

Business Innovation Observatory



Internet of Things

Wearable technology

Case study 44

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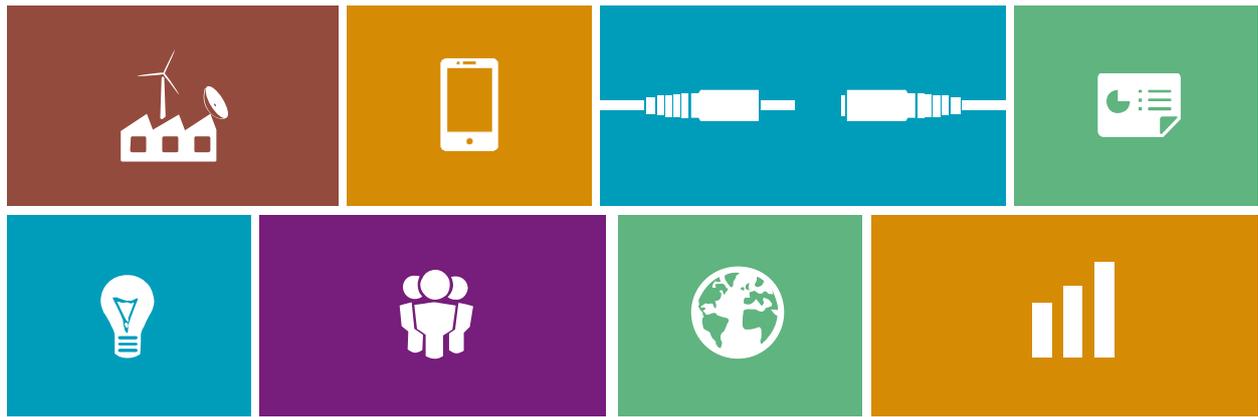
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1. Executive summary

Wearable technology refers to clothing and personal accessories that incorporate advanced computer and electronic technologies. The products that contain wearable technology are called wearables. Applications of wearable technologies include wearable cameras, smart clothing, wearable apps platforms, smart glasses, activity trackers, smart watches, as well as health and happiness wearables.

Wearable technology offers a variety of benefits. For advertisement agencies, smart glasses and wearable sensors allow enhanced data collection on consumer feedback, which **drives down the cost of traditional market research** in labs and improves accuracy of consumer research. Also, the integration of wearables in enterprises processes leads to **improved efficiency and increased labour productivity**. In healthcare, wearable technology is put to use for **increased automation of health care metrics collection**.

The market potential of wearable technology is estimated to be immense as it stretches **across different sectors** such as retail, entertainment and media, as well as healthcare, including sport and fitness applications. **The global market for wearables is estimated to reach EUR 34 billion by 2016.**

The showcased companies are offering **product solutions** (Yepzon, GlassUp, and Withings) or are **service providers** (See Through, Sensum). These companies are relatively young but have become successful in a short time. Product life cycles are relatively brief and the common denominator between these companies lies in their quick reaction time and short R&D cycles in order to launch their products and services as swiftly as possible.

The value chain of wearable technologies consists of chip and components producers, integrators, test and standardisation houses, network providers, product solutions producers, service providers and distribution and retail. Chip and component producers are expected to benefit from substantial investments in the coming decade in order to make wearables even smaller and more comfortable as well as have a longer battery life.

The growth of wearable technology has been largely **driven by the level of market penetration of smartphones aided by technological advancements of battery life and size**. However, there are also some reported obstacles for further adoption, such as balancing the price of wearables with their added value to users, the development of highly specialised wearables for each body part, and the "battle" between the operating systems.

Policymakers can facilitate and stimulate the growth of wearable technology. Wearables need privacy protection regulation. This need is evidenced by results of a PwC survey where 82% of consumers identified themselves as worried that wearables could invade their privacy. Furthermore, policy makers need to drive down roaming costs charged by service providers to users of mobile internet. This barrier is already addressed by new EU legislation to be adopted in 2015. And thirdly policy makers can facilitate the adoption of health wearables as medical devices.



The trend of Internet of Things refers to the phenomenon in which not only computers, but all sorts of devices with embedded computing capacity are interconnected. This includes self-driving cars, drones, smart sensors, connected homes, and wearable devices. Together, these interconnected pieces of equipment allow society to enter an era of smart devices, in which these elements are part of a larger cohesion actually widely known as the Internet of Things.

For both commercial enterprises and public sector organisations, this has drastic implications on how consumers are reached,

connected and engaged with.

For much of the recent years, wearable technology has been the subject of great hype and sometimes even greater scepticism

The same applies to back-end operations. When wearables become mainstreamed, Big Data as we know it today will be dwarfed by a deluge of super data.

This leads to an enormous potential to cull, analyse, and interpret it to deliver insights that can unlock tremendous value, both for businesses and for society at large.

Both the consumer market and the B2B market stand to be radicalised by the mainstreaming of wearable technology. Applications in sports, entertainment, retail, manufacturing, workplace training as well as health care and medicine are already underway.

In recent years, wearable technology has been the subject of great hype and sometimes even greater scepticism, driven by speculation around whether these emerging devices will have a positive or negative impact on our lives – if they will have any impact at all.³

Just as tablets faced scepticism in their early days, with consumers and critics questioning the need for new devices, so too does wearable technology. Issues around cost, style and necessity are holding consumers back. Indeed, many sceptics currently consider the smartphone as the perfect device.

But new smart devices do not have to replace the smartphone – or any other existing device. PwC’s report, “The Wearable Future,” surveyed consumers to ask if they would need their wearable device to replace an existing piece of technology in order to justify its purchase. The survey indicated that **76% of the panel of 1,000 consumers said no.**⁴ In fact, for the short term at least, it is likely that wearable devices will be designed to work as companion devices, just as the new Apple Watch will rely on the iPhone as a connective hub.

Table 1 below shows the companies detailed in this report, their business innovation, and their most apparent success signals.

Table 1: Overview of the company cases referred to in this case study

Company	Location	Business innovation	Signals of success
Sensum	Northern Ireland and United States	Founded in 2012, Sensum offers a solution that provides deep insight into how audiences truly respond to the media. Sensum’s solution captures and processes cognitive responses, and displays them on a mobile device such as a tablet. These conscious and subconscious responses can then be recorded, mapped, and compared.	<ul style="list-style-type: none"> Their work won them funding from Northern Ireland Screen and the Arts Council of Northern Ireland in 2010 to generate a horror film from emotional responses of the audience.⁵ Movie lovers were excited when the film premiered in 2011, and both the New Scientist and Channel 4 showed strong interest in it, leading to the development of Sensum’s emotional response measurement technology into a business.
Yepzon	Finland	Yepzon is a simple, yet powerful device that prevents children from getting lost. The device is able to track the carriers’ whereabouts anytime anywhere through a convenient smartphone app. The device cannot be turned off and is waterproof and shockproof, making ones children even safer.	<ul style="list-style-type: none"> Yepzon Group is a technology company developing mobile wearable technologies and smart clothing applications. Founded in 2013, the company directly employs three people and about twenty subcontracted product developers. Yepzon is fully owned by European investors, most of which are Finnish private investors operating in various sectors. The company’s head office is located in Tampere, Finland. Yepzon Group’s wholly-owned subsidiary Yepzon Ltd is registered in London



GlassUp	Italy	GlassUp is an eyeglasses display solution that allows users to read emails, text messages, directions, heartbeats, translations, or any other info selected by the relevant apps. This prevents users from having to grab their smartphones. GlassUp is in essence a second screen output for a mobile or portable smart device.	<ul style="list-style-type: none"> To develop the smart glass, GlassUp selected some of the best qualified optical scientists in Italy. Moreover, they are collaborating with various universities around Italy, and are connected with other specialized centres in Italy and elsewhere. GlassUp already filed a patent application covering their technology in Italy. GlassUp raised more than EUR 100,000 on crowdfunding website Indiegogo.com and EUR 400,000 from the Seventh Framework Programme of the European Union.
SeeThrough	United Kingdom	Using adapted and enhanced versions of technologies such as Google Glass, See Through is a software platform able to record everything a consumer experiences as if literally 'through their eyes'. It records and detects all the advertising that large focus groups of individuals are exposed to, measures the quality of their interaction and evaluates how effective those advertisements and media channels are in driving purchasing or behavioural changes.	<ul style="list-style-type: none"> Based in London and San Francisco they have worked on projects across the globe including Mexico, Brazil, Canada, the UK, South Africa, Japan and the Philippines.
Withings	France	Withings is a French company that builds smart devices and apps around health. It has a broad product portfolio of smart devices that can connect to the internet, such as a wireless scale, a smart body analyser, and a blood pressure monitor.	<ul style="list-style-type: none"> In July 2013 Withings received a EUR 25.8 million investment from Bpifrance, Idinvest Partners, 360 CapitalPartners, and Ventech. Withings has recently won 3 CES innovation awards for its products.

2.2. Presentation of the companies examined in the case study

The case studies of companies offering wearable technology products or services to support the production and exploitation of these products include: Sensusm (North Ireland), Yepzon (Finland), GlassUp (Italy), See Through (United Kingdom) and Withings (France). The aim of the selection is to demonstrate the scope of applications for wearable technology. Each case study shows how the solution developed solves challenges in different industries, such as advertising, healthcare, fitness, and child care. Together they are examples of the benefits that are offered by wearable technologies.

Problem 1 – Advertisers and marketers are in need of accurate means of proving the true value of audience responses to their content in order to optimise the effectiveness of marketing messages sent to the audience via for example internet, television and radio.

Innovative solution 1 – Sensusm is a platform that captures, consolidates and analyses data streams from wearable technology. When this data is combined with traditional market research, it provides a 360° understanding of customers, how they feel, what drives them, and what they connect with. Sensusm can be used for example to test ads, in-store retail environments, websites, product concepts, and customer and patient journeys.

Hardware provider Shimmer developed in cooperation with Sensusm a measurement device with sensors measuring sweat levels while watching a movie or a show.



Source: Sensusm



Problem 2 – Children are great explorers. Each day is a new adventure filled with interesting things and exciting new places. A large concern of young parents is to keep track of the location of their children. In the EU alone, 250,000 children are reported missing to local authorities annually.

Innovative solution 2 – Simply put, Yepzon provides peace of mind by giving parents a quick and easy way to locate their children's whereabouts. The small and lightweight Yepzon location device conveniently goes where the child goes. If the child gets lost, Yepzon's universal user interface enables positioning from near or far. The device application works on all primary smartphone platforms and is easy and safe to use. In addition, no personal information will be asked and no user credentials are required. The Yepzon application is compatible with all major platforms and lets the user enjoy Yepzon also on their tablet. The device has no buttons, is ready to use in a minute and has a battery that will last for several months. Yepzon combines positioning technologies, mobile equipment and a new type of cloud service.

The small and lightweight Yepzon location device conveniently goes where the child goes



Source: Yepzon

Problem 3 – Smartphones have become increasingly important in our day-to-day lives, both privately and professionally. In using smartphones, an essential disadvantage for most apps is that the smartphone needs to be grabbed in order to check a notification or other app specific info.

Innovative solution 3 – With GlassUp, consumers can control their apps directly from their glasses. Messages and notifications are shown for only a few moments, on the side of the field of view in an unobtrusive manner. Uses include apps for: educational purposes, for instance to instruct a user while making any kind of exercise; apps developed for technical interventions in industry, such as maintenance and warehousing; and apps designed to deliver local information to tourists.

Compared to Google Glass, GlassUp eyeglasses are more focused on showing information, in a very utilitarian approach:

- GlassUp is only able to receive information, and cannot send any data. As no photos or videos can be taken with the device, this mitigates any privacy issues;
- The projection is Monochrome (currently green, but they may switch to amber);
- GlassUp projects the information closer to the centre of vision resulting in less strain on the eye of the wearer.

GlassUp is able to display speed and heartrate while running.



Source: indiegogo.com

Problem 4 – Advertisement and marketing agencies have been trying for decades to get into the mind of the consumer in order to optimise marketing strategies. These companies often conduct expensive and time-consuming research retrieving consumer perceptions rather than actual and reliable data through the eyes of the consumer

Innovative solution 4 – See Through is a technology-led market research agency built on top of a high-tech software development company called Race Yourself, which previously specialised in the wearable space. Using adapted and enhanced versions of technologies such as Google Glass they are able to record everything a consumer experiences as if literally 'seen through their eyes', without the prohibitive cost of, say, eye tracking technologies. The technology automatically time tags, indexes, and organises video in an insight dashboard, detecting human voice and automatically subtitling and scheduling translation by a translation team. In the background, a powerful machine-learning Artificial Intelligence helps to do heavy lifting and task organising that previously took months. This allows for the execution of trials with large numbers of respondents over many hours in a matter of days – ready for insight analysis.



See Through software enables the recording of consumer experience through a smart glass



Source: weseethrough.com

Problem 5 – With the growth in possibilities of tracking everything people do – from whereabouts, eating habits to sleep cycles – consumers have started to quantify their lives. The main goal of this self-monitoring is for the user to learn as much as they can about their own body performance. The problem however, is that there is so much to keep track of that consumers may get confused.

Innovative solution 5 – Withings is a French company building smart devices and apps around health. It has a broad product portfolio of smart devices which can connect to the internet such as a wireless scale, a smart body analyser, or a blood pressure monitor. The solutions of Withings revolve around the concept of tracking health-

related data which users can monitor and analyse through easy and accessible dashboards available on smartphones and tablets. The combination of ease-of-use, accessibility, and playfulness empowers and motivates users to manage their weight, be more active, or strengthen their heart, among several other things. Withings has recently won 3 CES awards for its products. The time between problem submission and acquired solution is roughly three months.

The Withings Smart Body Analyser is a smart scale that not only measures weight, but also calculates your body mass index (BMI) and fat mass, and registers heart rate and indoor air quality/air temperature.



Source: Withings

3. Socio-Economic Relevance

Wearable technology is a socio-economic relevant trend that offers benefits to consumers and enterprises across different sectors. In this section the market potential of wearables is explored as well as its social potential. Also, the dynamics of the value chains in which wearable tech companies operate are described.

3.1. Market potential of the trend

The market for wearable technology is already enjoying substantive penetration in the health and fitness arena with key players such as Google, Apple, Samsung, Withings, Qualcomm and Microsoft making strategic moves within this sector. If current developments are any indication for the future, it appears that the wearable technology segment is going to be a **crowded landscape with strong competition**.

The value chain for wearables is highly dynamic. For example, in 2025 an estimated EUR 21.5 billion will be spent on formulations and intermediate materials

ABI Research estimates the global market for wearable technology in health and fitness to be the largest component of wearable technology products shipped today. This sector alone could reach 170 million devices by 2017. It is

estimated that in 2013 60% of the wearable technology market can be attributed to sport and activity trackers. Juniper Research predicts global smart glass shipments to cross 10 million units per year by 2018, along with substantially lower prices. Various reports suggest that first generation applications for smart glasses would include video documentation, but the true potential of this technology would shine when diagnostics, surgical assistance, and remote monitoring are enabled.^{6 7}

Different reports support varying numbers as regards the total market size - for example, the Credit Suisse report expects a wearable technology market of approximately EUR 34 billion by 2016. Gartner predicts that by 2020, consumer data collected from wearable devices will drive 5% of sales from the Global top 1000 companies. Research analyst firm Berg Insight predicts a compounded annual growth rate (CAGR) of approximately 50% for wearable technology devices by 2018. Juniper Research forecasts that the retail revenue from smart wearable devices, including smart watches and glasses, will reach EUR 16.3 billion by 2018 compared to EUR 1.2 billion in 2013.



3.2. Social potential of the trend

The potential socio-economic benefits of wearable devices are large and cross multiple sectors. For instance, among the workforce, devices can be used as training agents, accelerating the process through which new employees are introduced to their organisation. In retail, wearable devices can facilitate point of sale processes, improve customer service throughout the store and increase purchasing speed. In manufacturing, wearable technology can help expedite production by creating hands-free guidance tools. In service industries, wearable devices can accelerate access to information and enable seamless action. In medical centres, wearable devices can improve accuracy of information, streamline procedures and increase clinical trials. And through fitness devices and corresponding incentives for users to exercise, wearable technology can drive significant decreases in healthcare costs. In all of these examples effective implementation of wearable technology can benefit both the users and the companies involved.

Further adoption of wearables also creates new jobs. In order to explore the demand for wearable technology skills, employment websites can provide an illustrative picture of which types of organisations are asking for what kind of skills. According to research conducted by Wanted Analytics, in May 2014, 1,018 ads worldwide referred to wearable technology specifically. Compared to May 2013, the term **wearable has appeared in 150% more job ads**. Their research also made clear that especially US based companies are recruiting specifically for wearable technology specialists. Intel had the highest number of job listings requiring candidates to work on or with this technology. Zoll, Nike, and Microsoft were also among the companies with the highest demand for candidates familiar with wearable technology.⁸ The study showed that most of these online job postings aim at recruiting software and web developers, marketing managers, and electrical engineers.⁹ Currently marketing managers with wearables experience are most sought after and relatively hard to fill compared to software developers and electrical engineers.

Wearable technology is also regarded as a transformative business innovation trend, urging more traditional industries such as fashion or jewellery to become more innovative. Until very recently, it sufficed for a piece of jewellery to be beautiful, meaningful or both. Its lack of utility was beside the point. However, over the past couple of years, a wide variety of wearable devices – such as fitness trackers like Jawbone, or Wi-Fi-enabled spectacles like GlassUp – have begun to compete with traditional jewellery for space on the

body.¹⁰ Although there are no studies publicly available of the substitution effect of smart watches versus traditional watches, it is eminent that traditional watch producers and market newcomers such as Apple will compete for a spot on the consumer's wrist.

As a result, the fashion and jewellery industries face new entrants in their market space and will need to develop a strategic response. This could mean adopting new market practices by incorporating wearable technology in their traditional product lines, yet it could also mean contrasting the offerings of their novel competitors with product lines that double down on the tradition of aesthetics over functionality. Combining fashion and jewellery products with wearable technology may lead to new types of partnerships between fashion and jewellery producers and wearable technology providers to become more frequent. An example of this can be found in the line of sportswear designed by Nike that incorporates wearable technology interacting with smartphones and MP3 players.

3.3. Value chain dynamics

The value chain for products and services that contain wearable technology consists of the actors depicted in Figure 2 on page 9. The companies that have been showcased in this report are all positioned either as producers of product solutions (Withings, GlassUp, Yezon) or as service providers (SeeThrough, Sensum) developing software solutions for products containing wearable technologies.

The value chain for wearables is highly dynamic. For example, in 2025 an estimated EUR 21.5 billion will be spent on formulations and intermediate materials for wearable technology.¹¹ Companies at **this early end of the value chain** can enjoy a significant commercial advantage over the coming decade. They will participate in a rapidly growing market and will be positioned to take a greater market share as parts of the value chain will become obsolete and will be eliminated accordingly. In order to benefit from this advantage, these companies will need to design today's devices differently. Wearable devices will need to be smaller, more flexible, more comfortable, and if possible should be designed to be worn invisibly, (e.g. hidden under clothing) or made of transparent materials. Wearable devices might also be designed to be implantable, worn under the skin, or disposable. Finally, future wearable devices should never be short of power, and for instance could be designed to include minute energy harvesters.



Figure 2: Value chain for wearable technologies



Source: adapted from Beecham Research Ltd. & Wearable Technologies AG

At the other end of the value chain, the dynamics between producers of product solutions and service providers also shape the industry to a large extent. For instance, app developers that have bet on Google Glass and the ecosystem of apps that comes with it, now lament the recent indications¹² that Google has postponed the launch of a consumer oriented version of its wearable product. As a result of this decision, many app developers have abandoned their apps and are facing significant sunk cost. In response, they are searching for new applications with competitors of Google Glass, such as GlassUp.

Another important note with regard to value chain dynamics is the interdependency between network providers of mobile data and providers of product solutions. Unlike smartphones, which have consumers buying both the product and a network provider subscription, wearable product providers or service providers typically include network provisions for mobile data services in their solutions. Consequently, solution providers negotiate with network providers over the cost of data transmission. A good example is exhibited by Yepzon, the Finnish developer of the wearable child tracking device. Yepzon will deploy a machine2machine (m2m)

platform¹³ to manage subscriptions for its products across markets and will allow for the Yepzon Group to enter new markets and to manage large volumes of m2m subscriptions through one user interface. The platform also enables Yepzon to provide a single connected device that will work in all European countries, in the US, and in Russia. Customers can move between these countries and use the application without additional hassle.

Furthermore, application platform giants Android and iOS are expected to battle for platform dominance of wearables. Similarly to their efforts in the tablet market and in the market for mobile devices, they will each strive to be the leading platform for app development. As the leaders in mobile operating systems, not doing so for wearables could result in losing their competitive advantage to incumbent development platforms. This struggle for dominance impacts upstream and downstream value-chain actors, as the demand for a wearable device partly depends on the apps that will work with it. Moreover, as competition between similar wearable devices tightens, the quality of the ecosystem of apps surrounding each device will matter more.

4. Drivers and obstacles

There are a number of drivers encouraging and obstacles hampering the uptake and diffusion of wearable technology. These impact both the companies developing products or services related to wearable technologies, and the use of these wearables by users in a range of different target sectors. Further detail on such drivers, as well as obstacles, are provided in the following section.

4.1. Trend drivers for wearable technology

Under the current scenario, the growth of the wearable technology market is driven (but also limited) by the level of penetration of smartphones. Almost all mainstream wearable devices now are paired with smartphones. Smartphone penetration is more than 50% in developed countries, whereas it is less in some of the large developing countries such as India.¹⁴ Increasingly, wearable devices will evolve as a stand-alone device. This is one of the reasons why its potential market and adoption will see significant growth in the future.

Another important trend driver has been the technological advancements of battery life and size. Battery size is one of the most important determinants for the size of wearables. In a market where function and fashion go hand in hand, it is important to keep the battery as small as possible without losing too much battery power. For this reason, for example GlassUp is developing two versions of their glass: one small and sleek version for the consumer market and one bigger version for professional users that require longer battery life.

A wearable device is a highly visible part of a user and a lot more personal than smartphones or tablets. Hence, two characteristics that usually do not feature in the decision making process for other tech products play a significant role here: fashionability and uniqueness. Mainstream adoption of wearables in the consumer market depends on wearable devices achieving these qualities. Therefore, a key customer requirement for successful uptake is the "human-centred design" of wearables.



Design thinking must be embedded in disruptive strategy and innovation, with a focus on optimising the customer experience. Much of what is on the market today lacks this critical process element. This aspect is still in its infancy, though, and as innovation speeds along, human-centred design will emerge as a key differentiator – and a key driver of wearable success.¹⁵

In the specific cases of Sensum and See Through, the development and sales have been driven by the positive buzz around measuring advertisement effectiveness through wearables. Until recently, there were still many sceptics around wearables in this application field because there were few studies able to scientifically validate the related added value. However, according to Sensum, this has changed as they point to the book of Nobel Prize winner Daniel Kahneman¹⁶ as an example of the importance of our sub conscience in decision making. The wearable software platform of Sensum is able to measure the decisions made by the sub conscience rather than only our conscience, which is assessed in more traditional market research surveys. The considerable hype that has been created around this theme and free trials has already convinced large brands to use their platform.

4.2. Obstacles to adoption of wearable technology

Currently, producers are struggling to balance the price of wearables with their added value to users. Purchasing a wearable – whether at the individual (consumer), corporate, or manufacturer level – must be cost-effective. Most research done on the industry thus far indicates price as the biggest hurdle for wearable investment. According to the technology research firm TNS Nielsen, some 55% of consumers

“The most important success factors for GlassUp are minimising product cost, being able to have the battery last long enough, keeping an attractive design and not disturbing the privacy of its users” – GlassUp

think wearable technologies are too expensive to purchase, while 24% of them believe they already have too many devices to again invest in. At the same time, in a separate survey, costs were outlined as the most important barrier to entry 72%.¹⁷

With more players in the market though, prices for new products are expected to lower. Hence, adoption of wearable technology as a mainstream consumer product is expected to increase.

Further, privacy constitutes a major concern for consumers, impacting wearables adoption. Several studies have shown that consumers worry about the collection and processing of personal data. **82% of the respondents to the aforementioned PwC survey¹⁸ said they are worried that wearable technology will invade their privacy.** Legal issues like taking a video at the cinema or taking pictures of people without their knowledge may need to be solved over time.

Another barrier to mass adoption of wearables is the development of highly specialised (single use-case) devices designed for different body parts. This is a complex challenge because it involves both functionality (what can it do?) and design fit (how/where would I wear it?). These questions and their interplay present dual friction for end user adoption as well: users do not want to be walking around with fifteen devices measuring fifteen different things across multiple body parts.¹⁹ Another big challenge confronting wearable technology today is the consistency of data. At its simplest level, the data that wearable technology provides can be very basic, offering a somewhat limited experience between a device on one end and a supporting app or mobile website on another. But for wearables to be most valuable to the user, the data from the wearables experience will need to be integrated more broadly in an interoperable ecosystem, rather than acting as a stand-alone solution. And when this happens, big data will become even bigger. A critical point for the wearable category will be its ability to account for environmental surroundings and collect data as seamlessly as it pushes data out. Most notably, wearable technology depends on the further practical realisation of the concept of the Internet of Things. Whether local or remote, wearable devices must be able to interact with other smart solutions and be used in conjunction with cloud computing possibilities and corresponding big data applications in order to deliver the benefits they have in store.

5. Policy recommendations

The analysis of drivers and obstacles above provokes several policy recommendations that have the potential to contribute to a business environment more conducive to the development and uptake of wearable technology. Entrepreneurs in wearable technology can benefit from a regulatory framework more adapted to their domain, specifically concerning privacy issues related to storage and

handling of personal data collected by wearable devices. Also, the uptake of wearable technology can benefit from further improvements in the regulation of costs associated with mobile data roaming. Finally, policymakers could spur the development and uptake of wearable technology by encouraging its integration in medical devices.



5.1. Regulatory framework can be adapted to wearable technology

“Laws are pretty outdated with regard to modern technologies such as wearable tech. The digital self is precious” – Sensusum

As the proliferation of personal devices accelerates, **data storage and data privacy will become key areas of concern**. However, the current European regulatory framework may not be adequately geared to deal with the complex privacy issues that may result from these developments.

The personal data collected by wearable technology devices on the individuals wearing them can be stored indefinitely in digital clouds for the use of pattern analysis of customer data by companies and public organisations. Medical insurance companies are already encouraging and rewarding their participants for using health-improving wearable technology devices. Despite the health benefits this may achieve, this presents opportunities for the mishandling and abuse of the data collected. Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data should be reviewed to gauge the extent to which the data collected via wearable devices is adequately covered by the current regulatory framework.

Another aspect to consider is the increasing problem of combining wearable technology with driving a vehicle. Driver distraction is a major cause in the increase of preventable accidents. The greatest factor contributing to driver distraction has been the growing use of technology while driving, in particular involving smartphones. In most countries it is forbidden to operate a smartphone while driving, but laws and regulations in place need to be reviewed to also cover the use of wearable devices while driving. Although these devices may be hands-free, distractions decrease a driver's alertness needed to react in unsafe situations on the road.

5.2. Policy makers can regulate roaming costs even further

In order to further drive the uptake of wearables with mobile internet connectivity, it is important to decrease roaming costs in EU and elsewhere in the world. Reports claim network provider margins as high as 90 percent.²⁰ This

problem has already been tackled by the European Commission's Eurotariff cap on prices for phone calls abroad, which led to an 80% price reduction across calls, SMS and data since 2007.²¹ It has also been addressed further by the European Parliament, voting in favour of banning roaming charges altogether from December 2015 onwards. However, further pressure on telecom providers should be exerted to adjust global roaming tariffs.

5.3. Policy makers can encourage the integration of wearable technology in medical devices

Across the globe, national healthcare systems face tremendous challenges driven by increasing costs, increasing healthcare demand as well as big improvements in addressing complex, previously untreatable conditions. Most healthcare systems are on an economically unsustainable path as healthcare consumes an ever increasing portion of GDP.²² Improvements in technology offer the most likely solution to meeting this rising demand at low cost²³.

Policymakers can encourage the integration of wearable technology in medical devices, helping entrepreneurs to **cross the boundary from provider of consumer electronics devices to provider of regulated medical devices**. Regulated wearable devices can be relied upon to provide accurate data and may be integrated into patient health records. Specifically, policymakers may attempt to increase the possibilities for field demonstration opportunities that display and diffuse the added value of wearable technology in medical devices. This would allow wearable technology entrepreneurs to convince healthcare providers and health insurers of the benefits their innovation has to offer.

However, the regulatory framework for allowing new medical devices on the market would need to be flexible enough to facilitate and spark rapid innovation, while remaining robust with regard to safeguarding public health. Also, health claims made by wearable providers or app developers would need to be scrutinised. A 2012 study by the New England Centre for Investigative Reporting revealed that of 1,500 health apps evaluated, 20% claimed to treat or cure medical problems, yet only a small percentage of them had been clinically tested or approved.²⁴



6. Appendix

6.1. Interviews

Company	Interviewee	Position
Sensum	Shane McCourt	CFO
Yepzon	Otto Linna	CEO
GlassUp	Francesco Giartosio	CEO
See Through	Alex Foster	CEO
Withings	Alexis Normand	Healthcare Development Manager

6.2. Websites

Sensum	www.sensum.co
Yepzon	www.yepzon.com
GlassUp	www.glassup.net
See Through	www.weseethrough.com
Withings	www.withings.com

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