

Wearable Electronics: Market & Technology analysis

Benjamin Roussel, Guillaume Girardin
 Yole Developpement, 75 cours Emile Zola, 69100 Villeurbanne, France
benjamin.roussel@yole.fr
girardin@yole.fr

Abstract:

More than 10 millions units of wearable devices were sold during the year 2014, but this number is rather low if we consider the total addressable market (TAM). These unbacked products seem to have a great but clearly under-exploited potential. In the future, several dozen of millions of units are expected, but to that end, not only is a mature technology mandatory, but market drivers as well as the most relevant applications need to be identified. Furthermore, a successful product must be part of a strong software ecosystem because a successful wearable device will need to interact with both environment and human, all of this with a seamless technology. This is the first step toward humans and the technology fusion. At the end, the real questions are, which segment is the most profitable, who will provide the seamless technology, the best business model and where the value can be found?

Key words: wearable, electronics, market, technology, trends, sensors

Past and Current Wearable Market

Wearable devices are not new [1]. During the 1960', Ed Thorpe and Claude Shannon invented a cigarette pack-sized pocket computer, that was designed to predict roulette wheels. The device was easily concealed in a shoe. Later, in the 1970's, HP released the first calculator watch, and during the 1980's and 1990's, Steve Mann developped many versions of the first prototype of connected helmet. More recently, the company Google, with its GoogleX Labs, developed and envisioned « Google Glass » as the first wearable targeting the mass market. But these ultra-light glasses, offering augmented reality features, faced technical, ethical and applications issues leading to the abortion of the project for the consumer market for now... All these products have a common point, despite huge opportunities offered, both consumer and professional markets were still opposed to these technologies until now.

What are sensors and wearables?

Recent advances in telecommunications, microelectronics, sensor manufacturing and data analysis techniques have opened up new opportunities for using wearable technology in daily life to achieve a range of health outcomes.

In the past, the size of sensors and front-end electronics made it too difficult and offer

unaccuracy data to use them in wearable tech to gather physiological and movement data.

Today, with smaller circuits, microcontroller functions, sensor fusion and wireless data transmission, wearable sensors can now be deployed in digital health monitoring systems.

We define a wearable device as an assembly of components monitoring internal or external stimuli, worn directly on the human skin. According to the FDA, Food and Drugs Agency, a wearable medical device is [2] :

"an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article, including a component part, or accessory which is:

recognized in the official National Formulary, or the United States Pharmacopoeia, or any supplement to them,

intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, in man or other animals, or

intended to affect the structure or any function of the body of man or other animals, and which does not achieve its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the achievement of any of its primary intended purposes."

Actually, a wearable device will provide additional non-intended purpose that can be valuable for humans. But what are these purposes?

Which segment are the most promising?

The real beginning of wearable technology, appearing after the smartphone revolution was some consumer-focused fitness sensors and wearables which are widely used by enthusiastic individuals to gather quantified data about their own health, it's called the "quantified-self". This is the first wave of wearable for mass market that appeared 5 years ago with Jawbone, FitBit, etc...

But the second wave of wearable which is predicted to expand the wearable market is now approaching, with devices and sensors targeting health applications.

Sensors and wearables that monitor physiological data of people and individuals with chronic conditions can facilitate timely clinical interventions. By combining physiological sensors with activity monitors and consumer-end electronic devices, this application of digital health can be used for early detection of symptoms in a patient's health status, facilitating timely medical interventions.

Apple, with the Apple Watch, is the first big company to release a product targeting precisely this kind of application. With the "ResearchKit" program, Apple stepped in the clinical market, allowing iPhone/Apple Watch users to participate to medical programs to collect data for fighting diseases, and also to monitor their own health.

Others applications and segments are predicted to be part of wearable market like: Safety Monitoring (to detect falls, epileptic seizures and heart attacks) or life improvement, with a sensing technology used in combination with interactive gaming and Virtual Reality environments and augmented feedback systems.

In summary, Health and medical wearable technology will strongly participate to the expansion of wearable products, but other segments like industry have also a strong interest in this technology to enhance productivity and security.

Finally, nobody has yet found out how to monetize wearable. The only way to sell wearable product seems to make people think these products are good for their life. This is so far the only added value perceived by the consumer. People make money with off-the-

shelves devices, or with hardware, but these devices are not yet very elaborate and suffer from a very low lifetime.

Technical challenges and limitations

We consider a wearable device as a natural evolution of a smartphone device. All the sensor included in a smartphone will be integrated in a wearable in the long term. For instance, in current most-advanced wearable products, we can find : Accelerometer, Magnetometer, Gyroscope, Pressure sensor, Light sensors, Heart rate sensors... exactly what we retrieve in a standard smartphone, only the form factor varies.

Therefore, following the smartphone trend, the decreasing costs and power consumption of sensors are major challenges for wearable. Size requirements (Miniaturization of physiological sensors) are already ones faced by smartphone makers. Lack of common standards interoperability issues, lack of clarity in health communication protocols and standards will also be a source of issues for long-term acceptance.

But despite all these concerns, we think that the most important challenges for wearable will be the software-hardware combination with contextual awareness, intuitive human interface and both accuracy and privacy related to the data. A strong ecosystem/support is needed because any trouble might impact the acceptance of this technology when your health and privacy are threatened.

We believe that the wearable market will explode and follow the path of the smartphone market because of several factor: With the rising share of ageing population and the increasing incidences of chronic and lifestyle diseases, wearable technology will benefits the increasing patient/physician acceptance and could be a helpful solution to reduced digital health costs. To that end, wearable products will also rely on the increasing mobile and smartphone penetration.

Future Market in Sensors and Wearables

According to our forecasts, we predict that the global market for wearable technology will rise to 160 million units shipment and \$48B in revenue by 2017 from 16 millions units shipments and \$2B in revenue during 2012. Between 2012 and 2020, wearable device shipments will increase 32-fold reaching 519 million units in 2020, with a CAGR rate of 54%.

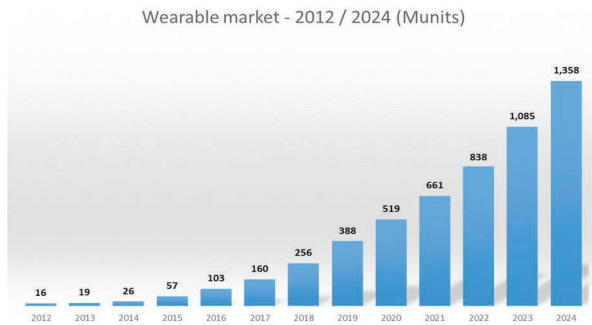


Fig. 1. Millions units of wearable devices counted and expected from 2012 to 2024.

Conclusion : Non profitable market yet...

Currently, the wearable market is a very fragmented one, structuring itself with a large numbers of small companies. These companies like Jawbone, FitBit or Misfit, that targeted fitness segment, are still looking for their business model, and because the wearable market is a very high value market, a long list of big companies are currently watching with interest, but are still in a stand-by mode, waiting for the good idea... Actually, this is the key question of wearable market, where do you find the value? Two steps in the answer, in the near future, the value is in the hardware, but at long term, clearly the value is the data, if you own/manage the data, if you own all the value chain (hardware, software and data valorization), if you are well-positionned, you are untouchable... look at what Apple is doing...

- [1] H. Salah, E. MacIntosh, and N. Rajakulendran, "Wearable Tech : Leveraging Canadian Innovation to Improve Health," 2014.
- [2] FDA, "General Wellness : Policy for Low Risk Devices Draft Guidance for Industry and Food and Drug Administration," 2015.