

# Wearables Testing

An Introduction to Wearable Technology  
and the Associated Quality Challenges

WHITEPAPER



# Introduction

For a short while, smartphones were considered the most intimate device you own. The first computer you interact with when you wake up and the last one put down before going to bed. Smartphones go everywhere you go. But there's a new trend seeking to disrupt that bond – wearable technology. From fitness trackers to smart watches, smart clothing to glasses, wearable technology is on pace to grow at an explosive rate. With the growth of these technologies comes the need to double down on testing efforts and not forsake high app quality. Users expect wearable devices and apps to work seamlessly together and with the broader wearable ecosystem and they won't tolerate anything less than perfection.

## The Wearable Technology Ecosystem

Today's wearable technology lives in an ecosystem that combines hardware and software. Those winning in the wearable tech ecosystem acknowledge that they not only need rock-solid integration between their device and their own app, but that they also have to play well with other apps and aggregators of wearable technology data. As a developer, you don't have to have your own wearable hardware to play in the space. Integrating with existing hardware, whether it's input hardware or notification hardware, allows you to take advantage of the growing space.

It seems every day there are new entrants to the wearables space. From glasses to watches, different hardware form factors each bring their own advantages and challenges, both for the hardware makers and the app developers

looking to make a splash on the latest form factor.

## **Fitness Trackers**

Much of the wearable space today can trace its roots back to standalone fitness trackers. These devices often leverage a variety of sensors to track distance, elevation and activity levels of users while awake, as well as sleep patterns while asleep. While some of these trackers leverage standard metrics such as steps taken, others use a proprietary algorithm for tracking activity.

Most fitness trackers serve a single purpose and are used to report data to an associated app on the user's smartphone or online. They are often designed to clip onto the user's clothing or be worn as a bracelet.

## **Smart Glasses**

Sometimes described as "Terminator Vision," a reference to the popular 1980s movie, smart glasses currently come in two varieties. Display-mounted glasses serve up images in the corner of the user's vision. A small screen placed near the eye delivers information the user verbally requests. Alternatively, whole-glass devices can overlay information onto the user's environment, providing a layer of augmented reality.

*"The bad news is that all of the different wearables that are on the market now use different development platforms. The good news, however, is that lots of the concepts transfer."*

-Sean McMains

iOS Director, Mutual Mobile

While smart glasses contain a variety of sensors, these devices primarily serve external information to users versus information gathered from the user. For instance, a user can request directions, read email or texts and take/send pictures, but the devices may not have information about the user's fitness or the environment.

## Smart Watches

Watches are the latest category of wearable technology to get buzz, but the current generation of smart watches may not be so smart after all. Often requiring a connection to a primary device such as a smartphone or tablet, smart watches can serve as an additional display to inform the user whether or not they should interact with their primary device. Newer smart watches are beginning to include additional sensors to replicate some of the data gathered by dedicated fitness trackers, including daily step totals and heart rate. As the

smart watch category expands, devices are beginning to get smarter and may begin to work on their own, independent of a primary device.

Smart watches represent a large opportunity as both companion devices or standalone devices. Because watches are easily accessible when worn, they can alert users throughout the day to information from their primary device

*"It's only a matter of time before watches untehter themselves from the phone. It's going to take some time for the technology to get there, but it's inevitable that it will happen."*

-Stuart Dredge

The Guardian

or about their fitness and they could eventually open the door to a whole new way of interacting online.

## **Smart Clothing and Jewelry**

Sensors are just starting to be incorporated into clothing and jewelry, providing many opportunities for additional body feedback or notifications from other devices. Smart clothing is the definition of wearable technology and may be the ultimate outlet for where the industry evolves to. Today's smart clothing offers the ability to measure body outputs such as heart rate or muscle movement, but there may be additional market opportunity if smart clothes are developed to warn users of dangerous environments (such as too much sun exposure ) or provide them with real time feedback (such as haptic feedback for navigation ).

While smart clothing is poised to take off, cost will be a potential roadblock, as users may not want to convert their entire wardrobe over to a smart system. However, it also enables companies in the fashion space to sell an entire line of tech-enabled clothing, or to sell sensors that interchange between articles of clothing.

## **Companion Apps**

Wearable devices are typically paired with a companion app that runs on a primary device such as smartphone, tablet or computer. The app can serve several purposes such as syncing data, providing notifications for the device and, of course, initial setup. Companion apps need to work well as they are often the face of the brand/device. They're the portal through which information is synced and serve as the display for trends and other relevant data. The easier the companion app is to use, the more likely a user is not

thinking of it as a separate experience. And it's important to understand how a companion app interacts with different devices, not just one manufacturer, but also how the app incorporates outside data from others' APIs.

## Aggregator Apps

Another set of apps in the wearable ecosystem is aggregators. They can bring in data from different wearables and data sources to provide a comprehensive overview. Aggregator apps have the potential to be games, provide coaching or instructions, serve information to insurance providers for discounts and more. By pulling in data from different APIs and devices, developers can create unique experiences that bring the data to life in new ways not necessarily imagined or supported by the original device manufacturer. Aggregator apps need to play well across APIs and deal with the growing fragmentation in the wearable space.

## On-device apps

Apps that leverage the wearable device themselves require special attention. They need to be pared down and designed specifically to work on the form factor. Bringing your app to a smart watch or glasses is not just about shrinking the interface. Developers need to be cognizant of use cases, battery life and user attention spans. In short, these types of apps need to serve up relevant information and then let the interface get out of the way.

## **W**hy You Should Care

Whether you're an established player in the wearables space or you're just kicking the tires, the growth rate of wearable technology should be enough

to pique your interest. As of 2013, there are more than 90 million wearable devices connected to the internet. That number is expected to grow six-fold over the next five years.

The market opportunity is attractive to develop winning app experiences and killer hardware. The average number of daily interactions with a smartphone is 150, but wearing a computer means more interaction and more opportunity for usage. That means there's more of a chance your app will be used and it will have to work every time. Creating a bad experience on a wearable device may not be the same as on a smartphone. On a phone, users can easily delete an app, but what happens when a user is dissatisfied with wearable technology? They may discard or discontinue use of the entire device.

The relatively low cost of most wearables could mean these new devices entice users and sell well in the mass market. With an average selling price around \$100 for most fitness trackers and \$300 for smart watches, wearables could see faster adoption patterns than smartphones. Users are going to expect your apps to keep up, and work with their wearable tech, as well as provide information into their new ecosystem.

Wearable technology can also help create the lock-in effect. If you create a device that partners exclusively with a particular technology, you can draw users further into your ecosystem. For instance, if you have a fitness tracker and also produce smart TVs, you can create connections between them to display relevant information to users on a bigger screen. Users may then be more likely to add additional devices from your brand to their collection to gain access to a unified experience.

Conversely, if you're an app developer creating apps that are device agnostic, you can get in front of as many users as possible. However, it is important to

prepare to handle different data types and information and address growing fragmentation in the industry.

Depending on the wearable technology, you may be able to sell multiple devices to the same user. If all of the information is going to a central repository, users may have a device for during the day and a device for night or weekends.

## **W**hat You Should Watch Out For

Because wearable technology is inherently mobile and designed for different types of users, body types, sizes and environments, in-the-wild testing is more important than ever. Testing devices and apps where users work, live and play makes sure they can withstand the abuse of everyday life and work when and where they are expected to. Wearable hardware needs to withstand a range of temperatures and moisture levels that everyday users are exposed to – not to mention getting jostled, banged around and roughed up. The apps designed for wearables need to function not only on their form factor, but also under the same varied conditions as smartphone apps, such as on different network connections and connectivity levels.

Overall, wearables pose both familiar and unique challenges for hardware and app developers.

### **Connectivity**

Wearable technology often requires either intermittent or constant connectivity with a primary device, and there are a variety of ways to connect, including hardware (such as 3.5mm jacks or USB), Wi-Fi or Bluetooth. Wireless



connections require extensive testing. Wi-Fi networks and configurations should be tested under real world circumstances to account for varying levels of signal in different environments.

More recently, wearable hardware has been integrating Bluetooth Low Energy (LE) radios. Using Bluetooth LE allows for more constant updates between the device and the associated app without being a substantial drain on battery life. However, while Apple has provided support for the protocol since the iPhone 4S, Android devices are just now starting to come equipped with the standard. Google officially started supporting Bluetooth LE APIs in Android 4.3 (Jelly Bean). As Android devices begin to leverage these newer chipsets and software, it will be important to test their connectivity.

## **Battery life**

Users have high expectation that their devices will work when and where they want them. Unfortunately, wearable technology is plagued by short battery life, primarily due to device size. Battery life is a challenge for both hardware producers and software developers. Developers should test to ensure their apps do not have an adverse effect on the battery life of the device. The shorter the battery life, the less likely a user is to interact with their device. If they have to charge too constantly they may abandon the device altogether.

## **Screen Size**

Much like smartphones, wearable technology requires thinking about form factor. You can't just shrink your app and call it a day. Smaller screen real estate and shorter user attention spans mean you have to get to the heart of what your app does. Adding complex menu systems or trying to fit too much information into a small display space can overwhelm the user. Instead, it

is important to think about the use case in which your user will most often interact with your app. Then design a unique interface to fit the screen size and form factor your app is appearing on.

## Soliciting User Feedback

While traditional app stores have known feedback mechanisms, evaluating how your users feel about your wearable technology is a challenge. For apps in the app stores, there can be a variety of factors driving ratings, including user opinion of the hardware component, how the device and app sync and the functionality and usability of the app itself. For on-device apps, collecting user feedback is a challenge. Even if you were able to get a star rating for an app, the lack of keyboard often means there is no process for capturing reviews to help you understand what the users are thinking.

## Testing on Real Devices

The physical nature of wearable technology makes it vital to test using real devices. While creating virtual devices to test content and data display is useful (particularly in regression and acceptance testing), adding real devices into the mix helps to mitigate syncing/connectivity issues, captures real data and can provide the real-time feedback you would want out of a wearable device.

# **T**esting for Wearable Technology

When testing wearable hardware and software it's important to think about the user experience beyond whether or not the app and device work. There are important testing opportunities across the SDLC including:

## Functional Testing

First and foremost, you'll want to ensure that your app or hardware works as you intend it to. Testing on real devices, in the wild gives you a sense of how your wearable technology will handle real world conditions. Leveraging a combination of test case execution to ensure elements such as data gathering, connectivity and alert display — in combination with thorough manual exploratory testing to uncover issues you may not have thought about — will give you the complete coverage you need.

## Usability Testing

As you fit your apps to a smaller form factor, it's important to understand what tradeoffs you're making and how they're impacting your user. Are you serving up relevant and timely information in an unobtrusive manner, or is your app bloated with a few too many features? Is your app easy to use on this new device? Performing a usability study with users in your target demographic will help you understand how intuitive users feel your app is and will allow you to concentrate on what matter most.

## Localization Testing

If you are targeting users across the globe, it's important that your wearable technology adapts to their culture, language and formats. With smaller screens to display information, it's important to validate word choice to make sure your translations fit into the interface while still having your intended meaning. Because wearable technology often includes a form of measurement, its essential to make sure you're using the correct number formatting for the market.

## Load and Performance Testing

While much of the communication of wearable technology is directly device-to-app, it is important to consider how your app handles load if it also stores user information in the cloud or syncs across multiple devices. Knowing how your app handles pressure during peak usage times can help you create a smoother, lag-free experience for users.

## Security Testing

If your wearable app communicates with a cloud server, it is important to ensure that you are protecting user information such as username and password, Personally Identifiable Information (PII) and Protected Health Information (PHI). Users are extremely sensitive regarding their private data, particularly location and workout data falling into the wrong hands. And with the recent string of attacks on companies from major retailers to social networks, it is more important than ever to ensure the security of your app and privacy of your users' information. Running a security audit will ensure your storage of data and the connection to your server are up to the required security and privacy demands of users.

## **C**onclusion

With wearable technology entering its growth phase, it's an exciting time to participate in the market. It is important when jumping in to make sure you deliver a consistent, high quality experience for users. Apps and hardware that win will be designed with the user in mind and will be thoroughly tested to ensure a seamless experience. As more hardware enters the market, it will be

important to handle the growing fragmentation, users will want their favorite apps – your apps – on every device they own, whether that’s their smart watch, smart glasses or some other unknown tech. It’s important to go into this new field with a firm commitment to quality at every step of the way. Your users expect your wearable technology (whether hardware or application) to just work, work well and get out of the way of their daily lives and you need to meet those expectations from day one. With so many options poised to enter the market, you can’t afford a disappointing launch or a quality misstep.

# About Applause

Applause is leading the app quality revolution by enabling companies to deliver digital experiences that win - from web to mobile to wearables and beyond. By combining in-the-wild testing services, software tools and analytics, Applause helps companies achieve the 360° app quality™ they need to thrive in the modern apps economy. Thousands of companies – including Google, Fox, Amazon, Box, Concur and Runkeeper – choose Applause to launch apps that delight their users. Learn more at [www.applause.com](http://www.applause.com).