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**Wearables conquering the Workplace of Generation Y –  
The opportunities and risks to integrate Wearable  
Technology at work**

Dissertação apresentada à Escola Brasileira de Administração  
Pública e de Empresas para obtenção do grau de Mestre

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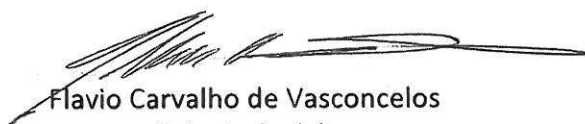
LUKAS EIDENHAMMER

**"WEARABLES CONQUERING THE WORKPLACE OF GENERATION Y – THE  
OPPORTUNITIES AND RISKS TO INTEGRATE WEARABLE TECHNOLOGY AT  
WORKERTAÇÃO".**

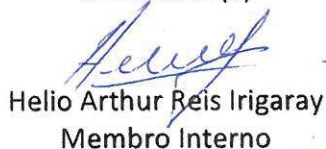
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## Abstract

**Purpose** - The purpose of this thesis is to investigate the attitude of Generation Y towards Wearable Technology (WT). The investigated gadgets of WT are Fitness trackers, Smart watches, Smart glasses and Smart Clothing. The research investigates the interest of individuals into WT sponsored by the employer and their data-sharing attitude.

**Design/Methodology** - The thesis uses a quantitative, online survey among individuals, which are 18 – 36 years old. The survey is threefold. First, individuals are questioned towards their tracking behavior and ownership of WT. Second, the likelihood to purchase WT is compared with the likelihood to request sponsored WT by an employer. Third, the data-sharing attitude of individuals is investigated. The survey was distributed via Social media and the data gathered via Qualtrics. The analysis was conducted with the statistics program SPSS.

**Findings** - First, the proportion of individuals tracking data and the data tracked confirm the interest of individuals to receive personal insights through WT. Second, the likelihood to request WT when sponsored by an employer shows a statistically significant increase for Smart watches, but decrease for Fitness trackers. For owners of WT, the likelihood increased for all four WTs. Third, the data-sharing attitude of individuals highlighted, that Generation Y does not trust the employer's objective.

**Research limitations** – The main limitation is that the research is not representative for the whole Generation Y. There exist several definitions of Generation Y and only one definition is applied for this thesis. In addition, the sample was not geographically limited to specific countries. In addition, the survey covers only a limited number of gadgets. Based on the responses for a single gadget, one derives with implications for the whole category of Wearable Technology. In addition, the topic of data sharing is covered by general questions about WT and not retrieved for each of the four devices.

**Practical implications** – By focusing on the individuals' perspective the thesis provides insight into the attitude of the Generation Y towards the innovative technology of Wearables. The research creates awareness about the employer-employee relationship and the topics of trust and sharing attitude. Employers and companies are interested into the data tracked by individuals and can derive with insights on how to integrate WT at the workplace.

**Originality** – The study focuses on the expectations and concerns of individuals towards WT, in comparison to the numerous studies highlighting the technological features.

**Keywords:** Wearable Technology, Employer-employee relationship, Generation Y

**Category:** Master thesis

## Resumo

**Objetivo** - O objectivo desta tese é investigar a atitude da geração Y face à wearable technology (WT) . Os aparelhos investigados de WT são fitness trackers, smart watches, smart glasses e smart clothing. A pesquisa investiga o interesse dos indivíduos interessados em WT patrocinados pela entidade empregadora e a sua atitude de partilha de dados.

**Metodologia** - A tese recorre a um questionário quantitativo online testado com indivíduos entre os 18 e 36 anos. O questionário é tripartido. Primeiro, indivíduos foram questionados perante o comportamento registado e posse de WT. Seguidamente, a probabilidade de adquirir WT foi comparada com a probabilidade de pedir WT patrocinados por um empregador. Por fim, a terceira parte investiga os comportamentos de partilha de dados. O questionário foi distribuído online através de redes sociais e a data recolhida foi analisada via Qualtrics. A análise foi interpretada através do programa SPSS.

**Resultados** - Primeiro, a proporção de indivíduos a registarem os seus dados e os dados recolhidos confirmam o interesse dos indivíduos em receber informações pessoais através de WT. Em segundo lugar, a probabilidade de requisitar WT quando patrocinados por um empregador mostra um aumento estatisticamente significativo para Smart watches, no entanto um decréscimo para Fitness trackers. Para os donos de WT a probabilidade aumentou para os quatro tipos de WT. Por último, a atitude perante partilha de dados por parte de indivíduos sublinhou que a Geração Y não confia nos objectivos do empregador.

**Limitações** – A principal limitação desta dissertação prende – se com o fato de a pesquisa não ser representativa de toda a Geração Y. Existem várias definições da Geração Y e uma dessas foi seleccionada para o desenvolvimento desta tese. Adicionalmente, a amostra não se encontrava geograficamente limitada a países específicos. Igualmente, apenas um número limitado de equipamentos foi considerado no questionário desenvolvido. Baseadas nas respostas para um aparelho único, é possível derivar as implicações para toda a categoria de WT. Em adição, o tópico de partilha de dados é coberto por questões gerais sobre WT e não para cada um dos quatro aparelhos.

**Aplicabilidade do trabalho** - Através do foco na perspectiva dos indivíduos, esta tese fornece uma compreensão alargada do comportamento da Geração Y relativamente às inovações tecnológicas dos wearables. Esta dissertação foca – se na relação empregador – empregado e nos tópicos de confiança e de partilha. Nomeadamente, os empregadores e as empresas encontram – se interessados relativamente aos dados rastreados pelos indivíduos que poderão fornecer uma melhor e mais completa perspectiva de como integrar os WT no local de trabalho.

**Originalidade** – Este estudo foca-se nas expectativas e preocupações dos indivíduos em comparação aos inúmeros estudos salientando características tecnológicas.

**Palavras chave:** Wearable Technology, Relação empregador-empregado, Geração Y

**Categoria do artigo:** Tese de mestrado

## 1. Introduction

### 1.1 Contextualization and Relevance of the Problem

Technology changes how work is done in organizations. Wearable Technology (WT) delivers new connections between individuals, analyzing their behavior in a hyper-connected world. Innovations in information and communication technology affect the nature of work and shape how people interact and communicate (Cascio & Montealegre, 2016). The digital revolution causes an increase of communication possibilities and exchange of data. This also leads to blurring boundaries between professional and private life (PWC, 2016).

A paradigm shift occurred, as work can be conducted virtually and anywhere, through global real-time communications. Besides the change towards remote working and home office, technology changes offices itself, as everything becomes more connected. Companies were always interested in measuring employee's performance and productivity and through innovation in WT, human behavior can now be quantified (Boudreau, 2016; Wilson, 2013).

The trend and interest to quantify one's behavior roots back to the 1990s with the practice of lifelogging. Lifelogging is the process of recording personal data and also referred as Personal Informatics (Dodge & Kitchin, 2007). This field of Personal Informatics assumes that through self-knowledge of one's data, it is possible to reflect, have self-discoveries and change one's behavior. Researchers and designers of "human-computer interaction" introduced self-tracking technologies focusing mainly on health, fitness and wellness (Klasnja & Pratt, 2012).

Wearable technology has evolved out of the mobile computing, which refers to garments and accessories that are enhanced using electronics (King, 2011). This development was possible because of advances in technology and miniaturization such as sensing, wireless communication or nanotechnology. Nowadays, WT allows tracking activities of humans with little effort. Another development is big data analytics, which allows analyzing and comparing vast amounts of data and investigate an individual's activity.

The "practice of linking wearable computing devices with data analysis and quantified feedback to improve performance" (Wilson, 2013, Analyzing the big data inside us) is named physiolytics. Even though physiolytics has its foundation in sports, it spills over into factories and offices as well, creating a Wearable Workplace (Wilson, 2013).

Besides the usage of WT in the fitness, health and medicine industry, it may affect several other fields such as aging, disabilities, education, transportation, finance, gaming and music (Tehrani & Andrew, 2014).

The trend to quantify everything was also picked up by the popular press. The Wired Magazine was the first to name it “Quantified Self” (Quantified Self, 2018a). The magazine editors described the Quantified Self as self-knowledge through numbers and started a blog about this topic in 2007. This blog was one of the first broad point-of-contact for people to share their self-tracking practice and is today a leading platform for interested individuals (Choe, Lee, Pratt & Kientz, 2014; Quantified Self, 2018a). The term “quantified self” gave the movement a catchy phrase and offered customers a platform to exchange experiences.

The research firm Tractica (2016) states that by 2021, more than 66 million Wearables will be used annually in the field of enterprise and industrial environment, in comparison to 2.3 million in 2015. Companies, which have wellness programs in place, already offer WT such as Fitbits (Ledger, 2014; Wilson 2013). IBM, for example, was one of the first companies in 2005 to provide its employees with Apple Watches to track themselves (PWC, 2016). However, besides the tracking of simple measures such as daily steps, companies are interested in more complex employees’ data, to be aware of their habits and health status (PWC, 2016).

A shift that goes along with this development is that companies require their employees to be equipped with Wearables tracking their behavior at the workplace (The Economist, 2018; PWC, 2016). Therefore, as a first step, the question is how the Generation Y or so-called millennials, which already entered or will soon enter the modern business world, will react towards Wearable Technology? There are several risks but also opportunities to integrate WT for employees. The question is if the millennials are ready to adapt to WT in a fully connected world.

## 1.2 Research Question & Objective

There are different future scenarios pushed by pioneers like Amazon, which request the monitoring of employees and constant data exchange through high connectivity (The Economist, 2018). However, to the author’s knowledge, the employee’s perception of this futuristic topic is not investigated yet. Based on the recent development towards companies requesting employees to wear WT, research is necessary that investigates the risks and opportunities to provide employees, belonging to Generation Y, with WT (Tractica, 2016).

In detail, the thesis investigates if current or future employees, belonging to Generation Y, are interested in adopting and using WT. The main question to be answered are:

- 1) What is the likelihood of Generation Y to request Wearable Technology (WT) sponsored by the employer?**
- 2) Are millennials willing to share the data tracked by their devices with their employer?**

The sub questions are the following:

- What are the reasons to buy WT?
- What is the likelihood of individuals to buy WT and is there a difference if the employer sponsors the WT?
- Is there a difference between owners and non-owners of WT?
- Because of what reasons do millennials hesitate to buy WT?

The outcome of answering the research and sub questions is to identify the risks and opportunities to integrate Wearable Technology at the Workplace of Generation Y. To answer this question, the research is covered in three parts:

- (1) In the beginning, the critical question to be clarified is if people are interested in buying Wearable technology itself. Thereby, individuals are questioned towards their tracking behaviour and ownership of WT.
- (2) Furthermore, the respondents' likelihood to purchase Wearable Technology is tested with two different scenarios. First, the individual likelihood to purchase WT is queried. Second, the scenario is changed to an employer sponsoring WT and the likelihood to request WT.
- (3) Besides the general objective to check the readiness of millennials towards WT, their data-sharing attitude is investigated.

The goal of the thesis is to create an understanding of employees' expectation towards employers offering devices like WT, which monitor the behavior of employees. Millennials are the future knowledge workers and therefore the goal is to investigate their specific needs and for which kind of purpose they are willing to use WT and share the data generated. Based on the insights of the questionnaire, a guideline on how companies may approach employees should be developed. The outcome provides insights of Generation Y's perception. Based on

this, the findings of this thesis offer a guideline for companies on how to create a win-win situation through offering Wearable Technology.

### 1.3 Justification

Digitalization changes the way of doing business and affects the relationship between employers and employees. Digital technology is becoming an integral part of the infrastructure, like electricity. Still, only limited research is available on how this affects work and the workplace (Barley, 2015).

Combining the current use-cases of Wearable Technology like public health, a person's fitness, wellness and work environment, can deliver immense potential to increase the quality of life of individuals and society. Thereby, the social value as well as public interest increases (Lee et al., 2016). A common argument in the field of health and psychology is that healthy people tend to be happier. The development of one application, which collects all kind of data about a person, offers breakthrough innovation, as it can increase work-life balance (w-l b), productivity and fitness (Kaul, 2016). However, there is little academic research on the impact of the quantified self, regarding well-being initiatives, productivity and technology adaptation of workers (Moore & Robinson, 2016). It is also questionable if constant self-tracking can lead to cyberchondria<sup>1</sup> (Albrecht, 2016; Muse et al., 2012).

Even though millennials have a positive attitude towards Wearables, legal and ethical hurdles must be solved so that WT is adapted and can become mainstream (PWC, 2016). The fundamental question to be addressed is privacy and on to which personnel level, individuals are willing to share data and companies are allowed to use an individual's data. The EU General Data Protection regulation, which took effect on 25<sup>th</sup> of May 2018 bolster the rights of individuals. Individuals have the right to request which data is processed about them and can require the correction of wrong information (Allenoverly.com, 2018).

However, there are also profitable opportunities for individuals sharing their data (Wilson, 2013; PWC 2016). For examples, the German health insurance company Generali started a program called Vitality, which offers a reduction of the insurance premium and subsidies

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<sup>1</sup> The behavior of individuals with health anxiety who continuously search for health-related information online is referred as cyberchondria. Longitudinal research is missing on how self-tracking influences mental health and if it may increase cyberchondria (Albrecht, 2016).



purchase of WT such as Fitness trackers (Generali-vitalityerleben.de, 2018; Kramer & Jahberg, 2016). The reasoning for an insurance company is analogous to that of a corporation as an insurer saves money by having healthier clients (Statista, 2018a).

The way technology changes work and organizations is a continually relevant research field for organizational psychology and organizational behavior, as this development is part of technology adoption by individuals (Cascio & Montealegre, 2016). The thesis goal is to provide practical relevance by examining under which circumstances millennials are willing to adapt towards Wearable Technology and to derive with implications to integrate WT at work.

### 1.4 Structure

The thesis consists of six parts. The introduction sets and explains the context of the thesis. A literature overview follows in chapter two, demonstrating the central concepts based on secondary literature. In section three methodology, the data collection and treatment are described. Based on the applied methods the findings and discussion are described in chapter four. In chapter five the conclusion is elaborated and the thesis finishes with recommendations in chapter six.



*Figure 1: Structure of thesis*

## 2. Theoretical framework

The different WT's offer considerable benefits to individuals by providing specific personal data and quantifying all kind of a person's activities. Thereby, individuals have the opportunity to gain numerous insights about their behavior. Besides the individual consumers, also employers are highly interested in the data about its employee's activities. By monitoring the employees, companies benefit by receiving detailed information about their activity and health status. The impact of Wearable Technologies is a two-sided sword. On the one hand, it promises to increase efficiency and productivity but leads on the other hand to surveillance and a low-trust environment. Amazon is a well-known example. Being a pioneer in the application of big data, but also receiving dubious fame because of surveillance and the breach of workers' rights (Ghosh, 2018; Hipwell, 2018). Amazon patented a wristband at the beginning of 2018 to shepherd its employees by tracking every movement of its employees. The wristband vibrates strategically to guide warehouse workers and increase their output (The Economist, 2018).

Chapter two builds the framework by describing the evolution of WT, stating the status quo of Wearable Technology and describing how it impacts the workplace. After an overview of (2.1) *How Technology changes work over time*, the disruptive potential of (2.2) *Ubiquitous computing* is explained. The (2.3) *Technology of Wearables* is defined, a (2.4) *Market overview* provided and the (2.5) *Status Quo of Wearable Technology* described. In (2.6) *the relevance of data tracked* for individual and businesses insights is defined. The following chapters discuss the (2.7) *Health risks* in nowadays workplace and the challenges towards (2.8) *Privacy and security of Wearables*. Afterwards, the (2.9) *Psychological theories* are described. To narrow down the objective of this thesis the attributes of (2.10) *Generation Y* are investigated.

### 2.1 The digital era - How technology changes work over time

Given the increasing dependency on technology within organizations but also societies, the question of how technology is changing work and organizations is highly salient (Cascio & Montealegre, 2016; The Economist, 2018).

The ability to acquire new information and knowledge is dependent on the core technological infrastructures available. This infrastructure is crucial for economic structures, social revolutions, cultural transformation and work models. In the so-called digital period, a paradigm shift towards digitalized data happened. (Cascio & Montealegre, 2016). The digital era leads to a transformation of businesses. Companies adapted to the digital era by providing

services and products through digitalized data, information and knowledge. In the digital era, goods can be shared with nearly zero marginal costs (McKinsey Quarterly May, 2014). These changes in business also affect the work environment and the expectations of employees. Skills become exchangeable and job profiles bear continually evolving demands (Khakurel, Porras and Melkas, 2017).

From an employee's perspective, a change triggered by technology is, for example, the topic of availability. Nowadays it is normal to be always online and reachable by phone. This changes the expectations, as people feel the pressure of being always accessible. Nowadays it is common that people answer E-mails within one hour and if not, the sender even suspects that something is wrong. As colleagues start to expect someone to reply within that short time, it is normal to check one's smartphone constantly, and if a notification comes in, to answer it immediately (Orlikowski, 2007). Availability is triggered from the "outside", with a device, which one can put aside, lose or simply forget. WT is different, as it is on the "inside", directly worn at users body and always on, monitoring every second of a user (Wooldridge, 2015).

## 2.2 Ubiquitous computing: Disruptive potential within the digital era

To wear technology is different from merely carrying a device. Through WT "the buzzing and twittering will be in our heads rather than in our pockets" (Wooldridge, 2015, para 12). Ubiquitous computing developed within the digital era. This term was introduced by Mark Weiser of the Xerox Palo Alto Research Centre in 1998. Ubiquitous computing facilitates physical and virtual interaction, which leads to the creation of pervasive technology that interweaves into everyday life. It describes that by deeply embedding computation in the world, completely different devices can be connected and communicate with each other, which sets the ground idea for the Internet of Things (IoT) (Weiser & Brown, 1996). The technology of ubiquitous computing developed further and is nowadays the basis of electronic monitoring systems and wearable computing devices. WT has the potential to be the next disruptive technology as it combines four developments: The constant improvement in power of computing, also known as Moore's Law (Moore, 2006), the increasing speed of broadband access, the spread of sensors and the invention of cloud computing (Wooldridge, 2015).

## 2.3 Technology of Wearables

Wearables gather data as users wear it around their wrist or wear clothes with integrated trackers. Other products are worn like glasses (Google glasses) or are attached as wearable

cameras (GoPro) (Moore & Robinson, 2016). Wearables might store data that can be transferred, e.g., via Bluetooth to other devices or are constantly networked. The data collected through WT allows the generation of real-time information (Tehrani & Andrew, 2014). Wearables are paired with smartphones and web accounts and are typically augmented with at least one other feature (Khakurel, Porras & Melkas, 2017). To measure mental and physical data, Bluetooth, triangulation algorithms and infrared sensors are used to gather data (Moore & Robinson, 2016). The technology itself needs not to be activated, as it is a part of the device (Wooldridge, 2015). WT is ultimately incorporated into the body through implanted devices such as chips or smart tattoos (Tehrani & Andrew, 2014).

## 2.4 Market overview and technology adoption rate of Wearable Technology

Market size and growth of WT are an indicator of the future development of a market. The global revenue of WT excluding Smart Watches was US\$ 7.722 billion in 2017. Within the global landscape, China generated the highest revenues with US\$ 2.806 followed by the United States (U.S.) US\$ 1,953 and Europe US\$ 1.166. Within Europe, the United Kingdom generates the highest revenues followed by Germany (Statista, 2018a).

For Europe, the revenue is expected to grow to nearly US\$ 1.5 billion until 2022. The compound annual growth rate (CAGR) of 4.5% is the highest growth rate. However, the total revenues for the European market cannot compete with the market size of U.S. or China (Statista, 2018a). The primary driver for growth is smartphone penetration as it allows quickly synchronizing Wearables. Another driver is the increasing interest in self-optimization.

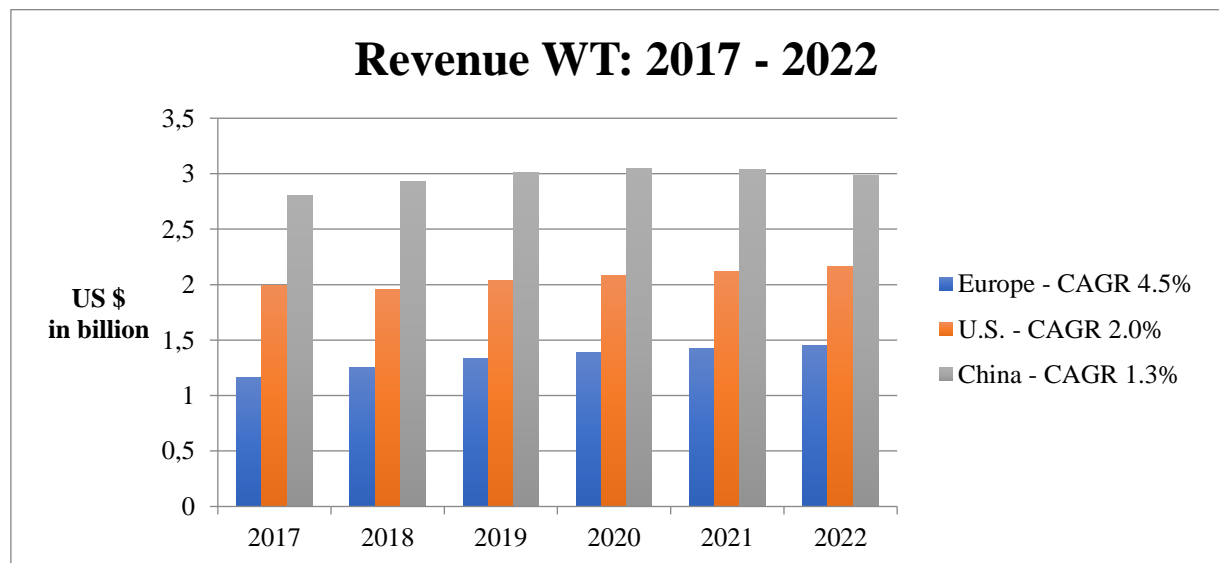
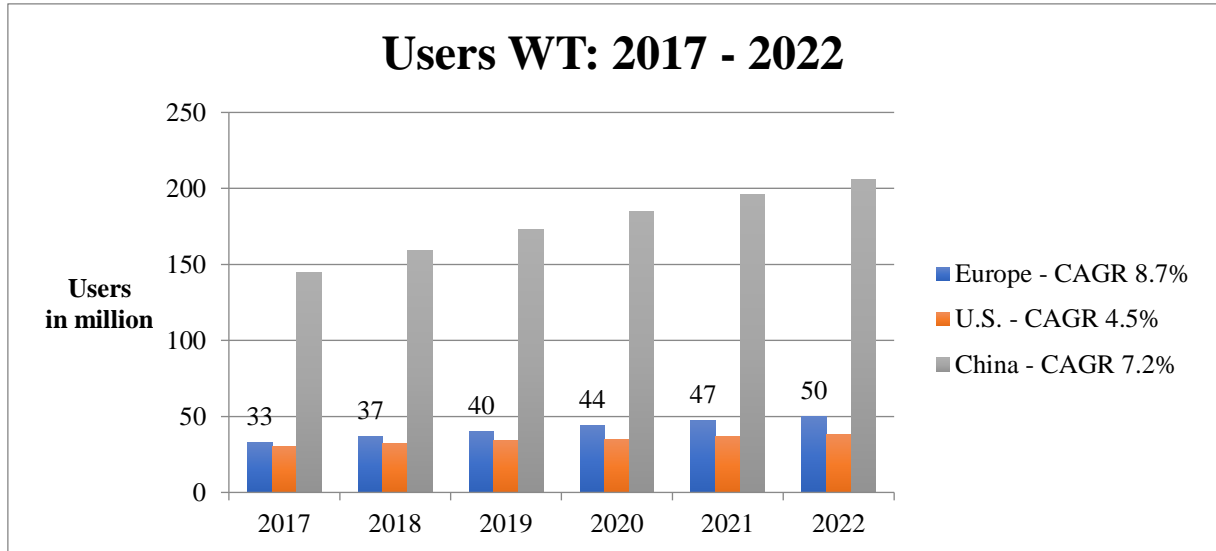


Figure 2: Revenue forecast until 2022 EU, U.S., China

In Europe, 33 million individuals use WT. The forecast until 2022 expects a CAGR of 8.7% to 50 million users. Therefore, the growth in Europe is the highest, as in the U.S. the CAGR for users is 4.5% and in China 7.2% (Statista, 2018a).



*Figure 3: User forecast until 2022 EU, U.S., China*

The Wearable penetration rate<sup>2</sup> is highest in the United Kingdom (UK) with 13.2%, followed by U.S and China with around 11% (Statista, 2018a).

When analyzing the Wearable devices shipment worldwide (Figure 4) the sales of Fitness trackers is dominant with 45 million units in 2017. However, the growth is predicted to stagnate from 2018 on. In 2018, the number of Smart watches nearly reaches the size of Fitness trackers, whereas the combination of Smart watches and Hybrid watches would already exceed the shipment of Fitness trackers in 2017. The number of Smart clothing is smaller with 2.4 million units but is predicted to experience sharp growth to 11.4 million units shipped in 2022 (Statista, 2018a).

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<sup>2</sup> Share of active paying customers in total population

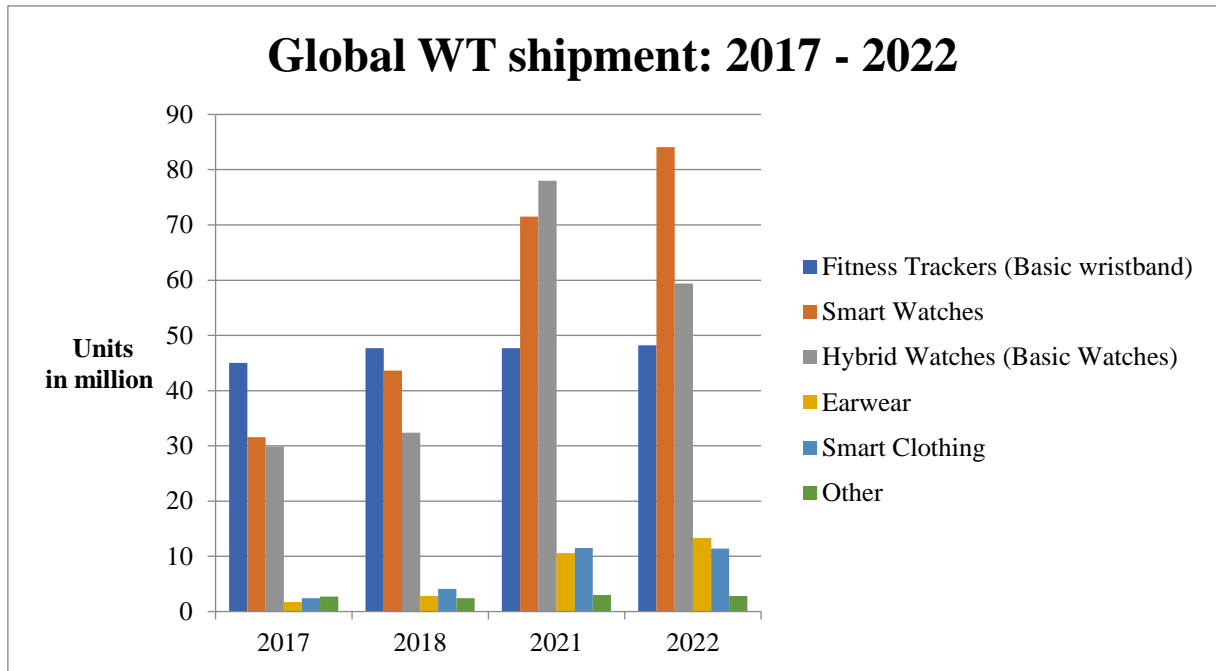


Figure 4: Global Wearable Technology shipment 2017 - 2022

#### 2.4.1 Wellness program offering WT

WT found more and more its place in companies, after IBM being one of the first companies to sponsor Apple Watches for its employees in 2005. In addition, insurance companies, but even universities have adapted WT (PWC, 2016).

Wellness programs offered by companies already include Wearable Technologies. By 2017, it was predicted that over 70% of multinational companies sponsor WT. However, the WTs offered are mainly Fitness trackers (Forni, 2016). The use cases below demonstrate the various offering of WT in organizations. Besides the wellness program of large corporations (1), the case of a university (2) and insurance company (3) provide the current status and a preview of what may establish.

#### 2.4.2 Use cases

##### (1) Company – Target Corporation:

The discount chain Target is an example from the corporate perspective. Target subsidizes free Fitbit activity trackers to its 300,000 employees. Target, also, sets a program in place where employees can participate in a team challenge to win 1 US\$ million which they can contribute to a charity of their choice (Business Insider, 2015).

### **(2) University - Oral Roberts University in Tulsa (U.S.):**

All students at this university are required to wear Fitbits to track their health data. The tracking already started years ago with paper and pen and switched to Fitbit, offering a convenient, technological alternative. The students wirelessly report their daily number of steps and heart rate, but not other data tracked like sleeping patterns. Students of the Oral Roberts University are required to reach 10k steps per day and 150 minutes of intense activity per week. The performance is part of the grade in health and physical education (Frankel, 2016).

### **(3) Statutory health insurance – Technician Insurance Germany (TK)**

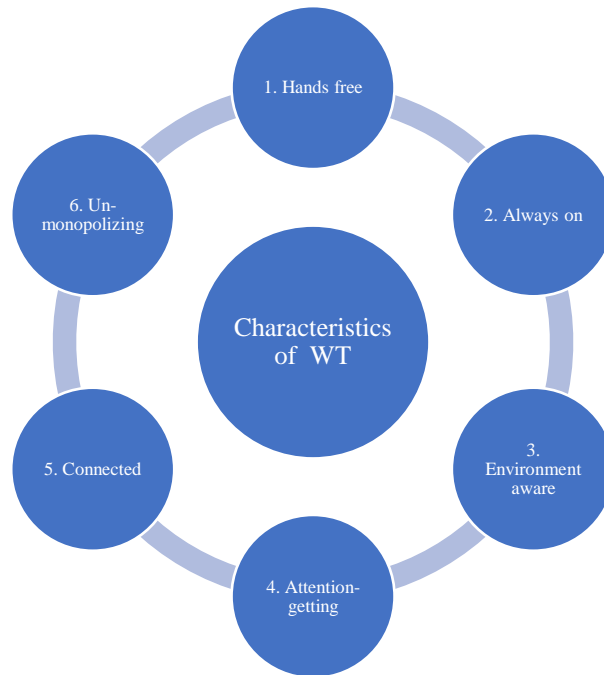
Statutory health insurances in Germany, like the TK, proposed to access fitness data of its clients. TK subsidizes the purchase of Wearables. The proposed solution is an electronic medical record, which stores all the monitored fitness data and health data of an individual. Besides the data completed by a doctor, the digitalized medical record includes a separate field to store users WT data. Individuals decide autonomously which of the data stored, they want to share (Süddeutsche.de GmbH, 2016).

## **2.5 The Status quo of Wearable Technology**

The purpose of Wearable Technology is to “create constant, convenient, seamless, portable, and mostly hands-free access to electronics and computers” (Tehrani & Andrew, 2014, para 3).

### **2.5.1 Characteristics of Wearable Technology**

Wearable technology is defined in this thesis as “accessories and clothing incorporating computer and advanced electronic technologies“ (PWC, 2016, p. 2). The characteristics of WT can be seen in figure 5. (Ching & Singh, 2016; Statista 2018a)



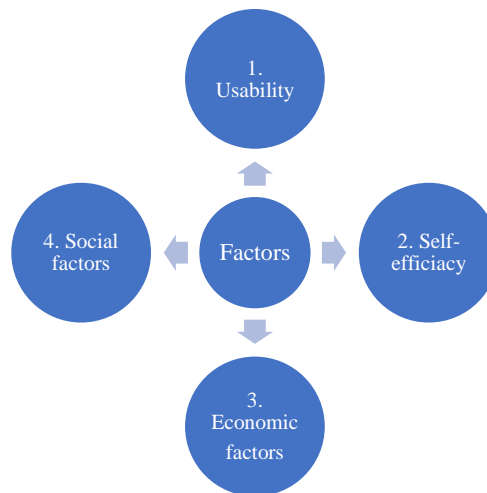
*Figure 5: Characteristics of WT*

1. **Hands-free:** Users can go after any other activity while using WT, as the gadget does not hinder them. This is one of the main advantages towards smartphone apps, for which individuals have to carry their smartphone (Statista, 2018a).
2. **Always on:** A WT is a responsive system, which is tracking data all the time. Therefore, users can request data at any time.
3. **Environment-aware:** WTs are environmentally aware, multimodal and multisensory.
4. **Attention-getting:** WT can keep users continuous attention by notifications such as receiving alerts, messages or reminders.
5. **Connected:** Real-time information exchange is possible as WT are connected to a wireless network.
6. **Un-monopolizing:** WT does not cut users off from the outside world.



### 2.5.2 Baseline criteria and barriers to use Wearables

The sales of Wearables increase constantly and already 1 in 10 Americans over 18 owns an activity tracker (Statista, 2018a). However, most devices fail to drive sustained engagement. More than half of consumers (U.S.) do not use their gadgets anymore. A third even stopped using their device within the first half year of obtaining it (Ledger & McCaffrey, 2014). Even though the triggers for engagement are well known from research, simple reasons lead to a suspension of WT. For example, users report that they lost their wearable, due to the small size. Therefore, a “baseline criteria” describes why customers adapt and engage with Wearables. The following figure 6 provides an overview of the four baseline criteria (Ledger & McCaffrey, 2014, p.6).



*Figure 6: Baseline criteria - factors*

#### 1 - Usability:

Usability is about creating efficiency, effectiveness and satisfaction so that the user directly feels using WT as an advantage. The factor (1) Usability consists of the following four sub-criteria:

##### 1.1 - Design & Aesthetics:

Physical design and aesthetics are an important factor as Wearables are worn at a prominent place and easily grab the attention of others (Ching & Singh, 2016). Ledger & McCaffrey (2014) argue that companies should focus on design elegance instead of the spectrum of features. Some users like the attention they receive, because of wearing a status symbol like an Apple watch or Google glass. Others prefer to hide it and put it around their ankle instead of

the wrist. Producers face the challenge to offer different products for each customer segment (Harrison et al., 2015). Thereby, users are more likely to wear the products for a longer period of time (Ching & Singh, 2016).

Barrier: Consumers attach importance to aesthetics and companies have to offer customized products (Harrison et al., 2015). Fitbit was the first to specifically develop a 22k-plated rose gold bangle, which allowed users to put the Fitbit tracker inside and wear Fitbit jewelry (Fitbit.com, 2018b).

### **1.2 - Setup Experience:**

The initial experience with a product is critical. Companies have to develop a promising unpacking and set-up experience.

Barrier: If the out-of-box experience is not fulfilling and consumers face difficulties setting up the device, they may not even start using it and do not engage with the Wearable (Ledger & McCaffrey, 2014).

### **1.3 - Fit & Comfort:**

The comfort and fit are critical for the first adoption and sustained utilization of a product. Wearables should not attract a user's attention when being worn and rather envelope to a person's body. In addition, the size and weight are important factors towards adoption (Ching & Singh, 2016).

Barrier: In a perfect setting, the users wear their gadgets all the time and should be able to carry out any activity. As soon as the Wearable hinders the user and one has to take it off frequently to conduct activities, the usage and engagement may decrease. Therefore, the Wearable has to be as comfortable as possible (Harrison et al., 2015). Users lose interest in their Wearable and for example, around 50% of Fitbit users abandon their gadget within the first two weeks (Shih et al., 2015).

### **1.4 - Quality & Robustness:**

A key requirement is to build a reliable wearable device as the device is exposed to all possible conditions. Wearables have to withstand different weather and temperature conditions, as well as being worn during competitive sports.

Barrier: Consumers expect reliability. A negative example of not fulfilling customer's expectation was the launch of Jawbone's Up. The product showed major failure rates and Jawbone had to offer full refund and relaunch its product (Phillips et al., 2013).

## **2 – Self-efficacy:**

Self-efficacy is about an individual's motivation to use WT and quantify them. The factor (2) Self-efficacy consists of the following two sub-criteria:

### **2.1 - User Experience & Lifestyle compatibility:**

Users wear WT all time, during the day and night, including in rest phases when sleeping. Customers nowadays expect familiar, simple intuitive operation of a device. Therefore, WT have to be completely compatible with every lifestyle and the device itself, including the mobile app, support and services, has to work seamlessly (Harrison et al., 2015).

Barrier: Any problem leads to a change towards another provider, as loyalty only exists towards the producer, which fulfils the highest expectations. Users complain about simple facts like unpractical WT or short battery life. The power consumption is a key decision factor, as gadgets often have to be recharged twice a week. (Ching & Singh, 2016; Harrison et al., 2015).

### **2.2 - Accuracy & Tracking:**

Wearables are not always reliable as they do not track all physical activity and the GPS is not a 100% accurate. Users complain that non step-based activities like Yoga or a workout in the gym are not captured. This leads also to the ideation of workarounds to trick the tracker and increase the activity tracked. Users describe putting their trackers at different positions so that their activity increased (Harrison et al., 2015).

Barrier: Since the early beginning of WT, precision of trackers is a barrier. Another one is that the devices do not offer a holistic tracking experience (Harrison et al.; 2015).

## **3 – Economic factors:**

The factor (3) Economic is the competitive advantage to an individual and his personal life or an organization and consists of the following one sub-criteria:

### **3.1 - Adoptability:**

The USP of a gadget has to be outstanding as there are many similar choices in the market and consumers are not familiar with the category of Wearables compared with e.g. mobile phones. Therefore, the relevance has to be clearly stated.

Barrier: Consumers may generally not be convinced what benefit derive from Wearable technology and as a result are not interested in buying a Wearable at all.

#### **4 - Social factors: Gamification & Individuality**

The factor (4) Social factors is about the social functionality, comparability, reward and gamification and consists of the following one sub-criteria:

##### **4.1 - Gamification & Individuality:**

Current gadgets offer a one size fits all approach. The gadgets provide text messages and motivational messages based on a user's activity, but do not differentiate between users separate goals. The gadgets offer gamification applications to allow users to compare their goal (Asimakopoulos, Asimakopoulos and Spillers, 2017).

The engagement towards competitions is dependent on the readiness of users towards changing their behaviour (Gouveia, Karapanos and Hassenzahl, 2015). Participants in teams are significantly more active than those participating as individuals. When starting an activity challenge, attrition is greater amongst participants not joining a team. This demonstrates the importance of social interactions, support and being part of a group (Glance et al., 2016).

Barrier: A barrier is that the tracked data of different gadgets like Fitbit and Jawbone cannot be compared and one cannot assure that the gadgets have the same accuracy. As competition between users is one of the key aspects for engagement, it is a barrier, as one can only compare his data with users using the same system and brand (Harrison et al., 2015).

### **2.5.3 Categories of Wearable Technology**

Many different gadgets belong to the category of Wearable Technology. The overview by Khakurel, Porras and Melkas (2017: p.7) of the different "categories of wearable technology for use in the work environment" (see Exhibit 1) was used as a basis. Based on this overview the different categories are identified and clustered (table 1). In the following, some market-leading products of the most important categories are described (Levy et al., 2018; Sawh, 2018).

**Fitness (A1) & Health trackers (A2):****Fitness trackers / bands (A1) like Fitbits**

Fitbit, Inc. is an American company, which is a pioneer in the activity tracker field. The products offer to track various data like tracking of steps, sleep patterns and heart rate. The Fitbit Charge 2 is presented as an example of a fitness wristband. Charge 2 is an activity tracker, measuring the heart rate of a user. Fitbit Charge 2 provides its user with a cardio fitness level. In addition, it is able to identify sports activities via auto exercise recognition, offers GPS tracking and has features such as guided breathing sessions (Fitbit.com, 2018a).



*Figure 7: Fitbit Charge 2 Activity Tracker*

**Health trackers (A2) like FreeStyle freedom lite® or Motiv Ring (Motiv, 2018)**

Health trackers often track similar features as Fitness trackers and therefore are comprised into the category A. Health trackers provide solutions for specific health problems like diabetes. The FreeStyle Freedom Lite measures the blood glucose and provides a user with test results (Myfreestyle.com, 2018).



*Figure 8: Freestyle freedom lite - diabetes tracker*

**Smart watches (B)** like the Apple watch (Apple, 2018)

Smart watches like the Apple Watch focus on fitness and health tracking, besides the features that are connected to a smartphone like the notification of incoming messages. Apple, for example, started an exclusive partnership with Nike to offer the Nike+ Running app and thereby tracking fitness data (Apple, 2018).



*Figure 9: Apple watch*

**Smart glasses (C)** like Google glass

Google (now Alphabet Inc.) developed an optical head-mounted display called Google glass. The glasses can be used by solely using the voice for interaction and therefore hands-free. The glasses provide several applications in the health sector as the glasses allow the user to provide his perspective to others via live stream. The glasses also allow users to analyze the behavior from their point of view (Levy et al., 2018).



*Figure 10: Google Glass*

**Smart clothing (D)** like Sensoria Fitness Motion & Activity Tracker

Sensoria produces Smart clothing with the tracker embedded into the material. The T-shirt, as seen in figure 11, monitors the heart rate of the user, without the need of a strap. The data can be extracted from a Smartphone using Bluetooth. Sensoria offers several products, which include shirts, socks and complete running systems (SensoriaFitness, 2018).



*Figure 11: Sensoria Fitness Motion & Activity Tracker*

### **Other (E):**

The category Other (E) describes gadgets that do not fit to the categories A to D but provide trendsetting concepts.

**Nymi band** is a multi-factor authenticator that allows employees to get access to different applications, such as the entrance. The Nymi band also measures the daily steps of a person. Because of the IoT application, the Nymi band is integrated with other sensors and data. This allows a seamless user experience of the gadget (Nymi, 2018).

**Smart Safety Helmet (SSH)** tracks the head gestures and the brain activity of the worker to recognize the anomalous behaviour. Thereby, head gesture and brain activity can reflect some human behaviours related to a risk of an accident when using machine-tools, reducing the risk of injury and thus increasing workers' safety (Li et al., 2015).

**Wireless Sensor Networks (WSNs)** is used for various applications in the field of "healthcare, surveillance, building monitoring, sports and fitness". WSN is a body sensor network that monitors the human body based on bio-electric signals. An example of a WSN is an ECG and acceleration monitor, which allows monitoring the daily stress level (Magno et al., 2013; Okada et al., 2013).

The following table 1 provides an overview of the categories of WT (A to E) and the specific information monitored and tracked by the gadget. Therefore, for each category, one can read off the data the devices track. The most common data tracked by WT are physical and health data, but also in a rest phase, data of the body is tracked. WT also tracks mental data and the output and results of individuals.

Data/ Devices	Physical & health data									
	Physical exertion	Altitude	Distance, distance travelled, Steps	Activity level, training, sports	Weight	Nutrition& diet, weight	Temperature	Physical disabilities	Sedentary work	Blood pressure
Fitness trackers (A1)	X	X	X	X						
Health tracker (A2)					X	X	X		X	X
Smart watches (B)	X	X	X	X					X	
Smart glasses (C)						X				
Smart clothing (D)	X	X	X	X	X		X			X
Other (E)									X	

Data/ Devices	Rest phase data			Mental data		
	Heart rate	Sleep – quality	Nervous system	Stress level	Emotions	Body motion
Fitness trackers/ (A1)		X				
Health tracker (A2)	X	X	X	X		X
Smart watches (B)	X	X				
Smart glasses (D)						
Smart clothing (C)	X	X				
Other (E)			X	X	X	

*Table 1: Categories of Wearable Technology*



## 2.6 Relevance of tracking data towards individual & business insights

WT generate insights about one's behavior and offer the user a comprehensive picture as they track all kind of data over the course of a day. The main use of Wearables is in the field of sports, health and wellness (PWC, 2016). Through reflecting on the data measured, users can be aware of their daily patterns (Crawford, Lingel & Karppi, 2015). Health is desirable for every individual and healthy employees are a key requirement for a company (Khakurel, Porras & Melkas, 2017). The precise health data provided for individuals is interesting as well for companies. It allows saving health care cost based on the data generated by Wearables (Han et al., 2017). Companies suffer significant financial losses every day due to illness and poor health of their employees. These costs consist of lost productivity due to illness, wage replacement costs and costs for medical treatment as well as pharmacy related costs (Kritzler et al., 2015). Through tracking and monitoring, symptoms can be detected early and allow companies to react properly. WT is embodied with a sensor that can track a human's physiological functions (see 2.6.1), such as physical & health data, rest phase data and mental data.

### 2.6.1 Physiological functions

#### **Physical & health data:**

Wearable Technologies allow monitoring physical and health data. Physiological measurement focuses on data such as physical exertion. Performance measurement focuses on attributes such as altitude or distance (Bonfiglio & De Rossi, 2011). Examples of physical and health data tracked include a person's activity level, training, sports, smart coaching, steps taken, distance travelled (per day), altitude, diet, calories, weight, but also sedentary time and temperature (Crawford, Lingel & Karppi, 2015; Gilmore, 2016; Khakurel, Porras & Melkas, 2017).

#### **(1) Insight Consumer / Employee:**

Based on the detailed data tracked, Wearables provide users with immediate feedback of their behaviour. The applications monitor variables like the daily steps and translate the activities into a broad goal such as weekly steps (Khakurel, Porras & Melkas, 2017). In addition, for physical & health data, the comparison between individual users through gamification is relevant as it enhances motivation and fun (Asimakopoulos, Asimakopoulos & Spillers, 2017).

## (2) Insight Business / Employer

Because of the accurate tracking, users pay more attention towards sedentary and productivity, as e.g., Smart watches give an hourly overview, how many steps a person walked. This also increases productivity as every single hour of a person's life is tracked. The relevance for the employer is high, independent of the industry operating in. The tracking of information offers the possibility for employers to incentivize and motivate its employees (Ledger, 2014).

### **Rest phase:**

Even in rest phases, technology measures data such as heart rate, or the quality and duration of sleep and sleep patterns (Crawford, Lingel & Karppi, 2015; Gilmore, 2016; Khakurel, Porras & Melkas, 2017).

## (1) Insight Consumer / Employee

For an individual, sleep patterns provide interesting health data. The quality and duration of sleep impact the long-term health of an individual (Gilmore, 2016).

## (2) Insight Business / Employer

Also, companies are interested in sleeping data as it impacts the performance of an employee. However, sharing such information is also an ethical question, as it is very personal.

### **Mental data:**

Technological trends lead to the development of attachable devices and microchips. Microchips can also be embedded in Smart clothing and can monitor health data about the wearer, but also provide the employee with requested data in real time. Mental data tracked can be emotion measurement or stress for example. (Cascio & Montealegre, 2016). By measuring the stress level, heart rate variability and the agility of the autonomic nervous system the status of mental health to a user can be defined (Riazul Islam et al., 2015). Indicating a person's stress level has positive outcomes for the individual as well as the company, as it leads to long-term health problems if not covered properly (Cascio & Montealegre, 2016).

### (1) Insight Consumer / Employee

By highlighting an individual's stress level, the gadget creates awareness about a serious topic, which is the health of a user. (Riazul Islam et al., 2015).

### (2) Insight Business / Employer

WT can be used to monitor in real time parameters such as psychological stress or work-related stress, mood. Even the individual and social behaviour and progress in the workplace can nowadays be tracked (Lavallière et al., 2016; Zenonos et al., 2016). The effects of stress can lead to burnout and long-term sick leave. Based on the data generated, employers can have a notion about the mood of the employees without asking specific questions (Khakurel, Porras & Melkas, 2017). A pre-screening can reduce sickness rate and save company health care costs. In addition, awareness is created about a precautionous topic, which allows a company to allocate resources in a better way. Based on this available data an employer can respond accordingly and facilitate preventive treatment (Han et al., 2017).

Another example for mental data is the option to summarize the mood results of all employees. The employer receives an hourly update on the mood of its employees. Based on the eight different types of moods that are shown, the employer can act appropriately. This allows him to increase productivity in the end as he can adapt to the mood of his team and thereby set actions to increase happiness or reduce stress and tiredness (Zenonos et al., 2016).

## 2.7 Health risks in nowadays workplace

People spend half of their waking day in their work environment (Hipp et al., 2015). Many jobs have shifted towards inactive duties, which are conducted sedentarily, often more than 8 hours per day (Mercer, Li & Grindrod, 2015). Also, a decrease in physical activity takes place as people also minimize activities, like walking, as the offer for motorized transportation increases (Khakurel, Porras & Melkas, 2017). Furthermore, employees are exposed to work-related risk factors such as stress (chronic), poor nutrition or substance abuse and frequent drinking (Ryu et al., 2017). Other health challenges are obesity and overweight (Carnethon et al., 2009). Therefore, these risk factors along with physical activity, weight management and diet are proposed in the Wellness program of the American Heart Association. The health issues cause

severe long-term complications (heart disease, type 2 diabetes), which also lead to economic costs for society (Carnethon et al., 2009).

## 2.8 Privacy and security of Wearables

The information tracked by WT is extensive as Wearable devices generate vast amounts of data. Monitoring all the physiological data allow companies to receive a detailed profile of an employee. As these innovations lead to another level of monitoring, beyond traditional hours logged, the impact of privacy and security of such data must be discussed (Moore & Robinson, 2016).

There are several players in sensible data tracked, like heart rate and GPS location. If such information can be accessed without an employee's knowledge, ethical questions arise. Especially, if such information is used for hiring and firing of employees or setting insurance fees. In addition, medical information is very sensitive and the question of data ownership crucial. Data privacy is a discussed topic, especially with the update of the EU General Data Protection regulation in May 2018 (Allenovery.com, 2018). There is an ongoing debate about ownership of generated data and e.g. if an American company is allowed to use data generated in Europe for its research (Ching & Singh, 2016).

Another discussion is the security of the devices itself, as the WTs offered show vulnerabilities for the security. An attack can exploit these vulnerabilities. The main problem is that WT devices are not standalone devices, as they require pairing with another gadget such as a Smartphone (Ching & Singh, 2016). Potential attackers can get access to the tracked data, without the knowledge of users. Because of this privacy breach, third parties can track activities of specific users. As a threat, insurance companies could take this advantage to create a "gray market" for getting users' health information data. Smart watches are also vulnerable and attackers can access private information such as messages, emails and contacts saved on the paired device (Ching & Singh, 2016).

Security is an issue that also mobile phones face, but one that will be solved by using biometric technology. In 2019, most of the mobile phone devices will use such technology standardized. Therefore, it is expected that by 2020 Wearables will have biometric technology in place as well (Armstrong, 2018).

## 2.9 Psychological theories

It is crucial to have the right fit between control, autonomy and surveillance to implement WT in an organization. Monitoring can increase employees' productivity successfully, but also puts individuals under pressure to reach monitored goals (The Conversation, 2016). In the following, two psychological theories are described to ease the understanding of employees' behavior towards monitoring and surveillance at work.

### 2.9.1 Self-determination theory (SDT)

Self-determination is the basis for intrinsic user motivation and requires autonomy, competence and psychological relatedness to be satisfied (Gagné & Deci, 2005). If WT lead to a lack of autonomy, competence or relatedness, users feel oppressed. In the worst case, this may even lead to negative effects such as stress, de-motivation and counterproductive behavior (Asimakopoulos, Asimakopoulos & Spillers, 2017).

In the field of WT, the need for autonomy is related towards having an overview of one's data. Competence is related towards being the decision maker within an environment. Autonomy and competence are basic needs in the decision-making process. The self-determination is also the bases for organizational citizenship (OC) (Gagné & Deci, 2005). OC is the voluntary behavior to support co-workers for the best possible result, without receiving a formal reward. Companies require organizational citizenship to solve complex problems (Gagné & Deci, 2005). However, research states that monitoring and quantifying of behavior can lead to a decrease of motivation. The intrinsic motivation is misinterpreted, as people's main motivation to act is not always to gain monetary rewards (Forest & Gagne, 2011). Organizational citizenship is especially important for companies, which deal with problems where knowledge workers' creativity is required to solve it. These companies must successfully integrate WT in a way to foster creativity instead of inhibiting it through increased surveillance. Therefore, organizations have to set the right incentives when they provide WT at the workplace, to nurture the helpfulness and collaboration of OC (Amabile, Fisher & Pillemer, 2014).

### 2.9.2 Hawthorne effect

The Hawthorne effect describes the change of behavior if someone is aware of being monitored (Jones, 1992). It can be problematic if employees change their behavior when being observed. Effects of trust in management state that electronic monitoring and surveillance, on average, has a negative relationship towards trust (Holland, Cooper & Hecker, 2015).

## 2.10 Generation Y

The focus of the thesis is towards Generation Y, which follows the Generation X. There are several generations described, such as Builders, Baby Boomers, Gen X, Gen Y and Gen Z (Arsenault, 2004; Hart, 2006; Huichun & Miller, 2003).

A generation is defined as a cohort of people, which are born within a same range of years and are shaped by the length of a phase of life (Howe & Strauss, 2000; Kupperschmidt, 2000). Individuals belong to a generation as they experience the same historical events and share similar social life experiences (Wong, Gardiner, Lang & Coulon, 2008).

Based on McCrindle & Wolfinger (2010, p.1), a generation is “a cohort united by age and life stage, conditions and technology, events and experiences”. Therefore, “the youth in Australia, the USA, the UK, Germany and Japan are shaped by the same broad events, trends and developments”. Formative experiences of Generation Y are the trends of globalization and digitalization.

The main development, which combines the experience of the individuals of Generation Y is the innovation in technology and utilization of technology. The innovations in technology also provide millennials worldwide with constant updates about the main events happening in other countries. Millennials make use of this development by easily accessing information and are active users of social media and online technologies (Jackson, Stoel & Brantley, 2011; McCrindle & Wolfinger, 2010; Neal, Quester & Hawkins, 2006; Wolburg & Pokrywczynski, 2001). Therefore, millennials are also described as digital natives, which differentiates Gen Y from previous generations (Parment, 2013).

The different authors place Generation Y or millennials as being born between 1979 and 1994, 1980 and 1994 or simply born in or after 1980 (McCrindle & Wolfinger, 2010; Ng, Schweitzer & Lyons, 2010; Smola & Sutton, 2002). Other definitions place Generation Y as being born between 1980 and 2000 (Hurrelmann & Albrecht, 2014). However, the categorization applied for this thesis is that individuals are born between 1982 and 2000 to belong to Generation Y (Howe & Strauss, 2000). The generation of Baby Boomers are said to be born between 1946 and 1964 and Generation X, between 1965 and 1980 (Arsenault, 2004; Howe & Strauss, 2000).

### 2.10.1 Attitude toward Wearable Technology

A consulting report (PWC, 2014) showed that 60% of workers are willing to share personal data from WT like a Smart watch. Another research based on a questionnaire from 14 large employers' states that employees are ready for Wearables at work. The reasoning states that

employees want to manage their health and that they expect employers to encourage and support them (Castlight Health, 2017). In 2016, every third large employer from the study already offered some Wearable device to track physical activity. Based on the outlook of Castlight Health (2017) this may increase to over 50 percent in 2018.

A study by Kultalahti & Viitala (2014) confirmed that work-life balance is one of the key motivational drivers for the Generation Y towards WT. Other drivers are flexibility, convenient social relationships, coaching based leadership and the opportunity to develop. If the usage of WT offers better work-life balance, even 70% of the respondents are willing to share data (PWC, 2014).

A research conducted by PWC (2014) pointed out that Generation Y is most likely to adapt to Wearables. The main fear is that those who need it most do not adopt, but instead mainly the healthy young employees. However, the study revealed that engagement with Wearables is not sustainable and people get bored after some months. Therefore, employers must act and encourage usage (PWC, 2014). One way to keep engagement up is through corporate challenges, which noticeably increased employees' activity. Besides the challenges, the sponsorship or reimbursement of Wearables is another option to incentivize activity; e.g. so that each employee walks up to 5k or 10k steps per day (Castlight Health, 2017).

### 3. Methodology

#### 3.1 Objective

This thesis uses a quantitative online survey to investigate the approach of individuals towards Wearable technology (see survey in exhibit 2.11).

The chapter 3 methodology is structured in the following way. First, the pre-process of theoretical data collection, including the questionnaire is described. Second, the sample description, data treatment, analysis and possible limitations are described.

The research and findings are divided into a first, descriptive part, stating the behavior of the sample. The descriptive part analyses the general habit of the sample. Second, an analysis to check for significant differences. Third, analyzing probabilities towards data sharing by using dichotomous categories. The second and third part focuses on the attitude of individuals when WT is provided and sponsored by an employer. Further insights are generated by analyzing the additional written arguments of respondents.

#### 3.2 Research question and issue

Companies are willing to sponsor WT for its employees. The self-tracking leads in the best-case scenario to healthier employees and allows saving health care costs. Besides making WT available, companies are in a next step interested in its employee's health or sports data. The thesis investigates if millennials are interested in adopting and using WT. The main question to be answered are:

- What is the likelihood of Generation Y to request Wearable Technology (WT) sponsored by the employer?
- Are millennials willing to share the data tracked by their devices with their employer?

The sub questions are:

- What are the reasons to buy WT?
- What is the likelihood of individuals to buy WT and is there a difference if the employer sponsors the WT?
- Is there a difference between owners and non-owners of WT?
- Because of what reasons do millennials hesitate to buy WT?



### 3.3 Study design

The research design is a descriptive, quantitative, online survey.

The researcher developed an understanding of Wearable Technology by investigating secondary data from recent journals, books and online sources. Based on these insights the questionnaire to investigate the possible use-cases for WT was developed. Research in academic papers and websites describe the state-of-the-art of WT and focus on the technological possibilities like accuracy (Lunney, Cunningham & Eastin, 2016). In comparison, this thesis focuses on the consumer side.

#### 3.3.1 Pre-tests

After building the questionnaire and transferring it into the online survey tool Qualtrics, a qualitative pre-test was conducted to confirm the used definitions. Also, a pilot run was executed to check the functionality of the questions in Qualtrics.

The pre-test was conducted to check if society understands the used definitions for Fitness trackers, Smart glasses, Smart watches and Smart clothing and the purpose of the questions. Thereby, ten students belonging to Generation Y were interviewed. These ten answers provided enough insights to understand which definitions and questions had to be adapted. Based on these insights the definitions and questions were finalized.

In a second step, the functionality of the questionnaire itself was tested in a pilot run. Thereby, the study design and the technical functionality like precondition for questions was tested. Besides, the logic and flow of the survey, comprehensibility and fit towards the target group was checked again.

#### 3.3.2 Structure of Questionnaire

First, the questions targeted respondents' attitude towards health, tracking and Wearable Technology. Thereby, the researcher receives an overview of the usage and preferences of the respondents.

Second, the sample was asked how likely they would buy WT in the future, by using a scale from 0 to 100 percent. The 0% stand for the fact that someone is not going to buy WT. The 100% stand for the fact that someone is going to buy with a probability of 100% the chosen

Wearable. The expectation was gathered for all the four categories of WT: Fitness trackers, Smart watches, Smart glasses and Smart clothing.

Third, respondents were asked about their motivation and hesitations toward WT. These first three parts construct a base, which allowed the researcher to set the answers in perspective. This was important as in the following several use cases were tested with WT sponsored by the employer and the exchange and sharing of data between individuals and their employer.

Fourth, the setting was changed to the following: Imagine your employer sponsors and provides you with Wearable Technologies. “Which of the following would you request: Fitness trackers, Smart Watches, Smart glasses or Smart clothing?” Again, the respondents were able to choose from a scale from 0% to 100%, whereas in that case the 100% stand for: I would definitely request this Wearable from my employer, with a probability of 100%.

Fifth, the questions about the sharing attitude of data followed and the questionnaire finished with demographic questions.

The researcher developed the questions, including the answer options, based on the existing literature. The reports of the consulting company PWC (2014; 2016) focus on the consumer side and adoption of WT. PWC compared user attitude towards WT in 2014 and 2016, but not in 2018 so far. Therefore, some of these already validated questions from PWC were used. These questions are marked in the survey (see exhibit 2.11).

### 3.4 Selection criteria

#### 3.4.1 Target population:

The target population investigated is Generation Y. The definition from Howe & Strauss (2000) is applied in this thesis, which states that individuals of Generation Y are born between 1982 and 2000. Therefore, an exclusion criteria is age. Individuals who were born before 1982 or after 2000 were excluded from the questionnaire.

As the sampling technique, the researcher used a convenience sampling. This method is used in cases where there is no general access to a representative population. Also, the field of research was not geographically limited.

### 3.4.2 Data collection

To collect the data, the researcher used his available network and posted the questionnaire through a private Facebook account and as well through the LinkedIn account. In addition, access to groups on Facebook and LinkedIn about WT was requested and the survey posted. The post was also shared spread within the private network of friends.

The data collection took part from December 2017 until the end of January 2018. No pre-selection towards respondents with previous WT experience took place. Everyone could participate in the survey. The survey was on average answered within 10 minutes. While running the survey no adoptions were necessary. The execution of the study was anonymous and the data generated is solely used for a scientific purpose and not shared with anyone. All the information collected is based on the online questionnaire, with a total sample size of 127. The survey itself was conducted with the premium account of Qualtrics, which eases the data collection and the subsequent treatment.

### 3.5 Sample

The perception of Generation Y can be portrayed as 105 respondents fit the participant selection criteria and are born between 1982 and 2000 (Howe & Strauss, 2000). Therefore, the respondents are between 18 and 36 years old. The accessible population by sharing the questionnaire via social media consists of individuals belong to Generation Y, mainly from the countries of Austria, Germany, Portugal and Brazil, which reflects the social environment of the researcher.

The respondents consist of students and young professionals, which are already employed in the market or will soon enter the workplace. A balanced ratio between male and female was achieved by chance, with a gender split of 50% male and 49% female (1% inter-sexual) respondents. The average age of the respondents is 26 years. Over 60% of the respondents are students and 86% already achieved at least a bachelor degree as the highest education.

### 3.6 Data treatment

The data processing consists of the four steps editing, coding, data entry and cleaning. In addition, for each question it was defined if it is a compulsory question, which has to be

answered or an non-compulsory question which can be left unanswered (Singleton & Straits, 2017). In total 127 (n) responses were recorded.

The first step, editing, is about checking the quality of the answers, checking for missing data and logic of answers (Singleton & Straits, 2017).

In a first step, the quality of the answers of the 127 respondents was investigated. Especially, the third part of the questionnaire was checked, as it includes open questions and respondents provided written answers. Besides investigating the written answers in the third part, also part one and two were checked towards completeness of the answers.

The check for missing data was executed by investigating the progress rate of the 127 respondents. The survey program Qualtrics defines the percentage of questions answered from 0% to 100%. Responses with a progress rate below 50% were marked as critical, because of the risk of missing data. Responses with a progress rate above 50% but below 100% were marked as well, but analyzed at a later stage.

The structure of the questionnaire is divided into the following parts. First, individuals were questioned towards their tracking behavior and ownership of WT, which provides insights into the general attitude towards WT (Questions 1-8). Second, the individual likelihood to purchase WT was compared with the likelihood to request sponsored WT by an employer (Questions 9-12). Third, the data-sharing attitude of individuals was investigated (Questions 13-19).

From the first part, the questions 3, 5 and 7 are compulsory, as they query the attitude of Generation Y towards WT. The questions 4 is about the data individuals wish to track and is non-compulsory. It is interesting to investigate to understand possible future trends of tracking, but does not affect the general understanding of the thinking of the respondents. In addition, question 6, which is about the health risks, is non-compulsory.

Respondents that started the questionnaire and only answered the questions 3 and 4 were excluded. These responses did not provide relevant information as only 2 questions were answered and the compulsory questions 5 and 7 were left out.<sup>3</sup> In addition, if individuals only answered questions from part one, then the parts two and three were not answered at all. 16 respondents were identified, which only started the questionnaire, but did answer less than three

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<sup>3</sup> The questions 1 and 2 in the questionnaire are used as an introduction. The questions start at Q3 (See exhibit 2.11).

questions. The average response time of those 16 individuals was below 30 seconds in comparison to the average answering time of 10 minutes. Therefore, those 16 responses were excluded in a first step, leading to 111 valid responses.

As second criteria, the age of the respondents was investigated. The goal is to investigate Generation Y, which is defined in this thesis as individuals born between 1982 and 2000 (Howe & Strauss, 2000). From the 111 valid responses, 6 individuals were born before 1982. However, in order to not exclude valid responses, the age of each of those 6 respondents was investigated. In every case, the six respondents were born before 1967 and therefore older than 50 years old. Even though, a respondent with an age of 39, being born in 1981 or 1980, could be argued to be included in the sample, individuals older than fifty belong to a different generation. Therefore, those 6 respondents were excluded in a second analysis, leading to 105 valid responses.

The second step of the four steps of data processing is coding. Coding is about assigning numerical values to the variables and questions in order to conduct a statistical analysis at a later stage. The third step, data entry, is about setting up a spreadsheet, with a column for each respondent, in order to analyze the data. The survey program Qualtrics eases the steps two and three as it automatically assigns numerical codes to the variables and allows downloading the data in a suitable spreadsheet.

The fourth step, cleaning, is about checking the data for possible errors and logic of answers.

For example at the compulsory question seven, individuals were asked if they own and use one of the 4 Wearable Technologies. Some respondents answered that they do not own e.g. a Smart watch, but in a second step answered that they use one. These answers had to be adapted as they were not logic. Usage of such data, without checking the logic of the answers, could lead to wrong conclusions (Singleton & Straits, 2017).

In addition, in the clearing step, number four, the 105 valid answers were investigated towards missing data. For the analysis, the information was transferred into the statistic program SPSS. The dataset was analyzed by investigating the descriptive statistics for each variable, searching for missing values. The analysis showed that 89 respondents fully answered the questionnaire and provided valid answers. However, for 16 respondents the progress rate was above 50% but below 100%. These 16 respondents answered more than 80% of the questions in an understandable way and therefore the respondents were included in the study as they provided useful information.

In five cases, there were missing values, which were marked in SPSS by inserting a respective value (-99) that the program recognizes as missing value. Respondents were asked what kind of WT they own, if they stated that they track data. However, several respondents did not answer this follow up question. A simple reason is that they use other gadgets, like apps, to track their data. As those questions were only analyzed in a descriptive way, the missing values do not distort the analysis.

### 3.7 Statistical treatment

For the statistical treatment, the IBM SPSS Statistics program version 22 for Mac OS X was used. This allowed conducting a descriptive and interference statistic. The level of significance was defined at  $\alpha = 5\%$ . Therefore, a test outcome with a value of  $p \leq 0.05$  is significant.

Whenever the variance was homogenous, a parametric test was used for the statistical analysis. Based on the Central limit theorem one can conclude that the sample follows a normal distribution, as the sample size exceeds the requested number of 30. Based on the sample size of 105 and 89 fully answered valid data sets without missing values, one can assume that the central limit theorem is valid (Bortz & Schuster, 2010; Field, 2009). The Levene-test was conducted to check for homogeneity of the variance. If the test is not significant one can assume homogeneity. The independent T-Test was used as a statistical method:

#### **Independent T-Test**

To check for a significant difference in mean between two independent groups, a T-Test was conducted. Whenever the variance was not homogenous, the non-parametric Welch test was conducted as well. To understand the strength of the effect, Cohens d was calculated, whereas the effect was defined based on the following:  $d = .20$  is a small,  $d = .50$  a medium and  $d = .80$  a strong effect (Cohen, 1988).

### 3.8 Limitations

Due to the limited time of conducting the master thesis, no pilot test for internal validation of the questionnaire was done.

To ease the comparison of the answers and the process of answering the questionnaire, as well as to save participant's time, mainly close-ended questions were being asked. However, some open questions were included, to receive a more profound insight.

The scale from 0 to 100% to check for the likelihood of buying or requesting WT provides a good indicator. However, it does not set a price point for which individuals would purchase specific WT or require a WT. Such information would make the outcome more tangible.

One of the limitations of the survey is that, when it comes to the preferences, the participants could select more than one option, which means that the sum of percentages will be higher than 100%. This type of questions has the advantage to offer better insight into the real preferences, rather than focusing only on the first choice that comes to mind. Additionally, it is easier for the respondents, as they do not have to decide for one particular option, which requires more time and may lead to the unfinished answering of the questionnaire.

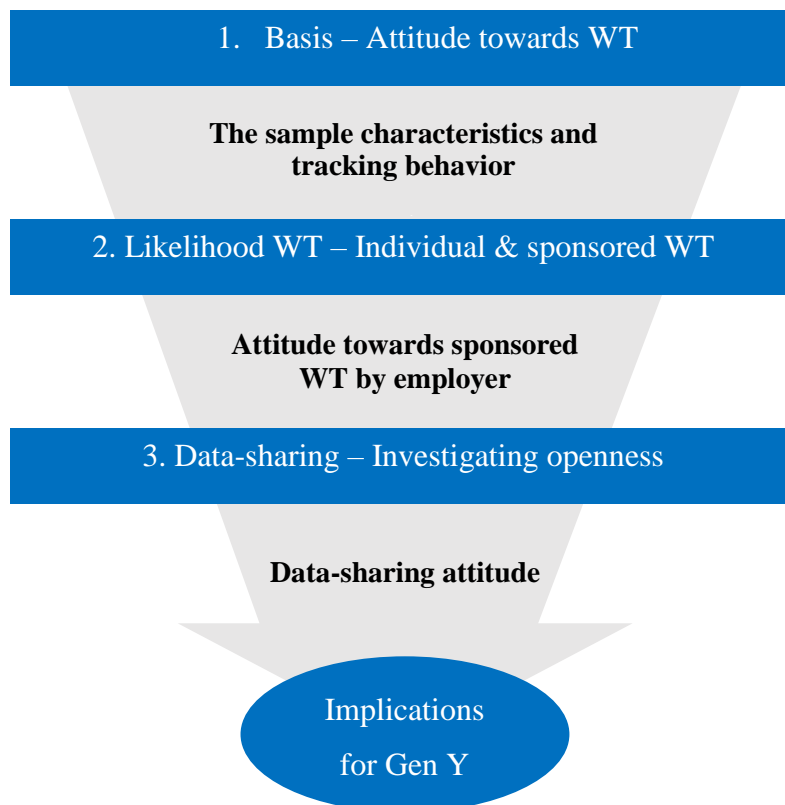
The quantitative survey was conducted online and answered by volunteering participants. The topic of work and the relationship towards an employer are sensitive topics, as the trust toward an employer may be limited. The interviewees may not feel comfortable to disclose their opinion about their employers. One procedure to increase employees confidence is to assure that all the data gathered is solely used for this research and proceeded anonymously.

Posting the survey in groups about WT on Facebook and LinkedIn limits the responses to a specific group. Individuals from such groups show a higher interest into WT than an average user. However, the researcher has no information how many individuals from these groups answered the questionnaire. Another limitation is that the researcher spread the survey in his personal environment. Therefore, it was possible to receive over 100 respondents of Generation Y. However, most of the respondents belong to the same social class and the educational background is high in comparison to an average individual of Gen Y (Statista, 2018b).

## 4. Findings & Discussion

The goal is to identify the risks that companies face when offering WT and to derive the opportunities to motivate employees to adapt towards WT. The collected responses of more than 100 respondents provide insights into the employee's perspective. The user's motivation and doubt is translated into guidelines on how to implement WT at work and engage with employees.

The findings are divided into three parts as seen in figure 12. First, the basis that provides an overview of the attitude towards WT. Second, the likelihood to purchase WT as an individual and request WT sponsored by an employer. Third, the openness and attitude towards sharing data.



*Figure 12: Guideline of Findings*



The first part, **Tracking behavior of sample**, provides an overview of the sample itself, including the demographic data. It states the current tracking behavior of respondents. This part also includes a description of the types and numbers of Wearables owned and used by the respondents and their motivation to buy WT.

The second part, **WT sponsored by employer**, investigates the openness of the respondents towards sponsored WT by the employer and states the sample-specific attitudes of respondents already owning WT and others who do not.

The third part, **data-sharing attitude**, describes and identifies the fears and hesitations of employees towards WT and elaborates the challenges to integrate WT.

## 1. Basis – Attitude towards WT

### 4.1 Tracking behavior of sample

To understand the behavior of the respondents, the demographics and usage patterns, of the respondents are analyzed (see Table 2).

#### 4.1.1 Demographics of sample

The relevant sample size consists of 105 respondents. The sample majority are German speakers, from either Austria or Germany. The second biggest group is Portuguese speakers from either Brazil or Portugal. The other nationalities varied with people from countries like Argentina, Australia or Sweden. The average age and median of the sample are 26 years. All the respondents belong to the Generation Y, and the majority is enrolled as students (60%).

A very high percentage (86%), in comparison to the average educational standard, has accomplished a higher educational degree, which is defined in this research as holding at least a bachelor degree. The respondents were asked towards their field of study, work or interest. Half of the respondents are interested or employed in business (Management, Marketing or Consulting), whereas the other half is interested in various fields, such as medicine, education or art.

<b>Demographics – Generation Y</b>	
<b>Number of valid responses</b>	105 responses
<b>Nationality distribution</b>	69% German speakers; 19% Portuguese speakers; 12% Other
<b>Average age</b>	26 years
<b>Students</b>	60% of respondents
<b>Achieved higher education</b>	86% of respondents
<b>Interested into business</b>	50% of respondents
<b>Ownership of Wearables</b>	30% of respondents

*Table 2: Demographic data of sample*

In total, nearly half of the sample respondents, 51 out of 105 (49%), monitor any of their behavior. The majority started tracking one year ago (31%). Only 15% follow their behavior for more than four years (see Exhibit 2.1). From the sample, only 30% of the sample own Wearable Technology. However, Fitness trackers, Smart Watches, Smart glasses and Smart clothing are a trend that will further increase (Tractica, 2016).

#### 4.1.2 Reasons to purchase WT

The main reason for respondents to buy WT is that it tracks significant personal information and offers personal insights (48%). Other expectations were a better work-life balance and increase of productivity at home and at work as seen in table 3.

The fact that a Wearable can be part of one's wardrobe was not important. The functionality to share data with friends was no deciding factor either. Respondents were allowed to choose more than one option.

#	Reason to purchase WT – Answer options:	%	Count
1	Tracks important personal information	25.35%	55
2	Personal insights	23.04%	50
3	Better work-life balance	18.43%	40
4	Increase productivity at home	13.36%	29
5	Increase productivity at work	12.90%	28
6	Looks fashionable or cool	5.07%	11
7	To share my data with friends	1.38%	3
8	Other	0.46%	1
	<b>Total</b>	<b>100%</b>	<b>217</b>

*Table 3: Reason to purchase Wearable Technology*

The interest into personal health and fitness data can be explained, as the main constraints of respondents towards long-term health are lack of physical activity and stress, with about 20%, followed by poor nutrition and obesity (table 4).

#	Top risks health	%	Count
1	Lack of physical activity	20.48%	68
2	Stress	19.58%	65
3	Poor nutrition	17.47%	58
4	Obesity	15.66%	52
5	Drinking/smoking	13.86%	46
6	Substance abuse	11.45%	38
7	Other	1.51%	5
	<b>Total</b>	<b>100%</b>	<b>332</b>

*Table 4: Top risks for long-term health*

This is well aligned with the risk factors identified by the American Heart Association, which includes obesity, overweight, stress (Carnethon et al., 2009). The fact that jobs shifted towards inactive duties and are conducted seated, increases the health risks (Mercer, Li & Grindrod, 2015). WT increases health consciousness and exercise. Even though respondents identify

stress as a major health risk, the standard gadgets available are not capable of tracking stress, as it requires specific technology (Khakurel, Porras & Melkas, 2017).

To deliver insightful information WT is worn the whole day, so individuals are willed to wear at home and work and track data all the time. Besides the personal insights, the survey outcome states that the exchange and comparison with other users (gamification) was no crucial factor. Even though in the literature gamification, to compare and share the results with friends is a crucial purchase factor (Asimakopoulos, Asimakopoulos & Spillers, 2017).

The respondents wish to receive even more detailed health data, which is not possible to track with standard WT. The suggestions were health data like heart rate and oxygen level in blood, but also specific workplace-related data such as time of speaking face to face with others (see Exhibit 2.3).

**Summary – Reasons to purchase WT:** The reason for individuals to buy WT is to track important personal information and receive personal insights. Users are also worried about stress, but standard devices are not able to measure stress. The insights allow users to cope with constraints towards long-term health, such as lack of physical activity and obesity.

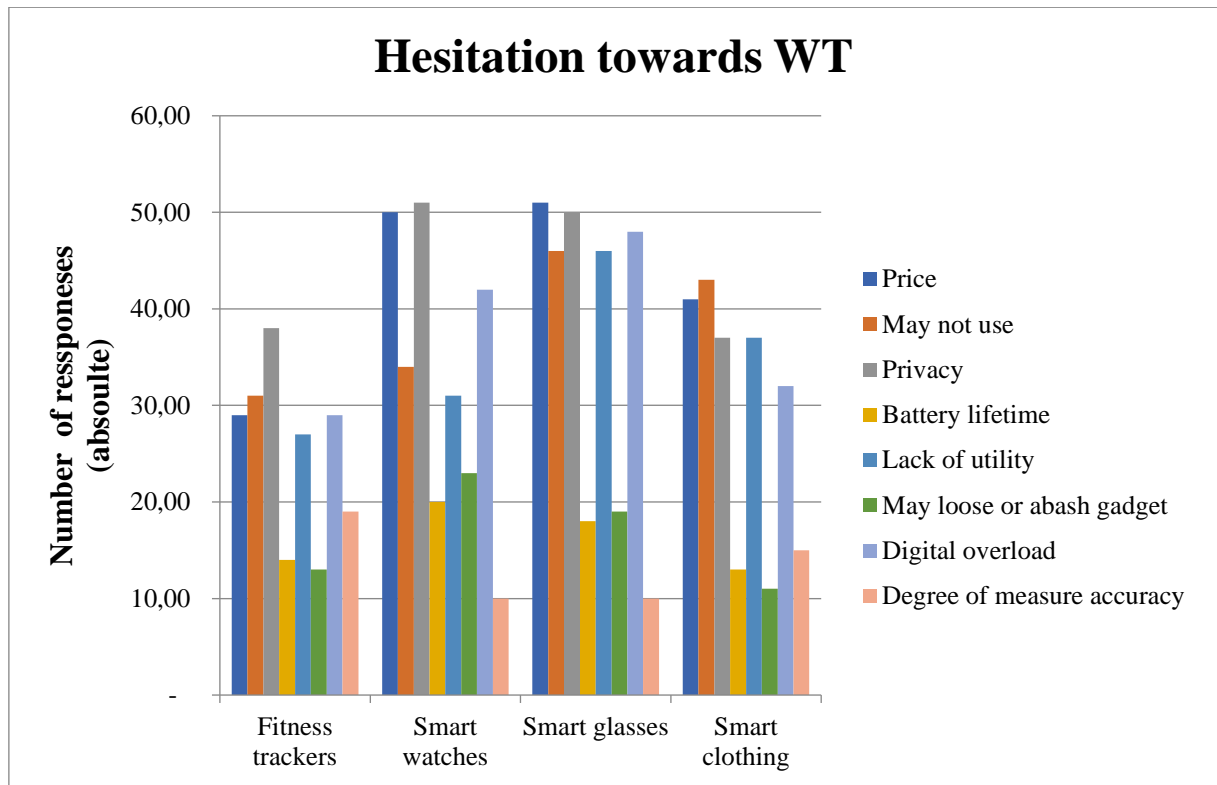
#### 4.1.3 Hesitations towards WT

In the research done by PWC (2016) the main two reasons why users hesitate to buy WT were price and may not use. The survey shows a different picture as it puts privacy in the first place followed by price. However, in this survey all the respondents belong to Generation Y, whereas PWC did not limit based on the age of respondents.

The hesitations regarding WT are various as seen in figure 13. The graph explores the reasons why users hesitate to buy WT. For all the four gadgets users were asked to select their reasons for hesitating to buy WT. Users were allowed to select multiple answers.

The most nominations went to Smart glasses (288 absolute) followed by Smart watches (261 absolute). For Smart glasses the primary concern is price, followed by privacy and digital overload. Other reasons were lack of utility and may not use. For Smart watches, the critical concern is as well privacy and price, followed by digital overload and may not use. For Smart clothing (total 229) the primary concern is may not use and price, followed by privacy and lack of utility. For Fitness trackers (total 200) privacy is the main concern, followed by may not use,

price and digital overload. In sheer numbers privacy, price and may not use were the most often selected reasons.



*Figure 13: Hesitation towards WT*

**Summary – Hesitations towards WT:** Following the theory, the survey confirms that also for Generation Y the most critical reasons to hesitate buying WT are price, privacy and the doubt if one would use the gadget. The respondents care less about battery lifetime or losing the gadget and the measuring accuracy is not a crucial deciding factor.

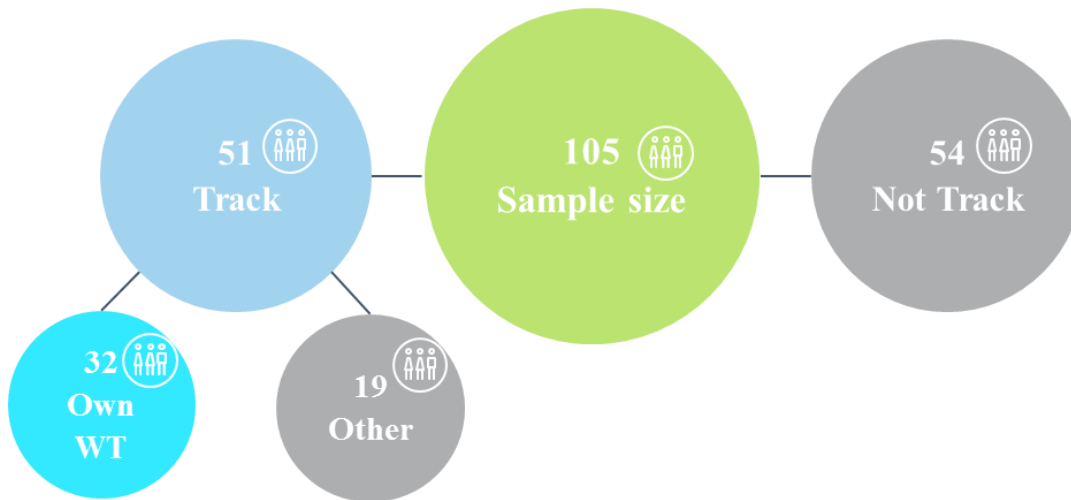
#### 4.1.4 Ownership and engagement towards WT

In 2017, the sales of Fitness tracker were the highest, followed by Smart watches. These two devices make of the majority of WT (Statista, 2018a). In alignment with these numbers, most devices owned are Fitness trackers (26 absolute) and Smart watches (11 absolute).

The respondents were not specifically selected towards being interested into WT. From the total sample of 105 respondents, 32 individuals (30%) own WT, whereas some respondents own

more than one Wearable. As 51 individuals track data, 19 respondents (37%) use other tools to monitor their data (figure 14).

### Sample overview towards tracking and ownership of WT



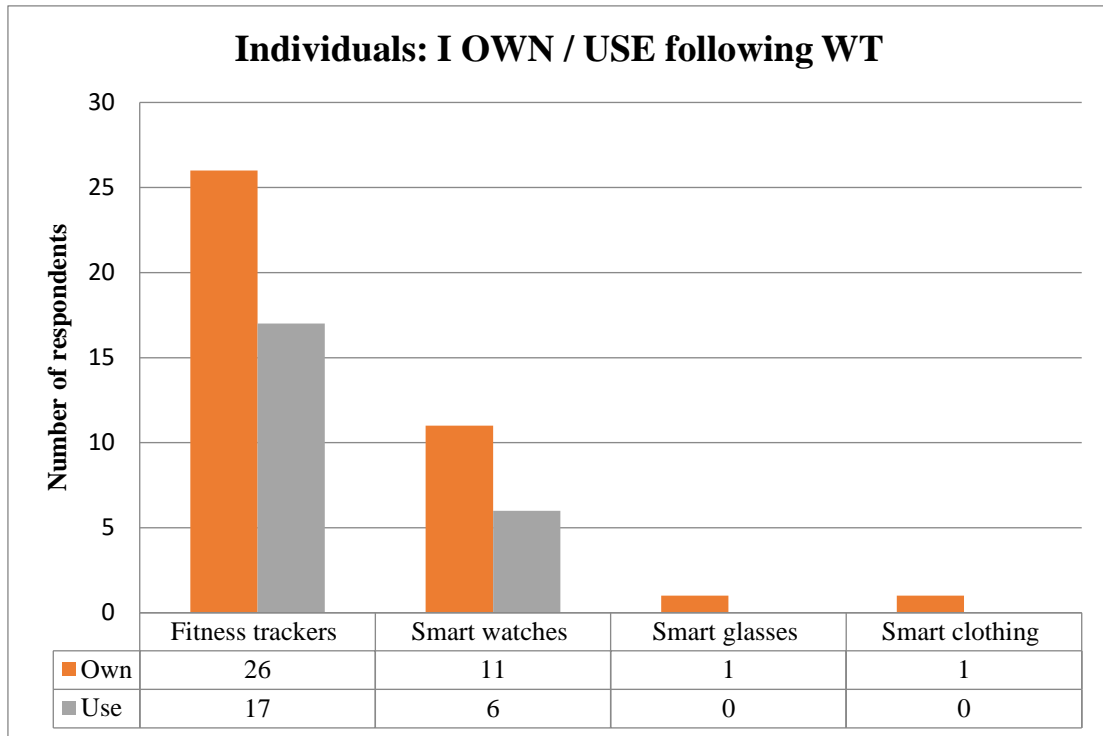
*Figure 14: Sample overview towards tracking and ownership of WT*

The majority, of the ones possessing Wearable Technology, own Fitness trackers or Smart watches. Fitness trackers are mentioned 26 times, Smart watches 11 times. Smart glasses and Smart clothing are only selected once, but not used by the owners. Some of the 32 individuals who own WT, possess more than one device and together own 39 devices in total (see figure 15).<sup>4</sup>

In literature, engagement is described as one of the hardest challenges, as it is hard to sustain for producers of WT and it decreases over time (Ledger & McCaffrey, 2014). In comparison to Fitness trackers or Smart Watches, Smart glasses and Smart clothing are only mentioned once by the sample and not used at all. 65% (17/26) of the owners of Fitness trackers also state to use them. The same is true for 55% (6/11) of owners of Smart watches. Three of the respondents own and use both, Fitness trackers and Smart watches.<sup>5</sup>

<sup>4</sup> Some individuals own more than one device. See Exhibit 2.5 for the details.

<sup>5</sup> 14 individuals own and use Fitness trackers, 3 individuals own and use Smart Watches and 3 individuals own and use both, Fitness tracker and Smart Watch.



*Figure 15: Ownership & usage of WT*

When analyzing the type of data tracked by the 51 respondents, many select physical activity, as 16% track sports behavior and 15% daily steps. In addition, 11% track their weight and 10% their sleeping patterns (see Exhibit 2.2). However, participants were asked to select all parameters they track and not limited to a single one.

The primary attribute, for owners of WT, to buy WT is the information the device provides, which they would otherwise not have. Over 70% mentioned the access to this insightful information. Other reasons with around 10% were the gaming features to compete with others through the app (see Exhibit 2.6).

**Summary – Ownership & engagement:** Fitness trackers and Smart Watches are the most popular devices sold worldwide and most of the sample respondents own and use Fitness trackers and Smart Watches. The engagement of WT by the sample group is higher than average (50%), as 65% use their Fitness trackers and 55% use their Smart Watches. None of the respondents actively uses neither Smart glasses nor Smart clothing.

## 4.2 Likelihood to purchase or request Wearable Technology

The respondents were asked towards their likelihood to purchase WT for all the four categories. As a next step, the setting was changed towards having the employer sponsoring and providing the WT. The respondents were asked again towards their likelihood to request WT. The likelihood was queried on a scale from 0% to 100%.

In a second step, the question was changed to the setting that the employer sponsors and provides the Wearable Technologies. Again, respondents had to indicate how likely they would request one of the four WT.

### 4.2.1 Descriptive analysis based on mean

**(A) Likelihood of an individual buying FT:** When asking towards their likelihood to purchase WT, the highest result was for Fitness trackers with a mean of 38.78, followed by Smart watches with a mean of 32.36, Smart clothing (Mean 24.95) and Smart glasses (Mean 14.41), (see exhibit 2.8.1). The mean did not surpass the 50% mark for any of the four WT, as seen in figure 16.

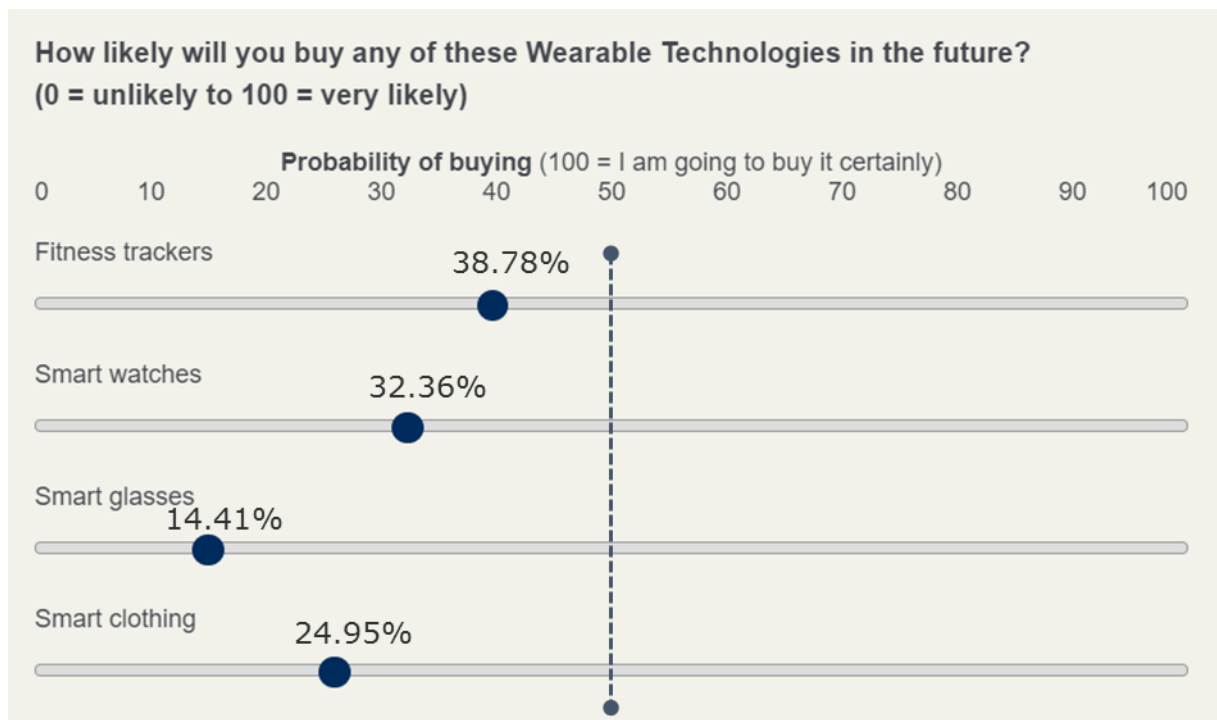


Figure 16: Likelihood of buying WT individual



## 2. Likelihood WT – Individual & sponsored WT

**(B) Likelihood of requesting FT sponsored by employer:** When WT is sponsored by the employer, the mean increased for Smart watches and Smart glasses, but not for Fitness trackers and Smart clothing. The highest likelihood was towards Smart watches (43.59); followed by Fitness tracker (36.63), Smart glasses (24.63) and Smart clothing (24.05), (see exhibit 2.8.2). Again, the mean did not surpass the 50% mark for any of the four WT, as seen in figure 17.



Figure 17: Likelihood of requesting WT from employer

**Summary – Likelihood buying individual & requesting sponsored WT:** The mean for (A) likelihood of buying WT in the future and (B) likelihood requesting WT if sponsored by the employer is below the 50% mark in both cases for all the four WTs. However, the mean to request WT increased for Smart Watches and Smart Glasses when sponsored by an employer, but not for Fitness Trackers and Smart Clothing.

#### 4.2.2 Descriptive analysis with threshold at 50%

In the first non-statistical analysis the likelihood did not surpass the 50% mark and even decreased for employer sponsored Fitness trackers or Smart clothing.

In the next analysis, the 50% mark was defined as a threshold at the 0% to 100% answer scale. Whenever the individual's probability of buying was above 50%, the scale was categorized into "I will buy" Wearable Technology. Whenever the probability of buying was below 50%, the scale was categorized into "I will not buy" Wearable Technology.

**(A) Likelihood of an individual buying FT:** The results show that Fitness trackers will be purchased most often (36), followed by Smart watches (31) and Smart clothing (16). Smart glasses surpassed only 11 times the 50% threshold (see table 5).

How likely will you buy any of these WT in the future? (in absolute numbers)					
#	Field	Purchase probability below 50%	Purchase probability above 50%	Valid	(Missing) Total
1	Fitness trackers	64	36	100	(5) 105
2	Smart watches	69	31	100	(5) 105
3	Smart Glasses	88	11	99	(6) 105
4	Smart clothing	83	16	99	(6) 105

*Table 5: Likelihood buying WT*

**(B) Likelihood of requesting FT sponsored by employer:** The changed setting, with the employer sponsoring WT delivered a different result. Smart watches will be requested most often (35), followed by Fitness trackers (31) and Smart glasses (23). Smart clothing was nominated only 21 times (see table 6).

<b>If your employer sponsors WT.</b> <b>Which would you request? (in absolute numbers)</b>					
#	Field	Purchase probability below 50%	Purchase probability above 50%	Valid	(Missing) Total
1	Fitness trackers	61	31	92	(13) 105
2	Smart watches	57	35	92	(13) 105
3	Smart glasses	69	23	92	(13) 105
4	Smart clothing	71	21	92	(13) 105

*Table 6: Likelihood requesting WT sponsored*

When comparing the answers, one sees that the amount of users who will request WT increase for Smart watches (35/31), Smart glasses (23/11) and Smart clothing (21/16). However, fewer users would request Fitness trackers (31/36) when offered by the employer. The outcome for FT is contradictive, as FT was nominated most often for the likelihood of buying it as an individual.

**Summary – Analysis of Mean and 50% Threshold:** The combined outcome of both analyses shows that WT sponsored by the employer only leads to a higher request for Smart watches. For Fitness trackers the likelihood decreases in both cases, however FT was nominated most often for the likelihood of buying it as an individual. The results for Smart glasses and Smart clothing was not clear and after analyzing the two methods used, no definite statement can be made.

### 4.2.3 Statistical analysis - does ownership change outcome?

As described in chapter 4.1.4, 32 individuals already own WT, whereas not all of them use it. In the following, an independent T-Test was conducted to assess if there is an effect of being already an owner of WT on the likelihood of buying WT or requesting WT.

For each of the WT Fitness tracker, Smart Watch, Smart glasses and Smart clothing, the individuals who do not own WT and the ones who do own & use WT were compared towards their (A) Likelihood of buying WT in the future and their (B) Likelihood of requesting sponsored WT in the future from an employer.

In every case, the mean for the (A) Likelihood of an individual buying and (B) Likelihood of requesting the gadgets was higher for the individuals who already own WT. For the WT's Fitness trackers and Smart glasses there is a statistically significant difference in the mean for the (A) Likelihood of buying and (B) Likelihood of requesting the gadgets. The effect was defined as small, based on Cohen's *d*.

On the following pages (60 - 66), the detailed analysis for each Wearable Technology is described. The T-Test results can be seen in exhibit 2.9.1 – 2.9.4. The outcome for the next analysis, the demographic variables, is described from page 67 on.

#### **(1) Fitness trackers**

The analysis showed a significant difference in mean for individuals who already own&use WT in both cases, (A) Likelihood of buying FT and (B) Likelihood of requesting FT sponsored by the employer.

(A) Fitness tracker – Likelihood of buying FT in the future:

The mean for the likelihood of buying FT in the future for individuals who do NOT own&use WT is 35.51 (SD=32.874) with a standard error (Std. error) of 3.63. The mean for the likelihood of buying FT in the future for individuals who DO own& use WT is 53.67 (SD=34.024) with a Std. error of 8.020.

FT - How likely will you buy any of these WT in the future?			
Field	N	Mean	Standard Deviation
Not	82	35.51	32.874
Own& Use	18	53.67	34.024
Levene statistic (p > .05)	t	df	P (p < 0.05)
0.910	-2.109	98	0.038

*Table 7: FT ownership likelihood buying*

There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.

The respective mean differs significantly between the individuals who already own&use WT and respondents who do not own&use WT. The difference in mean for Fitness tracker was -18.154, (95% [-35.239, -1.069]),  $t(98) = -2.109$ ,  $p < 0.05$ . (See Exhibit 2.9.1 & 2.9.2).

The calculated effect size Cohen's  $d$  has a value of -0.426. The respective Pearson correlation  $r$  is 0.208, which is defined as a small effect (Cohen 1988)<sup>6</sup>.

(B) Fitness tracker – Likelihood of requesting FT sponsored by employer in the future:

The mean for the likelihood of requesting sponsored FT for individuals who do NOT own&use WT is 31.58 (SD=35.769) with a Std. error of 4.13. The mean for requesting sponsored FT for individual who DO own& use WT is 58.88 (SD=35.980) with a Std. error of 8.727.

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<sup>6</sup> Rosenthal =  $r$ ; threshold for large effect = 0.5; medium effect = 0.3 and small effect = 0.1.; Cohen's  $d$  =  $d$ ; large effect = 0.8; medium effect = 0.5 and small effect = 0.2.

FT - If your employer sponsors any WT. Which WT would you request?			
Field	N	Mean	Standard Deviation
Not	75	31.587	35.769
Own& Use	17	58.882	35.981
Levene statistic (p > .05)	t	df	P (p < 0.05)
0.533	-2.838	90	0.006

*Table 8: FT ownership likelihood requesting*

There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.

The respective mean differs significantly between the individuals who already own&use WT and respondents who do not own&use WT. The difference in mean for the probability of buying Fitness tracker was -27.296, (95% [-46.404, -8.187] ),  $t(90) = -2.838$ ,  $p < 0.05$  (See Exhibit 2.9.1 & 2.9.2).

The calculated effect size Cohen's d has a value of -0.598. The respective Pearson correlation  $r$  is 0.287, which is defined as a small effect (Cohen 1988).

## **(2) Smart watches**

The analysis showed a significant difference in mean for individuals who already own&use WT in both cases, (A) Likelihood of buying SW and (B) Likelihood of requesting SW sponsored by the employer.

(A) Smart watches – Likelihood of buying SW in the future:

The mean for the likelihood of buying SW in the future for individuals who do NOT own&use WT is 26.91 (SD=31.546) with a Standard error of 3.484. The mean for the likelihood of buying SW in the future for individuals who DO own& use WT is 57.17 (SD=35.169) with a std. error of 8.289.

SW - How likely will you buy any of these WT in the future?			
Field	N	Mean	Standard Deviation
Not	82	26.91	31.546
Own& Use	18	57.17	35.169
Levene statistic (p > .05)	t	df	P (p < 0.05)
0.777	-3.609	98	0.001

*Table 9: SW ownership likelihood buying*

There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test.

However, there were 4 outliers identified, according to inspection with a box-plot. Therefore, the nonparametric Mann-Whitney U Test was conducted. As the result showed a significant difference, the outliers were not excluded of the sample.

The respective mean differs significantly between the individuals who already own&use WT and respondents who do not own&use WT. The difference in mean for SW was -30.252, (95% [-46.886, -13.618]),  $t(98) = -3.609$ ,  $p < 0.05$  (See Exhibit 2.9.1 & 2.9.2).

The calculated effect size Cohen's d has a value of -0.929. The respective Pearson correlation r is 0.343, which is defined as a small effect (Cohen 1988).

(B) Smart watches – Likelihood of requesting SW sponsored by employer in the future:

The mean for the likelihood of requesting sponsored SW for individuals who do NOT own&use WT is 37.587 (Standard Deviation - SD=36.392) with a standard error (std. error) of 4.202. The mean for requesting sponsored SW for individual who DO own& use WT is 70.06 (SD=32.41) with a Std. error of 7.860.

SW - If your employer sponsors any WT. Which WT would you request?			
Field	N	Mean	Standard Deviation
Not	75	37.587	36.392
Own& Use	17	70.058	32.410
Levene statistic ( $p > .05$ )	t	df	P ( $p < 0.05$ )
0.122	-3.385	90	0.001

*Table 10: SW ownership likelihood requesting*

There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.

The respective mean differs significantly between the individuals who already own&use SW and respondents who do not own&use SW. The difference in mean for SW was -32.472, (95% [-51.533, -13.412]),  $t(90) = -3.385$ ,  $p < 0.05$  (See Exhibit 2.9.1 & 2.9.2).

The calculated effect size Cohen's  $d$  has a value of -0.714. The respective Pearson correlation  $r$  is 0.336, which is defined as a small effect (Cohen 1988).

### **(3 & 4) Smart glasses & Smart clothing**

There was no statistically significant difference in the probability of buying or requesting WT for Smart glasses or Smart clothing by owners and non-owners.

#### **(3) Smart glasses**

(A) Smart glasses - Likelihood of buying SG in the future:

There was no statistically significant difference in the probability of buying SG as  $t(96) = 0.197$ ,  $p = .844$ . There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.



The mean for the likelihood of buying SG in the future for individuals who do NOT own&use WT is 14.65 (SD=25.838) with a Std. error of 2.889. The mean for the likelihood of buying SG in the future for individuals who DO own& use WT is 13.33 (SD=24.435) with a Std. error of 5.759.

SG - How likely will you buy any of these WT in the future?			
Field	N	Mean	Standard Deviation
Not	80	14.65	25.838
Own& Use	18	13.33	24.435
Levene statistic	t	df	P
(p > .05)			(p < 0.05)
0.806	0.197	96	0.844

*Table 11: SG ownership likelihood buying*

(B) Smart glasses – Likelihood of requesting SG sponsored by employer in the future:

There was no statistically significant difference in the probability of requesting SG as  $t(90) = -2.97$ ,  $p = .767$ . There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.

The mean for the likelihood of requesting sponsored SG for individuals who do NOT own&use WT is 24.133 (SD=34.235) with a Std. error of 3.953. The mean for requesting sponsored SW for individual who DO own& use WT is 26.82 (SD=31.303) with a Std. error of 7.592.

SG - If your employer sponsors any WT. Which WT would you request?			
Field	N	Mean	Standard Deviation
Not	80	24.13	34.235
Own& Use	18	26.82	31.303
Levene statistic (p > .05)	t	df	P (p < 0.05)
0.815	-.297	90	0.767

*Table 12: SG ownership likelihood requesting*

#### (4) Smart clothing

(A) Smart clothing — Likelihood of buying SC in the future:

There was no statistically significant difference in the probability of buying SC as  $t(97) = -1.896$ ,  $p = .061$ . There was homogeneity of variance (Levene's test,  $p > .05$ ) and one could use the T-Test. There were no outliers, according to inspection with a box-plot.

The mean for the likelihood of buying SC in the future for individuals who do NOT own&use WT is 22.38 (SD=28.189) with a Std. error of 3.132. The mean for the likelihood of buying SC in the future for individuals who DO own& use WT is 36.50 (SD=30.301) with a Std. error of 7.142.

SC - How likely will you buy any of these WT in the future?			
Field	N	Mean	Standard Deviation
Not	81	22.38	28.189
Own& Use	18	36.50	30.301
Levene statistic (p > .05)	t	df	P (p < 0.05)
0.692	1.896	97	0.061

*Table 13: SC ownership likelihood buying*

(B) Smart clothing – Likelihood of requesting SC sponsored by employer in the future:

There was no statistically significant difference in the probability of requesting SC as  $t(20.14) = -1.194$ ,  $p = .246$ . There was no homogeneity of variance (Levene's test,  $p < .05$ ) and one had to use the non-parametric Welch-Test. There were no outliers, according to inspection with a box-plot.

The mean for the likelihood of requesting sponsored SC for individuals who do NOT own&use WT is 21.689 (SD=30.954) with a Std. error of 3.574. The mean for requesting sponsored SC for individual who DO own& use WT is 34.529 (SD=41.868) with a Std. error of 10.154.

SC - If your employer sponsors any WT. Which WT would you request?			
Field	N	Mean	Standard Deviation
Not	75	21.68	30.954
Own& Use	17	34.53	41.868
Levene statistic ( $p > .05$ )	t	df	p ( $p < 0.05$ )
0.029	-1.194	20.14	0.246

*Table 14: SC ownership likelihood requesting*

### **Summary – Ownership of WT:**

Individuals who already own WT have a higher probability of buying WT and as well have a higher probability of requesting WT sponsored by the employer. This implication seems intuitive as individuals, which possess Wearable Technology, are already convinced of the utility of WT. However, the statistical analysis only identified the increase for Fitness trackers and Smart watches as a small statistical significant effect. The mean for Smart Glasses and Smart Clothing increased as well, but the difference was not statistically significant.

#### 4.2.4 Demographics variables – Gender, nationality, education, business interest

As the sample provided large amount of data the researcher conducted several additional T-Tests regarding the (A) Likelihood of buying WT and (B) Likelihood of requesting WT sponsored by employer in the future. The following demographic variables were tested: Gender, nationality, student vs. non-students and business interest vs. non-business interest.

There was only one significant outcome for the variable Gender. Male respondents' likelihood to buy Smart watches was 14.87 percentage points higher to their female counterparts. The small effect is significant for the likelihood of buying Smart watches between male and female respondents. This is consistent with the theory (PWC, 2016).

(A) Smart watches — Likelihood of buying SW in the future:

The mean for the likelihood of buying SW in the future for male individuals is 38.23 (SD=36.657) with a Std. error of 5.590. The mean for the likelihood of buying SW in the future for female individuals is 23.36 (SD=32.149) with a Std. error of 4.847.

There was no homogeneity of variance (Levene's test,  $p < .05$ ) and one had to use the non-parametric Welch-Test. There were no outliers, according to inspection with a box-plot.

The respective mean differs significantly between male and female respondents. The difference in mean for SW was 14.869, (95% [0.153, 29.584]),  $t(83.042) = 2.010$ ,  $p < 0.05$  (See Exhibit 2.9.3).

The calculated effect size Cohen's  $d$  has a value of 0.441. The respective Pearson correlation  $r$  is 0.215, which is defined as a small effect (Cohen 1988).

**Summary – demographic variables:** Men show a higher likelihood to purchase Smart watches than women do. There was no other statistical significant difference for any of the other tested demographic variables.

#### 4.2.5 Correlation

To understand the correlation of the purchase decision if an employer sponsors WT, the correlation coefficient  $r$  was calculated for each gadget. The analysis investigates if there is a correlation that if an individual is going to buy WT in the future, is also going to request WT

provided by the employer. As expected, the analysis shows a positive, significant correlation, for all the four Wearable Technologies (table 15).

The correlation is highest for Smart glasses, followed by Smart watches, Smart clothing and Fitness trackers. However, the calculated effect size was medium in all the four cases. See detailed correlation analysis in exhibit 2.10.1 – 2.10.4

	<b>Correlation <math>r</math></b>	<b>Two-tailed Significance <math>p</math></b>	<b>Effect <math>r</math></b>
<b>Fitness trackers</b>	0.613**	$p < 0,01$	Medium
<b>Smart watches</b>	0.693**	$p < 0,01$	Medium
<b>Smart glasses</b>	0.714**	$p < 0,01$	Medium
<b>Smart clothing</b>	0.667**	$p < 0,01$	Medium
** Correlation is significant at the 0.01 level (2-tailed). <i>Per Cohens'd = d; large effect = 0.8; medium effect = 0.5 and small effect = 0.2.</i>			

*Table 15: Correlation likelihood buying requesting WT*

### 3. Data-sharing – Investigating openness

#### 4.3 Data sharing attitude

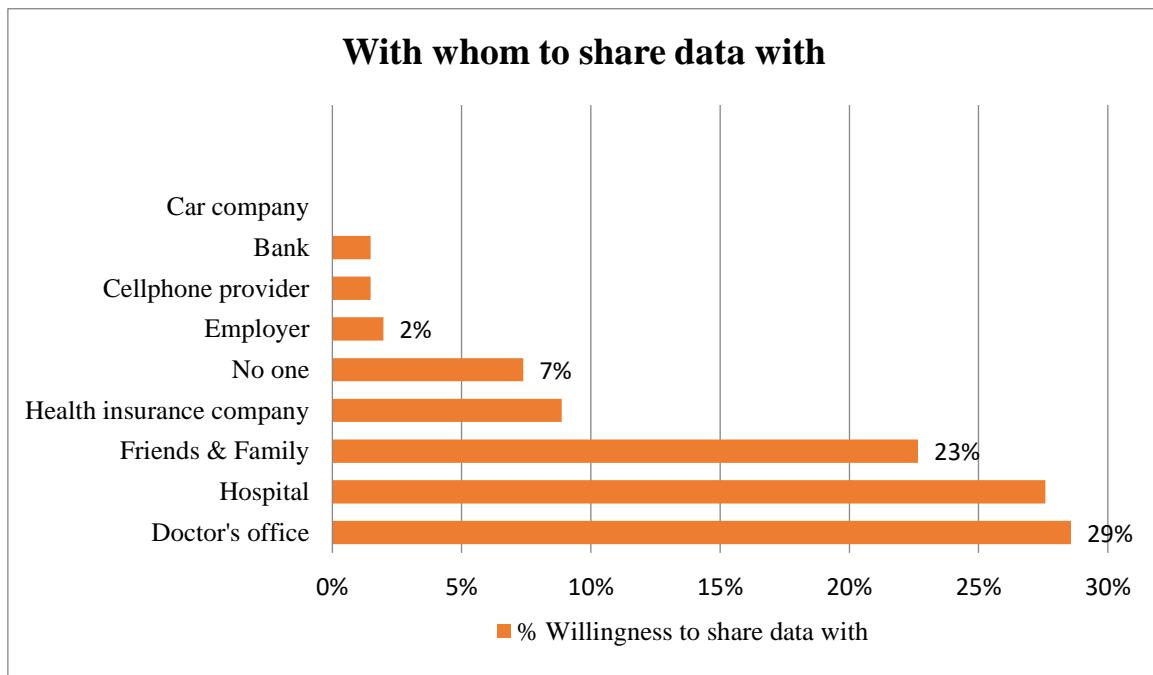
The individuals' openness in the previous chapter 4 to adapt towards WT does not provide a clear picture. Market leading companies such as Amazon, create future scenarios that require their employees to be equipped with Wearables at their workplace (The Economist, 2018). Other companies are interested in the employees' well being to save costs (PWC, 2016). The companies reasoning is that through increased health, the individual's productivity increases and costs are reduced. Also, as a side effect, WT can lead to a higher motivation of employees (Henning and van de Ven, 2017).

In the following chapter, the individuals' data-sharing attitude is investigated. The survey analyzed with whom respondents are willing to share data and what types of data they are willing to share. In addition, several questions focus on the data sharing with the employer.

The literature states that 60% of workers are willing to share personal data from WT (PWC, 2014). Work-life balance is one of the vital motivational drivers for the Generation Y towards WT (Kultalahti & Liisa Viitala, 2014). If the usage of WT offers better work-life balance, then 70% of Generation Y are willing to share WT data (PWC, 2014).

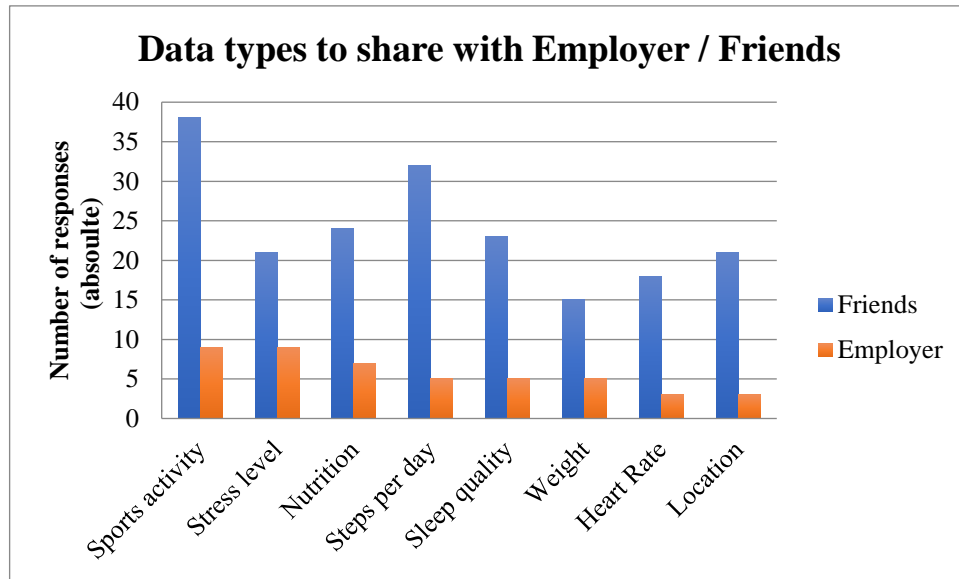
#### 4.3.1 Purpose of sharing data

The respondents are not open at all towards sharing any data with their employers. The contrary, only 2 % (4 absolute) of the respondents do want to share any data with their employers (figure 18). 7% state that they do not want to share data with anyone at all. In comparison, data is more trusted towards friends and family (23%; 46 absolute). Respondents are willing to share data for health purposes and therefore with a doctor's office (29%) or a hospital (28%). Even 9% are willed to share their data with insurance companies.



*Figure 18: Willingness to share data with*

Even though individuals are rather suspicious towards sharing data with employers, persons who either selected Friends & Family (46) or Employer (4) were asked to choose which of the data like sports activity, stress level, etc. they would share. The result in figure 19 emphasizes the apprehension of sharing data with the employer or a company.



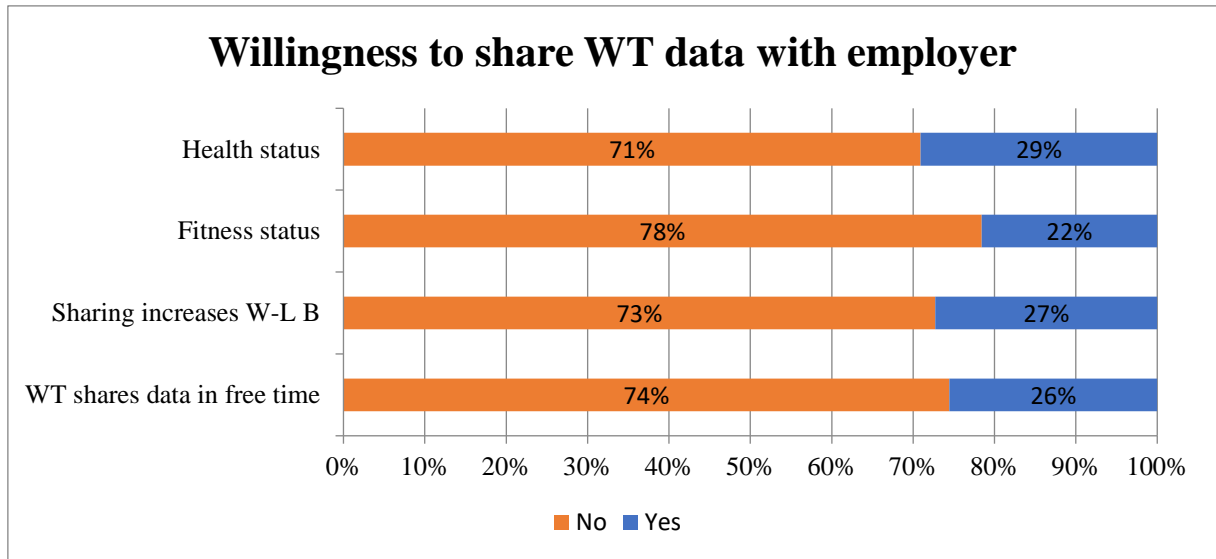
*Figure 19: Data types to share with employer / friends*

Individuals selected most often to share sports data or stress level with their employer, however in comparison to friends and family the bar is very small. Based on the absolute number of responses, the interviewed persons mentioned maximum nine times that they are willing to share sports activity or sports level with the employer. In comparison, sports data was selected 38 times and stress level 21 times. Not any data was selected less than 15 times with friends.

#### 4.3.2 Data sharing attitude towards employer

The questionnaire included four questions to understand the preferences of users towards sharing data with employers. First, the questions one and two covered the topic of sharing health or sports data with the employer. Second, respondents were asked if they believe that sharing data with the employer increases the work-life balance. WT tracks data the whole day, including free time of users. Therefore, the third question was if respondents were ok that WT shares data of their free time. Every issue had the answer options Yes and No, but included a text box and respondents were prompted to explain their chosen answer.

On average in only 26% of the cases, respondents believe that sharing information with employers has an advantage for the individual (Figure 20). In all the four cases respondents were very considered about the objective of the employer, as they do not trust an employer to sponsor WT without having any ulterior motives.



*Figure 20: Willingness to share WT data with employer*

**Health Status** - Would you like to have your employer informed about your health status and indicators like stress level so that he can act and support you?

Over 70% do not want to share any data at all. The reasons are privacy reason and the fact that they do not trust their employers. Several answers state that: *“It is none of his business”* and respondents are unsure what the data is used for. Employers that genuinely care about an individual’s health status are rare and the consequences of sharing any health data may not be used appropriately.

Respondents agree to share their health status and indicators like stress level if they can individually choose which data to share and if it does not take place via an app or automatic transfer. However, a highly stressed individual prefers to directly speak about the problem instead of having a gadget that automatically shares such a message: *“I still can communicate if I am stressed. I don’t need to be tracked – I am not a slave!”* Notably, a problem such as high stress, because of too much work and over hours should be solved in a personal meeting instead through an app.

Individuals would be willing to share data if it solely used for the improvement of one’s health status. But users also show constraints towards their employers, as one stated: *“If they don’t use it against me but really support me”*.



**Share Fitness status** - Would you like to have your employer informed about your fitness status and goals so that he can act, support and incentivize you?

Respondents are even less willing to share their fitness status. A general constraint is that the fitness status may not be even relevant for a job, as one answer explains: *“Not necessary to be a sports freak to fulfill my duty at the office”*.

Also, users want to remain the owner of their data and voluntarily choose any data shared. Apps that automatically share data *“intrude the personal, private territory”*. Only if an individual decides for himself that the data is relevant, he should have the option to share it voluntarily. No automatic request from the employer side is accepted. Constant tracking may create more stress and lead to a worse fitness status, health status and work-life balance.

**Work-life balance** - Do you think that sharing data of your Wearable with your employer would increase work-life balance?

The clear answer is that sharing data would not increase w-l balance, as indicated in figure 20.

Employees are missing the “Futuristic thinking” of employers to improve the workplace and working conditions for employees. Respondents would be willing to share data if their tracked data was used to increase working conditions. A use case could be that WT demonstrates bad working conditions and evidence of stress and overtime caused by the employer. WT can be useful for data like working hours but respondents are cautious about sensitive health data: *“The app can monitor my working hours, but never automatically track and share sensitive health data like stress”*. Employees do not believe that employers have the appropriate program in place to deal with such data. Especially to draw the right conclusions about stress and mental health requires specified applications and skills. The information that someone is relaxed can lead to different conclusions and may be completely wrong if it is just based on a few parameters tracked. Another doubt mentioned was that not a single system could be used for everyone as health data or stress levels differ from person to person and is highly connected to an individual’s past.

**Wearable Technology shares data in free time** - Are you ok that your Wearable shares private data when you are not at your workplace? (In your free time)

The primary constraint towards sharing data with Wearable Technology is privacy. Respondents handle the separation between work and their private life carefully. There exists no trust in the employer, as several times persons were worried that “*Information could be used against me*”. This is emphasized by other statements that employers anyhow try to control as much as they can in a legally way. Therefore, sharing such private information would lead to more surveillance as it is unknown what the data is used for. The separation of work and life is an essential part for respondents to maintain a healthy work-life balance.

**Additional remarks** - Do you have any further remarks regarding Wearable Technology offered by your employer and used at work?

Individuals are well informed about their rights and the value of their data. They are aware that the data belongs to them and are cautious about any type of data shared. Besides, health data is perceived as very personal data. All information tracked though WT is private and individuals want to decide which data an employer receives. The employer is not regarded as trustworthy and the offer to sponsor and provide WT for employees does not change this. Respondents fear that they lose track of the data shared and would not be well informed what for the employer uses it.

Respondents would be willing to participate in an incentive-based system if the system solely offers advantages and does not exclude anyone from participating. The monitoring technology is not advanced enough to deliver a holistic picture of an individual and may lead to wrong conclusions. Also, users who do not participate may not face any disadvantages.

The request from an employer to track sports data may lead to additional competition outside of work. People start comparing the status of their sports level, as this part of their free time is connected to work.

Several respondents connect the topic of WT with the book “1984” of George Orwell. The book describes an environment of total government surveillance (Orwell, 1949).

**Summary - Data sharing:** Individuals do not trust the employer’s objective, want to remain the owner of their data and have no confidence that an employer has an adequate program in place to access data.

## 5. Conclusion

The goal of the thesis is to create an understanding of employees' openness towards WT sponsored by an employer. The theory emphasizes the openness of Generation Y towards WT.

### 5.1 Implications

The research confirms the interest of individuals into the quantified self, as nearly 50% track their data. However, only 30% use WTs to monitor their data. Based on the analysis and discussion, the thesis derives with seven implications in regards to the research questions and the opportunities and risks to integrate WT at the workplace. The research questions were the following:

- 1) What is the likelihood of Generation Y to request Wearable Technology (WT) sponsored by the employer?
- 2) Are millennials willing to share the data tracked by their devices with their employer?

Sub questions:

- What are the reasons to buy WT?
- What is the likelihood of individuals to buy WT and is there a difference if the employer sponsors the WT?
- Is there a difference between owners and non-owners of WT?
- Because of what reasons do millennials hesitate to buy WT?

One has to keep in mind the limitation that the research is not representative, as there exist several definitions of Generation Y and only one of those definitions was applied for the thesis. Nevertheless, the thesis derived with the following implications after investigating individuals born between 18 and 36, belonging to Generation Y based on the definition of Howe & Strauss (2000).

Comparing the millennials answers, towards (1) likelihood of buying WT in the future and (2) likelihood of requesting WT sponsored by the employer, showed differences between the four Wearables investigated. However, the mean for the likelihood to buy or request WT was below 50% in all cases.

Only, for Smart watches the likelihood increased for requesting WT sponsored by the employer. For Fitness trackers the likelihood of requesting sponsored WT even decreased. The analysis for Smart glasses and Smart clothing did not provide a clear answer.

*Implication 1: The setting that the employer sponsors WT leads to a statistically significant increase of the likelihood to request Smart watches, but a statistically significant decrease for Fitness trackers*

*Implication 2: The likelihood of Generation Y to request Wearable Technology (WT) sponsored by the employer is below 50% and does only increase for Smart watches, compared to the individuals' likelihood to buy WT.*

When comparing the answers with individuals who already own&use WT the outcome was different, as the likelihood to buy or request Fitness tracker and Smart watches increased, unrelated to the WT being sponsored. The likelihood to buy or request Smart glasses or Smart clothing increased as well, however not statistically significant.

*Implication 3: Owners of WT show a higher likelihood to buy or request WT. For the devices Fitness trackers and Smart watches the higher likelihood to buy or request WT was statistically significant, showing a small effect.*

The main reason to buy WT is to track important personal information, followed by WT providing personal insights. The interest towards such information can be explained, as the main health constraint of respondents were lack of physical activity, besides stress, poor nutrition and obesity. The respondents would also wish to track data such as stress. However, conventional devices can only track basic data such as daily steps.

*Implication 4: The main reason to buy WT is to track personal information.*

The survey confirms the theory, that the most critical reasons for hesitating buying WT are price, privacy and the doubt if one would use the gadget. Price sensitivity of prospective customers is a topic where the employer or insurance companies can come into the play, as they have an interest in healthy employees and clients (Generali-vitalityerleben.de, 2018; Kramer & Jahberg, 2016). The investment of subsidizing WT would remunerate through reduction of sickness rate and illness (Henning and van de Ven, 2017). However, an investment would only pay off if long-term engagement was secured, which is a bottleneck of WT (PWC, 2014). Engagement rates towards WT are low and it is unclear if respondents would actively use the sponsored WT (Ledger & McCaffrey, 2014). As gadgets can only provide limited insight and not a holistic approach, users question if it is worth to purchase an expensive device they may not even use.

*Implication 5: Millennials hesitate to buy WT because of price, privacy and doubt if they would use the gadget.*

The data-sharing attitude of Generation Y confirms the importance of privacy as a risk factor. Respondents have privacy issues towards the technology itself, but also towards the employer sponsoring WT. The employers are not regarded as trustworthy to share data with and respondents do question the objective of companies when requesting personal data. Only approximately 25% of the respondents are willing to share data with the employer.

*Implication 6: Respondents are considered about the objective of an employer and argue that an employer has ulterior motives to sponsor WT. Individuals have doubts towards data protection and want to remain the owner of their data.*

Some users are convinced that sharing data with an employer may increase work-life balance. Respondents would be willing to share data if it was used to increase working conditions. The problem is that most employers do not have a futuristic thinking towards the workplace and do not act to enhance working conditions for employees. The challenge is to draw the right conclusions from an individual's data. Conclusions about stress and mental health require specified applications and skills that companies lack.

*Implication 7: Users question the employers' objective and have no confidence that an employer is equipped with an adequate program to analyze the shared data.*

## 5.2 Limitations

Several limitations have to be stated about the research of Wearable Technology. The website Quantified Self (2018b) lists already over 505 different tools to track data. Therefore, the general overview of Wearable Technology provided is limited and the survey focused on the most popular devices (FT, SW, SG, SC). Other popular tools to track data are mobile apps. A limitation of the research is that mobile apps were not included in the questionnaires. Fitness apps cover around 25% of the total Fitness market (Statista, 2018a). Respondents who solely use apps to track their behavior were thereby excluded.

There are different definitions of Smart watches. SW are not always part of the Fitness market. It is assumed in this research that owners of Smart watches use the fitness monitoring function of the device. A limitation is that this was not separately checked as it was out of scope to investigate this by including such detailed questions into the already extensive survey. However, as SW allow tracking of the same data as Fitness trackers an increasing convergence of Smart watches and Fitness trackers is expected (Statista, 2018a).

The WT Smart clothing was not popular towards respondents and it has to be questioned if respondents understood the actual value of Smart clothing based on the description. Smart clothing is described, as the next generation of WT as the micro sensors are directly implanted into the garments and users will not even be aware of the sensors. This allows measuring all kind of data, without even wearing an extra device such as the current popular Fitness tracker or Smart watches (Statista, 2018a).

## 6. Recommendation

The recommendation states the theoretical relevance and managerial relevance, describes the limitations and future research and finishes with the conclusion.

### 6.1 Theoretical relevance

Companies still struggle to understand the thinking of millennials. The theory review identified a gap regarding the millennials interest towards Wearable Technology, especially the likelihood to request sponsored devices. WT is covered in academia from a technological perspective. Because of companies like Amazon, it is important to also investigate it from the individuals

perspective. The thesis creates awareness about futuristic scenarios, which are already started to be implemented by pioneering companies.

The insights allow interested parties such as companies acting as employers, but also industries like the insurance industry, to understand the motivation and hesitation of millennials towards WT. Besides, the thesis investigated the data-sharing attitude. In regards to developments, like the updated EU General Data Protection regulation these insights allow understanding the thinking of the employee and customer side. The sensitivity of personal data is emphasised by the outcome that individuals lack trust towards their employers. Thereby, the study confirmed the major barrier of privacy towards integration Wearable Technology at the workplace.

The outcome showed that the hesitation to purchase Wearable Technology because of the high price could not be solved through sponsoring of WT. The implications derived from the research, provide a current status towards the perception of millennials. Future research can build on these findings and investigate how employers should cope with the lack of trust of the employees.

## 6.2 Managerial relevance

The thesis is focused on providing practical implications regarding the risks and opportunities to integrate Wearable Technology. The first part of the analysis provides insights into the reasons to buy WT and the reasons why millennials hesitate to purchase it. The research includes data about the perceived health risks or data wished to track. Thereby, the employers or interested industry player receive a basic understanding of millennials attitude towards WT.

The second part directly tests the likelihood of millennials to buy WT as an individual or request it when sponsored by the employer. Based on the results, the differences between the four devices are worked out. Companies can use the outcome to select what device to offer.

By including the third part of data sharing attitude, a sensitive topic is investigated. The research states that millennials do not trust their employer. Therefore, the individuals are not willing to share data and want to remain the owner of their data. The offer of an employer to provide WT does not increase the likelihood of millennials to request WT and could even weaken the employee-employer relationship. The lack of trust is the main barrier identified towards the integration of Wearable Technology. Based on this outcome, companies have to derive with strategies on how to gain the trust of their employees.

### 6.3 Limitation and future research

The survey questionnaire was built to receive an overall picture of WT, focusing on four devices and not on a single category. The goal was to collect descriptive data to understand millennials' perspective towards WT. The future research could investigate each WT more specifically. However, one has to keep in mind, that for example, the website Quantified Self (2018b) lists already over 505 different tools to track data. Therefore, a categorisation of devices is necessary to conduct research and receive general insights.

The major implication that survey respondents do not trust an employer is surprising. Therefore, the topic of data sharing and privacy towards the employer should be further investigated. With a qualitative approach, individuals can be questioned towards their employee-employer relationship and trust level.

One has to keep in mind that over 60% of the individuals are still enrolled as students and therefore may not even have any relevant experience with an employer. Thus, a longitudinal survey, questioning individuals every two years would be interesting, to understand if the attitude towards WT and data-sharing changes.

The researcher used his access to Generation Y and managed to receive 105 valid responses. An interesting study would be the comparison to other age groups. This is relevant as there is the fear that only young and healthy individuals adopt towards WT, but not the older generation (Castlight Health, 2017). In addition, one has to be aware that the sample is not representative for the Generation Y. Besides using one of the many definitions in place, the sample is also a very homogenous group with a high socioeconomic status and educational standard, compared to the average millennial population. It would be interesting to conduct the same survey with a representative sample of Generation Y.

### 6.4 Conclusion

It is shown that millennials are interested in tracking and monitoring their data, but one has to conclude that currently, the offer from an employer to sponsor a Wearable device is not persuading. The survey results show that the likelihood of Generation Y to request Wearable Technology, sponsored by the employer is below 50%. In comparison to the likelihood of individuals to purchase Wearable Technology, there is only a significant increase towards



sponsored Smart watches. For Smart glasses the likelihood increased as well, but not significant and for the other devices, the likelihood even decreased.

Millennials do not trust the employer. Instead of convincing users to wear WT, employers have to offer WT without any liability for employees, as individuals do not believe that the sharing of information with the employer provides an advantage. Based on the insights about data sharing attitude of millennials, it is essential that employees remain the owner of the data and have the full autonomy about the data the Wearable technology tracks.

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## II. Appendix

**Exhibit 1: Categories of Wearables**

Wearable Categories	Availability		Product Example	Wearing Position	Study Citation <sup>7</sup>	Categorisation thesis
	Commercial off the shelf (COTS)	Proof of Concept (PoC)				
Performance monitor	x		Zephyr BioHarness 3	Chest	Milosevic et al., 2012	(A1) Fitness tracker
Smartwatch	x		Apple Watch	Wrist	Kritzler et al., 2015; Yang & Shen, 2015	(B) Smart watches
Smart clothing	x	x	Electronic shirt	Upper part of body	Pioggia et al., 2009, Yang & Shen, 2015	(C) Smart clothing
Heads-up display	x		Headmounted display HMD	Head	Chen & Kamara, 2011; Nee et al., 2012; Kenn and Bürgy, 2014	(D) Smart glasses
Implanted devices	x		Artificial pancreas	Stomach	Nadeem et al., 2015	(A2) Health tracker
Blood pressure monitor	x		Blood pressure sensor node	Arm	Nadeem et al., 2015	(A2) Health tracker
Emotion measurement		x	Emotion board	Arm	Setz et al., 2010	(E) Other
Heart rate monitor	x		Wahoo chest belt	Chest	Muaremi et al., 2013	(A2) Health tracker
Electroencephalogram (EEG) monitor	x		EEG device	Head	Dubinsky et al., 2014; Durkin & Lokshina, 2015	(A2) Health tracker
Electromyography monitor		x	EMG sensor node	Thigh	Nadeem et al., 2015	(A2) Health tracker
Digital pedometer	x		Fitbit, Nike+ Fuelband, Jawbone UP, Misfit	Wrist	Singh et al., 2015; Glance et al., 2016; Zenonos et al., 2016	(A1) Fitness tracker

<sup>7</sup> Study citations can be found in the paper of Khakurel, Porras & Melkas (2017, p.7)

Wearable Categories	Availability	Product Example	Wearing Position	Study Citation <sup>1</sup>	Categorisation thesis	
	Commercial off the shelf (COTS)	Proof of Concept (PoC)				
Body motion monitor/tracker	x	x	Inertial Monitoring Wearable	Waist, thigh, knee, ankle, upper back	Pioggia et al., 2009; Nadeem et al., 2015; Yang & Shen, 2015; Yang et al., 2016	(E) Other
Pulse oximetry	x		Pulse oximetry sensor node	Finger	Nadeem et al., 2015	(A2) Health tracker
Wearable Electro Cardiac Graphic (ECG) and acceleration monitor		x	MBIT	Chest	Shirouzu et al., 2015	(A2) Health tracker
Head-worn terminal/body motion monitor		x	Smart Safety Helmet combined with EEG sensors	Head and chest	Li et al., 2014	(A2) Health tracker
Heartbeat authenticator	x		ECG device, Nymi band	Wrist	Dubinsky et al, 2014	(A1) Fitness tracker & (A2) Health tracker
Fitness and activity tracker/monitor		x	Toshiba Silmee Bar Type sensor	Chest, pocket	Moran & Nakata, 2010; Moran et al., 2013; Sole et al., 2013; Zeonos et al., 2016)	(A1) Fitness tracker & (A2) Health tracker
Blood sugar and cholesterol monitor	x		Blood sugar and cholesterol sensors	Arm	Hamper, 2015	(A2) Health tracker
Chest-mounted display		x	Chest mounted display	Chest	Chen & Kamara, 2011	(A1) Fitness tracker
Eyewear		x	Wireless personnel supervision system	Eye, head	Leinonen et al., 2013; Alam et al., 2015	(E) Other

Wearable Categories	Availability		Product Example	Wearing Position	Study Citation	Categorisation thesis
	Commercial off the shelf (COTS)	Proof of Concept (PoC)				
Stooped device		x	Wearable stooping assist device (WSAD)	Over the body	Luo and Yu, 2013	(A2) Health tracker
Wearable robot		x	Electrohydraulic wearable robot	Over the body	Chu et al., 2014	(E) Other
Human behaviour tracker		x	Sociometric badge	Neck	Kim et al., 2009	(E) Other
Multi-factor authenticator	x		Nymi band	Arm	Nymi, 2018	(E) Other
Smart Safety Helmet (SSH)	x		Smart Safety Helmet (SSH) track	Head	Li et al., 2014	(E) Other
Wireless Sensor Networks (WSNs)	x		Wearable ECG and acceleration monitor	On-body	Magno et al., 2013, Okada et al., 2013	(A1) Fitness tracker & (A2) Health tracker
Sociometric badges	x		Vocera Communications System	Around neck	Olguin et al., 2009	(E) Other

**Source:** Khakurel, Porras and Melkas, 2017, p.7

**Exhibit 2.1: Years of tracking****For how many years do you track your behavior?**

#	Answer	%	Count
1	1 year	30.61%	15
2	2 years	18.37%	9
3	3 years	14.29%	7
4	4 years	16.33%	8
5	5 years	8.16%	4
6	8 years	0.00%	0
7	10 years	8.16%	4
8	Depends on behavior:	4.08%	2
	<b>Total</b>	<b>100%</b>	<b>49</b>

**Exhibit 2.2: Type of behavior tracked****Do you track any of your behavior?**

You can select multiple answers.

#	Answer	%	Count
1	I do not track any data	32.34%	54
2	Sports	15.57%	26
3	Steps per day	14.97%	25
4	Weight	10.78%	18
5	Sleep	10.18%	17
6	Nutrition	4.79%	8
7	Heart Rate	4.19%	7
8	Drinking/smoking	2.99%	5
9	Other	4.19%	7
	<b>Total</b>	<b>100%</b>	<b>167</b>

**Exhibit 2.3:** What kind of data wished to track

<b>Imagine you could track any kind of data:</b>		
<b>1. Possible</b>	<b>2. Possible - under constraints</b>	<b>3. Not possible - futuristic</b>
Sleep, calories spent, steps, sports	Nutrition (micro), vitamin intake, in blood level of alcohol	Pheromone scan, hormones, menstruation
	Health, heart rate, oxygen level, specific sports data (speed)	Muscle gained, grade of exhaustion
	Specific work data, time of speaking face to face, mood	Brain sharpness, dreams, smiles, bad thoughts

**Exhibit 2.4:** Own & Use of WT**Do you OWN/USE any of these Wearable Technologies?**

#	Question	#1-OWN Device	#2-USE Device	<i>Difference</i>
1	Fitness trackers	26	20	6
2	Smart watches	11	6	5
3	Smart glasses	1	0	1
4	Smart clothing	1	0	1
<b>Total</b>	<b>All gadgets</b>	<b>39</b>	<b>26</b>	<b>13</b>





**Exhibit 2.7:** Reasons for why a prospective user might purchase WT**Reasons why someone might purchase WT**

#	Answer	%	Count
1	Tracks important personal information	25.35%	55
2	Personal insights	23.04%	50
3	Better work-life balance	18.43%	40
4	Increases productivity at home	13.36%	29
5	Increases productivity at work	12.90%	28
6	Looks fashionable or cool	5.07%	11
7	To share my data with friends	1.38%	3
8	Other	0.46%	1
	<b>Total</b>	<b>100%</b>	<b>217</b>

**Exhibit 2.8.1:** Likelihood of buying WT in the future

<b>Likelihood of buying any of these WT in the future? (0% - 100%)</b>					
#	Field	Min	Max	Mean	Standard Deviation
1	Fitness trackers	0	100	38.78	33.65
3	Smart watches	0	100	32.36	34.10
3	Smart glasses	0	100	14.41	25.47
4	Smart clothing	0	100	24.95	28.95

**Exhibit 2.8.2:** Likelihood of requesting WT in the future

<b>Likelihood of requesting any of these WT if sponsored by employer (0% - 100%)</b>					
#	Field	Min	Max	Mean	Standard Deviation
1	Fitness trackers	0	100	36.63	37.17
2	Smart watches	0	100	43.59	37.71
3	Smart glasses	0	100	24.63	33.56
4	Smart clothing	0	100	24.05	33.35

**Exhibit 2.9.1:** Independent T-Test - Group statistics: Fitness trackers, Smart watches, Smart glasses, Smart clothing

<b>Group Statistics</b>					
	Own_Use	N	Mean	Std. Deviation	Std. Error Mean
<b>Fitness trackers</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	not	82	35,51	32,874	3,630
	Own&Use	18	53,67	34,024	8,020
<b>Fitness trackers</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	not	75	31,5867	35,76881	4,13023
	Own&Use	17	58,8824	35,98069	8,72660
<b>Smart watches</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	not	82	26,91	31,546	3,484
	Own&Use	18	57,17	35,169	8,289

<b>Smart watches</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Smart watches	not	75	37,5867	36,39204	4,20219
	Own&Use	17	70,0588	32,41040	7,86068
<b>Smart glasses</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	not	80	14,65	25,838	2,889
	Own&Use	18	13,33	24,435	5,759
<b>Smart glasses</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	not	75	24,1333	34,23462	3,95307
	Own&Use	17	26,8235	31,30342	7,59220
<b>Smart clothing</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	not	81	22,38	28,189	3,132
	Own&Use	18	36,50	30,301	7,142
<b>Smart clothing</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	not	75	21,6800	30,95426	3,57429
	Own&Use	17	34,5294	41,86753	10,15437

**Exhibit 2.9.2:** Independent T-Test: Fitness trackers, Smart watches, Smart glasses, Smart clothing

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
<b>Fitness trackers</b> - How likely will you buy any of these WT in the future?  (0 = unlikely to 100 = very likely)	Equal variances assumed	,013	,910	-2,109	98
	Equal variances not assumed			-2,062	24,465
<b>Fitness trackers</b> - Which of the following Wearable Technologies would you request?  (0 = unlikely to 100 = very likely) -	Equal variances assumed	,392	,533	-2,838	90
	Equal variances not assumed			-2,827	23,714
<b>Smart watches</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,081	,777	-3,609	98
	Equal variances not assumed			-3,364	23,382
<b>Smart watches</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	2,431	,122	-3,385	90
	Equal variances not assumed			-3,643	25,993
<b>Smart glasses</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,061	,806	,197	96
	Equal variances not assumed			,204	26,272

<b>Smart glasses</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	,055	,815	-,297	90
	Equal variances not assumed			-,314	25,447
<b>Smart clothing</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,157	,692	-1,896	97
	Equal variances not assumed			-1,810	23,980
<b>Smart clothing</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	4,942	,029	-1,443	90
	Equal variances not assumed			-1,194	20,144

#### Independent Samples Test

t-test for equality of means		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	95% Confidence Interval of the Difference
					Lower	Upper
<b>Fitness trackers</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,038	-18,154	8,609	-35,239	-1,069
	Equal variances not assumed	,050	-18,154	8,803	-36,305	-,004
<b>Fitness trackers</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	,006	-27,29569	9,61837	-46,40426	-8,18711
	Equal variances not assumed	,009	-27,29569	9,65465	-47,23465	-7,35673

<b>Smart watches</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,000	-30,252	8,382	-46,886	-13,618
	Equal variances not assumed	,003	-30,252	8,992	-48,836	-11,668
<b>Smart watches</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	,001	-32,47216	9,59422	-51,53274	-13,41157
	Equal variances not assumed	,001	-32,47216	8,91340	-50,79416	-14,15016
<b>Smart glasses</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,844	1,317	6,677	-11,937	14,571
	Equal variances not assumed	,840	1,317	6,443	-11,921	14,554
<b>Smart glasses</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	,767	-2,69020	9,06114	-20,69173	15,31133
	Equal variances not assumed	,756	-2,69020	8,55969	-20,30351	14,92312
<b>Smart clothing</b> - How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely)	Equal variances assumed	,061	-14,117	7,445	-28,893	,659
	Equal variances not assumed	,083	-14,117	7,799	-30,214	1,979
<b>Smart clothing</b> - Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely)	Equal variances assumed	,153	-12,84941	8,90690	-30,54453	4,84570
	Equal variances not assumed	,246	-12,84941	10,76507	-35,29470	9,59587

**Exhibit 2.9.3:** Independent T-Test - Group statistics, Smart watches - Male vs. Female**Group Statistics**

	Sex	N	Mean	Std. Deviation	Std. Error Mean
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	Male	43	38,23	36,657	5,590
	Female	44	23,36	32,149	4,847

**Independent Samples Test**

t-test for Equality of Means		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	Equal variances assumed	6,229	,014	2,013	85
	Equal variances not assumed			2,010	83,042

### Independent Samples Test

		Sig. (2-tailed)	Mean diff,	Std. Error diff.	95% Confidence Interval of the Difference	95% Confidence Interval of the Difference
					Lower	Upper
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	Equal variances assumed	,047	14,869	7,387	0.181	29,557
	Equal variances not assumed	,048	14,869	7,399	0.153	29,584

### Exhibit 2.10.1: Correlation Fitness tracker

#### Descriptive Statistics

	Mean	Std. Deviation	N
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Fitness trackers	38,78	33,647	100
Which of the following Wearable Technologies would you request?  (0 = unlikely to 100 = very likely) - Fitness trackers	36,6304	37,16838	92



### Correlations

		How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Fitness trackers	Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Fitness trackers
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Fitness trackers	Pearson Correlation	1	,613**
	Sig. (2-tailed)	d	,000
	Sum of Squares and Cross-products	112079,160	69752,152
	Covariance	1132,113	766,507
	N	100	92
Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Fitness trackers	Pearson Correlation	,613**	1
	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	69752,152	125715,435
	Covariance	766,507	1381,488
	N	92	92
**. Correlation is significant at the 0.01 level (2-tailed).			

**Exhibit 2.10.2:** Correlation Smart watches**Descriptive Statistics**

	Mean	Std. Deviation	N
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart clothing	24,95	28,947	99
Which of the following Wearable Technologies would you request?  (0 = unlikely to 100 = very likely) - Smart clothing	24,0543	33,35436	92

**Correlations**

		How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart clothing	Which of the following Wearable Technologies would you request?  (0 = unlikely to 100 = very likely) - Smart clothing
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart clothing	Pearson Correlation	1	,667**
	Sig. (2-tailed)		,000
	Sum of Squares and Cross-products	82114,747	57981,902
	Covariance	837,906	637,164
	N	99	92
	Pearson Correlation	,667**	1

Which of the following Wearable Technologies would you request?	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	57981,902	101238,728
	Covariance	637,164	1112,513
(0 = unlikely to 100 = very likely) - Smart clothing	N	92	92
**. Correlation is significant at the 0.01 level (2-tailed).			

**Exhibit 2.10.3:** Correlation Smart glasses

Descriptive Statistics			
	Mean	Std. Deviation	N
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart glasses	14,41	25,468	98
Which of the following Wearable Technologies would you request?	24,6304	33,56271	92
(0 = unlikely to 100 = very likely) - Smart glasses			

## Correlations

		How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart glasses	Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Smart glasses
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart glasses	Pearson Correlation	1	,714**
	Sig. (2-tailed)		,000
	Sum of Squares and Cross-products	62917,673	53882,538
	Covariance	648,636	598,695
	N	98	91
Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Smart glasses	Pearson Correlation	,714**	1
	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	53882,538	102507,435
	Covariance	598,695	1126,455
	N	91	92
**. Correlation is significant at the 0.01 level (2-tailed).			

**Exhibit 2.10.4:** Correlation Smart clothing**Descriptive Statistics**

	Mean	Std. Deviation	N
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	32,36	34,103	100
Which of the following Wearable Technologies would you request?  (0 = unlikely to 100 = very likely) - Smart watches	43,5870	37,71267	92

### Correlations

		How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Smart watches
How likely will you buy any of these WT in the future? (0 = unlikely to 100 = very likely) Smart watches	Pearson Correlation	1	,693**
	Sig. (2-tailed)		,000
	Sum of Squares and Cross-products	115141,040	82264,717
	Covariance	1163,041	904,008
	N	100	92
Which of the following Wearable Technologies would you request? (0 = unlikely to 100 = very likely) - Smart watches	Pearson Correlation	,693**	1
	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	82264,717	129424,304
	Covariance	904,008	1422,245
	N	92	92
**. Correlation is significant at the 0.01 level (2-tailed).			

## Exhibit 2.11: Questionnaire

### Start of Block: Default Question Block

Q1 First, let me thank you for answering this survey.  
This research is part of my master thesis about **Wearable Technology**.  
All data collected will remain confidential.

On average it takes respondents **about 8 to 10 minutes** to answer it.

Any questions or doubts, please feel free to contact me: lukas.eidenhammer@gmx.at  
Let's get this started!

Please click the arrow below to start.

Page Break

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Q2  
Introduction: What is Wearable Technology?  
Wearable Technology (WT) can be described as accessories and clothing that incorporates technology and analyzes a humans behavior, providing detailed personal data on behavior and/or physical traits.

Examples of existing Wearable Technology are: Fitness trackers like FitBit Smart glasses like Google glasses Smart watches like Apple or Samsung watch Smart clothing like Polar biometric T-shirts (Tracker, heart rate, haptic vibration)

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**Q3 Do you track any of your behaviors? You can select multiple answers.**

- ☐ Weight (1)
- ☐ Sports (2)
- ☐ Drinking/smoking (3)
- ☐ Nutrition (4)
- ☐ Steps per day (5)
- ☐ Heart Rate (6)
- ☐ Sleep (9)
- ☐ No (7)
- ☐ Other (8) \_\_\_\_\_

**Q4 Imagine you could track any kind of data. Which one would you be interested in, if you could choose any?**

*Display This Question:*

*If Do you track any of your behaviors? You can select multiple answers. = Weight*

*Or Do you track any of your behaviors? You can select multiple answers. = Sports*

*Or Do you track any of your behaviors? You can select multiple answers. = Drinking/smoking*

*Or Do you track any of your behaviors? You can select multiple answers. = Nutrition*

*Or Do you track any of your behaviors? You can select multiple answers. = Steps per day*

*Or Do you track any of your behaviors? You can select multiple answers. = Heart Rate*

*Or Do you track any of your behaviors? You can select multiple answers. = Sleep*

*Or Do you track any of your behaviors? You can select multiple answers. = Other*



**Q5 For how many years do you track your behavior?**

- ☐ 1 year (1)
- ☐ 2 years (2)
- ☐ 3 years (3)
- ☐ 4 years (4)
- ☐ 5 years (5)
- ☐ 8 years (6)
- ☐ 10 years (7)
- ☐ Depends on behavior: (8) \_\_\_\_\_
- 



**Q6 What do you consider as the top risks for long term health?**  
**You can select multiple answers.**

- ☐ Obesity (1)
- ☐ Lack of physical activity (2)
- ☐ Drinking/smoking (3)
- ☐ Poor nutrition (4)
- ☐ Substance abuse (5)
- ☐ Stress (6)
- ☐ Other (7) \_\_\_\_\_
- 

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Q7 Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the ones you use regularly in the right column.

	I OWN the following device/s	I USE the following device/s
	You can select multiple answers (1)	You can select multiple answers (1)
Fitness trackers (1)	<input type="checkbox"/>	<input type="checkbox"/>
Smart glasses (2)	<input type="checkbox"/>	<input type="checkbox"/>
Smart watches (3)	<input type="checkbox"/>	<input type="checkbox"/>
Smart clothing (4)	<input type="checkbox"/>	<input type="checkbox"/>

Display This Question:

If Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the... : I OWN the following device/s = Fitness trackers [ You can select multiple answers ]

Or Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the... : I OWN the following device/s = Smart glasses [ You can select multiple answers ]

Or Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the... : I OWN the following device/s = Smart watches [ You can select multiple answers ]

Or Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the... : I OWN the following device/s = Smart clothing [ You can select multiple answers ]

Or Do you OWN any of these Wearable Technologies? If yes, do you USE it regularly? Please select the... : I USE the following device/s = You can select multiple answers



Q8 Which of the following attributes were reasons for you to buy Wearable Technology? You can select multiple answers.

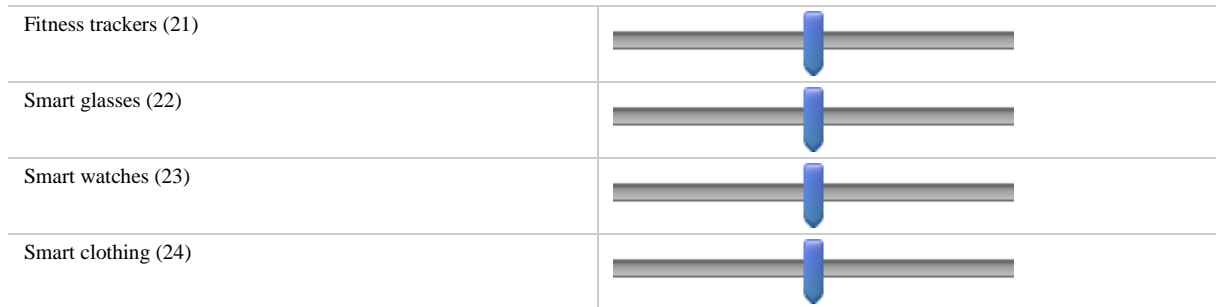
- ☐ Has features that reward frequent users with monetary reward (1)
- ☐ Provides me with Information that I would otherwise not have (2)
- ☐ Allows me to cut back on my spending (3)
- ☐ Has apps/ features that reward frequent users with loyalty points (4)
- ☐ Looks good: is an important part of my wardrobe/ outfits (5)
- ☐ Gaming features to compete with others (6)
- ☐ Other (7) \_\_\_\_\_



**Q9 How likely will you buy any of these Wearable Technologies in the future?**  
(0%= unlikely to 100% = very likely)

**Probability of buying %** (100% = I am going to buy it certainly)

0% 10 20 30 40 50 60 70 80 90 100%



**Q10 Below are possible reasons for why someone might purchase a Wearable Technology device. Please select the statements that would motivate you to adopt Wearable Technology.**

- ☐ Personal insights (1)
- ☐ Better work-life balance (2)
- ☐ To share my data with friends (3)
- ☐ Increases productivity at home (4)
- ☐ Other (5) \_\_\_\_\_
- ☐ Tracks important personal information (6)
- ☐ Looks fashionable or cool (7)
- ☐ Increases productivity at work (8)



**Q11 What are your biggest hesitations regarding Wearable Technology? \*PWC**

	Fitness trackers (1)	Smart glasses (2)	Smart watches (3)	Smart clothing (4)
Price (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
May not use (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Privacy (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Battery lifetime (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of relevance/ utility (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
May loose or abash gadget (6)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digital overload (7)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Degree of measure accuracy (8)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product quality (9)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Page Break





**Q12 Now assume your EMPLOYER purchases these Wearable Technologies for you.**



**Which of the following Wearable Technologies would you request?**  
(0% = unlikely to 100% = very likely)

**Probability of requesting from employer %** (100% = I am going to request it certainly)

0% 10 20 30 40 50 60 70 80 90 100%

Fitness trackers (21)	
Smart glasses (22)	
Smart watches (23)	
Smart clothing (24)	

Page Break



**Q13 With whom would you be willing to share your personal data? \*PWC**

- ☐ Friends (1)
- ☐ Employer (2)
- ☐ Hospital (3)
- ☐ Health insurance company (4)
- ☐ Cellphone provider (5)
- ☐ Bank (6)
- ☐ No one (7)
- ☐ Other (8) \_\_\_\_\_
- ☐ Doctor's office (9)
- ☐ Car company (10)

Display This Question:

If With whom would you be willing to share your personal data? = Friends

Or With whom would you be willing to share your personal data? = Employer



**Q14 What kind of personal data are you willing to share with your Friends/ Employer?**

	Friends (1)	Employer (2)
Weight (1)	<input type="checkbox"/>	<input type="checkbox"/>
Sports activity (2)	<input type="checkbox"/>	<input type="checkbox"/>
Location (3)	<input type="checkbox"/>	<input type="checkbox"/>
Nutrition (4)	<input type="checkbox"/>	<input type="checkbox"/>
Steps per day (5)	<input type="checkbox"/>	<input type="checkbox"/>
Heart Rate (6)	<input type="checkbox"/>	<input type="checkbox"/>
Sleep quality (7)	<input type="checkbox"/>	<input type="checkbox"/>
Stress level (9)	<input type="checkbox"/>	<input type="checkbox"/>
Other (8)	<input type="checkbox"/>	<input type="checkbox"/>

Page Break

**Q15 Are you ok that your Wearable shares private data when you are not at your workplace? (In your free time)**

☐ Yes (1) \_\_\_\_\_

☐ No (why not?) (2) \_\_\_\_\_

**Q16 Do you think that sharing data of your Wearable with your employer would increase work-life balance?**

☐ Yes (1) \_\_\_\_\_

☐ No (why not?) (2) \_\_\_\_\_

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Page Break

**Q17 Would you like to have your employer informed about your health status and indicators like stress level so that he can act and support you?**

☐ Yes (1) \_\_\_\_\_

☐ No (why not?) (2) \_\_\_\_\_

-----  
**Q18 Would you like to have your employer informed about your fitness status and goals so that he can act, support and incentivize you?**

☐ Yes (1) \_\_\_\_\_

☐ No (why not?) (2) \_\_\_\_\_

-----  
**Q19 Do you have any further remarks regarding Wearable Technology offered by your employer and used at work?**

\_\_\_\_\_

-----  
Page Break

**Q20 Feedback: Do you have any suggestions to improve this questionnaire?**

\_\_\_\_\_

-----  
Nearly done, now only basic demographic questions are left:

**Q21 Nationality**

- ☐ Austria (1)
- ☐ Germany (2)
- ☐ Portugal (3)
- ☐ Italy (4)
- ☐ France (5)
- ☐ Brazil (6)
- ☐ Other (7) \_\_\_\_\_

**Q22 Age:**

\_\_\_\_\_

**Q23 Sex?**

- ☐ Male (1)
- ☐ Female (2)
- ☐ Inter-sexual (3)

**Q24 Field of study or industry interested to work in:**

\_\_\_\_\_





**Q25 Employment status?**

- ☐ Student (7)
- ☐ Working (paid employee) (1)
- ☐ Working (self-employed) (2)
- ☐ Job seeking (4)
- 

**Q26 Highest degree of education?**

- ☐ Doctoral degree (1)
- ☐ Master's degree (2)
- ☐ Bachelor's degree (3)
- ☐ High school graduate (4)
- ☐ Less than high school degree (5)

End of Block: Default Question Block

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