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The Key Success Factors of Wearable Computing Devices: An User-Centricity Perspective

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Abstract: In modern electronic business era, the currently popular topic of wearable computing devices (WCD) has prompted foreign and local industry players to look proactively into various WCD-related developments, including the external appearances of WCD hardware, software applications, human-device interface designs, and the appearances of WCDs expected by general users. Setting aside the necessary functional specifications and application requirements of WCDs, the wearing habits that general users have already developed is a more fundamental consideration. These habits should form the basis for the design of both WCD hardware and software at the technological level. In this paper, an analysis is made of the items that general users customarily wear and the purpose(s) and frequency of wearing them. The findings will serve as a reference for industry players who wish to enter the WCD market.

Keywords: wearable computing devices, hardware, software, user-centricity

1. INTRODUCTION

Wearable computing devices have evolved over decades, with devices taking on more and more computing and communication capabilities, offering up new opportunities by expanding the ecosystem of players involved. The role of wireless connectivity, platforms, analytics, and applications is increasing, making way for a broader, emerging wearable computing devices category.

ABI Research [1] estimates the market for WCDs in the sports and health sectors will grow to nearly 170 million devices by 2017 — an annual growth rate of 41 percent. Forrester Research views growth in the sector as contingent upon the big five software platforms: Apple, Google, Microsoft, Amazon and Facebook. It predicts that Google is the likely winner in the race for the next major device category, due to the jump Android has with some early device manufacturers. Hence, an analysis in this paper is made of the items that general users customarily wear and the purpose(s) and frequency of wearing them. The findings will serve as a reference for industry players who wish to enter the WCD market.

2. THE DEVELOPMENT OF WCDS

Recent studies give partial insight on how WCD and business models [2] intersect from a user-centric perspective. First, related studies about WCD have examined issues related to architecture [3], [4] and awareness management in networks [5]. Furthermore, cloud computing is presented as an option to support WCD issues [6]. Next, limits of literature on wearable devices (e.g. accessories) examines application wear-ability for network surfing through multiple accessories or devices [7] as well as in heterogeneous network environments [8]. Third, while research on business models focused on value creation [9] business models that may be harnessed and their design [10]. Some studies ventured toward payment adoption [11] or demand related variables [12]. However, user habit factors also affect user wearing mobility and users put a high premium on the quality of their experience as evidenced by research on innovative business model.

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As past works rarely examined wearable technology, devices, and business models from a user-centric perspective, this preliminary study makes a contribution by looking at these factors simultaneously. Indeed, making sense of the new trends in devices, platforms and available content, software and applications from the user wearing habit is increasingly difficult given their diversity. It is not clear yet whether other studies did not focus on specific user wearing issues., this paper contributes a different user-centric method of tackling user wearing associated with wear-ability while looking at devices, users and some habit as well as business models. In the following section, we report our preliminary findings.

3. PRELIMINARY FINDINGS AND RESULTS

3.1 General user preferred body parts for WCDs: Eyes, head, and hands

For the general user, a WCD is worn in much closer contact with the body and especially the heart than smart phones are. After all, the latter cannot be worn and may be randomly placed anywhere, whereas a WCD must be placed on the body and will influence the daily behaviors of its user. Surveys of user wearing habits indicate that the preferred body parts for various types of WCDs (as Figure 1) are as follows (in descending order): (i) eyes (approximately 72%)—sunglasses, shades, and prescription glasses (for vision correction); (ii) head (approximately 70%)—hats, caps, and scarves; and (iii) hand—wrist watches (68.1%), bracelets (49.7%), and rings (59.4%). Audio earphones and headphones, WCDs with which consumers are already familiar, received a preference rate of 64.7%.

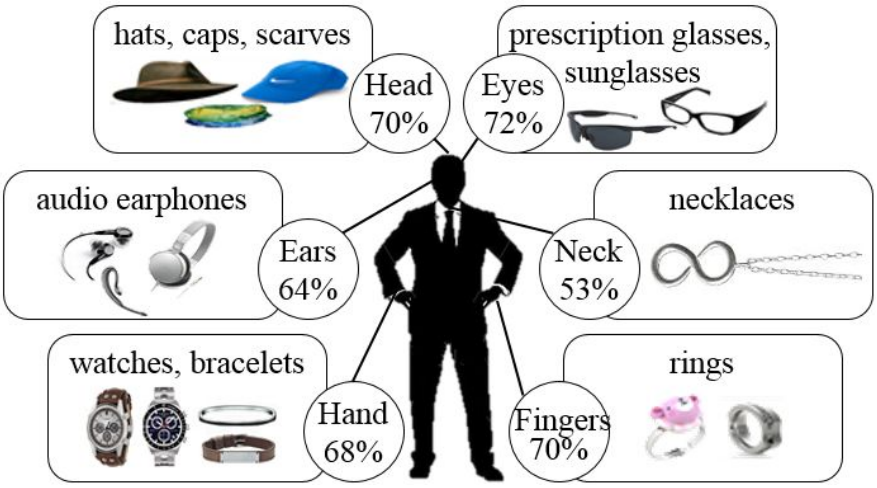

Figure 1 Body parts on which general users customarily wear WCDs [13] [14]

3.2 Users' habits for WCDs based on wearing frequency (in descending order): Glasses, watches, and rings

Additional analyses were made of the customary wearing frequency of WCDs by general users. Wearing frequency is a reflection of the strength of the user demand for a WCD function. This information will also provide an understanding of the degree of adhesiveness that general users have with their current WCDs. There are two main categories (as Figure 2) of WCDs: (i) Perpetually worn: items that are worn for a long duration on a daily basis, including prescription glasses for correction of short- or long-sightedness or other vision problems (56.6%), watches (40.6%), and rings (30%); and (ii) frequently worn: items that are frequently worn whenever necessary, either daily or at least once a week. These include sunglasses and shades (36.3%) and audio earphones and headphones (29%).

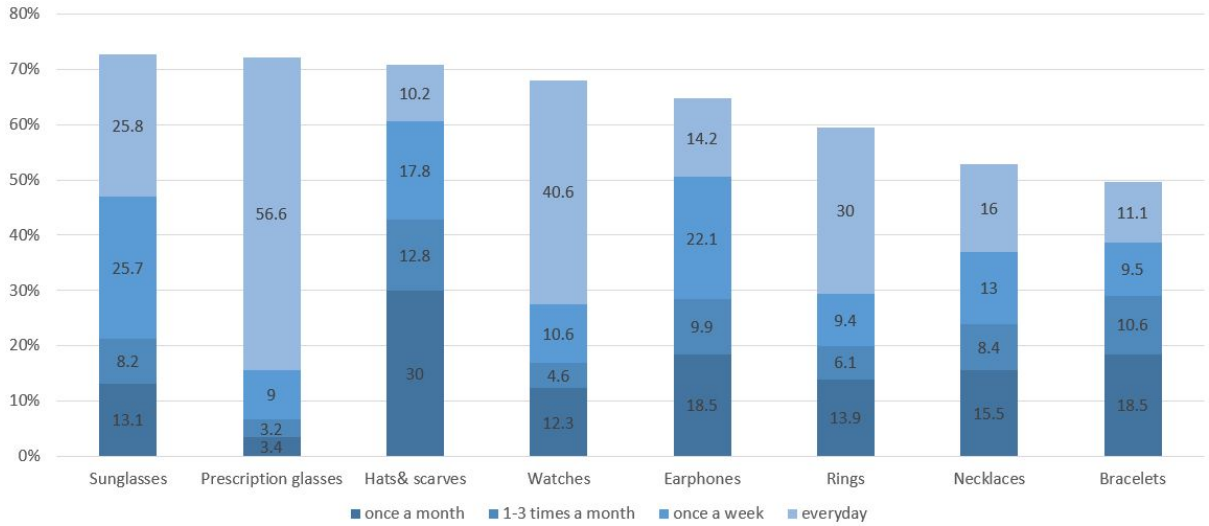

Figure 2 Frequency of wearing WCDs to which users are accustomed [13] [14]

4. BUSINESS MODELS AND CHANCES

WCD became a defining characteristic of many devices (e.g. PDAs, mp3 players) that saw their functions converge into smart phones and eventually became a noted feature of a range of devices (e.g. tablets). The trend likely being improved wear-ability of devices (e.g. Google glasses). While wearable computing has been around for a long time, the nearing step may prove better adopted as users become used to well-designed I/O apparatus that will make this sort of wear-ability both sensible and natural. These changes in WCD have a great impact on business models. For wireless carriers, it means more devices are connected to their networks and thus a rise in their traditional businesses of carrying voice and data. But this also implies new value streams that come from a different way/process of interacting with users. Device makers can now make money on the physical devices themselves, but also derive advantages from sharing platforms/OS. Apps and software developers, also have new possibilities to maximize downloads and adjust payment possibilities by moving from free to fee-based models.

Even a modest proliferation of WCD in the coming years will create massive new data streams that will likely exhibit exponential growth. Thus the analytics layer is critical to enabling many WCDs, particularly those with sensors to monitor the movement and state of the person wearing the devices. Big Data allows WCD implementations to drive true business value for a company taking advantage of this connectivity and data capture.

Leveraging the power of "Big Data" and the capabilities that data vendors offer to enterprises can be extended to WCD applications. These analytics can take data collected by the connection and endpoint and turn it into actionable insights that consumers can use to improve their lives and businesses can use to help their customers.

With social networks hugely popular, and the myriad of data these networks compile, it is expected that the rise of WCDs will also leverage the role of social. After a data transaction takes place, a social element can be layered on top of the data collected to paint a richer picture of the person or process being monitored.

5. WHAT IS NEXT?

The WCD market has highly anticipated potential into which many large international manufacturers are preparing to venture. However, the key to the success of a WCD lies in its user-centricity in terms of development and design. With the trend of giving smart phones more and more functions, one suggestion is to move away from the mindset of standard applications and, instead, find those applications that users really need

from the perspective of what they wear and how they wear them. First, the design should be based on user experiences: What is the purpose of a user having multiple WCDs? What is the WCD demand for each? What are the scenarios or occasions in which it will be used? To arrive at the answers to these questions, it is necessary to make in-depth observations of user habits, behaviors, and needs. Only then will the WCDs be designed to meet user needs. Second, there must be insights into the user daily wearing habits: Observations must be made of the WCD currently being used by general users and their usage behaviors. Issues to consider include the possibility of making WCD more intelligent and overcoming the inconveniences of using smart phones so as to identify the WCD and applications that are genuinely needed by a majority of users.

Our preliminary findings are designed to be flexible enough to address those developments. WCD for the commercial/industrial market will benefit from fewer constraints than in the end-user market, but their application set may also be more limited and their costs higher. In some ways, the development of WCD may imitate that of smart phones, which began primarily as a tool for business, with innovations such as push to talk focused on industrial applications. We could imagine WCD with their functions and capabilities getting honed in the commercial/industrial world, where tolerance for issues around usability, comfort, and appearances may be higher. It may be only later that when costs have declined, usability has improved, and comfort and appearance issues have been addressed, WCD become fit for the en-user world.

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