A Review and User Study on

WEARABLE SMART DEVICE

Group 4

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Part I. Introduction

The terms "**wearable technology** ", "**wearable devices** ", and "**wearables**" all refer to electronic technologies or computers that are incorporated into items of clothing and accessories which can comfortably be worn on the body.

Examples of wearable devices include watches, glasses, contact lenses, e-textiles and smart fabrics, headbands, beanies and caps, jewelry such as rings, bracelets, and hearing aid-like devices that are designed to look like earrings.
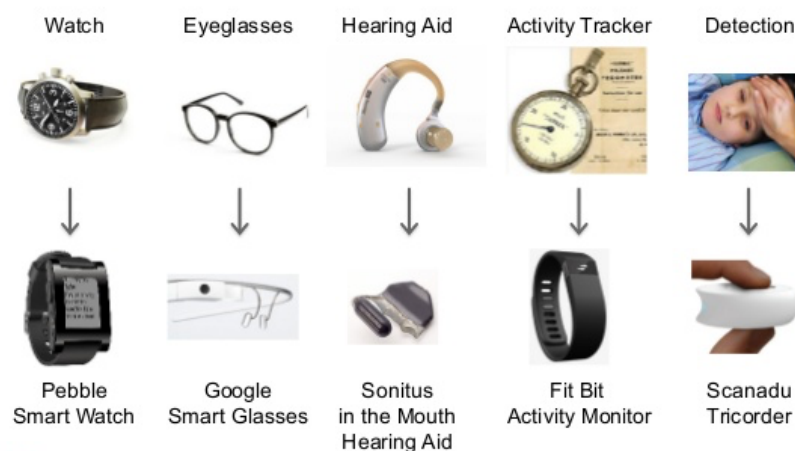

Figure 1   From wearables to smart wearables[1]

Generally, **smart** wearable technology will have some form of **communications capability** and will allow the wearer access to information in real time. **Data-input** capabilities are also a feature of such devices, as is local storage. To make an analogy to smart phones, a smart wearable device should have powerful ability **accessibility to the internet**, and support **extensive function modules**. Some thinks the smart wearable devices are smart in that the system will **learn from us**, even when we are not consciously using it.

As the smart wearable devices continue to penetrate into our daily lives and the wearable technologies evolve in a rapid speed, the study of user experience in this specific field becomes imminent. In this report, we will take a glimpse of the history as well as the current trend of wearable smart devices. After that, a user study research will be conducted in order to bring some insights into user-centered designs of future wearable devices.

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[1] VolerSystems, www.volersystems.com

Part II.   Literature Review

A.   History of wearable smart device

In 1968 Ivan Sutherland described a head-mounted display with half-silvered mirrors that let the wearer see a virtual world superimposed on reality. His work, as well as subsequent work by others, entailed a serious limitation: Because the wearer was tethered to a workstation, generally powered from an ac outlet, the apparatus was confined to a lab or some other fixed location.

Miniaturization of components has enabled systems that are wearable and nearly invisible, so that individuals can move about and interact freely, supported by their personal information domain.

Pioneers have attempted to enhance or extend the functionality of clothing, or to create wearable's as accessories able to provide users with surveillance.

B.   Categories

Wearable Technology usage can be categorized into two major categories:

- personal usage
- business usage

Whether for personal or business use, wearable tech gadgets are primarily used for one of the following fields:

- **Sports and Fitness**: Dominant gadgets in the wearable technology field.
- **Healthcare**: Use innovative data collecting and interpretation systems to help monitor health.
- **Security:** From body cameras to panic buttons that set off alarms, one of the biggest beneficiaries of wearable technology.
- **Gaming & Entertainment:** Wearable is the ultimate solution to smoother, novel and fun experiences. Augmented reality through the use of wearable devices has been discussed since the late 1990s.
- **Fashion:** The urge to look smart and in touch with the latest trends and remain ahead of the curve.

C.   Social Impacts

The sociological and cultural impact wearable technology should not be minimized, it may even change the nature of mobile phones and other hand-held devices entirely. The early prototypes were quite **obtrusive** and often made people ill at ease, but more recently the apparatus has been gaining social **acceptance**, partly because of miniaturization, and partly because of dramatic changes in people's **attitudes** toward personal electronics.

In turn, the acceptance of smart wearable devices could bring revolutionary changes to social lives. Followings are some of the potential applications that have not been actualized but would reform the way we work, communicate and live if the day comes,

- **Empathy**

People often disagree because they fail to see something exactly the same way--Two people equipped with clothing-based multimedia computers can not only stay in touch, sending data, voice, and video to each other, but

can also exchange perfectly accurate viewpoints.

- **Safety net**

A homogeneous community all wearing the same form of the apparatus. People would most likely focus primarily on their own surroundings, but they could occasionally receive an image from someone sending an important signal. A community of individuals networked in this way could look out for each other much like a neighborhood watch.

- **The *Sociometer*: Understanding Human Networks**

Being able to measure the relationship between communication networks and different environmental and organizational attributes, enable us to create better workplaces with improved communication and collaboration among their members.

Part III. Market Analysis

A.   Market Segmentation

Wearable Technology is on the rise in both personal and business use. In the consumer space, sales of smart wristbands (aka activity trackers such as the Jawbone UP and Fitbit Flex) started accelerating in 2013. Smart watches are a second high-profile sector and, while wearable devices have been around for years, it has only started gaining mass market attention with the introduction of new models by Samsung and, later, by Apple. The now defunct Google Glass gained a lot of media attention but the project ground to a halt in early 2015, with Google stopping device sales.

In healthcare, wearables have long been used - for example in detecting health disorders such as sleep apnea. Medical Professionals such as Google Glass Surgeon even organized themselves in WATCH Society the Wearable Technology in Healthcare Society, in order to search for collaboration and valid use of wearable technology in healthcare.

In professional sports, wearable technology has applications in monitoring and real time feedback for athletes. The decreasing cost of processing power and other components is encouraging widespread adoption and availability. Wearable technologies have helped make healthcare reform possible. The Affordable Care Act or Obamacare is pushing the value based care model and technology provides the support needed for the program to succeed and the US Government to save money. Telehealth is one such healthcare distribution method within the Population Health Programs model using wearable technologies to help bring down US healthcare costs.
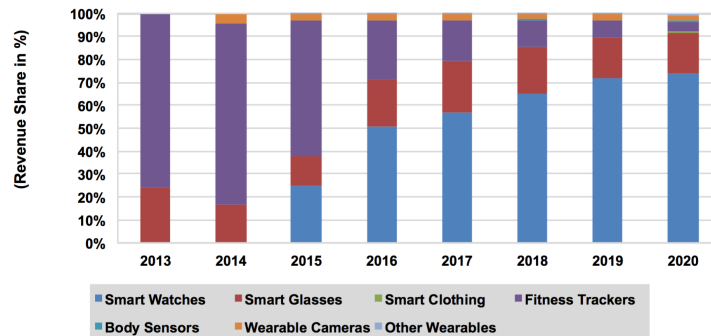
Figure 2   Enterprise and Industrial Wearable Revenue Share by Device Type, World Markets: 2013-2020[2]

B.   Customer Overview

1.   Customer Profile

HRI's survey results suggest stirrings of consumer interest, especially in fitness bands and especially in receiving health information from wearables. Nearly one in two consumers said they were "very" or "somewhat" likely to buy one in the next year. Consumers indicated less interest in buying smart watches (35%), smart (sensor-equipped) clothing (20%), smart glasses (19%) or people-tracking devices (13%).

Wearable tech owners tended to be younger males (18 to 34 years old). The next wave of fitness band buyers was more likely to be older females (35 to 54 years old). Survey respondents weighing the purchase of a fitness band said that their biggest hesitations were price, privacy and concern that they won't actually use it.

This last worry is based in reality, as studies of activity tracker users have found that many stop using them within months of purchase. Just one in ten consumers told HRI they use a wearable every day. Once the novelty wears off, many consumers abandon their devices, many of which require regular syncing, powering up and other steps needed to keep it running.

2.   Key facts

- Consumers have not embraced health wearable technology in large numbers, but they are interested. And wearable tech is not a part of most people's lives. Just one in five own a piece, such as a fitness band. Less than one-third said they were familiar with many top consumer brands.
- Technology companies hoping to exploit this nascent interest will have to create affordable products offering greater value both for users and their partners.
- Most consumers do not want to pay much for their wearable devices. They would rather be paid to use them, and companies—especially insurers—offering incentives for use may gain traction. HRI's survey found that 68% of consumers would wear employer-provided wearables streaming anonymous data to a database in exchange for breaks on insurance premiums.
- Simple social strategies might not work well for health wearables. Few consumers are interested in

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[2] Global Wearable Devices Market 2014 Trends & 2019 Opportunities. September 3, 2014.

sharing health data with friends and family. Social media strategies for health wearables must be engaging, interoperable and intelligent if they are to succeed.

- Consumers remain concerned about privacy. But they trust clinicians more with their data than any other entity. To retain that trust, companies will need to be transparent about what is being done with the data.

C.   Market Drivers

The market for enterprise and industrial wearables has a number of drivers that will fuel adoption and growth. These drivers are outlined below. The ability to quantify employee wellness and overall health of a company through wearables is a powerful factor that should find increasing adoption in the workplace. This is part of a larger trend of people analytics within companies where big data and machine learning is being used to enhance human resource functions, such as hiring and retention, sales, and employee satisfaction.

Smartphones can be a distraction at work, with users having a tendency to check notifications multiple times during the day. The smart watch provides an opportunity to reduce the number of times you unlock and open your phone, as notifications are filtered to your wrist.

Hands-free capability is a highly valuable resource in the workplace, especially in industrial settings. Wearables solve that basic need by allowing workers to continue using their hands for other activities, while providing them with the necessary information, or the ability to communicate.

Wearables can also help improve industrial workflows, impacting the cost and delivery of the product or service. Wearables like smart glasses and wearable cameras can roll all of those separate mechanisms into one device. For the first time, workers on the shop floor or in the field can provide their colleagues and managers a first- person view of what they are seeing. This can help in specific situations when they need help or assistance, or when they need to give instructions or provide training.

D.   Market Barriers

A few barriers could slow growth and adoption.

Policies around data security and privacy in the workplace have a big impact on how employees use wearables in the workplace, especially health and fitness tracking wearables that are part of a corporate wellness program. It is important that employees check their individual state laws and local laws, such as how the data will be used once they leave the company and if the data is transferable. It is also important to understand how well the data is secured and encrypted to prevent the data falling into the hands of hackers.

The invisibility of wearables is critical in certain customer-facing applications within the enterprise. In use cases like retail, hotels, and transportation, the risk exists that customers are put off by the sight of Google Glass or any other smart glasses device that looks different from a normal pair of glasses. Unless the wearable becomes invisible to the customer, there are risks that the customer will mistake it for a recording device or facial recognition device, perceiving it as a threat to their privacy.

In some extreme cases, we have seen employers like the insurance provider USAA put a blanket ban on wearables in the workplace, citing reasons related to inadvertent recording of audio and images, safety hazards, and infringement on employee privacy. While some of this is a knee jerk reaction to Google Glass, educating employers about the positive benefits or wearables is an uphill battle, especially concerning improving workflow,

allowing for a more productive worker, or the use of wearables in corporate wellness. Nevertheless, there will be companies that apply prohibitive policies or might even ban wearables in the near term, which could impact the growth of enterprise and industrial wearables.

In certain areas like oil and gas, safety becomes the primary concern, especially when it comes to using electronic equipment in a hazardous chemical environment like an oil rig. There are specific standards that any electronic equipment, such as wearables, will need to meet, along with training the personnel who operate the equipment. Therefore, the adoption of wearables in hazardous environments is likely to take longer.

E.   Market Trend

The global wearable devices market is growing steadily, but it holds immense business potential with the rapid pace of innovation and wider acceptance. Currently, wearable devices are still in its early stage, with most devices being launched for healthcare or sports activities. Several fitness-related wearable devices were launched in 2013 and it is believed that more smart bracelets, watches and other products will drive rapid growth in the wearable device market.

However, washability of wearable devices, privacy concerns, battery back-up and lack of wider social acceptability and several other issues pose major challenge to the growth of this business. Major trends prevailing in the global wearable devices market are bracelets dominating the market, planned introduction of iTV 4G by Apple and cloud computing being touted as the next IT wave.

Part IV.   Research Methodology

A.   Research Problem

With the development of technology and the rise of consumption level, smart wearable device companies are putting more emphasis on developing new products and functions to gain more market share. Through our analysis of the current technology and market demand, we could foresee that smart wearable devices will develop into a more practical, more intelligent, more convenient fashion. But the more practical problem remains: what do consumers really want to have and pay for?

User-centered design is critical for the success of product development. Prior to developing phase, validated user needs should be specified. Throughout the product development cycle, the use of personas should act as a reminder to everyone and get the team on a same ground.

Thus we are conducting a user-centered research to learn more about our target consumers and aid in the design and development phase of smart wearable devices. We want to find out typical tendencies, motivations and behaviors of different kinds of users. By the analysis of the communication, we hope to establish persona to help analysis the critical factors why consumers want to purchase or keep using the smart wearable devices and what kinds of function they want smart wearable devices achieve and other critical factors. Personas will then be established to help R&D departments to understand the result.

B.   Plan

Our research team has developed a detailed and comprehensive plan to realize our research content and obtain the expected results.

First of all, we sort out qualified participants for the two segments: experienced consumers and inexperienced person both of whom are selected from our classmates and friends taking into account the circumstances of the expected consumers who want to purchase and use smart wearable devices are mostly from young people interested in fashion and technology.

Next, we collect basic information from online survey. There are many basic questions we want to obtain from the survey, such as gender distribution, the interest or participation in the related areas, the main reason if the participants buy or want to buy smart wearable devices, what functions do the participants want to smart wearable devices to achieve, and so on.

Thirdly, we carry out two focus groups. We have some open topics in the communication, such as the experience of the participants with smart wearable devices, the reasons why they purchased the devices or why they do not purchase, what attitudes they hole towards the future of smart wearable devices and so on.

Then we analyze records to divide the characteristics of all the participates into three types: behavior, motivation and preferences.

Finally, we classify findings to form three coherent persons. Though the establishment of the three typical persona, we can do some further analysis to consumer expectations and preferences.

Part V.   Research Results

A.   Research Implementation Details

1.   Subjects Enrollment

To find out the qualified subjects for the two segments, we provided a questionnaire to possible people that are in our department or our friends and then sorted them by our criterion. The detailed questions could be found in appendix A.

The following charts show the result of the participants' answers toward those questions.

Chart 1 indicates the proportion of participants focus in the parts of health condition, fashion, new technology and sports.
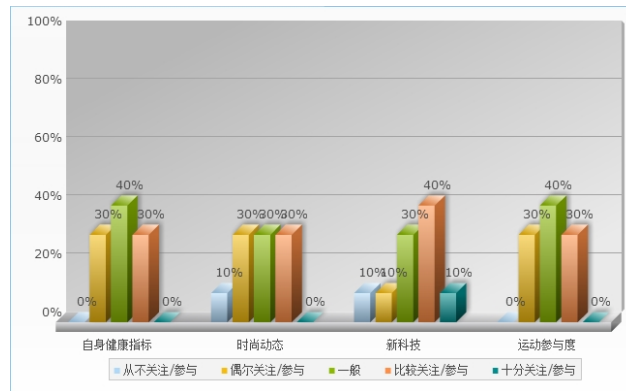
Chart 1

From the chart, we can see that towards health condition, most people will choose to concern with to some extent, but there is no person who choose "very concerned" extent. For latest fashion, most of people choose to care for, but there are some people don't care about it at all. For new technology, we have a lot of different views: for 70% people focus on it sometimes, and we not only have technology maniacs for 10%, but have 20% of people who do not interested in it very well. Most people likely to check their sports participation level to some extent.

We have to choose those like the new technology and fashion, care about health and sports in the first focus group; participants dislike those things for the second focus group.

In chart 2, we can see the major functions the people who have the experience of using wearable devices use.
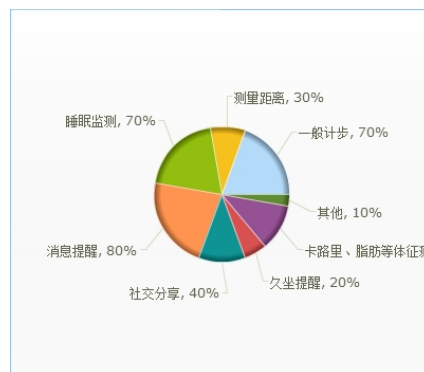

Chart 2

From the chart, we can find out that 80% of participants use the function of reminding new messages; 70% of them use the function of assessing sleep or the function of counting the steps. People about 40 percent use social share functions, and 30% of them use the devices to measure the distance.

2. Questions Design for Focus Group

The first focus group is made of people who have used wearable devices and most of them like that experience. We prepared 9 topics for them to discuss:

1. Talk about the smart wearable devices you have experienced. What are the features?
2. Where do you learn about these products?
3. Have you ever stopped using or took off the device? Why?
4. Have you ever influenced by other people rather than advertisements?
5. Talk about your overall experience using the wearable devices?

6. How about the app connected to the device?
7. What features do you consider important or attractive?
8. How do you think of these following smart wearable devices and their future development?

Figure 3 Examples of wearable devices (from JD.com)

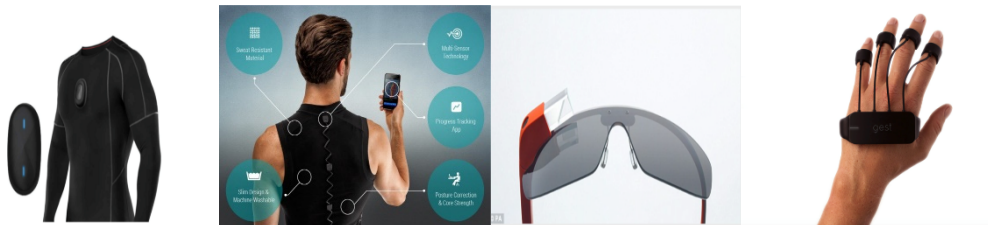9. How do you think of these smart wearable devices and their future development?

Figure 4 Possible future wearable devices (from the internet)

By asking them the questions, we can infer their advices, complaints, preferences and motivations of wearable devices of experienced users.

For the second group, we chose some students didn't have the experience and may not use it in the future. For them, we've got 8 similar questions corresponding to the first group's questions.

1. Talk about the smart wearable devices you have experienced. What are the features?
2. Where do you learn about these products?
3. Why you didn't choose to use one of those wearable devices?
4. At what price will you accept the wearable devices?
5. Talk about your expected functions using the wearable devices?
6. What features do you consider important or attractive?
7. How do you think of these following smart wearable devices and their future development (figure 1)?
8. How do you think of these smart wearable devices and their future development (figure 2)?

B. Analysis

From the record of the two focus groups, we can find out some important information about the subjects' view of wearable devices.

For the first group, we have 5 students who have a long time experience with the wearable devices. Most uses often like to wear the devices during their exercise, some even never put it off under any condition. They are fastidious about the appearance of the device. They like the reminding and map function and someone thinks it may replace the smart phone to some extent. They are all satisfied with the sleeping assessing functions and they

like the soft alarm very much. But they are worried about the privacy guarantee of the device because they do not like the social function with strangers. They all think the data in the device are reliable and they use the data to evaluate their health and sport level. They think the smart suit is an interesting direction of the future's development.

For the second group which composed of 5 subjects that have no experience with the wearable devices, however, they don't like the appearance of the devices in the market now because they are not fashion enough especially for girls. Most of them don't like the feeling of wearing a watch on their wrists. They all have a common that the data the device recorded are not reliable at all, and they don't think the assessment in health and sleep quality will help them a lot because they can feel the discomfort of their bodies by themselves. Some of them are not satisfied with the current functions and appearance of the smart watches, and they think they will not buy one until the watch applies more high technology functions. They think google glass is a good direction for wearable devices. It is not the price that matter, it is the expected functions and user experience of the device that matters for them.

C.   Persona Formulation

Personas are archetypal users of an intranet or website that represent the needs of larger groups of users, in terms of their goals and personal characteristics. They act as 'stand-ins' for real users and help guide decisions about functionality and design.

Personas identify the user motivations, expectations and goals responsible for driving online behavior, and bring users to life by giving them names, personalities and often a photo.

Although personas are fictitious, they are based on knowledge of real users. Some form of user research is conducted before they are written to ensure they represent end users rather than the opinion of the person writing the personas.

To create our persona for smart wearable devices users, we will go through those steps:

1.   Decide on a research method and conduct this research (focus group)

The purpose of the focus group is to identify trends or patterns in user behaviors, expectations and motivations to form the basis of the personas. One of the best ways to gather this data is to interview real users. This is usually achievable when designing intranets but becomes harder when we need access to users of a public website.

2.   Review all the research data and look for patterns in attitudes and behaviors

Here is some raw data of our focus group experiment, which plays the role of the initial prototype of our personas.

3.   **Analyze research data and identify persona set**

Whilst listing these patterns, we will begin to see clusters of attitudes and behaviors that make up different personas, such as the frequent traveler that is skilled in researching holidays and finding the best prices. This persona is motivated by keeping the cost of each holiday down so they can travel more in the future. The persona's goal is to go on as many holidays as possible.

Once we have defined these clusters of attitudes and behaviors, give each persona a brief description, such as 'independent traveler' or 'bargain hunter'. There is no ideal number of personas, however try to keep the set small. Four or five personas work as effective design tools, whilst over ten personas may introduce the same confusion as

a large user requirements document.

4. Formulate personas

We start writing the personas by adding details around the behavioral traits. We select details from our research, such as working environment, frustrations, relationships with others, skill level, and some demographics. Then we give each persona a name and a photo, unless our organizational or team culture is better suited to the more generic personas, like Bob's persona listed as a series of bullet points.

Then we keep our personas to one page, so they remain effective communication tools and can be referred to quickly during design discussions. Also, we include goals for each persona. This can include experience goals as well as end goals. In the case of Bob, the expert mechanic, an experience goal would be to 'not look stupid', whilst an end goal would be 'remain informed about the company'. Finally, we identify the primary and secondary personas (explained earlier on in this article) to help direct design priorities.

After completing those procedures, we come out with our 3 special personas. They are shown as below:

Jack Primary Persona
- 19 years old
- Basketball team leader
- Student in Tsinghua University
- Fan of cutting edge technology
- Keeps wearing smart bracelet for 2 years and really loves it

Under the influence of his roommates and other advertisements, Jack began wearing smart bracelet. Since then, he kept wearing this bracelet under any condition and has a positive comment on it.

Jack has a bracelet which looks very cool. He uses it to collect the real time health data of his body. After his basketball game match, he uses this bracelet to get an idea of how tired he is and the exact exercise amount. To avoid unexpected accident, he will also wore this bracelet on his right wrist during the match.

Jack often uses other functions in smart bracelet instead of his mobile phone, like health monitoring, navigation etc. He will also use the smart bracelet to read the information in the push notification and monitor his sleeping quality every night. He believes that the data given by smart bracelet is very accurate and reliable according to his experience.

Moreover, Jack will also use the smart bracelet to interact with other smart devices like MI intelligent scale. Sometimes, he may even do some interesting little experiment, like making his dog wear this bracelet.

"I like doing sports and I wanna know how things going during this time."

Typical Tasks:
- Heart beat monitoring
- Navigation when in an unfamiliar place
- Sleeping monitoring

Quintus

- 24 years old
- White collar worker in a consulting company
- Graduated from UC Berkeley one year ago
- Earns a moderate salary
- Once received a smart bracelet as present but stopped using it after a short time

Through the advertisements and friends references, Quintus started using smart bracelet but he quitted since he thought he has an awful user experience.

Quintus has a heavy workload and faces a huge pressure everyday. He believes that comparing with mobile phone, APPs in smart bracelet are not well designed and many key functions are not practical that they cannot replace the same functions in his mobile. Furthermore, APPs smart bracelet didn't get updated and sometimes, it may lose connection with his mobile. What's more, Quintus feels that may functions of smart bracelet are not really to his need, such as health data monitoring and so on.

Meanwhile, Quintus feels embarrass to wear such an informal-looking bracelet in a business meeting. Quintus also thinks it's uncomfortable to have a bracelet on his wrist and it sometimes may even slip from his wrist.

Moreover, Quintus doesn't want to be interrupted by some social functions in the smart bracelet since he want to protect his own privacy. He also feels the frequent charge of the smart bracelet is troublesome for him.

"I work overtime everyday and I need practical and reliable stuff."

Typical Tasks:
- Deal with various cases
- Join meeting with clients
- Read and deliver reports

Janice

- 22 years old
- Cheerleader
- College Student
- Fan of fashion
- Wondering if she should buy a smart bracelet recently

Many of Janice's friends had bought smart bracelet. However, Janice has no smart bracelet user experience ever before. She is considering about this topic recently.

As for her attitude towards the smart bracelet, Janice will pay more attention to the cost performance and overall functions usability. The functions she values most is the traditional function of an ordinary watch.

Janice cares most about the looking of smart bracelet. As a girl, she wants it to provide a various type to match her clothes and looks cute instead of full of elements of technology. She also needs the the band to be adjustable. Furthermore, she prefers more interaction ways like voice activation and so on. Moreover, as conservative she is, Janice also worries about the privacy issues. Janice also doubts that data provided by smart bracelet may not be very accurate as people expected.

Though having some idea about this smart device, Janice says she may need 3 to 5 years to buy this concept. What's more, she will appreciate it if there are related warranties for such smart bracelet and she's looking forward to more breakthrough in this field.

"As a female, I pay more attention to fashion and usage."

Typical Tasks:
- Study industrial engineering
- Shopping online
- Join parties

Part VI.   Discussions

Understanding the needs of users is one of the most critical success factors for any industries. Our persona may work in the future for getting further understanding of smart wearable devices users.

The three personas convey different user stories to us. Jack, the primary persona, is also the primary target customer of current smart wearable companies. He is a fan of sports and a technology goer. He is curious and open to new things. We have depicted him as a student, but his enthusiasm may not easily vanish when he grows older, making him different from Quintus, one of the secondary persona. For those companies should be take much care of the user experience of people like Jack-they are always the early adopters and opinion leaders. They could be a valuable fortune to them if a strong loyalty is formed. The companies should continue to come out with new things, to lead or keep up with new trends so that Jack will not slip away to other brands with cooler products.

Quintus and Janice are alike in some ways. But we could see that Janice is a main stream user, cautious in many aspects while Quintus is a late adopter. Quintus would only consider picking smart bracelet once again when technology had evolved to a much higher level and all his criteria were met. For many companies, the top concern is not to attract people like Quintus at a huge cost of development, but to persuade people like Janice that some of the terrific things about the product are just what they want.

Our research has some degrees of limitation. First, participants of the focus groups are mainly students from Tsinghua university. Although their experiences and opinions with technology, fashion and health varies, their age, education background and purchasing power fail to reflect the market as a whole. Accordingly, the three personas established could be a little biased. Secondly, due to the lack of resources, the research group could not extend the study to products other than smart watches and smart bracelets. Topics on more advanced products, such as AR glasses and wearable monitor instruments, were not introduced into the focus group.

Appendix

A.   Questionnaire for focus group participants

1. What is your name?
2. What is your gender?
3. What is your major?
4. What is your current mobile phone brand?
5. How about your interest or participation in the following areas?
   - Self health index
   - Fashion trends
   - New science and technology
   - Sport participation
6. Have you ever used smart wearable devices (such as smart bracelet, smart clothing, etc.)?
7. What is the main reason if you buy or want to buy smart wearable devices?
8. What functions do you want to smart wearable devices to achieve?
   - General steps calculation
   - Distance measurement
   - Sleep monitoring
   - Message alert
   - Social sharing
   - Sedentary reminder
   - Calorie, fat and other health indicator
   - Other (simplify interaction)

B.   Primitive record for user study

行为习惯

5 运动的时候戴着记录运动量

2 洗澡的时候不戴

4 无论什么情景会一直佩戴

3，5 运动的的时候不喜欢戴，出汗不舒适

1 尽量一直戴，运动的时候戴左手避免干扰

1 习惯用智能手表代替手机的功能，比如信息推送，地图导航

2 不习惯侵犯隐私的社交功能：如睡眠时间匹配，陌生人加好友等等

3 追求清净，不希望一直通过可穿戴与世界联结

7 8 10　不喜欢手腕上有东西

动机

4 中断使用的原因是关键功能不好用

1 追求尖端产品

2 睡眠监测很准，所以坚持使用

5 中断的原因是不牢

4 容易受平面广告宣传影响购买

5 受周围人影响购买

3 尝试手环是受周围佩戴的人影响

2 自己买的动机不强烈，如果是别人赠送会尝试体验

1 外形不够酷，就不想继续用了

4 app 的体验不好，就不想用了

6 外形的需求没有被满足

10 应用做得不够完善

6 不买：刷微博等平时手机用的功能无法被替代

6，7，8，9，10 不买：不关心监测心跳等健康数据，或觉得不准

7 不买：手环（无屏幕）交互方式太单一

10 对于未来发展比较悲观，不打算投入

9 不买：能连接多种设备，如智能家居，手机等

最好有语音交互，但还没有被满足。3-5 年

6 app 和自己的手机匹配不上

678910 通过广告了解现在的产品发展趋势

偏好

5 睡眠唤醒是很好玩的功能，但使用的时间长了就感觉到有些不太方便，有些鸡肋。

5 注重外形风格与商务场合相符

1 希望是可调节的表带

3，4 注重外观

3，5 看重健康参数监测，如心跳

2 希望能方便看时间

2 注重睡眠测量精准

2 注重外观

5 用手环做好玩的实验，比如给狗戴上

1 运动时监测心跳，好知道自己有多累

1 很赞赏体贴的维修服务，以旧换新

1 app 版本太低，没有随着手机版本更新而优化，体验不好

5 喜欢和其他智能硬件产品配套使用，如小米智能秤

2，4 希望综合手表的功能

1 注重消息推送功能

4 注重性价比，以及功能（显示性能）和续航的平衡

3 没什么特殊功能的彩色屏幕很费电鸡肋

2 等 普通消费者不会考虑高端的户外功能的手环

4 认为运动量计算统计功能不准不靠谱

3 比较保守，对新型可穿戴顾虑比较多，注重隐私，对于隐私性比较好的贴身产品看好，健康医疗

6 7 智能服装舒适度存疑

6 7 喜欢贴近日常生活的设计，不喜欢科技感

9 喜欢能更突破性的产品，不喜欢智能服装等功能局限的。

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Choudhury T, Pentland A. The sociometer: A wearable device for understanding human networks[C]//CSCW'02 Workshop: Ad hoc Communications and Collaboration in Ubiquitous Computing Environments. 2002.

Lv Z, Feng L, Feng S, et al. Extending touch-less interaction on vision based wearable device[J]. arXiv preprint arXiv:1504.01025, 2015.

Tehrani, Kiana, and Andrew Michael. "Wearable Technology and Wearable Devices: Everything You Need to Know." Wearable Devices Magazine, WearableDevices.com, March 2014. Web.

"Wearable Computing: A First Step Toward Personal Imaging". IEEE Computer 30(2)

What is a Wearable Device? WearableDevices.com. Retrieved 10-29-2013

"Understanding Wearable Technology | Aspencor Tech". Aspencor Tech (in en-US). https://plus.google.com/u/0/118079295382543085720. Retrieved 2015-11-07.

Wikipedia contributors, "Wearable technology," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=Wearable_technology&oldid=690554296 (accessed November 23, 2015).

http://image.slidesharecdn.com/trendssensorswearableiot-150311163418-conversion-gate01/95/trends-in-sensors-wearable-devices-and-iot-6-638.jpg

PwC Health Research Institute. Health wearables: Early days. April 1, 2014

Calabria T. An introduction to personas and how to create them. March 2, 2004

Global Wearable Devices Market 2014 Trends & 2019 Opportunities. September 3, 2014.

Rock Health, "2014 Midyear Digital Health Funding Update: Obliterating Records," http://rockhealth.com/2014/06/2014-midyear-digital-healthfunding-update, June 30, 2014.

Rock Health, "2014 Midyear Digital Health Funding Update: Obliterating Records," http://rockhealth.com/2014/06/2014-midyear-digital-healthfunding-update, June 30, 2014.

Lee, Stephanie M., "Genentech CEO wonders if wearables craze is 'a bit trivial,' San Francisco Chronicle, http://blog.sfgate.com/