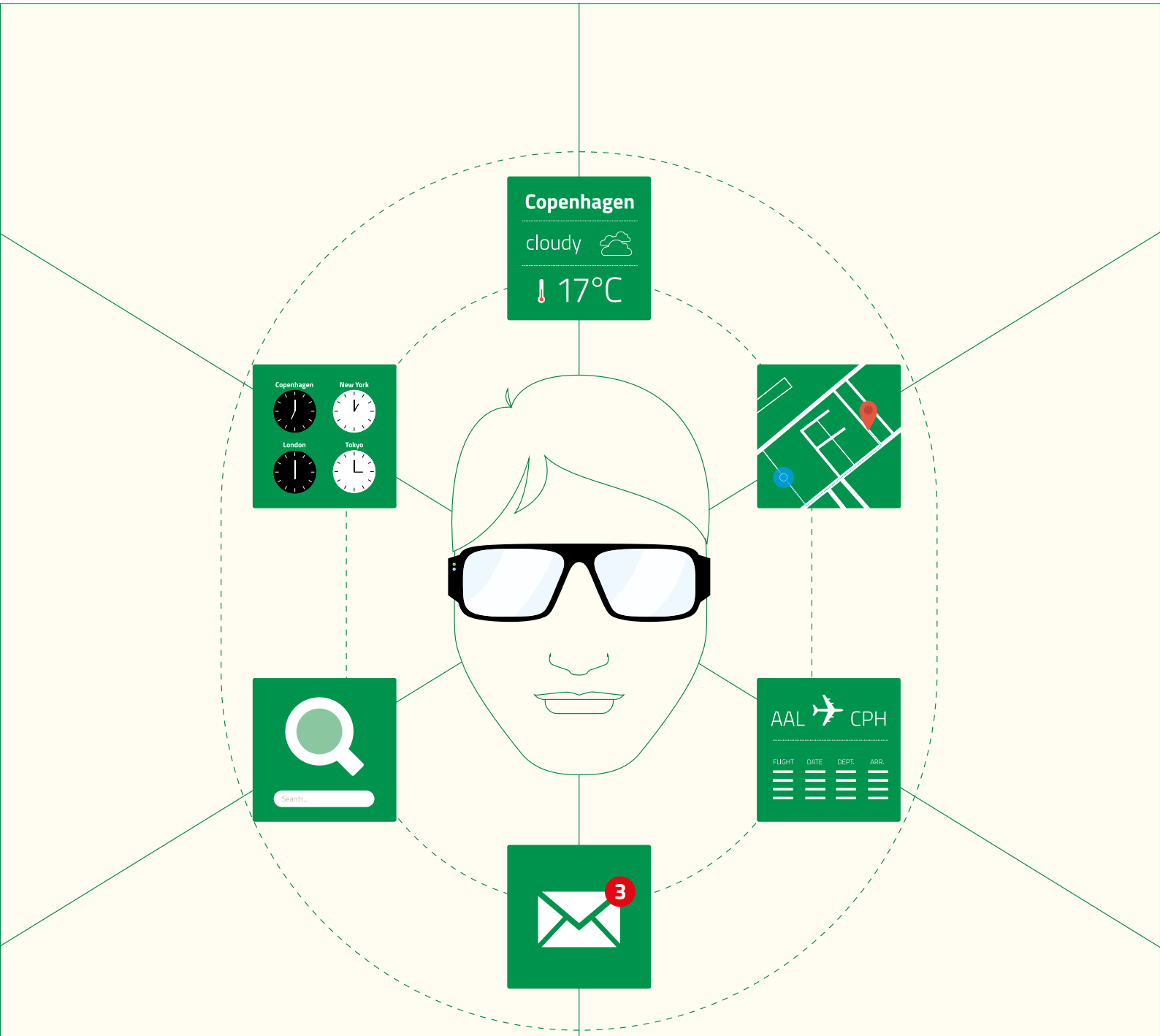
Seven Theses on the Future of Smart Glasses

A trend analysis of the future of smart glasses in retail



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Executive summary

This report shows that opticians and people with interests in the eyeglass business need to be ready to understand, assist with and even sell smart glasses within the next five to seven years. On the background of an analysis based on research, papers, news stories, interviews and surveys, seven theses about the technological development and nearby future of smart glasses are proposed. The report shows that:

- *Today's smart glasses are similar to the first versions of smartphones. But technological development is exponential and smart glasses will soon be mainstream. However, not as widely adopted as smartphones.*
- *Google Glass is an icebreaker product and other products are following in the slipstream. There are already many different smart glass products on the market and on a prototype level. All the big IT companies and many startups are already producing and/or have patents for new products.*
- *Early adopters will start using smart glasses in three years and the early majority in five to seven years.*
- *In terms of use and design, smart glasses will be divided into two types: 1) glasses for industrial, health and fitness purposes that will have many functionalities and thus a more computerized and sporty design, and 2) glasses for the ordinary consumer that will look more like ordinary glasses with fashionable designs.*
- *This new product category introduces technology to previously prohibitive scenarios where safety, logistics and even etiquette limited the use of laptops and smartphones. While consumer use is in the spotlight today, we expect business to drive acceptance and transformative use cases.*
- *The opticians' target group will shift from including mainly people aged 50 or above who need prescription glasses to also including a whole new group of millennials who will demand smart glasses and help will be needed regarding choosing the right frames, design, technology, etc.*
- *Furthermore, the target group will shift from only comprising private users to also including industrial users, as the differences between specialized industrial products and consumer versions will increase – e.g. Google Glass may be adapted and used by doctors as a crucial tool for operations.*
- *The report concludes by suggesting that the classic competencies from the fields of optics and ophthalmology, as well as opticians' knowledge about frames, design, etc., will become highly valuable in a future when smart glasses will be mainstream.*

Seven Theses on the Future of Smart Glasses

A trend analysis of the future of smart glasses in retail

The overall aim of the report is to look to the future and try to determine when and how smart glasses will be used and sold on a regular basis. The main question that will be addressed in the report is asked from the perspective of opticians and spectacle retail stores: What is the future of smart glasses?

The report will discuss this question on the basis of seven theses about the near future.

- *Smart glasses is a completely new product category, but a combination of known elements*
- *Technological development is exponential and the smart glass future will be here soon*
- *There are several smart glasses on the market and more to follow as part of a broad wearable trend that is already huge and converging*
- *Smart glasses will be mainstream in five to seven years, starting with young early adopters in three years*
- *Smart glasses are linked to a data revolution and will initially be big in healthcare, sports, fitness and enterprise*
- *Fashion and price will be key market drivers regarding the broad majority's adoption of smart glasses*
- *Smart glasses are part of the broad category of "spectacles", and opticians' salespeople will need new competencies to handle the technology and understand its social implications.*

The theses are not presented in a specific consecutive way. They represent different takes on the new phenomenon of smart glasses, but they all consistently point towards a future involving significant use of smart glasses.

These theses are proposed in order to establish a thorough understanding of the technology and market drivers of smart glasses. On this basis, the aim of the report is to forecast when and how smart glasses will be mainstream and thus something for opticians to deal with. The report concludes by suggesting that the classic competencies in the fields of optics and ophthalmology, as well as opticians' knowledge about frames, design, etc., will become highly valuable in a future when smart glasses will be mainstream. Thus, there are many good reasons for opticians to gain knowledge of the technology and establish retail strategies. This report will explain how and why.

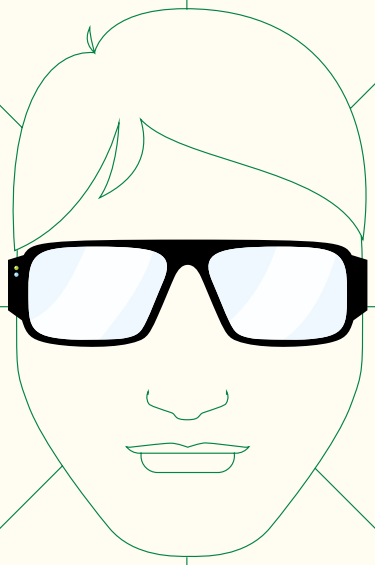
Thesis 1

Smart glasses is a completely new product category, but a combination of known elements

Perspectives

Thesis 2

Thesis 7



Thesis 3

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Overall, smart glasses are part of a new emergent trend known as wearable technology, which also contains products such as smart watches, jewellery, sportswear and clothes. In short, wearables are products that can be worn for an extended period of time and have advanced circuitry, wireless connectivity and independent processing. Most trend experts believe that computer processes in general will be a ubiquitous part of our daily lives in the near future.

On the other hand, smart glasses are also a distinct independent category within the wearable trend which is a combination of known things: spectacles and app-based computers (like the smartphone). This emergent technology and product type is currently being introduced as a concept on the market, with Google Glass as a driving force. There has been a great deal of "hype" and publicity about smart glasses, especially Google Glass, which has paved the way for other products and a wider discussion in the public and media about the technology and related issues such as privacy, social etiquette and possible effects on the eyes. However, before proceeding with a presentation of the other theses, I will provide a brief explanation of the technology and related concepts.

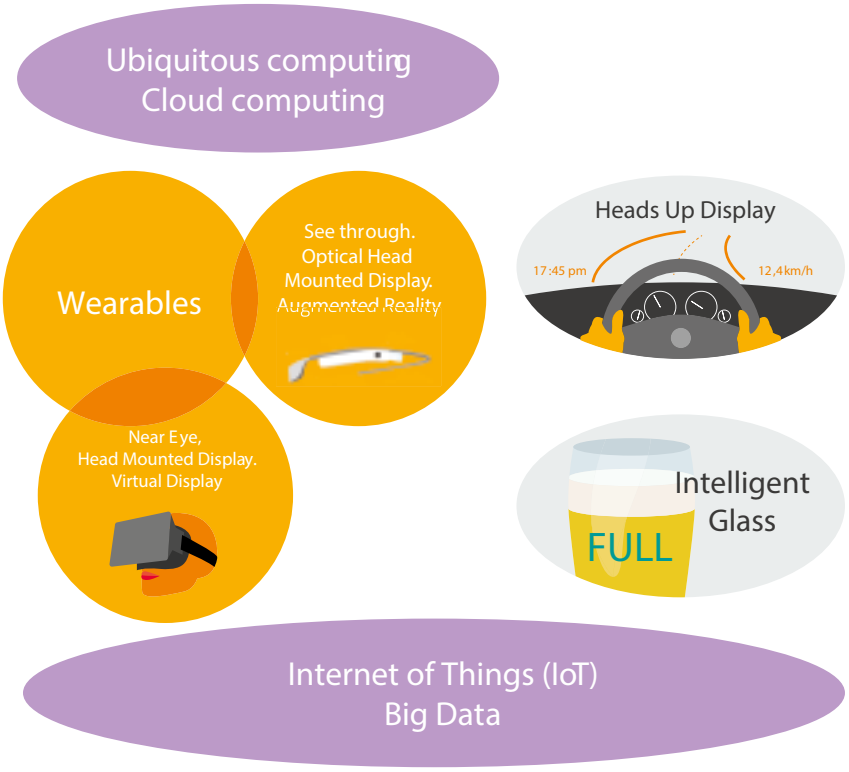


Figure 1: *The different smart glass concepts. This report focuses on the see-through technology as part of the broad wearable trend. Heads-up display is also used e.g. in cars (not as head-mounted), and intelligent glass is also applied in other areas like glass and mirrors (not heads-up display). The Internet of Things, sensors and Big Data as well as ubiquitous computing and cloud computing are part of the same overall technological development that has enabled the development of smart glasses.*

Google Glass has been and still is the driving force behind the new trend of smart glasses.

Google Glass has been and still is the driving force behind the new trend of smart glasses. As a type of technology, it is characterized by being an optical head-mounted display (OHMD). This is a device that is mounted on the head with a display which reflects projected images (e.g. a map) from a computing

Figure 2: *Oculus Rift, left in the picture, is an immersive head-mounted display that can produce a virtual reality. Google Glass on the other hand is a see-through smart glass with augmented reality functions.*

device, while the user can simultaneously see through the display.

This is somewhat similar to the head-mounted displays with opaque glass helmets that are typically used as devices for virtual reality gaming (e.g. Oculus Rift), but smart glasses with see-through displays and augmented reality functions (laying digital information on top of reality) are also a completely different type of product with a wide range of applications. Smart glasses function very much in the same way as mobile phones and tablets, with the possibility of implementing various programs (apps). Most products work with a combination of a few keys (touch) and voice commands. They often have the following features:

- *Camera and video functionality*
- *Speedometer, thermometer, altimeter, barometer, compass*
- *Calculator, clock, calendar*
- *Mobile telephony, typically via Bluetooth for the telephone*
- *GPS navigation*
- *Music*
- *Activity tracker, such as heart rate, pulse, and calories burned*
- *Connection to social media, e.g. Facebook*
- *Apps for news, gaming, work tools, etc.*
- *Communication via Wi-Fi, Bluetooth and GPS.*

In short, the same functionalities as in a smartphone or tablet, but on a smaller scale and at eye level. Unlike other wearables and body-integrated technologies, which require the user to look down or away, with smart glasses the user looks straight out at the world, without having to rely on the use of his or her hands. This provides

Figure 3: *Innovega combines a contact lens with smart glasses that project images onto the lens.*

a completely different interaction situation and radically new applications. The latest developments in optics technology are heading towards smart contact lenses and implantation. Much points to the possibility that contact lenses will take on a vast field of applications, since they may not be seen as aesthetically and socially disruptive. Google have already made great strides in this field with their "smart contact lens". However, fully functional smartphone-like smart contact lenses lie well further into the future than smart glasses.

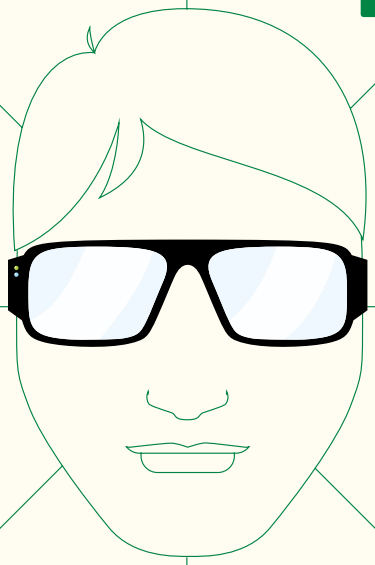
Another approach to making smart glasses less bulky may be to simply take the lens needed to magnify what is on the display out of the glasses and bring it closer to the eye. A company called Innovega is doing this by developing contact lenses with a tiny bump that serves as a microscope for content that can be streamed from the inside of a pair of glasses. This and other kinds of technological convergences will be described in thesis 3. The following section presents a thesis about the overall technological development.

Thesis 1

Perspectives

Thesis 2

Technological development is exponential and the smart glass future will be here soon



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The development of smart glasses and their possible implementation in society are based on two key drivers:

A. *The development of smaller, more effective and cheaper technology*
B. *A development in the market and culture that is conducive to adopting the new technology*

As the technological development is the premise on which the rest is grounded, thesis 2 will state an obvious but sometimes forgotten fact: technological development has been and will continue to be exponential for some time. In theses 3 and 4 we shall look deeper into the market structure.

Five years ago, not many could imagine products like Google Glass. However, at that time only few people had smartphones. Today the smartphone is an ordinary thing for most people, and it is even hard to imagine that the smartphone we know today has as much computing power as a top-of-the-line Powerbook laptop did six or seven years ago. Many of the crucial building blocks of computing – microchip density, processing speed, storage capacity, energy efficiency, download speed, and so on – have been improving at exponential rates for a long time. This is an important point to consider in order to understand how quickly smart glasses will develop into products that look like a pair of ordinary glasses with limited attached awkward technology.

In this context the notion of exponential rates, also known as *Moore's law*, is key. Gordon Moore is the co-founder of Intel. He predicted the doubling of computer power every year (later adjusted to 18 months). As he said, one could buy twice as much power per dollar in 1963 as one could in 1962, twice as much again in 1964, and twice as much again in 1965.

Figure 4: Imagine a large football stadium. You are sitting on the top row, but next to you is a dripping tap. You are told that it drips 1 ml. the first minute, 2 ml. the second minute, 4 ml. the third minute, etc. If the stadium were sealed so that no water could disappear, how long would it take before the water flooded you? Answer: the stadium would be full of water after 44 minutes (8,796.093 m3 water).

This exponential curve has been a rule of thumb for the technological development of computer power since the 1960s. Physicists such as Michio Kaku suggest that this curve will continue until circa 2020-25. Others like Ray Kurzweill and researchers at the Singularity University claim the exponential growth will continue nonstop into the future, making machines many times smarter than human beings. But this is not a commonly held belief. However, looking at the curve over the last forty

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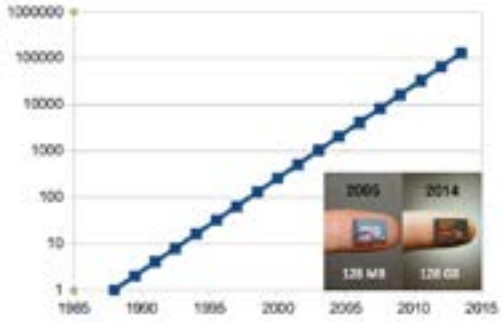
Figure 5: *Moore's law: Above the different products that have been enabled by the development. on the right, a doubling of computer power every 18 month. For instance, Google Glass has 2 GB ram, which is the same as the fastest PC, the Pentium 4, in 2006.*



Technology is getting smaller, cheaper and faster. But as most people are quick adapters and quick to forget the past, people tend to overestimate the development in the short term but underestimate it in the long term.

years and considering how it will continue the next five years (see figure 5 below) may indicate the general trend for the future.

Technology is getting smaller, cheaper and faster. But as most people are quick adapters and quick to forget the past, people tend to overestimate the development in the short term but underestimate it in the long term. Understanding the historical developments can help us give prognoses for the future, e.g. that the exponential curve will continue until 2022. What we see at the moment with the emergence of Google Glass and other smart glasses is just the beginning. They are all more or less first versions and prototypes of the product category. However, the development will not follow a linear curve, as we tend to think, but more of an exponential curve. It is therefore difficult to predict the kinds of products that will emerge, and when, but many signs indicate that user-friendly versions will soon be available on the market at accessible prices. However, this is of course the self-understanding in the industry, which is purely based on the technological possibilities if these could be projected into the future with certainty. But technology adoption and the market are also issues that need to be taken into consideration. This will be the focus of theses 4 and 5. But let us first look at the different types of smart glass products and their relation to the broader development of wearables.

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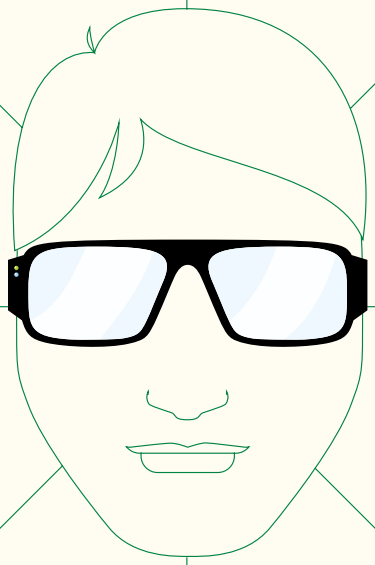
Thesis 1

Perspectives

Thesis 2



Thesis 7

Thesis 3

Smart glasses are part of a broad wearable trend that is already huge and converging

Thesis 6

Thesis 4

Thesis 5

Smart glasses are both wearable computers and spectacles. As a product category, smart glasses may thus be seen as a completely new type of product, but also as a combination of known things. Smart glasses as such are a converged type of product, but there are many different ways of interpreting the combination computer plus glasses. Overall, the development of smart glasses has been led by computer companies, as the primary functionalities are computer processes. Many companies have developed smart glass technology and all the big IT companies have filed for different patents (Lenovo, Microsoft, Apple, etc.). However, it was only with the release of Google Glass in 2012 that the development really took off. As Google is mainly a computer company, its design philosophy has also been not to develop smart glasses as such, but to move computer processes into the periphery of the user, and this can be done in many ways.

The overall thinking has thus not been concerned with glasses/spectacles as such, but solely with computing. This broader trend is called *wearable computing*, and the goal (the computer company vision) is to provide the user with relevant information at relevant times with as little inconvenience as possible, and at the same time be able to track, monitor, guide, record, and so on. It's a dream of the enhancement of everyday life.

One can think of other ways of doing this: developing smart contact lenses, smart clothes, smart watches, smart chips implanted into the skin and other more science fiction-like scenarios. However, attaching the

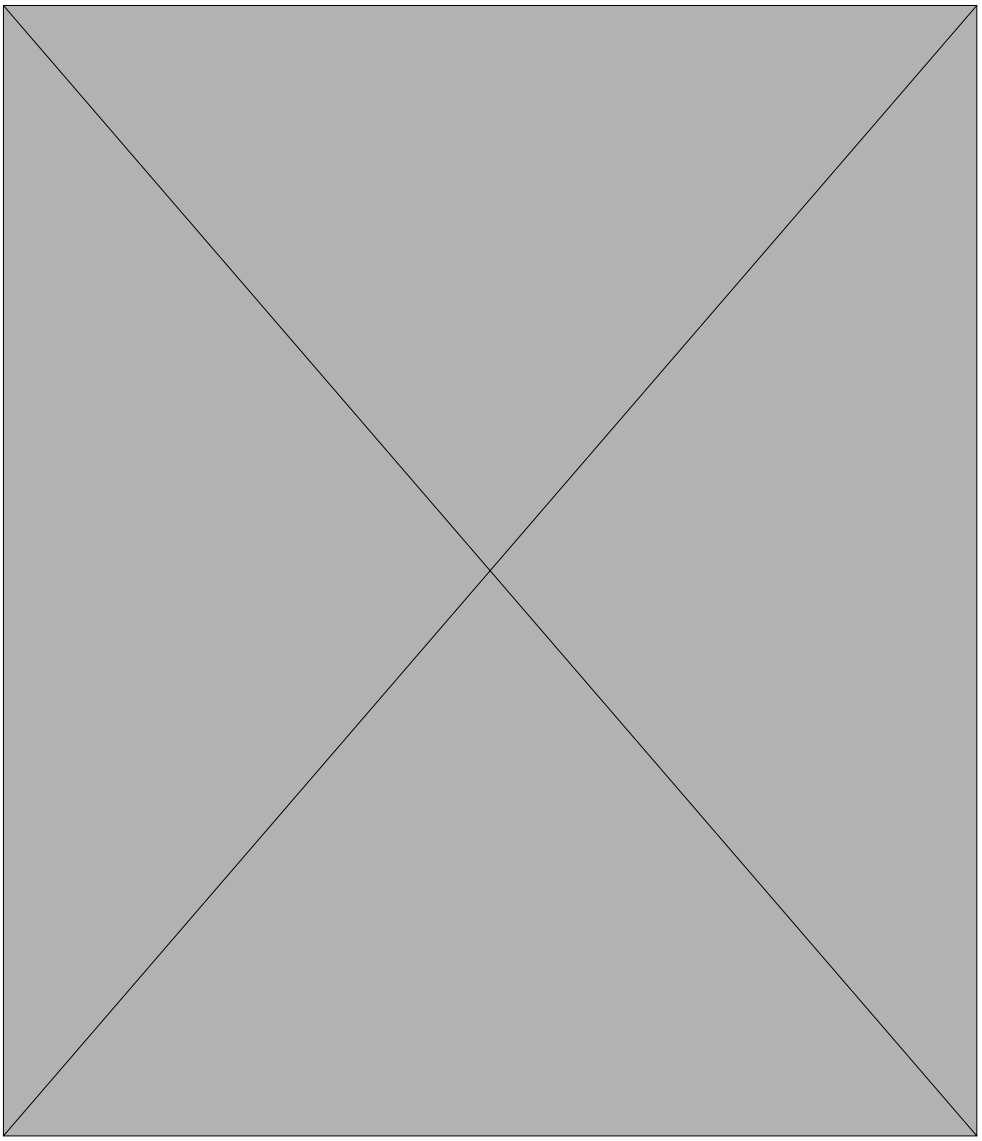


Figure 6: *Wearable technology is a potentially huge industry and directed towards all parts of the body. In this model smart glasses have a market share of 12%.*

... attaching the computer to a frame and placing it in front of the eye remains the most feasible way of fulfilling the wearable computer vision. It is a very tangible way of interpreting the computer design philosophy of information in the periphery.

computer to a frame and placing it in front of the eye remains the most feasible way of fulfilling the wearable computer vision. It is a very tangible way of interpreting the computer design philosophy of information in the periphery. Nevertheless, there has been a great deal of criticism of Google Glass for various reasons. One of them is that Glass looks too much like a science fiction computer placed on the face. In other words, the novelty of the product category computer + glasses involves an imbalance towards the computer part. Many other companies are now developing prototypes and many are already commercial products. There is a tendency moving towards restoring the balance between computer and glass and even moving the imbalance the other way.

These issues will be further discussed in thesis 4. But first we shall briefly look at the different products on the market today. It is not the intention here to review all the different glasses and their different functionalities, but merely to point out that there are differences in use cases, design and price. Most glasses cost about $500-1,000. Google Glass, which is currently only available in a beta developer version, costs $1,500, but is expected to retail on the market for $600. Below you can see a selection of different products.

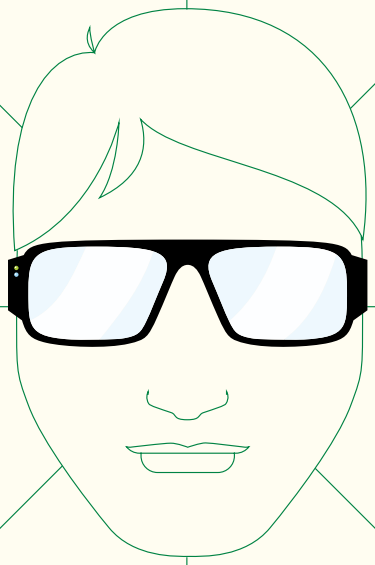
The companies' ability to construct the device with as small elements as possible, and their goals for how many different functionalites, the smart glasses must have, partly determine the level of the computerized design, with very visible computers on the frame, versus the normal spectacle design. Overall, there is a strong tendency towards the normal spectacle design, most prominently in the products: Laforge Optical, Icis; Weon glasses; Epiphany Eyewear and the new version of Google Glass, which is produced in close collaboration with Luxotica and RayBan.

Not only are many different types of products being developed and manufactured, but well-known major IT companies like Microsoft, Sony, Lenovo and Apple have also filed patents for versions of smart glasses. The simple fact that so many big companies and new start-ups are working on this kind of technology is itself proof that there will be many more smart glasses on the market in the near future. In the next section we shall take a closer look at this issue.

Thesis 1

Perspectives

Thesis 2



Thesis 7

Thesis 3

Thesis 4

Smart glasses will be mainstream in five to seven years, starting with young early adopters in three years

Thesis 6

Thesis 5

As stated in thesis 2, the technological development is growing exponentially. This was determined as market driver A), the development of smaller, more effective and cheaper technology. The second key driver is B), the development in the market and culture towards the adoption of new technology. Let us now consider this in more detail.

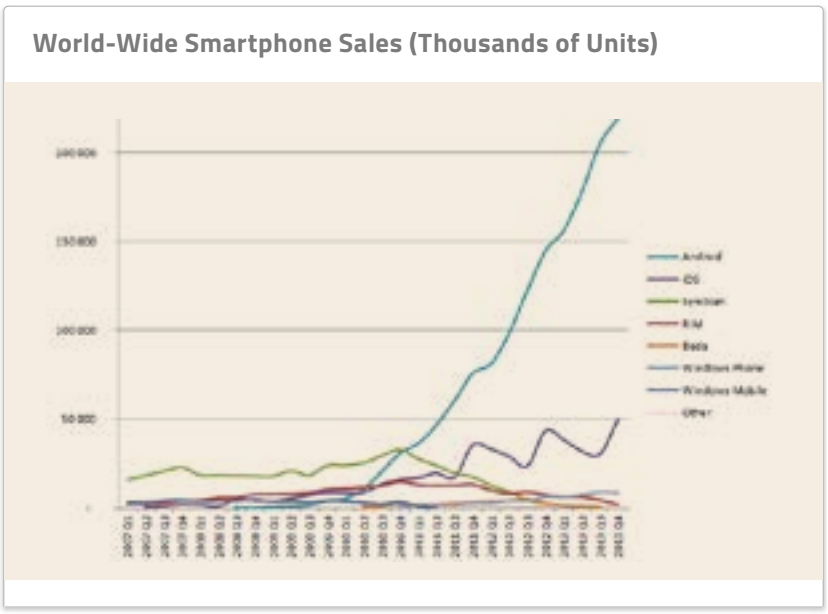


Figure 7: *The development of smartphone sales on the basis of different operating systems. Though smartphones whave been on the market since the mid 1990s, it was not until 2010 that the market grew.*

Currently, smart glass technology is where the first versions of smartphones were. The first smartphones were the Nokia 9000, BlackBerry and Windows Mobile from the mid 1990s. But it was not until the release of the first iPhone in 2007 and the 3G version in 2010, and in particular the release of the Android operating system the same year, that the product category really took off. In other words, there was a development period of 10 years from the first version to widespread adoption. However, with the exponential development curve in mind, this period will be shorter for smart glasses – but presumably not similar, as the smartphone is a "unique" and "necessary" product.

Nonetheless, when some people say that they won't use smart glasses in the future because they don't know what they need it for, it is relevant to recall the history of technology and especially what has been coined the "Walkman effect". In its day the Walkman encountered a lot of criticism from the man in the street. In aesthetic terms, many people thought it was just plain silly to walk around with big headphones on one's head. They also considered it profoundly antisocial to wear them in public. The Walkman effect returns in relation to smart glasses, because smart glasses also represent a new, different and visible element on the head, which can control mental impressions. So it is not entirely surprising that the same issues crop up. The history of the smartphone and the tablet is similar: at first people didn't know what to do with the technology, but as the products developed people started buying. However, the development of acceptance and use of products follows two types of models, which can be understood through 1) the diffusion of innovation and 2) the "hype cycle".

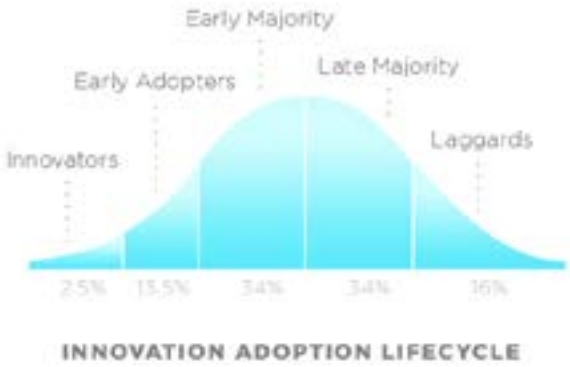


Figure 8: *According to Rogers the diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Within the rate of adoption, there is a point at which an innovation reaches critical mass. The categories of adopters are: innovators, early adopters, early majority, late majority, and laggards. Diffusion manifests itself in different ways in various cultures and fields and is highly subject to the type of adopters and innovation-decision process.*

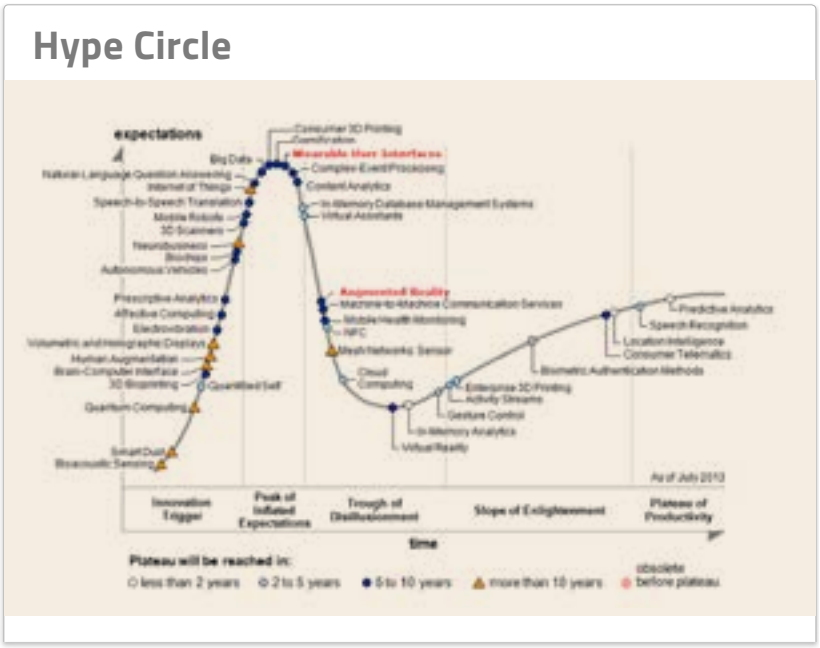


Figure 9: *The Gartner hype cycle is published every year with a description of new technologies.*

The logic of the diffusion model is that a new product and trend will follow a specific pattern regarding early adopters that use the product long before the early and late majority. At present, the innovators in the US are only slowly adopting smart glasses.

The logic of the hype cycle is similar, but comes from a different angle. Every type of technology moves through different stages: from the innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and finally the plateau of productivity. At the top of the "mountain" in the 2014 version with a peak of inflated expectations is "Wearable User Interfaces", which includes smart glasses. It is marked with a blue dot, which means that it will hit the plateau of productivity in five to 10 years. But it first "has to" go down and through a period of disillusionment.

We did some research in order to track the talk about Google Glass specifically. As figure 10 shows, there has been some peaking in the talk about Google Glass. And as the graph shows, it is now dramatically falling, which supports the logic of Gartner's hype cycle.

Figure 10: *The development of interest in Google Glass has some peaking points but falls dramatically from July 2014.*

Figure 11: *Projection of sales of Google Glass. Source: Business Insider Intelligence.*

Combining these models gives a good insight into the current development of Google Glass. The first version of Google Glass from 2012 may be compared to some of the first versions of smartphones from the beginning of 2000. At the moment, only innovators and very early adopters are using smart glasses, and it is our guess that it will be approximately seven years before the majority will have adopted a version of the product.

The first version of Google Glass from 2012 may be compared to some of the first versions of smartphones from the beginning of 2000. At the moment, only innovators and very early adopters are using smart glasses, and it is our guess that it will be approximately seven years before the majority will have adopted a version of the product.

BI Intelligence predicts that 22 million of these glasses will be sold on the world market by 2018. That is three years from now, and implies adoption by the early majority. However, the report "Smart Glasses: Consumer, Enterprise and Healthcare Strategies and Forecasts 2014-2019" estimates that shipments are unlikely to exceed 10 million per annum until 2018. And in its white-paper, "Wearable Technology – Market Assessment", HIS Electronics and Media foresees that the market for wireless devices, including smart glasses, will grow at a rate of 18% in the coming years.

In either case, it is currently very difficult to give more precise prognoses of the future sale of smart glasses. It is more interesting to take a closer look at some of the surveys and data-gathering work that has been conducted as part of this trend reporting. We conducted several types of research in order to gather data about the possible adoption of smart glasses in the future:

- *Survey among 1,680 Danish students*
- *Scanning of the 52 most popular reviews of Google Glass based on Google page rankings*
- *Big data mapping and analysis of twitter mentions of smart glasses, Google Glass, wearables and related terms.*

Survey among Danish students

We did a survey among 1,680 Danish students at different universities to find out about their knowledge of smart glasses and thoughts about possibly using a pair of smart glasses if they were affordable (i.e. smartphone price). Overall, 73% of the respondents knew about smart glasses such as Google Glass. However, the most interesting question was about using smart glasses in relation to being a student and doing student activities.

The students were asked if they would consider using smart glasses as a tool for their studies. Around 22% answered yes, 44% answered no and 34% answered maybe. Overall, this indicates that students currently have difficulties understanding the usefulness of smart glasses. But considering that it is very difficult to acquire a pair of smart glasses, it is likely that none of the students have actually tried a pair. So their answers depend on their ability to imagine use cases. Taking into account the fact that the general population almost always meets new technology with some restraint to begin with, it is actually surprising that 22% stated that they would buy and use a pair. This number is in the middle range compared to other surveys conducted. A survey by Love-MyVouchers (n=1132) (2014) concluded that 68% would not feel comfortable using smart glasses when talking to other people, leaving 32% as potential buyers. Other studies from Glass Almanac show that, at the moment, 12-15% of American consumers would be willing to buy Google Glass if the cost was $750 (Braaten, 2014). This survey also shows that the target group consists mainly of young men between the ages of 18 and 34 (the millennials) – like the university students in our survey. If we look even more closely at the target group, our survey shows that, among the students from business-oriented

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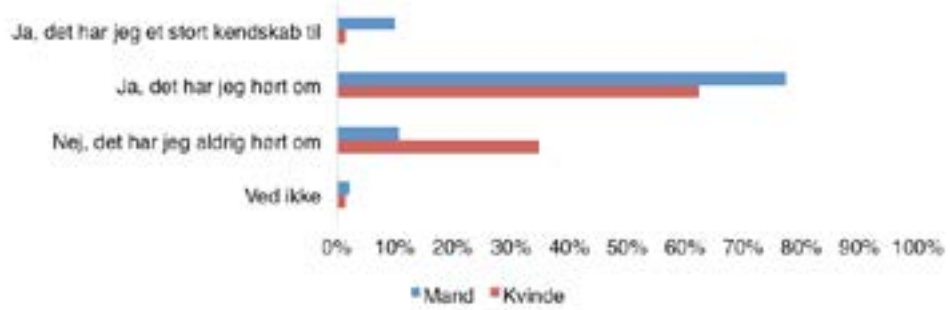
If we look even more closely at the target group, our survey shows that, among the students from business-oriented universities, as many as 53% of the students would buy a pair and use them. We can thus presume that there is an early adopters market of at least 20% within the 18-34 demographic *at the moment.*

universities, as many as 53% of the students would buy a pair and use them. We can thus presume that there is an early adopters market of at least 20% within the 18-34 demographic *at the moment.* This is comparable to the adoption of smartphones a decade ago. However, this is all based on the students' imagination of the product, as in fact none of them or only very few have tried a pair. A premise in this imaginary concept is thus that the product is affordable and that it fulfils the user's needs with useful functionalities and design.

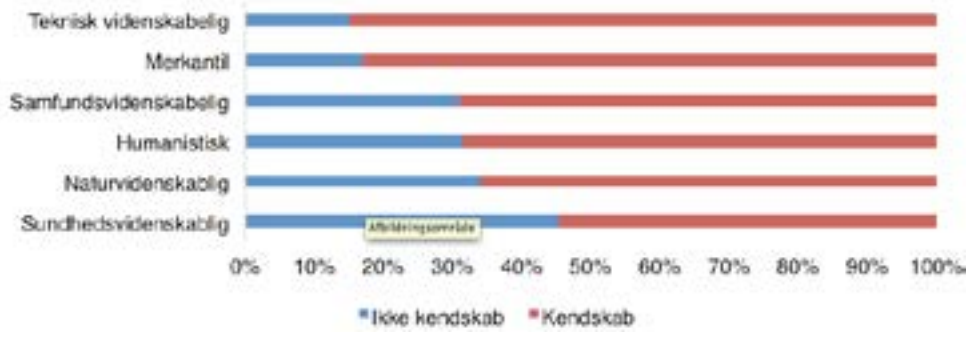
Figure 2: "How familiar are you with intelligent glasses such as Google Glass or Epson Moverio?" by gender



Source: Analyse & Tal 2014 **1680 respondents**

Figure 12: *The students were asked: "Do you know about smart glasses?", and most of the students do. However, there was a difference regarding sex: men know more about the technology than women. And 10% of the men know a lot about the technology while 38% of the women have never heard of it.*

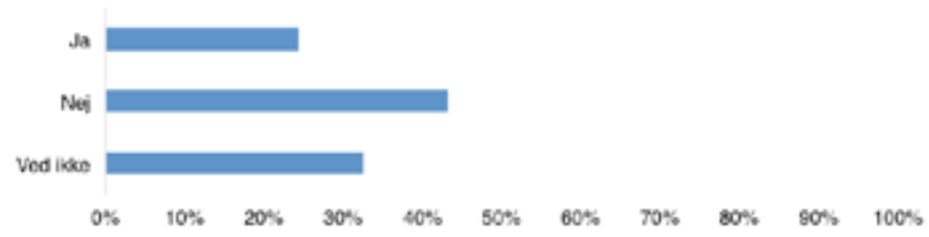
Figure 3: "How familiar are you with intelligent glasses such as Google Glass or Epson Moverio?" by academic area



Source: Analyse & Tal 2014 **1628 respondents**

Figure 13: *Students from different Danish universities have different levels of awareness of smart glasses. Students from the technical and business-oriented universities have a great deal more knowledge about the product than students from the rest of the disciplines. This may be due to the fact that they are more oriented towards technical products and the market in the first place.*

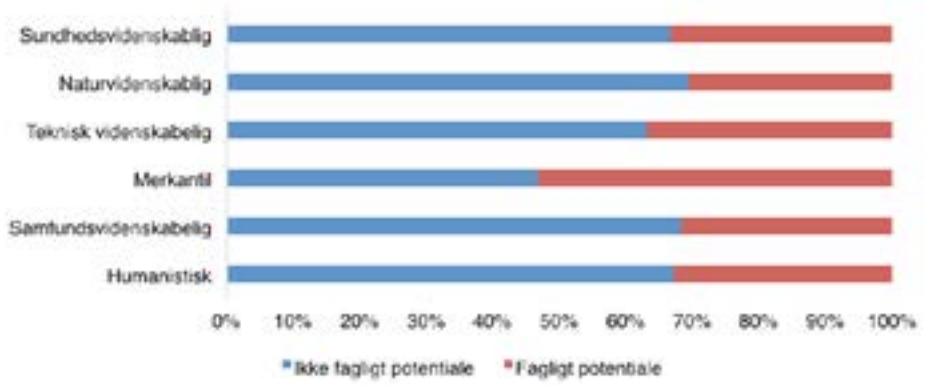
Figure 5: "Do you think intelligent glasses has potential as a study tool for you?"



Source: Analyse & Tal 2014 **1216 respondents**

Figure 14: *The students were asked if they would consider using smart glasses as a tool for their studies. Around 22% answered yes, 44% answered no and 34% answered maybe. Overall, this indicates that students currently find it difficult to understand the usefulness of smart glasses. But more interestingly, 22% would currently consider buying a pair if they were accessible and affordable.*

Figure 8: "Do you think intelligent glasses has potential as a study tool for you?" by academic area



Source: Analyse & Tal 2014 **798 respondents**

Figure 15: *Students at different universities were asked if they would consider using smart glasses as a tool in their studies. 60-70% of students at most universities answered no, but 53% of students from the business-oriented universities answered yes. This indicates that students with an interest in markets and new products have more faith in the usefulness of smart glasses than other students.*

Data from the 52 most prominent reviews of Google Glass

We also examined 52 of the most prominent reviews of Google Glass through semi-automatic text analysis (ANTA) and scanning and readings of more than one year of relevant news sites. We tagged the many different words in the reviews and developed a network, as shown in figure 16.

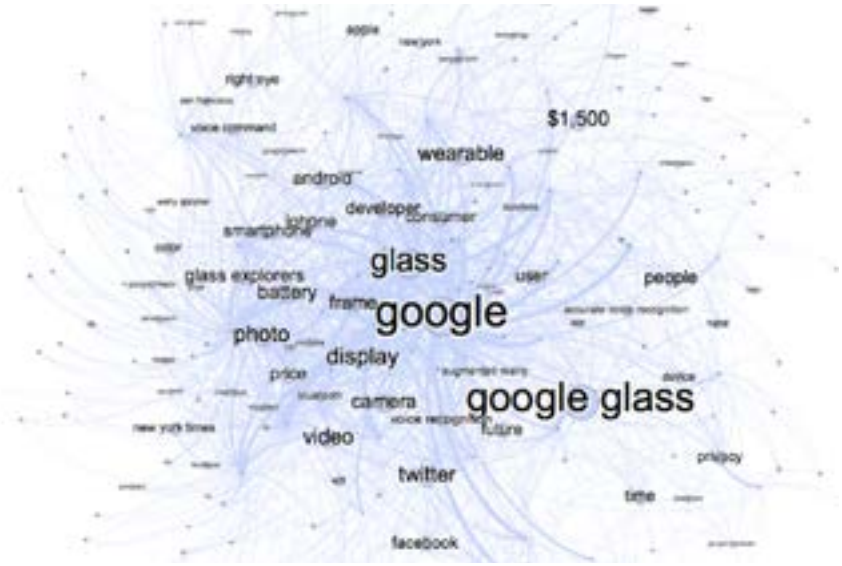


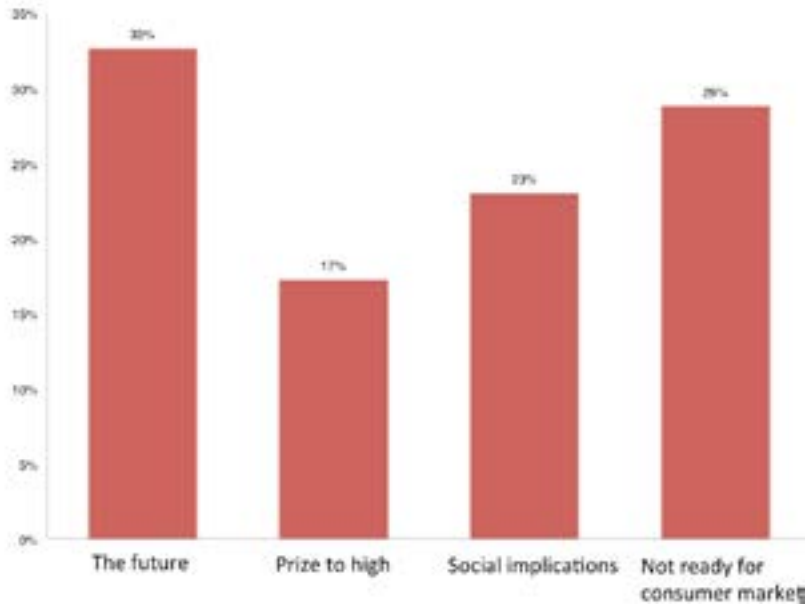
Figure 16: *A dash between two words means that the words have appeared in the same review. The sizes of the various words are then calculated according to the number of times the word appears in the overall data material.*

As can be seen from figure 16, a large proportion of the words described hardware and software. In the text network, we see this expressed with terms such as display, camera, video, voice command ("ok glass"), battery, voice recognition, Bluetooth, Wi-Fi, interface and touchpad. In this context, the reviewers discuss what works and what doesn't work. For example, many of the reviewers are thrilled by voice recognition, while many are displeased with the battery life. The reviewers compare Google Glass with smartphones and Iphones. Comparing it to other devices, reviewers notice the absence of so-called "killer apps". These could be applications in line with Google's own google maps, google plus and gmail, and other applications from third-party developers, such as the New York Times, CNN, Facebook and Twitter, which all occur in the text network and thus play an important role for reviewers. This surely indicates that reviewers are concerned with the technological properties of the product. However, the most interesting parts are shown in figure 17.

Figure 17 shows the four overall themes of the reviews. The issue of social implications will be discussed in thesis 6. Questions about the future of the product were addressed

...at the moment there are two big obstacles beside the social implications: the price and consumer acceptance. In both cases, this will naturally be solved through technological and cultural development.

Figure 17: *The overall themes that recur in the reviews are the future price, social implications and the question of whether the product is ready for the general user.*

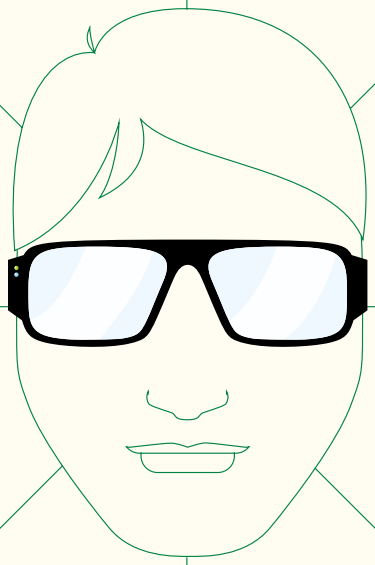


earlier. As an addition it can be noted that mentioning "the future" and talking about smart glasses as part of the future is very natural for the reviewers, but that at the moment there are two big obstacles beside the social implications: the price and consumer acceptance. In both cases, this will naturally be solved through technological and cultural development. However, it is worthwhile considering in detail what the prime market drivers will be. This will be the topic of thesis 5, which will specifically address the consumer market versus the industry market, taking price into consideration.

Thesis 1

Perspectives

Thesis 2



Thesis 7

Thesis 3

Thesis 6

Thesis 4

Thesis 5

Enterprise, healthcare and fitness will be key market drivers for smart glasses in the first phase

As shown in figure 17, the reviewers generally address functionality and the broad consumer market as issues to be dealt with. As stated above, the challenge at the moment is that the technology is in a phase comparable to that of the first smartphones, which means that both the technological functionalities and the consumer culture and view of the technology is premature. But, as has also been stated, Google Glass is currently a kind of icebreaker that takes on all the battles regarding technology, functionalities, design, privacy and so on, and many other companies and products will follow in the slipstream.

We carried out a big data twitter analysis of keywords. Through the open source tool Twitter Capture and Analysis Toolset (TCAT), we collected 361,898 tweets dealing with wearables from 1 September to 1 October 2014. Throughout that month, the program collected all tweets containing words related to smart glasses and wearables. Figure 18 shows a network map of the keywords and their connections. This research shows four major and recurrent themes: overall discussions of 1) wearables, 2) related technologies, 3) health, and 4) privacy.

... Google Glass is currently a kind of icebreaker that takes on all the battles regarding technology, functionalities, design, privacy and so on, and many other companies and products will follow in the slipstream.

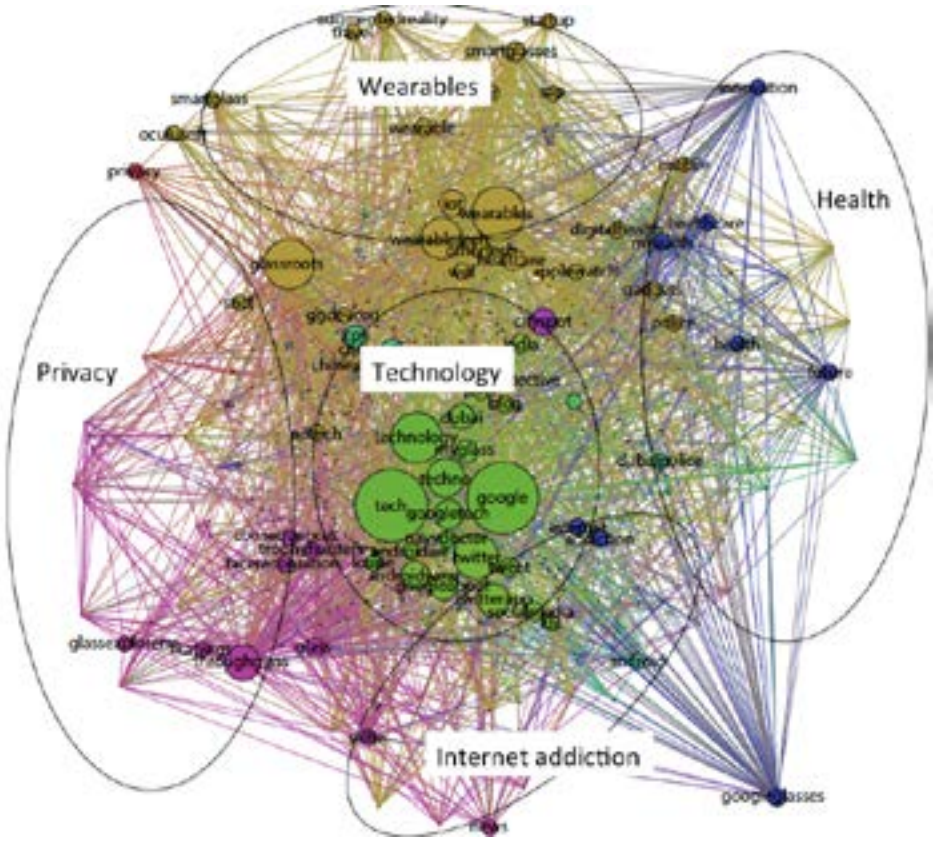


Figure 18: *A dash between two hashtags means that these hashtags have appeared together in at least one twitter message. The size of the various hashtags are calculated according to the number of times the hashtag occurs in the overall data set. For the sake of simplicity, only words that appear in more than 40 tweets are included. Finally, the figure shapes are coloured so that hashtags that often occur together are located near each other and have the same colour (so-called modularity).*

Concerning key drivers in the market, the different possibilities regarding technological functionalities and usefulness are central concerns, especially in the area of health and fitness. Based on our analysis, data gathering, talks with experts and reading of reports, whitepapers etc., we believe the overall key market drivers will be:

1. Industry
Industry adoption: surgery, education, project planning, emergency, warehouse and packaging, production facilities, advertising, repair situations, patient records, telemedicine, healthcare monitoring, etc.

2. Consumers
A. Task-related adoption: cycling, running, wayfinding, impaired person use (blind, hearing, cognitive disabilities), sport, project planning, etc.

B. Infotainment adoption: gaming, cooking, social updates, note taking, calendar use, search, personal health, fitness and tracking, etc.

Target group
Just as there are different key market drivers regarding use cases, there are of course also different target groups. Overall, the target group is differentiated into the two segments following the difference between use cases from industry and consumers. While use in industries will be driven by the different tasks that have to be solved, e.g. information for doctors, policemen, service encounters and entrepreneurs, consumer use will, at least in the beginning, be driven by health, "quantified selfers" and fitness. Consequently, users in industry will be older and will not be divided by sex in any significant way, although it can be expected that male users will dominate in the beginning, partly due to their overrepresentation in e.g. surgical medicine, police, production, etc.

... 64% of millennials said they would be excited to try a wearable technology product, compared to 42% of the general population. Thus, companies (opticians) need to have young people – their lifestyles, desires and aesthetics – in mind when selling and providing services to them.

However, this relatively low difference will not apply when it comes to the broad consumer use. Here, as shown by our survey (figures 12-15), the early adopters will tend to be young males (millennials: 18-34) with technical and/or commercial backgrounds. The PWC survey in "The Future of Wearables" shows that 64% of millennials said they would be excited to try a wearable technology product, compared to 42% of the general population. Thus, companies (opticians) need to have young people – their lifestyles, desires and aesthetics – in mind when selling and providing services to them.

Furthermore, 62% of millennials aged 18 to 24 said they expect half of all TV watching to take place on wearable screens like smart glasses in the future. And as social media become more and more fundamental to the way millennials receive information and interact with friends and family, the millennials will want their smart glasses to offer unobtrusive anytime/anywhere access to their favourite networks. Regarding the gaming functions, younger millennials are even more drawn to the products: 64% of consumers aged 18 to 24 say they would be motivated by this feature. And perhaps even more interestingly, millennials in particular are enthusiastic about applications of wearable technology in the workplace: 83% say its potential to make us more efficient and more productive at work is an important benefit, and they are more than twice as likely as adults aged 35 and older to say they want their device to provide information about their personal productivity on the job. This relates to the new concept of the enterprization of consumers.

... millennials in particular are enthusiastic about applications of wearable technology in the workplace: 83% say its potential to make us more efficient and more productive at work is an important benefit ...

The 'enterprization' of consumers
A relatively new trend in technology is what has been known as consumerization, that is, the reorientation of product and service designs around the individual end user. The emergence of the individual consumer as the primary driver of product and service design originated from a major IT industry shift after the early decades of computer usage and development, which was dominated by large businesses and government organizations. Consumerization has taken place roughly since the introduction of the personal PC and specifically since the introduction of internet services such as Facebook, which present a challenge to corporate intranets, as well as smartphones and tablets, which have outcompeted many similar but less user friendly corporate devices.

The Google Glass strategy has been to follow the consumerization path, partly of course because the market is larger, and partly because the history of new technologies shows that consumer-friendly products will eventually be used in business as well. However, several experts forecast that the development of wearables will be central to how employees conduct their work. This is particularly the case with smart glasses, which have so many obvious use potentials in business that they will probably reverse recent technological history and make the *enterprization of consumers* a new trend.

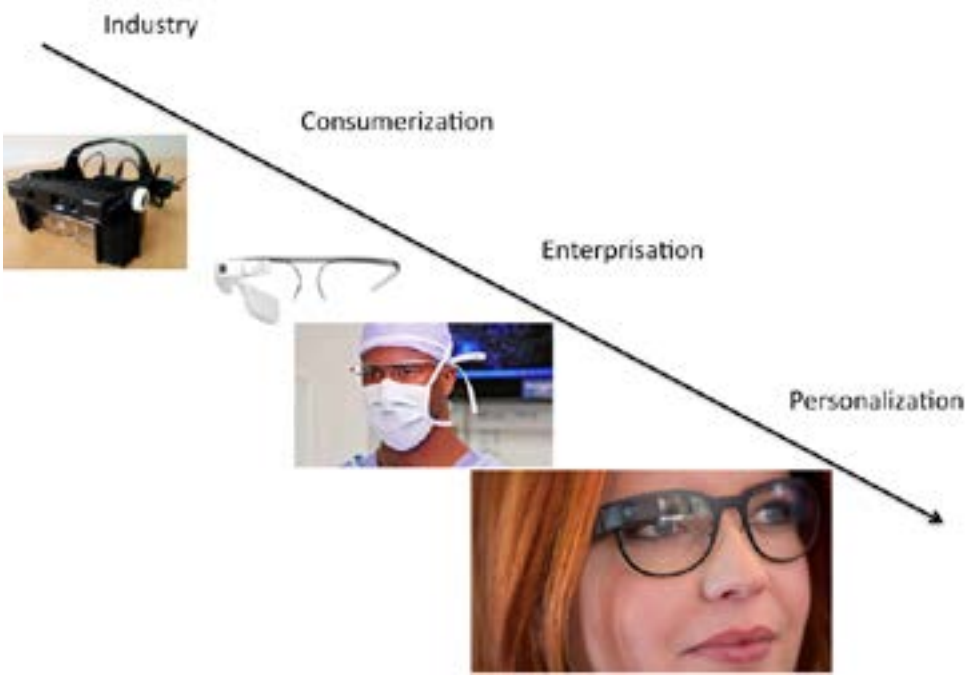


Figure 19: *A new trend: A) industrial design that lacks user-friendliness. B) design for consumers with user-friendly functionality. C) enterprise picks up the product and makes use cases. D) consumers want personalized versions.*

This is also evident when one looks at the different smart glass products as they predominantly direct their focus on industry and the B2B market. Google Glass has had and still has a very strong consumer approach (with cooperation with e.g. RayBan producer Luxottica), but has recently introduced their "Glass at Work" programme, which involves 10 official (big) companies applying Glass in different settings. One of the most talked-about use cases has so far been the use of Google Glass by doctors. This shows a new trend whereby products designed for consumers are first applied by industry and then by consumers (figure 19). So industry and business will properly drive the market in the first instance, especially regarding manufacturing and health.

... This shows a new trend whereby products designed for consumers are first applied by industry and then by consumers...

Use in task-related areas and in industries

It has become apparent that there are vast ranges of directly useful and task-related functions that make sense on an intuitive level, because Glass lets the user use his or her hands. These include the projection of instruction manuals, road maps and various other similar resources at eye level, while workers are, for example, engaged in extinguishing fire, pursuing criminals, operating on patients, etc. There is also one highly important function: smart glasses can in many cases enable others to see what the user is seeing. So it is not just a question of accessing necessary information; an instructor who sees what the user sees can also guide him through a process. So there are evident applications, not only in relation to carrying out tasks, but also, more specifically, in relation to education, instruction and personal health, in a more or less medical sense of the word.

Google is in the process of developing an app that can tell the person where he/she is, because it can recognize the neighbourhood, the inside of the house, etc. This will

be of use to people who are blind or who suffer from cognitive disorders such as Asperger's syndrome and Alzheimer's. The potential in this area is significant.

The things that are crystal clear to most commentators are the use cases for enterprises in manufacturing, oil and gas, healthcare and field service. The same use cases crop up over and over again. These companies have real business metrics showing ROI that allows them to justify spending significant money on solving these problems in the enterprise.
Overall, the key market drivers in industry and task-oriented work will be:

- *Relevant functionalities that can enhance everyday life in work settings*
- *Development regarding combination of different data types and devices: big data, smartphone as hub and combination of data sources*
- *Economic considerations regarding performance efficiency and time-saving.*

Commercialization and the broad use in society
One of the big market drivers in the whole wearable tech industry is personalization and service thinking. This implies among other things implementation of fashion thinking as a huge issue. The practice known as "human-centred design" is one that can reshape an entire enterprise and its capabilities system around the customer or user experience. This practice is critical to the success of wearable devices. Design thinking is slowly being embedded in disruptive strategy and innovation, with a focus on optimizing the customer experience. But this was not the case in the beginning, when the development was driven by a strong focus on computing and technology. Much of what is on the market today still lacks this critical design element. The category of smart glasses is still in its infancy, but as innovation speeds along, human-centred design will emerge as a key differentiator – and a key driver of smart glass success.

In addition to the direct applications which tackle specific problems, smart glasses are also useful to a wide lifestyle segment of people, who today are known as quantified selfers (QS'ers). These people are characterized by their "need" to measure their behaviour. This is done by using technology that measures and correlates self-reported or self-measured data. Thus people get an instantaneous picture of their state of being. Health and fitness applications are thus not only seen as hospital tools, but as personal and private tools.

There are already an enormous amount of technology and programs on the market to measure sleep, motion, food and body signals, such as blood sugar, heartbeat, blood pressure, etc. Combined with social media, where one can share statuses, smart glasses could play a special role, because they equip people to document even more of their lives as they are lived. This is also known as life-logging. The number of people who think about, document and share their lives has increased at the same rate as technological development. There is no indication that this group will get smaller. The tendency to document and show how much exercise you've done, how much fun you've had, and how much good food you've eaten is only in its gestation period. So we can also assume that smart glasses will enforce and create a synergy effect when it comes to further life-logging. This is especially the case regarding fitness and health, infotainment and daily information management. But Glass first of all has to be useful.

Usefulness
Of course, smart glasses have to be useful. They need to have some kind of "killer app": a "must-have" program. However, this will not be the case from the beginning.

Figure 20: *Traditional speakers are large, not easily portable, and create a shared listening experience. Near eye displays have several key advantages over traditional displays: compact size, lightweight, portable, very low power, can be see-through. The logic is the same: the personalization of the experience.*

It was not the case with the smartphone, the iPad or the new "phablet" smartphone. These products were slowly adopted by the consumers, who created different "needs" afterwards in "collaboration" with a worldwide app-developer community. The same will probably be the case with smart glasses. However, in an age of information overload, information for information's sake is not winning many points with consumers. For one thing, many are sceptical of the accuracy of the information provided by wearable technology, and more importantly, they don't know what to do with it. For smart glasses to really be useful they need to deliver data that is not just informative but also prescriptive, giving consumers a clear understanding of which steps they need to take. To do this, smart glasses will be driven by human-centred design, creating a simplified user experience and an easier means to achieving goals – much as Apple did with both the iPod and iPhone. This development will gather pace in the years to come.

Within the next five to seven years healthcare will be privatized and the boundaries will slowly disappear until the smart glasses' (and other wearables) tracking of bodily impulses will be communicated and treated by doctors in new digital ways.

As stated in relation to figure 18, healthcare, fitness and wellness are key market drivers that merge the private sphere with the public medical sphere. Within the next five to seven years healthcare will be privatized and the boundaries will slowly disappear until the smart glasses' (and other wearables) tracking of bodily impulses will be communicated and treated by doctors in new digital ways. This is also shown in figure 21.

Health tops the list of importance. In the PWC study, more than 80% of consumers listed eating healthier, exercising smarter and accessing more convenient healthcare as important benefits of wearable technology, and millennials are most enthusiastic about the health benefits that wearable devices can deliver. 61% of millennials agree that wearable technology will help extend the average life expectancy by 10 years, and they are 26% more likely than adults aged 35 and older to agree that wearable tech will help decrease obesity rates.

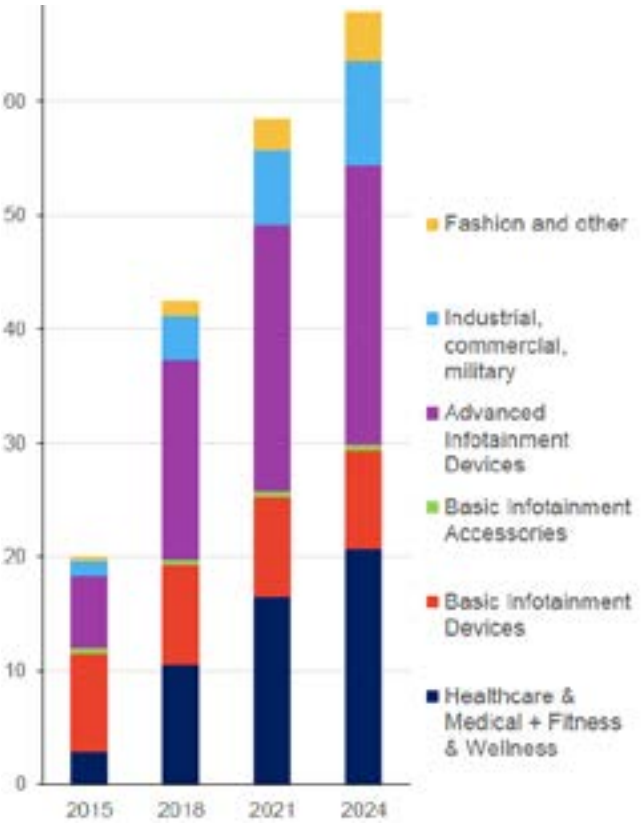
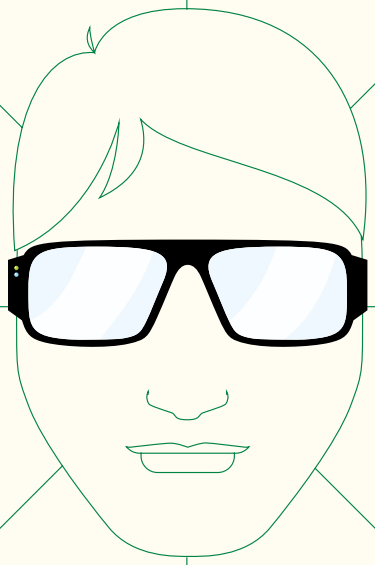


Figure 20: *The overall use of wearables will primary be in healthcare and fitness and advanced infotainment. This will be driven by smart watches, but also by smart glasses. Everyone agrees that healthcare and medical + fitness and wellness will be a key market driver and be a field that will provide killer apps. When people find out that they can live better lives through the use of e.g. smart glasses, they will be more willing to pay for them. Source: IDTechEx report "Wearable Technology 2015-2015".*

Thesis 1

Perspectives

Thesis 2



Thesis 7

Fashion and price will be key market drivers regarding the broad majority's adoption of smart glasses

Thesis 3

Thesis 6

Thesis 4

Thesis 5

In the nearby future the smart glass product types will probably be divided into two distinct categories:

1. *Smart glasses that are used in industry and thus have a computerized design*
2. *Smart glasses that are used by consumers and thus have a normal spectacle design*

There are already many different types of industrial smart glasses, but, as mentioned, there is a new emerging trend whereby industries adopt and apply consumer products because of their user-friendliness, but often with some slight changes. Overall, both the consumer and the industry will be concerned with fashion, but this is of course primarily a concern for the consumer. Let us look at the fashion issue and then the price issues.

> ... The question is whether the company will create a computer that has similarities to spectacles or create spectacles that have computer functionalities.

Fashion

The Google Glass computerized science fiction Start Trek design was only attractive to the nerdier types. Google Glass was properly wrong to try to reach the consumer with this kind of design (but not regarding industries). As mentioned earlier, the combination of computer and spectacles is a key issue here.

The question is whether the company will create a computer that has similarities to spectacles or create spectacles that have computer functionalities. Google indisputably did the first thing, as shown in figure 21, but the trend is now evidently moving towards the latter, as shown in the review of the different products above. This has obvious consequences for retail: Will and/or should smart glasses be sold from IT shops and/or opticians?

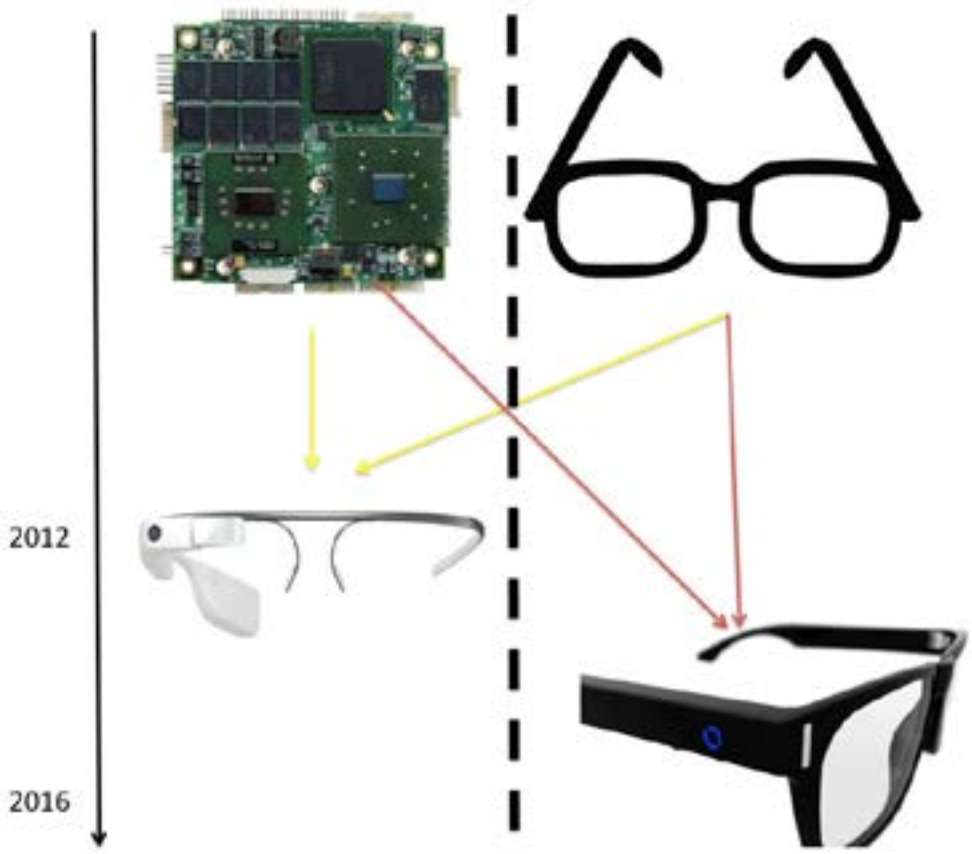


Figure 21: *The combination of computer and spectacles can emphasize the computer design or the spectacle design.*

Given the new movement towards ordinary spectacle design, it may be the latter if the spectacle industry heads the market development.

There is an overall trend in the whole wearable tech industry towards thinking in terms of fashion. Health, fitness, sports and everyday activities are part of the

user's identity. This simply means that most people do not want to walk around looking like a tech nerd. Just as the iPhone has become an identity marker, smart glasses will need to be cool to be used. Therefore, smart glasses, although they are computers, will increasingly be understood as spectacles with all the consequences this may have for the design thinking and thus for the whole optical industry. This, of course, is why the largest manufacturer, Luxottica, has teamed up with Google.

... Health, fitness, sports and everyday activities are part of the user's identity. This simply means that most people do not want to walk around looking like a tech nerd. Just as the iPhone has become an identity marker, smart glasses will need to be cool to be used.

So imagine that in five to seven years a company brings out smart glasses that are virtually unnoticeable. They have a tiny display in the lenses and the electronics and battery are neatly concealed in the frame. They are easily operated with a few fairly discreet touch gestures, eye movements, and, when appropriate, voice commands. Now this is no longer something that irks people around you – it's something you buy as an add-on to your normal glasses, giving you a head-up display for navigating city streets and translating signs while travelling.

Price

Consumers are willing to buy almost any kind of product as long as the price is right. In the PWC survey, users were asked if they would be willing to adopt wearable technology products at different price points ($100, $300 and $500) if they had to pay for them themselves. They were then asked if they would be more willing to adopt them if an entertainment and media, healthcare, retail or financial institution paid for them. In every case, consumers were considerably more willing to adopt technology if an institution paid for it, despite concerns about privacy and security. If they were to pay for it themselves, they would not pay more than $300, which is what a cheap smartphone costs today and much less than Google Glass costs ($1500).

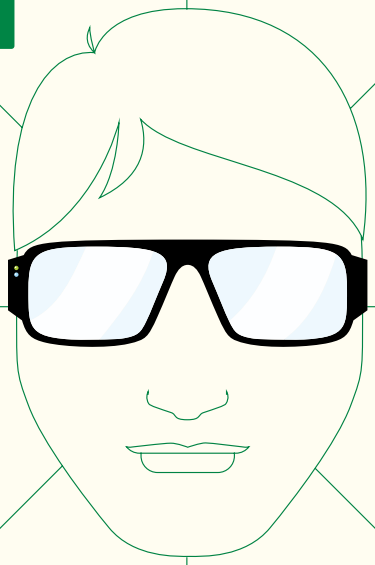
Price, of course, is a short-term barrier, as the market becomes more saturated and competitive following Moore's law, but in the meantime, the business and industry world will experiment and apply smart glasses in various settings and thus pave the way for the use of smart glasses in everyday life within the next five to seven years ("enterprization of consumers"). In this context it is worth noting that according to the PWC study, 76% of consumers say they would *not* need their wearable device to replace an existing piece of technology in order to justify its purchase. The smartphone will be a hub that communicates with other devices – thus the glasses would not replace it.

The key market drivers concerning the consumer will be:

- *Price, price, price*
- *Fashion and unique design*
- *Identity and personalization statement*
- *Usefulness regarding daily information management and time productivity*
- *Combination with smartphone as the hub*
- *Ability to track personal information*

Perspectives

Opticians' salespeople will need new competencies to handle the technology and understand its social implications, and opticians will need to engage in new partnerships



Thesis 1

Thesis 2

Thesis 3

Thesis 4

Thesis 5

Thesis 6

Thesis 7

From the opticians' perspective, defining what smart glasses are is crucial, since in the long run this will determine the extent to which opticians will need to get involved with the product category. There is a general conservatism in the industry, which may also be linked to the fact that the main target group is broadly middle class people over the age of 50. The most likely scenario is probably that the shops will look on passively while the new technologies proliferate. However, as a consequence of the analysis in this report, which indicates that smart glasses will be sold and used within the next five to seven years, opticians should prepare themselves for the future.

Google Glass is already being sold with compatible glasses with a more "normal" aesthetic design and the option of prescription lenses. So in principle Glass is outside the opticians' realm. And Glass is far from being the most spectacle-like product. Other products such as Epiphany Eyewear, Weon Glass and Laforge Optical will easily be sold from ordinary opticians.

The main problem in this context is the lack of knowledge about the technology and what customer service and advice related to the glasses will involve. Besides the fact that smart glasses will be more like ordinary glasses and thus evidently relate to opticians' daily work, other key issues thus arise concerning knowledge of:

- *New business models and service thinking*
- *Social implications and privacy issues*
- *New knowledge and competencies*

Disruptive business models

Talking about smart glasses necessary raises the question of the opticians' business model. Maybe in future some of them should work with a more broad and diversified service concept? The use of spectacles, contact lenses and prescription glasses in other types of products (e.g. virtual reality glasses, helmets, skiing goggles, and of course smart glasses of various kinds) raises the question of coming up with new business models. Models which are more flexible and capable of helping the consumer by proposing unique solutions regarding the type of frame, design, prescription glass, smart technology within the glass or attached to the frame, in combination with the ability to provide the user with regular updated services regarding technology, design, etc.

This new thinking about business models may also affect the collaboration between opticians and other brands and industries. There is an opportunity for brands to collaborate with retailers such as opticians through various forms of wearable tech, and new partnerships will arise between companies in different industries, such as Google, Luxottica and Intel. Obviously opticians will then need new skills and competencies to handle smart glasses.

In the near future, there will be new scenarios and business models in which companies pay for devices and thereby help their employees do their work better. Insurance companies will pay for wearables if they get permission to track health data. According to PWC, millennials are two times more likely than adults aged 35+ to be very willing to adopt smart glasses if a retail, entertainment and media or health insurance company pays for it. These are just some examples of completely new business models that build on data, and spectacle retailers, who potentially have a lot of data on their customers, can use this more systematically. Opticians need to tap into this emerging market, where there is a trade-off between employees receiving attractive products like smart glasses in return for letting companies track their behaviour. So regarding business models, we will probably witness two types of shared markets:

A. *Work-related smart glasses with specialized offers and services, e.g. the optician moving out and visiting companies and helping employees get the right smart glasses for their specialized purpose. In this area opticians need to understand technology and work settings.*
B. *The huge private consumer market with unique smart glass models that look like ordinary glasses. In this area opticians need to understand technology and everyday use scenarios, e.g. sports and health and even more importantly, use in social interactions.*

Social implications and privacy issues

Without question, consumers are leery of the impact wearable technology will have on the privacy and security of their personal information. Our Twitter analysis clearly showed that privacy is a big concern (figure 18). This will be a boundary that manufacturers of smart glasses and the companies that use them will repeatedly have to test, navigate and respect.

One of the main barriers against the sale and use of intelligent glasses is undoubtedly people's discomfort with the idea of constantly being able to be filmed and uploaded to the internet *(sousveillance),* possibly for

commercial use or by countries as part of their surveillance techniques. There is also the fact that a lot of the data that is stored in the smart glasses or their clouds seem to belong to the company that provide them (e.g. Google+).

But some much more basic legal questions have already arisen as a result of the glasses being banned in certain situations. This applies particularly to traffic: the first fine for driving with Google Glass has already been issued to a woman in California. Meanwhile, Google Glass has been banned in several American bars in Silicon Valley, e.g. at the 5 Point Café and Press Play Bar. This is not a purely legal matter, but shows a general desire to avoid potential sousveillance. Other places where the glasses could be banned include casinos, cinemas, concerts and even workplaces, if there is too much opportunity to cheat and deceive.

However, the PWC survey from "The Wearable Future" showed that, when millennials were asked how they felt about the future of wearable tech as part of everyday life, 41% of respondents said they felt excited, while 59% expressed concern. Across demographics, millennials and early adopters are the most enthusiastic: 53% of millennials and 54% of early adopters say they are excited about the future of wearable tech. Privacy issues will continually be negotiated among peers, but as millennials and new generations grow up, in five to seven years data sharing will probably have reached new heights – whether we like it or not.

For the time being, smart glasses are creating a lot of attention, and this has led to something that has become known as the *glasshole effect*. Glassholes are people who do not follow this or that diffuse social etiquette for using the new smart glasses, to the extent that will often film and take pictures of people and publish them online. The basic response they get is: "Get that camera out of my face." Thus the issue of privacy is also related to the issue of use in social contexts. Research strongly suggests that use in social contexts is currently a very difficult matter. However, these issues will probably change when there are many more normal-looking smart glasses on the market. And new technologies and products are always put to use long before the establishment of any new rules of behaviour, norms and specific codes of social etiquette relating to them. Opticians will also need to consider these issues and be able to help possible buyers with advice on proper use.

New competencies and knowledge

The discussion of new business models and issues of privacy and use in social contexts have been addressed in these final remarks because they are obvious and data-supported issues that need to be taken into consideration. This trend report has focused specifically on smart glasses in relation to their adoption and possible sale by opticians. I have stated tentatively that smart glasses will be mainstream within the next five to seven years, and I have suggested that shops and retailers will need to adjust to a considerably larger internet-driven market and its new business models. One interesting effect of the development could be a flagship store in Copenhagen where early adopters could buy and look at many different types of smart glasses.

One of the most obvious consequences will be that the opticians' target group will shift from including mainly people aged 50 or above who need prescription glasses to also including a whole new group of millennials who will demand smart glasses and help with choosing the right frames, design, technology, etc. This will surely have an impact on the way the shops are designed physically and, even more importantly, lead to the emergence of new types of internet shops.

Another concern will be to provide glasses for all the new types of industrial uses. There will be a whole new market for industrial uses, where smart glasses with or without prescription lenses will be required. And as the market grows and the overall development of private consumer use and industrial use of products converge in a consumerization of the industry and enterprization of the consumer world, people as employees and employees as ordinary people will ask for advice about acquiring smart glasses that can be used both at work and in their private lives. The potential market will be huge and so will the need to provide the users with qualified guidance on proper use, e.g. eye issues regarding length and forms of use.

At this points to the fact that salespeople in opticians of various kinds should be able to handle the new products and the new emerging business models. In three years, early adopters will be asking opticians about prescription lenses for their smart glasses, and will be willing to pay for smart glasses if the optician sells them. And within the next five to seven years there will be huge transformations in retail and the types of products, and the whole wearable industry will continue to grow exponentially. The opticians who are prepared for this new digital future will be the ones who survive.

The smart glass utopia

Jack opened his eyes and put his smart glasses on. They replied "good morning Jack, you had a night of perfect slumber, one hour of light sleep, six hours of REM."
Downstairs, a nutrient-rich protein shake was waiting for him. His mom had already gotten a report from his smart glass scanning of his pupils that he was a little low on iron and calcium that morning.
En route to school, traffic was light, thanks to a recent reconfiguration of roads based on data the city had gathered from wearable devices and pushed to his smart glasses.

In school Jack took notes, conferred arrangements with his calendar and answered emails quickly, easy and without disturbing the social activities he was engaged in through his smart glass.
When home again Jack went for at mountain-bike ride and his smart glasses tracked his activity and crossed the data gathering with his pulse, heart rate, sleep pattern and what he had been eating that day.
When home again he received a message from his smart glasses that he should go see a doctor. He answered "yes", at his smart glasses and immediately booked an appointment at the doctor.

He was about to get sick – but because he so quickly had visited the doctor and received proper care, the illness never developed into a problematic state.

The smart glass dystopia

Jack was with his friends in a self-driving car, pinging messages back and forth, talking trough their devices, when a flashing note popped up on all their smartglasses: ClubToNight. GET HERE.
As Jack nervously approached the nightclub's entry, the scanner flashed red, setting off a series of alarms. MINOR. MINOR. MINOR. Jack and his friends were horrified – they'd forgotten about the identity chip in their smart glasses.

But somehow they got into the club. Inside the club, he turned on the face recognition app on his smart glasses. They told him who to talk with and what to say, in order to be a success, and he obeyed.
When home again, Jack's attempt to retreat from the world was thwarted by the constant alerts from his smart glasses: *Begin Algebra Homework Now. Daily Iron Intake Low. Steps Taken – 3,208; Steps Needed – 6,792.* No matter how much he did, it was never enough. And though he was lonely, he couldn't seem to find the solace of being fully alone. His smart glasses always told him to do things and alerted him with all sorts of information. His attention was always partial.

Jack looked out his window at the empty streets. He remembered when people at least rode their scooters around and talked to each other. Actually talked, face to face, with no distractions.

These two stories was inspired by the PWC paper "The Future of Wearables"

Motivation, background and methodology

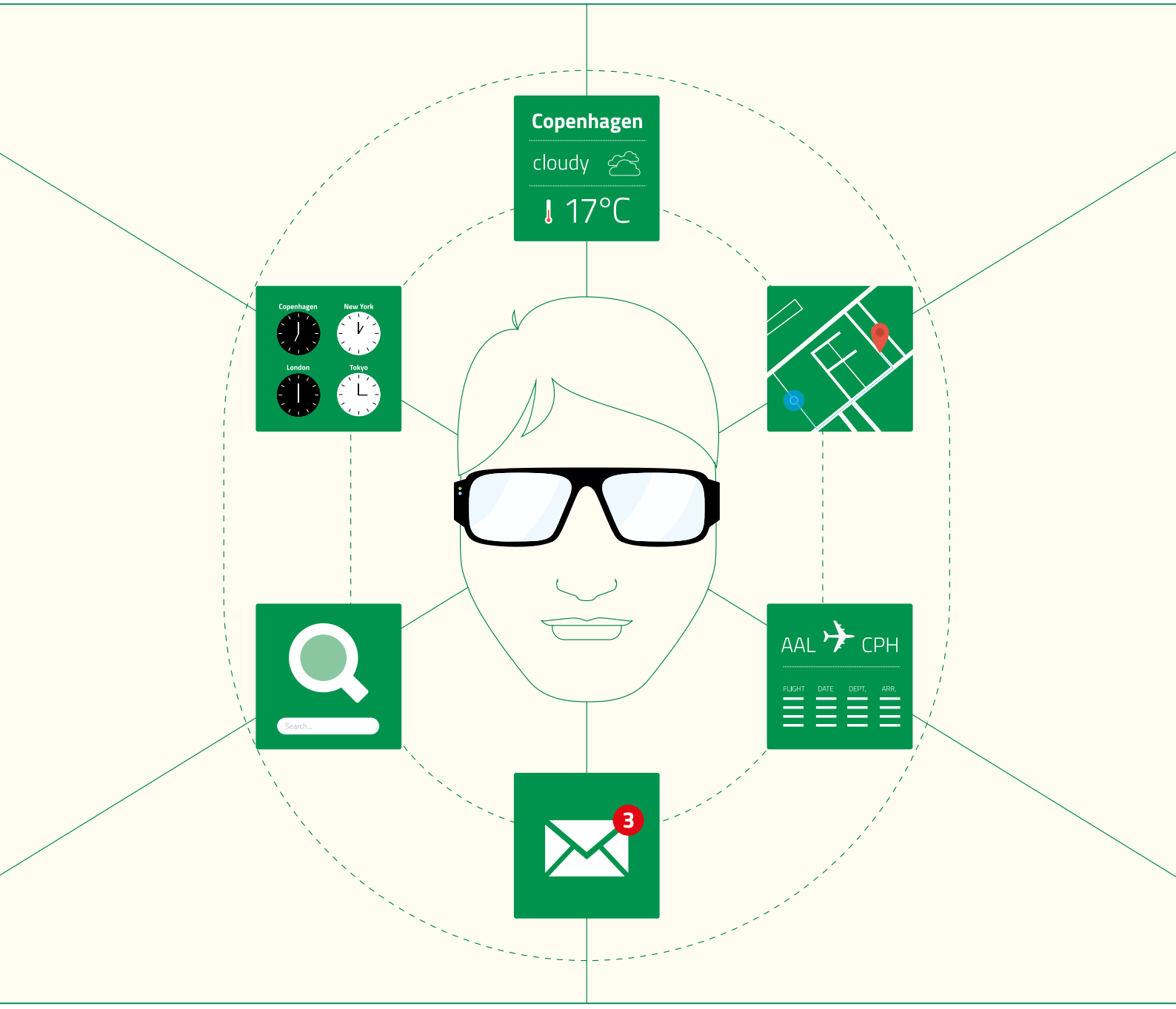
The analysis and development of these seven theses were carried out by the author of the report as part of a larger smart glass project funded by the Danish Synoptic Foundation. The project also included a report on the overall issues that need to be addressed regarding the development of smart glass technology and the dissemination of this knowledge as well as interactional research of the actual use of Glass in social interaction. The project has been running since the beginning of 2014 and is organizationally grounded in the firm Nextwork A/S and the Centre of Interaction Research and Communication Design at the University of Copenhagen. Whereas the other projects concern dissemination and new research, this trend report provides hands-on descriptions of the technology development and provides a basis for forecasting the near future.

In order to do so, different types of analyses have been conducted:

- *Scanning and reading research and news stories*
- *Scanning and reading new scientific papers*
- *Visiting Google in Palo Alto and interviewing, among others, Thad Starner, one of the inventors of smart glasses*
- *Participating in conferences and seminars in Denmark, the UK and the US*
- *Interviews with key stakeholders in Denmark, the UK and the US*
- *Survey among the possible early adopters segment (20-35-year-olds)*
- *Analysis of the 53 most prominent reviews of Google Glass*
- *Big data analysis of Twitter conversations regarding Google Glass over three months*

Seven Thesis on the Future of Smart Glasses

A trend analysis of the future of smart glasses in retail



Synoptik-Fonden