

Study Session 8

Wearable Systems and Equipments

Market trends, Use cases and Challenges

Ulrike Haltrich

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Overview

1. Issues
2. Market trends
3. Wireless charging in wearables
4. Smart Clothing in fitness, health care and mHealth
5. User Interface requirements of Wearables
6. Standardization questions
7. Status and next steps in TC 100

Issues

- **Wearable standardisation**
 - Usability/User Interface, IoT/data, energy, networking
 - B2B (people at work with busy hands or eyes, and those senses not fully available as for handicaps)
 - Body area network, conditions of use “on the body” , including low power Bluetooth
 - Codecs: higher efficiency for low energy consumption
 - Codecs: not only codecs for human communication signals (voice, video) but also for M2M and biometric signals
 - Wireless charging
 - Interaction objectives beyond entertainment like health & fitness

Strategy Analytics

1. Wearable is defined as: a mobile phone / tablet companion-device or standalone-device worn on-body or in-clothing
2. Splits the market between the major currently-known categories (e.g. watches, glasses, fitness bands, smart clothing)
3. Fitness bands are dominant device class in 2013 (91%)
4. Key Players Samsung and Sony, Apple, Google, Intel and Microsoft
5. Wearable devices a 125M unit market in 2017
6. Existing apps focus on mobile phone connectivity
7. The “wearable” is not yet a stand alone device
8. Wearables will impact our everyday lives - from automated home entry and lighting, to elderly care and patient tracking, clinical health and fitness
9. Adoption of NFC in wearables, for example, will simplify the pairing between the device and a smartphone

Display Search

Total global market for wearable device expected to reach 485M units by 2018



Wireless charging in wearables

1. Charging wearables in an effective, smooth and seamless way is still one of the biggest headaches for device vendors
2. Wireless charging and battery management are key topics
3. Not acceptable to recharge watches, wristbands every single day (or even at more spaced intervals)
4. One interesting angle to consider however is that users will increasingly have a number of devices on/around them (smartphone + Tablet + watch + wristband + ...)
5. Instead of considering the power usage/resource of each device taken separately, it may make sense for further standardization activities to look at pooling together those disparate energy storages and sources

Wireless Charging

1. February 2014 the Alliance for Wireless Power (A4WP, recently rebranded “Rezence” : <http://www.rezence.com/>) and the Power Matters Alliance (PMA: <http://www.powermatters.org/>) signed an agreement to ensure that their two standards will work together
2. A4WP (Alliance for Wireless Power) that is looking at the wearable eco-system from a charging point of view
3. Broadcom (integration with its WICED Wireless Internet Connectivity for Embedded Devices line of Wi-Fi chipsets):
<http://www.broadcom.com/products/Wireless-Charging>
4. Qualcomm (one of the pioneer of wireless charging with its WiPower technology, and now porting it into SnapDragon mobile application processors): <https://www.qualcomm.com/products/wipower>
5. Intel (partnership with Witricity for wireless charging integration

Smart clothing in fitness and health care

- Plantiga (footwear sensing and tracking for shock absorption):
<http://www.plantiga.com/#about>
- Stepsss (insoles with embedded sensors for improving walking/running):
<http://www.stepsss.co/>
- NuFabrx (nano-encapsulation fabric for embedding medication / drug delivery):
<http://nufabrx.com/product/nufabrx-pillowcase/>
- Citizen Sciences (fabrics embedded with micro-sensors): <http://www.cityzensciences.fr/en/>
- Hexoskin (Bluetooth vest that tracks the body's vital signs including heart rate, heart rate variability, breathing, VO2 max, stress, sleep and activity level. Hexoskin is currently being used by the Canadian Space Agency, Olympic and professional athletes and medical researchers): <http://www.hexoskin.com/>
- OMSignal (capture physiological signals acquired from the body such as ECG, breathing patterns, and physical activity, and interpret them to deliver engaging information and

Smart clothing in fitness and health care

- Zephyr Technologies (compact physiological monitoring module that enables the capture and transmission of comprehensive physiological data on the wearer via mobile and fixed data networks): <http://zephyranywhere.com/products/bioharness-3/>
- Sensoria (socks infused with textile sensors and paired with an electronic anklet that not only tracks steps, speed, calories, altitude and distance but goes well beyond that to track cadence, foot landing technique and weight distribution on the foot): <http://www.sensoriainc.com/sensoria-healthcare/>

Smart clothing in health care

- Accuracy, Quality of Service and reliability required in a medical context (even if just for diagnostics purposes, not actual treatment) means that this is a field which would require much more stringent product development, testing and pre-commercial validation
- Qualcomm and Palomar Health launched an incubator for Google Glass (and other wearables) to be used in medical applications: <http://www.palomarhealth.org/ContentPage.aspx?nd=32&news=354>

Mobile Health (source: RockHeal+h)

- Mobile Healthcare and medical App downloads will reach 44 million in 2012, rising to 142 million in 2016 ([Juniper](#) 2012)
- 84% of doctors use tablets - 74% iPad, 10% other ([MobiHealthNews](#), April 2012)
- McKinsey projects opportunities in global mHealth to be \$60 billion
- 19% of Smartphone Users Have Health Apps ([Pew Report](#), 2012)
- 69% of US adults are willing to communicate with providers by email. However, only 49% are interested in communicating via online chat or web portal, 45% by text message, and 40% by mobile health applications ([PWC](#), 2013)
- 36% of healthcare companies have no mobile technology strategy currently ([Robert Half Technology](#), 2014)
- 59% of physicians and insurers believe widespread adoption of

RockHeal+h

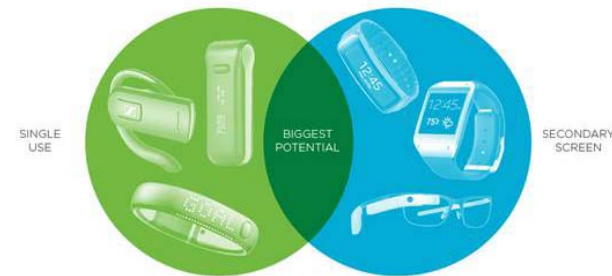
A wide range of products have emerged or are being developed in the category, covering numerous aspects of human physiology



Source: Rock Health review of marketing for 75+ companies
 Note: Companies are selected, not comprehensive

User interface requirements of wearables

- While the variety of wearable devices being a major UX challenge (no screen / small screen / large screen, one-hand operation / no-hand operation…), one certain thing is that wearables’ UX cannot be a straightforward “shrinking” of smartphone/Tablet interaction modalities.
- In UX terms there are 2 kinds of wearables, for which UX requirements may be vastly different:
 - Single-use wearables (often as companion devices of smartphone)
 - Multiple-use wearables (often a secondary screens with/ in replacement of smartphones)



Standardization questions

- How to manage battery life and various charging issue (also echoing the aforementioned point about wireless charging for wearables)?
- How to synchronize sensing data between multiple device vendors, multiple OSes, multiple smartphones/Tablets and multiple Clouds? How will privacy be enforced (or affected)?
- Evaluate the comfort of wearable devices given e.g. the large number of sensors

Status and next steps

1. Established a study session 8 in May 2014
2. Co-chairs of SS 8 are J. Yoshio and U. Haltrich
3. Call for experts on 18 August 2014
4. Proposal: Focus as a first step on wearable and fitness/health supporting technologies including wireless charging and user interfaces

Draft scope of SS 8

- Conduct a Survey of wearable and fitness/health supporting technologies, use cases and research projects
- Develop an inventory of wearable and fitness/health supporting related standards, e.g. M2M
- Survey every possibility of standardization under the TC 100 scope
- Identify future new work items related to TC 100

Any experts volunteering to support this work?