Smartwatches: the Good, the Bad and the *Ugly?*

Marta E. Cecchinato
UCL Interaction Centre
University College London
London, WC1E 6BT
m.cecchinato@cs.ucl.ac.uk

Jon Bird
City University London
London, EC1V 0HB
jon.bird@city.ac.uk

Anna L. Cox
UCL Interaction Centre
University College London
London, WC1E 6BT
anna.cox@ucl.ac.uk

Abstract
Wearable computers are expected to become the next big thing but popular press is divided on whether they will be successful. In this paper we review the existing literature on one type of wearable – smartwatches – and extend their definition, in addition to highlighting the need to understand users' everyday appropriation of these technologies. We present initial findings from an on going interview study with early adopters that is, to the best of our knowledge, the first to investigate why and how people use smartwatches in real life. We describe everyday use of smartwatches, highlight the added value seen by users, and identify the limitations to mass adoption as expressed by current users.

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Smartwatch; wearable computing; wearable devices; wrist-worn devices; mobile computers; smartphone.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Wearable computers, "*any body-worn computer that is designed to provide useful services while the user is performing other tasks*" [13, p.10], are expected to become the next big thing, but popular press is divided

on whether they will be successful. In November 2013 Forbes magazine claimed 2014 would be the year of wearables [12] and Time magazine dedicated their September 2014 cover story to wearable technologies [7]. However, in June 2014 Fortune magazine published an article on why "*2014 is not the year of wearables*", suggesting that the anticipated wearable revolution had not lived up to expectations [14].

Commercial wearable computers include wrist-worn devices such as activity trackers and smartwatches (SWs), along with health monitors. Market predictions indicate that fitness tracking device sales will drop from 70 million in 2014 to 68.1 million in 2015 as SWs become more popular, offering communication features in addition to activity and health monitoring [5]. With the release of the Apple Watch in early 2015[1], SWs may be on the verge of mass popularity. In this paper we discuss commercially available SWs, where adoption is still in its infancy.

Existing research reports studies that suggest improvements for SW hardware and software. Yet, very little research has been done on users' adoption of these devices. In this paper we update the definition of SWs and present initial findings from an on going study on how early adopters are appropriating commercial SWs in their everyday life.

What is a Smartwatch?

The first SW is considered to be the IBM Linux Watch, launched in 2000 [10]. During the past 15 years SWs have developed and now offer greater functionality. In 2012 the Pebble Smartwatch was launched on a crowd-funding website[2] and since then SWs have received growing attention from the popular media. Over the past two years more than 20 SWs have been released, and there is great anticipation for the Apple Watch due to be released in early 2015.

Previous definitions of SWs [3,10] have been superseded by current devices and so we suggest the following updated definition:

> *"a wrist-worn device with computational power, that can connect to other devices via short range wireless connectivity; provides alert notifications; collects personal data through a range of sensors and stores them; and has an integrated clock".*

Related Work

To the best of our knowledge, no study has looked at how users actually make use of SWs, which are sold as devices to "*get information you want conveniently on your wrist*"[3] and "*stay connected to things that matter*"[4]. Several studies have looked at how hardware and software may be improved for SWs (e.g. [2]), however, few have looked at the user experience of such devices, focusing primarily on specific use cases. For example, Ye et al. [15] studied accessibility implications of mainstream wearable technologies using a prototype wristband. Although their focus was not just on wrist-worn devices, they did find that small, easily accessible and discreet wearables could help people with

[1] https://www.apple.com/uk/watch/

[2] www.kickstarter.com

[3] https://moto360.motorola.com/

[4] https://getpebble.com/

visual impairments retrieve information and participate in social interactions.

One concern for wearables is the privacy or security issue that may arise. Instead of focusing on software improvements, Migicovski et al. [9] developed a proof of concept application for the Pebble Smartwatch to highlight the broader security implications. Their use case scenario involves dishonest students who collaboratively cheat in real-time on multiple-choice exams. Privacy implications must also be considered as wearable devices are beginning to be used by companies to process customer information. For example, airline companies have started trialling wearable devices such as Google Glass or Sony Smartwatch 2 to handle passengers' information [8].

Giang et al. [6] conducted a pioneering study on a particular real life scenario. They compared the impact on drivers of notifications provided on a Pebble Smartwatch and a smartphone. In their simulation lab-based study they measured glance duration on the two devices using three distracting conditions (no notifications, simple notifications and interactive notifications) and four driving scenarios, comparing results within subjects. Findings show that users had longer glances when using the watch, suggesting that SWs may be more detrimental to driving performance. Overall, this study highlights how there are potential differences in how drivers modulate their interactions with a SW compared to a smartphone.

Another potential real life use case of a SW was studied by Bernaerts et al. [1], where they developed an app to digitally augment interactions in an office environment. They implemented their app on a Samsung Galaxy Gear Watch with the purpose of performing common office actions, such as knocking on someone's door, without losing too much time. Such an implementation has potential for reducing unintended interruptions in the office.

Despite being valuable and necessary studies, the previous work presented in this section relates to specific use case scenarios and does not consider everyday use. Smart wrist-worn devices introduce the opportunity to explore new research areas of mobile user experience because, unlike mobile devices, wearables are more discreet and allow minimal interference between the user and the task. To the best of our knowledge, this is the first study that reports findings on *why* and *how* people use SWs in real life. By conducting exploratory interviews with early adopters, we are able to identify why people are buying them, the added value, and limitations for mass adoption.

Method

We conducted 10 semi-structured interviews with early adopters of SWs. Participants were recruited through flyers, advertisements on social media and online groups, and by word-of-mouth. They completed a recruitment survey to be selected for the interview. Selection criteria included: owning a SW for at least three weeks, living in the UK, and being over 18.

Participants were all males, with ages ranging from 26 to 63 (M=34.3, SD=10.9). Occupations included: PhD student, software engineer, business development manager, chief innovation officer, design evaluation specialist, UX consultant, UX researcher commercial manager, and design evaluation specialist. 90% of participants were educated to undergraduate degree level or higher. Overall, participants reported

Moto360 *(Android OS)* Pebble *(Pebble OS)*

Samsung Gear S *(Tizon OS)* LG G watch *(Android OS)*

Figure 1: SWs used by participants

experiences with the following SWs (see Figure 1): Pebble (n=5), Moto360 (n=2), LG G watch (n=2), Samsung Gear S (n=1). As an incentive to take part in the study, participants were entered into a prize raffle for one of three £25 Amazon vouchers.

Findings

Findings presented in this paper are the result of an on going thematic analysis [4] of the data. In the recruitment survey, participants all defined themselves as either innovators (n=7) or early adopters (n=2) and one participant considered himself as part of the early majority category [11]. Questions of the recruitment survey also included 'who bought the smartwatch?', 'how long have you used the smartwatch for?' and 'do you own a traditional watch?'. Only two participants paid full retail price for their SW, two participants received one through their work, and the rest bought them at a discounted price. They all reported owning their SW for at least 3 weeks (MIN=3 weeks, MAX=2 years). Confirming their self-classification as innovators or early adopters in the survey, the main reason for getting a SW was curiosity: "*it's what's next*" (P5, Moto360), "*I wanted to be one of the first people to try those things because it was promising things that we had never experienced and we are not clear how it will make our life easier or more difficult*" (P8, Pebble). The one participant who considered himself part of the early majority bought his Pebble "*because it was one of the few that did sleep monitoring*" (P3, Pebble).

Smartwatches aesthetics

The aesthetic appeal of SWs is considered an important factor because "*I cannot have the same watch for every occasion, it sort of looks weird*" (P6, Moto360). In fact, seven participants also own traditional watches, and four of them report wearing these occasionally. However, personal preference still has a large impact on design and the same watch is not considered aesthetically appealing by all participants.

"The Pebble is pretty unassuming looking. It doesn't really look like 'uh look at that fancy piece of tech'. I'd be a bit uncomfortable with some of the Android watches though, because some of them are quite ostentatiously kinda 'look at this techno widget gizmo thing!'" (P1, Pebble).

"The round face, the form factor of the 360 made it an easy choice" (P5, Moto360).

Smartwatch use in everyday life

The way people use their SW is dependent on personal preferences. The participants variously reported that they used their SW for notifications, as an augmented traditional watch, as a health tracker, as an entertainment device or a combination of the above. The following three examples demonstrate ways in which participants have appropriated their watch.

"*Now I can leave my phone somewhere with the volume turned off and it's plugged charging and if someone sends me a message* […] *I can see that someone's messaged me, I can see who it is and decide whether I care to go and see what the long message is or just ignore them if they're not important*" (P3, Pebble).

"I jogged home last night, […] *and I was running three apps at the same time. 'Cause it was the first time I ran home, I had Google Maps running,* […] *I was also running Spotify. So I had my phone in my rucksack*

with the headphones in my ears and the watch on the wrist. Spotify is playing tunes delivering me entertainment and then I've got Runkeeper as well tracking my progress. […] *That's kind of like the brilliant triumvirate"* (P5, Moto360).

"A lot of the time actually [I use my Pebble] *as a watch. This is really important for me. I can't tell the time* [...] *so I have a watch face on the Pebble that says in words what the time is.* […] *That was one of the first watch faces they mocked up and I thought, 'Oh my god, I need to have this'"* (P1, Pebble).

Added value and limitations to Smartwatch use
Overall, several participants noted that the main benefit of having a SW is to be less dependent on one's smartphone, especially in social situations.

"I don't think it is an exaggeration to say that it has changed my life in the last 30 days. [Interviewer: How?] *I'm less rude, I don't take my phone out of my pocket when I'm with people. I've stopped doing what I'm now calling the 'Smartphone Fosbury Flop', you know the high jump move, where somebody will lean backwards in their chair in order to make room to get their phone out of their pocket"* (P5, Moto360).

"It means I'm quicker at seeing [text messages]*, but I'm probably less likely to actually write a response*" (P1, Pebble).

"It means I'm not hanging out with people and always checking my phone" (P3, Pebble).

"In public people prefer the fact that you look at a watch, as opposed to the fact that you're looking at a phone" (P4, Pebble).

However, despite recognising the added value of unobtrusive notifications, participants acknowledge that SWs are still in early stages and therefore only "[suit] *early adopters. I don't really think there is much of a reason* [for them]" (P2, LG G watch).

"The intention is nice. They want you to keep your phone away, this really tiny device on you that sort of monitors you and pushes all the important notifications to you, but even though all that is promised, it still feels that it's half way. […] *It's quite odd that they have this thing they call smartwatch but it isn't in any way smart"* (P6, Moto360).

"*I would recommend people <u>not</u> to buy them* […] *it's like the original iPhone* […] *I think the smartwatch is kinda in that phase… unless you really want to play with it, don't really bother*" (P1, Pebble).

Discussion and Conclusion

In this paper we have extended the definition of SWs and presented initial findings from an on going interview study with 10 participants who have used a SW for at least three weeks. As suggested by our title, we can summarise our main findings about early adopters and their use of SWs as:

- *The Good.* In the paper we emphasise that the added value of a SW is being able to receive unobtrusive notifications in social situations, hence reducing mobile phone dependency.

- *The Bad.* Despite a general appreciation for inconspicuous notifications, early adopters from this study are still confused as to what the real benefit of a SW is. When compared to smartphones, they still do not offer enough additional functionality in order for them to take off for mass adoption.

- *The Ugly?* Aesthetics desirability of SWs highly depends on personal preferences. As our participants point out, SWs have not entirely replaced traditional watches and users have different opinions about what a SW should look like.

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