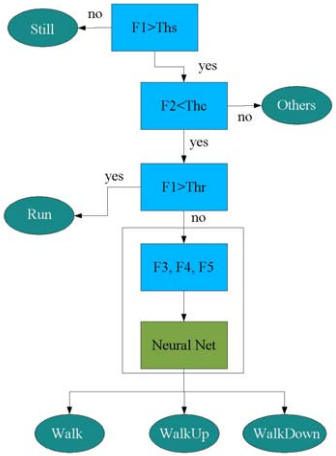
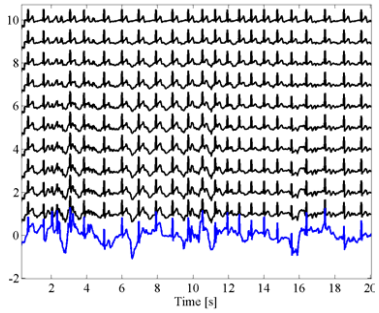
Agenda

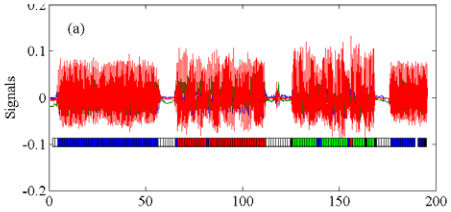
- What are smart textiles: today and tomorrow
- Market segmentation
- How economy can profit and society benefit
- The future evolution: a demonstration of the convergence

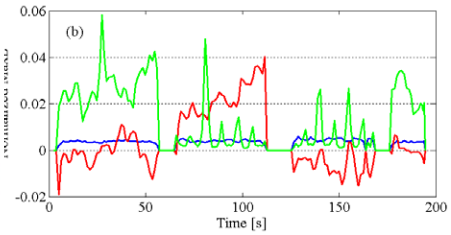
SFIT: today











Cardiovascular diseases and rehabilitation

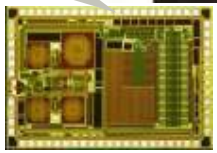
Sensing, processing and communicating

EC IST MyHeart & Wealthy projects

SFIT: tomorrow

Microsystems physical sensors (attitude, fall, health, …)

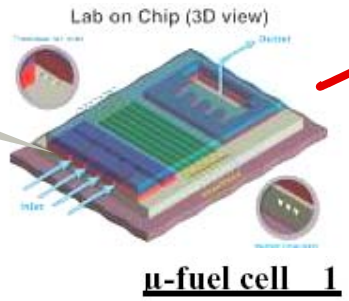
Micro-communicating: sensor interface, processing and wireless

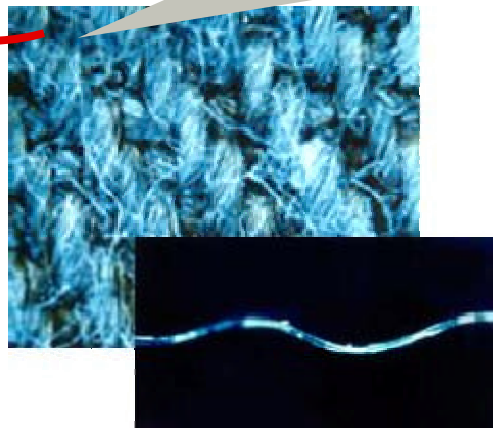


Flexible displays

- Nano-engineered surfaces
- Conductive fabrics
- Micro-interfaces

Point of care





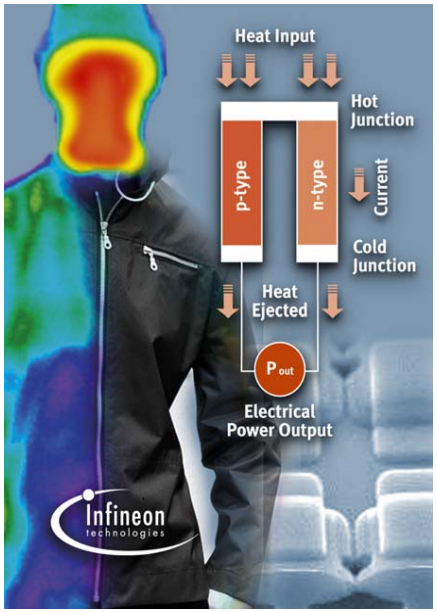
Micro-energy generators

SFIT: the journey to tomorrow

Source: IEEE Spectrum

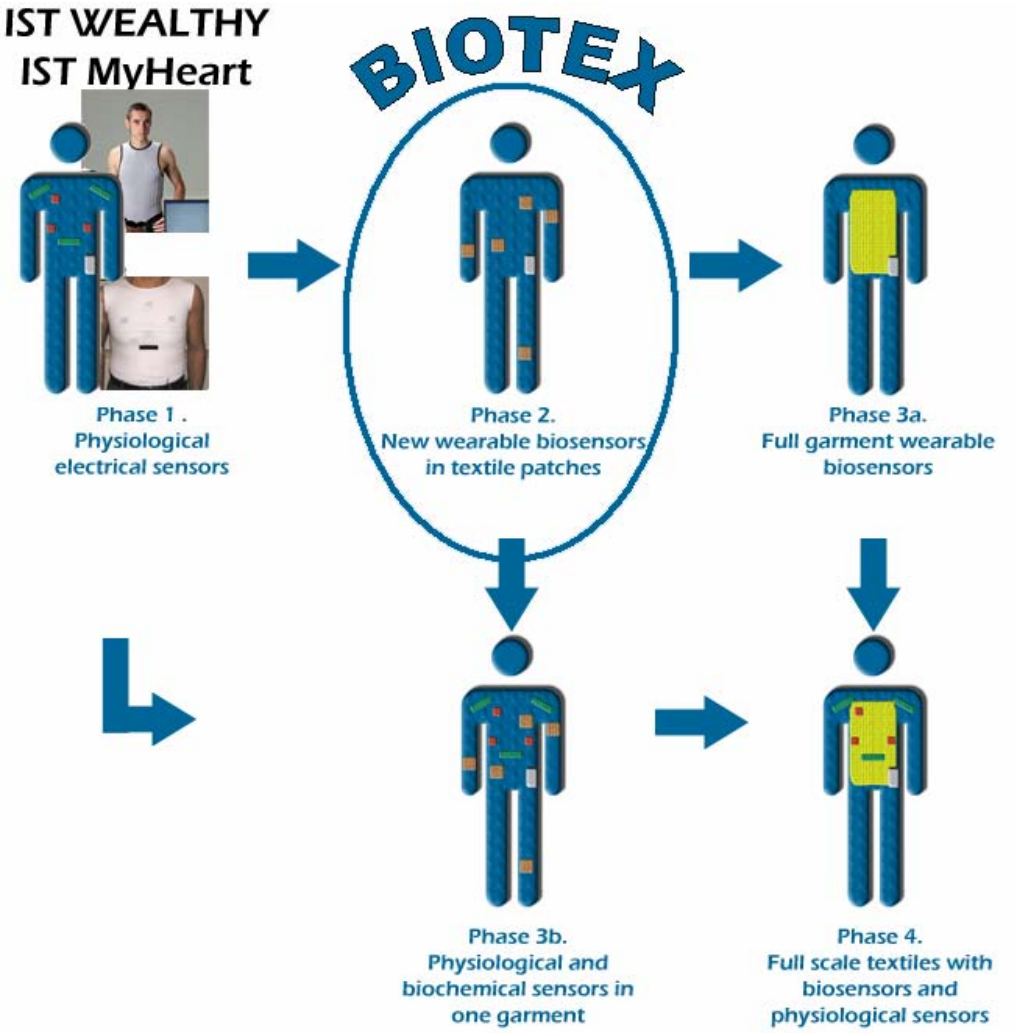
SFIT: the journey to tomorrow, the main trends

- Adding biochemical sensors to physiological measurements
- From monitoring single parameter to multiple parameters
- Adding actuation capability to sensing and monitoring (closing the loop)
- Towards fully autonomous system (energy, communication, actuation)
- Towards plastic electronics



Source: Infineon

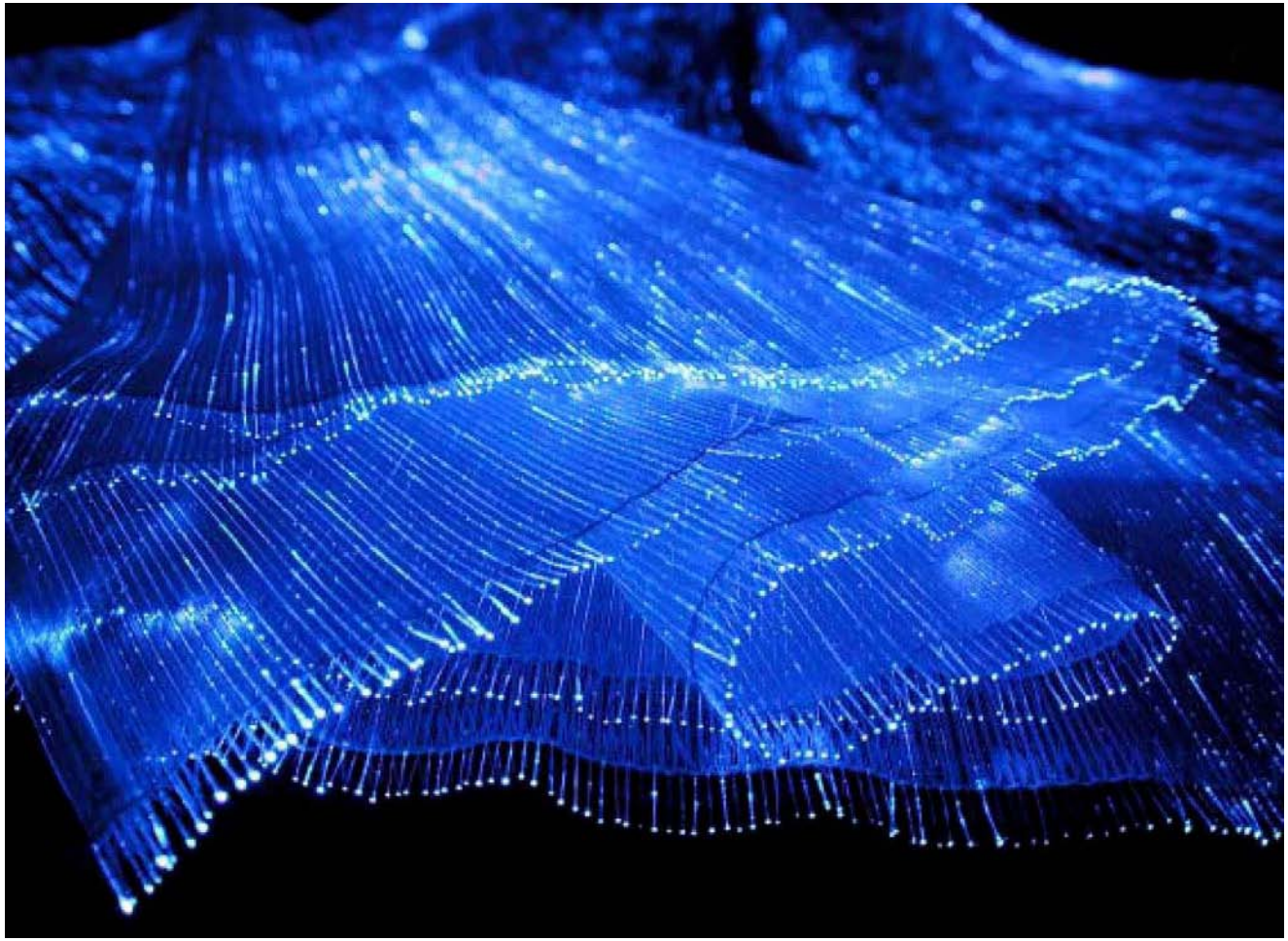
Roadmap


IST WEALTHY
IST MyHeart
BIOTEX
Phase 1 .
Physiological
electrical sensors
Phase 2.
New wearable biosensors
in textile patches
Phase 3a.
Full garment wearable
biosensors
Phase 3b.
Physiological and
biochemical sensors in
one garment
Phase 4.
Full scale textiles with
biosensors and
physiological sensors

The market segments

- **Wearable textile: segmentation**
  1. Medical
  2. Consumer
  3. Protective and professional
  4. Military
- **Non-wearable textiles: segmentation**
  1. Medical (e.g. hospital bed sheets)
  2. Large surface textile (decoration, entertainment)
  3. Security related
  4. Car Industry

Example: non wearable textile for decoration (Penelope)



Source: Penelope

What are the existing market forecasts?

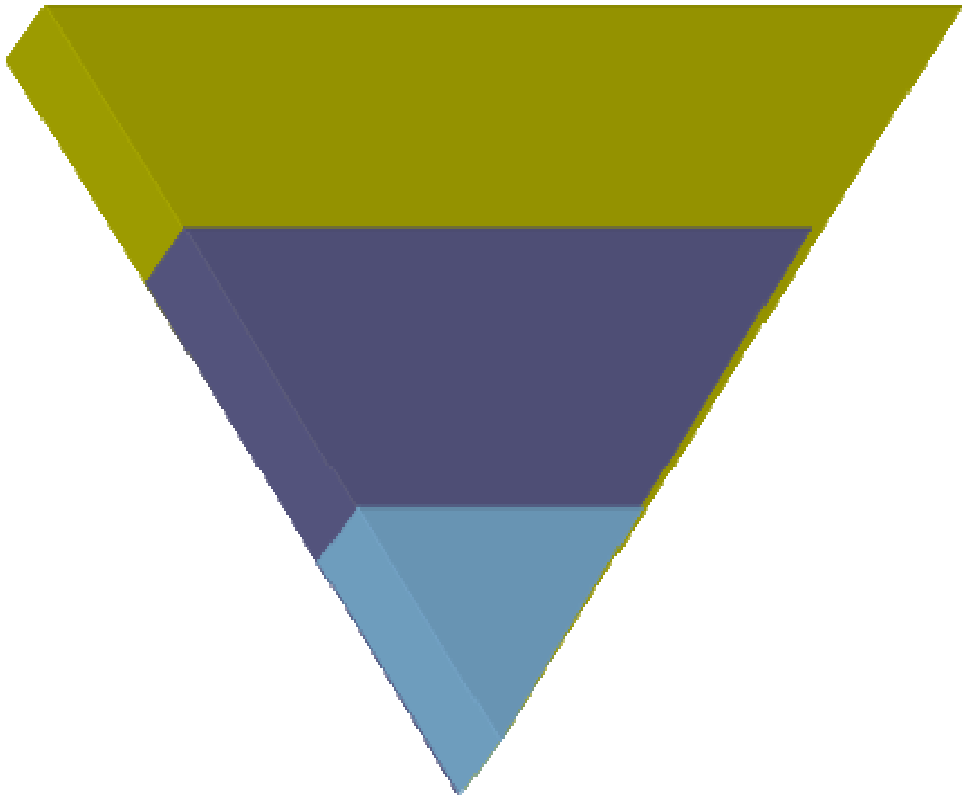
- **Venture Development Corporation** (worldwide) :
  - 303 M$ in 2003 for SFIT market
  - 520 – 530 M$ in 2008
- **BCC** (US market only)
  - 64.4 M$ in 2004
  - 299 M$ in 2009
    - 80 M$ in Safety field including professional – about 30%
    - 66 M$ in Biomedical – about 20%
    - 122 M$ Consumer – about 40%
    - 31 M$ Military – about 10%
- **SmartFabrics 2006**:
  - SFIT, a $340 million dollar industry
  - Growth rate 19% annually
  - Projected to reach $720 million by 2008

Type of business expected

Supporting services

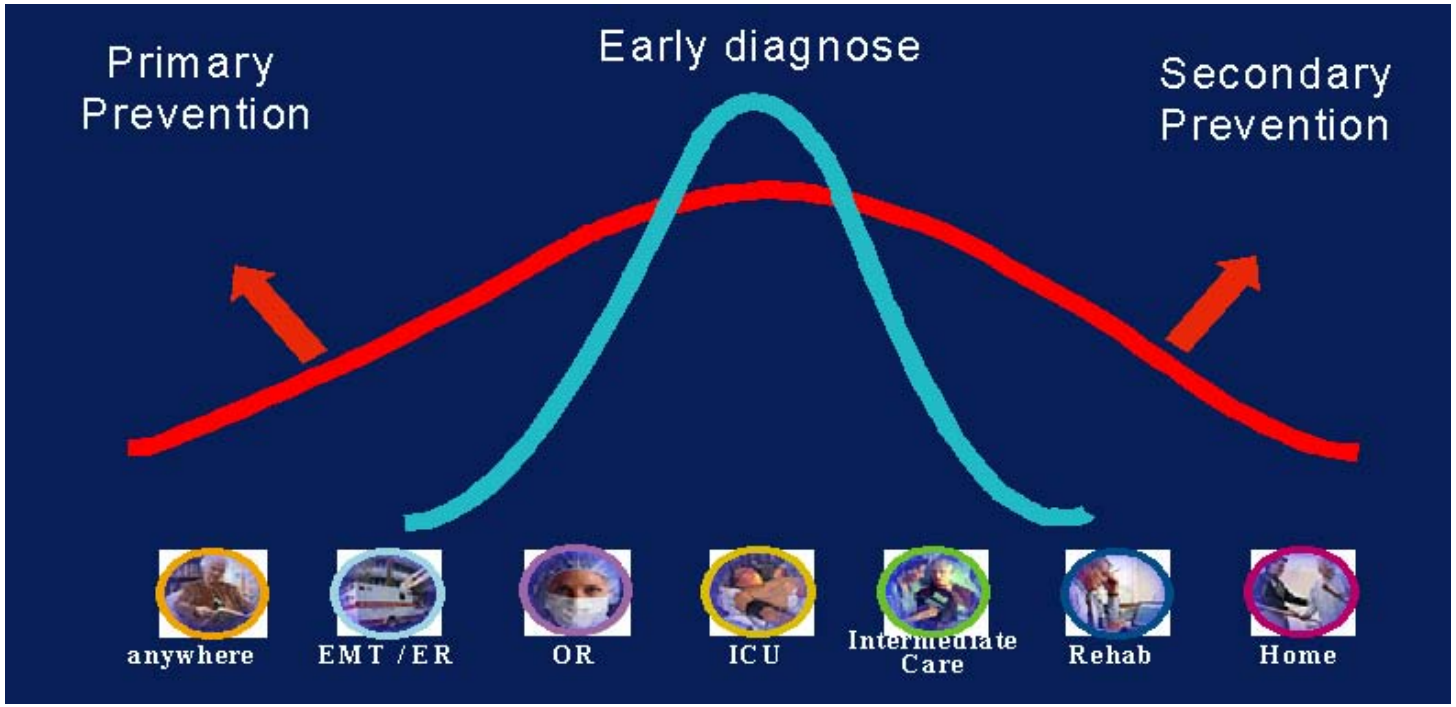
Electronics systems

Textile components



Sub-segmentation

- **Biomedical**



Source: MyHeartt

Sub-segmentation

- **Professional**
  - Rescue and emergency (firemen, etc)
  - Victim clothing
  - Protective, preventive
    - Driver
    - Security personnel
    - Remote maintenance
  - Sport training

Source: ProeTEX

Sub-segmentation

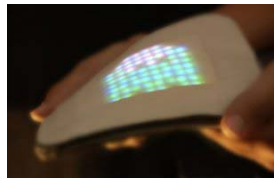
- **Consumer**
  - Sport
    - Extreme sport (aquatic, mountain)
    - Elite sport (training)
    - Consumer sport market
  - Fashion related clothing
  - Entertainment clothing – in combination with gaming applications

Source: Adidas & Polar

Source: Philips

Universal market needs

- Autonomy
  - Emergency: 1 day
  - Consumer: several days
- Washability and resistance
  - Several years for re-usable garments
  - Less than year for underwear type garments
- Cycling considerations
  - Temperature
  - Deformation, e.g. 500 testing cycles
- Respect of electric and electromagnetic exposure regulations
- Burning behavior: lack of toxic fumes / skin sticking
- Communication capabilities (display or data communication)
- Fashion and fun

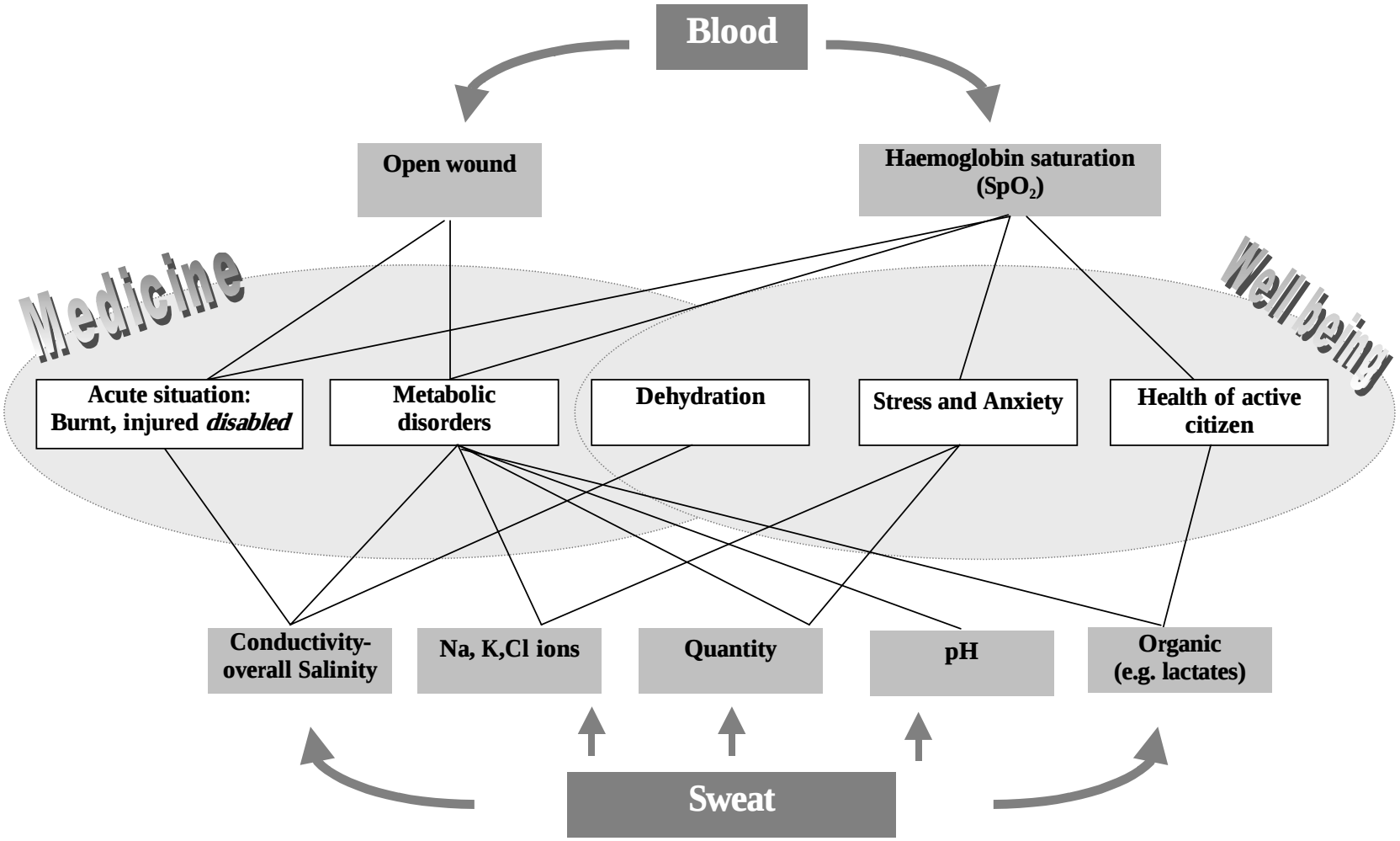


Source: France Telecom

Specific market needs

- Depending on the market segment
- Often overlapping
  - E.g. Several physiological measurements can be used with different signification:
    - Pulse (medical, sport, metabolism, stress)
    - Strain (from sleep apnea to rehabilitation to sport training applications)
- Performances depending on the specific market segment
- More often required physiological parameters
  - ECG/Pulse
  - Temperature
  - Strain (posture, gesture and respiration)
  - Conductivity

Needs for wearable biochemical sensors



Conclusions

- The intelligent textile industry is still in its infancy
- From research to health economy: it is the vision of a promising concept
- There is a high potential for rapid growth of the related wearable electronics for medical, professional, sporting equipment and leisure
- Health and medical industries will eventually become large markets
- Initially, the biggest market may be the military
- There are non-wearable applications that will provide revenues in the short term like automotive interiors

Thank you for your attention.