



Inside Wearables - Part 2

A look at the uncertain future of smart wearable devices, and five industry developments that will be necessary for meaningful mass market adoption and sustained engagement

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Foreword

In January 2014, Endeavour Partners presented its first white paper on wearable technology. In this white paper, we presented consumer research showing the alarming rate at which consumers were abandoning wearable technology and described several factors that were critical, from both a product design and behavioral science perspective, in driving deeper, sustained engagement with consumers. The first white paper can be found at www.endeavourpartners.net/white-papers.

Since we published the first white paper, the wearables market has continued to evolve at a heroic pace. However, while there is a great deal of excitement around wearables at the moment, the future mass market success of wearable technology, particularly in the next 2-3 years, is far from guaranteed. Abandonment rates continue to be high despite increased adoption, and the industry continues to struggle to deliver products and services that provide sustained benefit to the mass market.

With that said, the wearables space is in a period of significant transition. There are five developments that are beginning to occur that have the potential to drive meaningful mass market adoption and the delivery of sustained benefit to consumers. The degree and speed at which these take place over the next 2-3 years will have a significant impact on the rate at which wearable technology truly becomes a mass market product category. This paper will present the state of the industry today and examine these developments.

This paper focuses specifically on the present state and evolution of *smart wearables*, wearable devices that provide advanced functionality, connect to the internet (typically via your smartphone), and are typically designed to be worn persistently. This category includes activity / fitness trackers (such as Fitbits, Jawbones, and Nike Fuelbands) and smartwatches (such as the Samsung Galaxy Gear and Pebble watches) as well as emerging categories like AR glasses and certain types of smart clothing.

This paper will not cover wearable technology that is designed to be worn during sessions (such as exercise gear like GPS and running watches, heart rate straps, etc.) nor will it cover wearable products designed specifically for healthcare applications (such as wearable cardiac event monitors, glucose monitors, and hearing aids).

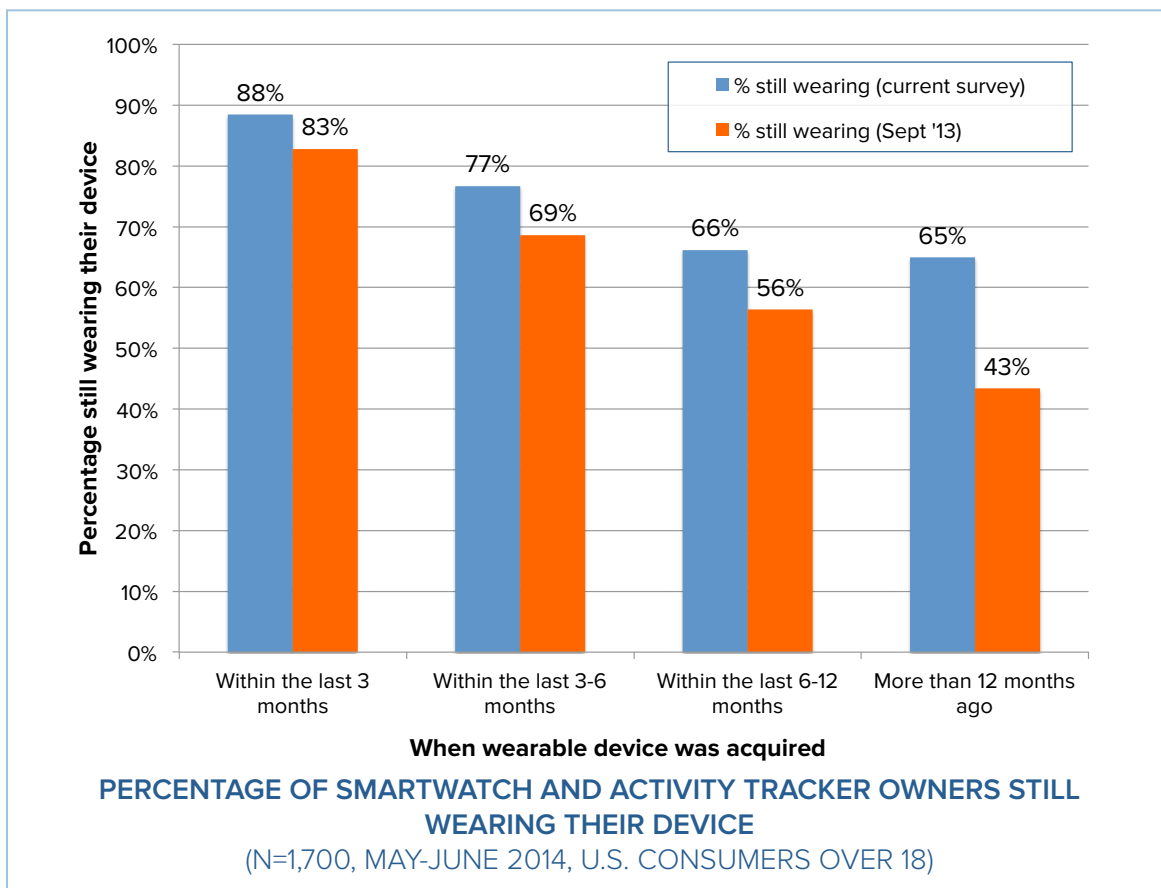
We hope you enjoy it and find it useful. If you have comments, questions or would like to discuss the evolution of the wearables space, please email Dan Ledger at dan@endeavourpartners.net.

The future mass-market success of smart wearables

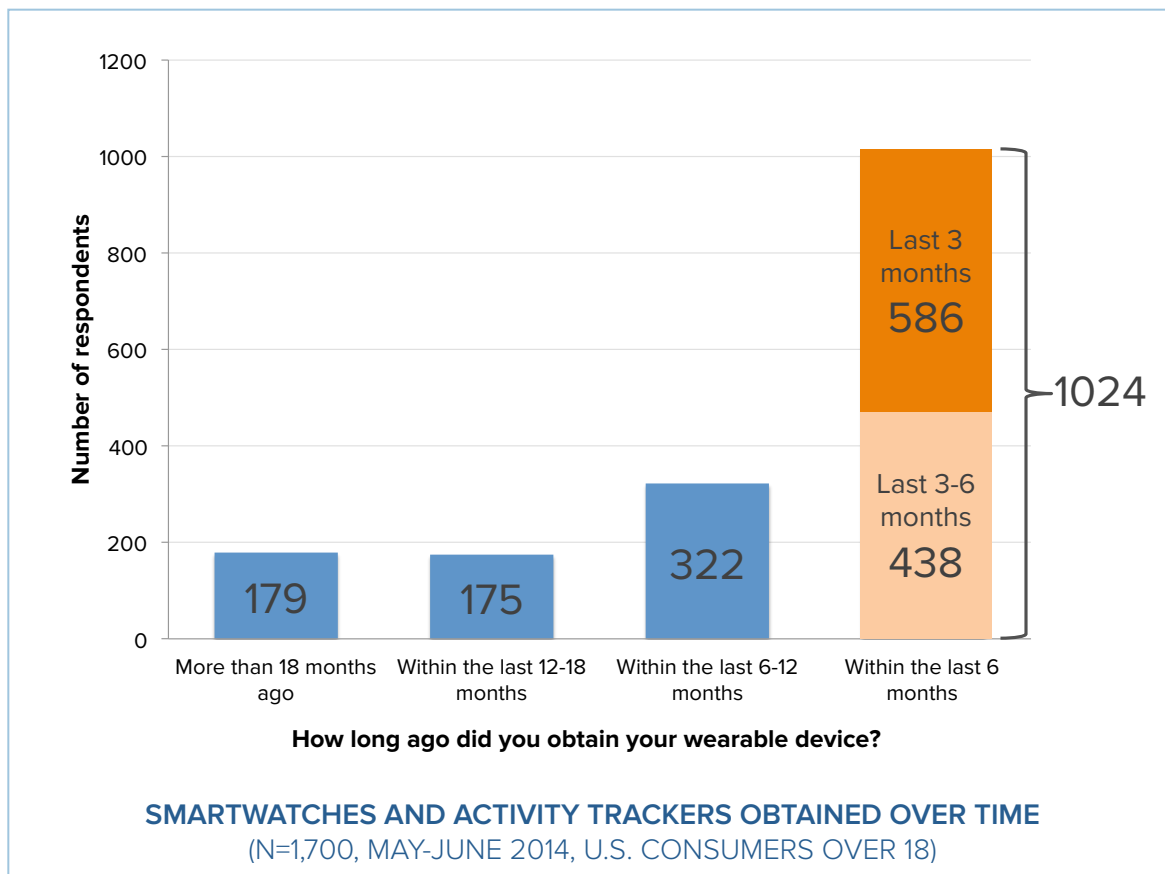
The world is awash with wildly varying opinions about the future of smart wearables. Some see this category as an overhyped bubble that is about to pop while others see the emergence of a new and powerful category of products and services that has the potential to help people live fundamentally healthier and more productive lives.

It's not surprising that this is the case. While the technology is exciting, the smart wearables in the market today haven't been universally adored. Many who have come to own these, have also been quick to abandon.

Endeavour Partners published research that we conducted in the fall of 2013 showing that about half of consumers abandoned their activity trackers. We have subsequently run this research every few months, and while the abandonment rates are improving, the fact of the matter is that, as of June 2014, about a third of owners of smart wearables still abandon these devices after six months. The abandonment rates for activity trackers is slightly higher than smartwatches, but they're presently very similar.



Despite the fact that consumers continue to abandon the smart wearables on the market today, there is still a great deal of interest around this category of devices. The rate of adoption of smart wearable technology has accelerated in recent months. In fact, three times as many U.S. consumers responded that they obtained a smart wearable in the last six month period than the six month period prior.

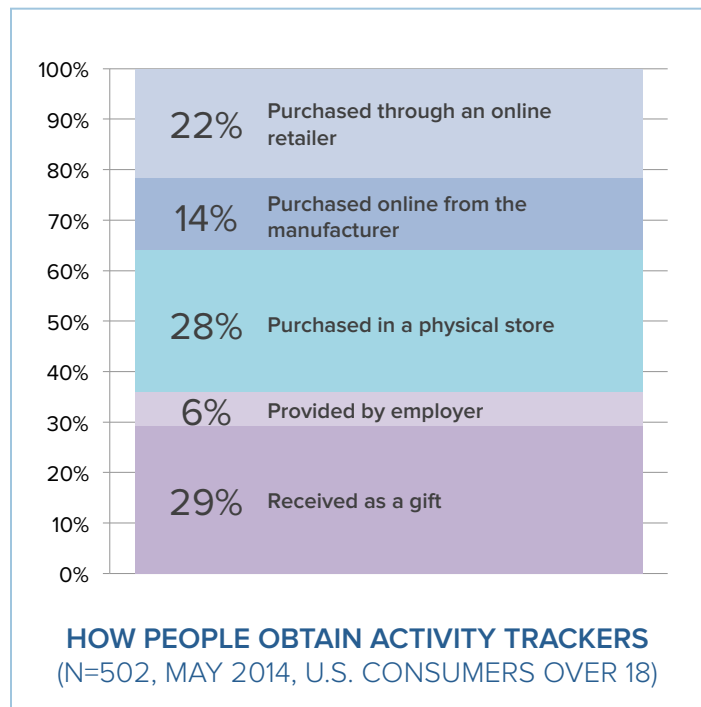


There are several factors that contribute to the growth of this market.

First, smartwatches, activity trackers, and other emerging smart wearables have become very visible products. They have received a great deal of attention from the main stream media and are now featured in television advertisements. These products are positioned with the promise of better health, better fitness, higher productivity, better sleep, etc. and naturally generate intrigue amongst consumers, most of whom have no prior experience with this category.

Second, smart wearable devices can now be found in many online and bricks-and-mortar retailers. Fitbit's products, for example, can now be found in electronics stores (BestBuy, RadioShack, Apple Store), recreation and sporting goods stores (Sports Authority, Dick's Sporting Goods, REI), warehouse clubs (Costco), discount retailers (Target, Walmart), and wireless carrier stores (Verizon, AT&T), to name a few.

Third, smart wearable devices are increasingly given as gifts and given to employees as part of broader corporate wellness programs. Their price point, novelty, and perceived value proposition has made them popular gifts. Large employers are rapidly adopting employee wellness programs, and a rapidly increasing percentage of consumers are obtaining activity trackers from their employers. As of May 2014, approximately a third of U.S. consumers who own a modern activity tracker received it as a gift or from their employer.



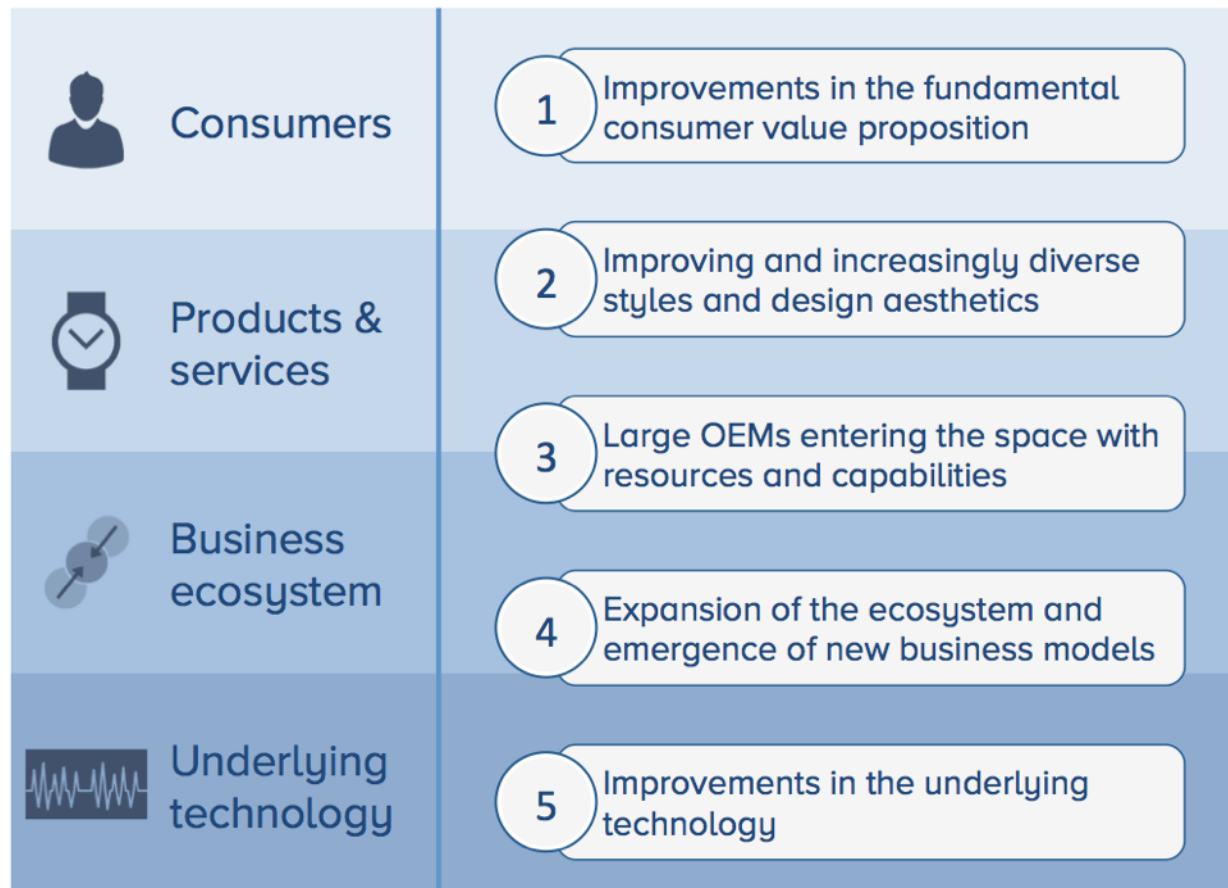
What does this mean for the future of smart wearables?

We have a rapidly increasing population of U.S. consumers who now own a smart wearable device, on the order of tens of millions of people, yet a significant percentage of these users continue to become disenfranchised with the devices over time.

This raises several important questions about the future market potential of smart wearable technology. In particular, as an increasingly large population of consumers becomes disenfranchised with this category of products, will they return to the category as products improve? What will it take to reignite their interest? And how long will this take?

The larger question in all of this is what will it take to build products and services that people aren't so quick to abandon, which generate lasting benefit to a broader set of people?

We are still in the early days of smart wearables and mass market adoption of smart wearables is far from guaranteed. However, we are at an important transition point in the industry. There are five fundamental shifts in the industry that are beginning to take place:



The extent to and rate at which these come to bear will have a significant impact on the future consumer demand within this category, particularly over the next 2-3 years.

This paper will explore these five developments, provide a perspective on the progress within each, and explore how each will shape the future of smart wearables.

1

Improvements in the fundamental consumer value proposition

Smart wearables will begin addressing a broader and more interesting set of consumer problems than the devices today; consumer health is going to be particularly important and significant

The smart wearable products currently in the market aren't for everyone. There are distinct populations that stand to derive meaningful, sustained benefit from these products, but these populations are a fraction of the mass market.

The top selling smart wearable products in the market are largely wrist-worn or belt-worn devices with relatively simple functionality provided by small to medium sized OEMs (Original Equipment Manufacturers). Activity trackers count steps and can be a great tool to help fairly inactive people develop healthier habits. Smartwatches essentially extend the simple elements of the smartphone experience onto the wrist with push notifications and extensions of smartphone app interfaces.

Moving forward, however, we will see an explosion of form factors as well as the benefits that these devices provide to consumers. In particular, we will see the emergence of use cases that address problems for which smart wearables are an optimal solution (rather than simply replicating smartphone functionality on the wrist).

Below are a few of the more interesting use cases that are beginning to emerge:

- **Building a stronger connection between people and their health** - this is perhaps the most exciting category for wearable technology. The activity trackers and simple heart rate monitoring watches on the market are primitive in comparison to what device vendors and service providers are currently developing. Through better bio-sensing and processing capabilities, emerging devices will be able to help consumers with a broad array of wellness related issues from stress and anxiety management to helping people optimize wellness through a better understanding of physiological patterns. These emerging products will provide clearer benefits to consumers but will also increasingly be beneficial to the healthcare system. In particular, they will also benefit the payer network, as payers continue to look for more innovative tools and approaches to keep their customers happy and healthy.

- **Providing contextual intelligence** - Google's Android Wear is probably the best early example of how a smart wearable device will begin to assume the role of a persistent virtual assistant that is able to provide meaningful and accurate information at your wrist. Android Wear extends Google Now, Google's intelligent personal assistant, and app functionality into a wearable device. The present implementation feels like how a v1.0 release typically does. Moving forward, however, we can expect to see this experience improve in utility and experience, and evolve from a tool of convenience (I don't have to take my smartphone out of my pocket to see an alert) to one of unique utility (gently providing meaningful insights and information at the right time).
- **Control and automation** - smart wearables will increasingly extend our connection to the physical world as the smartphone has begun to do. Physical gestures or changes in physical or physiological state detected by a smart wearable will be increasingly used to trigger events within a user's context. We are already seeing examples of this functionality on the popular automation platform, If This Then That (ifttt.com). This platform allows consumers to generate their own automation routines across several cloud based services that they subscribe to. Jawbone, Fitbit, and Android Wear are now available as automation sources. A user can, for example, trigger an event when a Jawbone detects that she is awake such as turning on lights in her home or turning on her coffee maker (via a Belkin connected outlet). These use cases are simple now, but as the sensing and interaction capabilities of these devices improve, the universe of useful automation tasks that they can support will expand.
- **Augmenting the deskless worker** - wearable technology is finding its way into enterprise applications too. Augmented Reality (AR) glasses are emerging as a powerful tool for the "deskless worker", those that typically work in the field and need both hands free to do their jobs (field technicians, for example). Companies like APX Labs are developing compelling enterprise solutions for vertical markets based on existing AR glasses platforms from companies like Google and Epson.

Beyond these, there are a number of interesting emerging applications such as authentication, payments, child tracking, and gaming. And as the developer ecosystems begin to grow around these device platforms, we will see an explosion of more interesting and imaginative use cases that simply aren't obvious today.

2

Improving and increasingly diverse styles and design aesthetics

Wearable technology will be increasingly hidden behind stylish designs, that will have a wider appeal than the technology-forward gadgety devices in the market today

Mass market adoption will ultimately be gated by the aesthetics and comfort of smart wearable devices. While early adopters may be more forgiving, the broader mass market consumers are far more discerning about accessories that they will wear on a daily basis on their wrist and other visible body parts.

Most of the devices on the market today have a very technology-forward design aesthetic, partially as a result of component technology and material technology limitations.

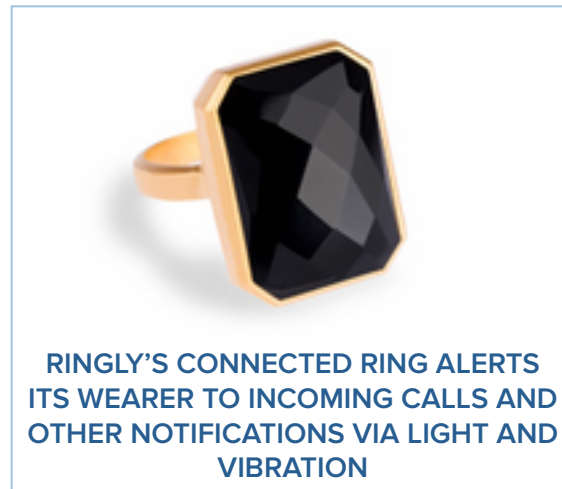
Over the next few years, we will watch the technology disappear into an increasingly diverse variety of design-forward form factors that will have greater appeal for more consumers.

A perfect example of this is the Activité, pictured below, a watch that Withings just announced. Buried within a stylish and traditional watch design are capabilities to measure distance (walking, running, swimming), calories burned, and sleep quality and quantity.



**THE STYLISH NEW WITHINGS ACTIVITÉ WATCH INCLUDES
ACTIVITY AND SLEEP TRACKING CAPABILITIES**

Another great example is Ringly, a stylish ring that communicates smartphone notifications to its wearer via vibration or light. This product is designed to help women, who prefer to keep a smartphone in a purse or bag, know when someone is calling or texting. This product is particularly excellent because A, there is no technology that is evident in the design, and B, it provides a great solution for a real problem.



Fitbit recently partnered with Tory Burch, a prominent women's fashion designer, to design a piece of jewelry that can accommodate the Fitbit Flex bug (activity tracker). The Misfit Bloom from Misfit Wearables is stylish piece of jewelry.

The companies who succeed in this respect will start with a design and then find innovative ways to disguise the technology, such as the companies mentioned above. Those that start with a technology-forward artifact and try to paint a layer of design over it will struggle. Google, for example, has attempted to dress up Google Glass by making new frames available from designer brands, but the result is simply an uglier pair of designer frames.

As the underlying component technology shrinks further and more designers are brought into this space, we will see an increasing number of stylish smart wearables with cleverly hidden technology that provide functional and well-thought interface and interaction modalities.

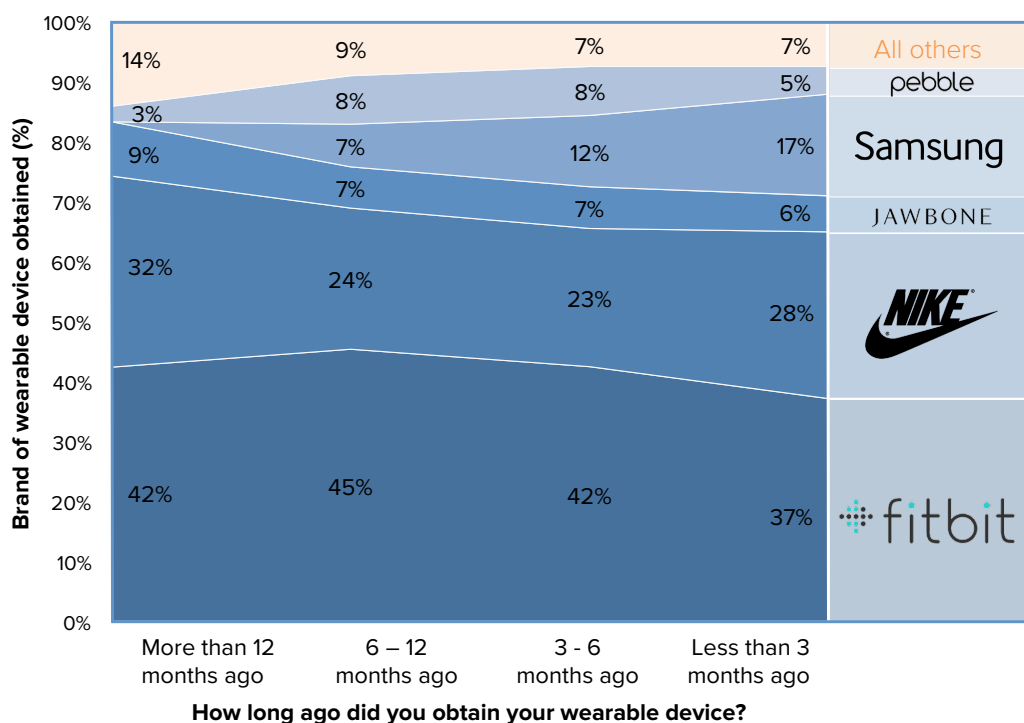
3

Large OEMs entering the space with resources and capabilities

Large device manufacturers have the potential to catalyze the mass market for wearables technology; smaller surviving players who don't get acquired will carve out new and important niches in this space

We are quickly transitioning into a new era of wearable technology in which several large device manufacturers with extensive resources, strong design and manufacturing capabilities, supply chain mastery, and hefty marketing budgets are beginning to bring highly capable devices to the market. This isn't to suggest that large players will immediately develop wearable products that consumers care about, but they will certainly help accelerate the progress.

Samsung, for example, is a relative new-comer to the wearables space. However, they are aggressively marketing and advertising the Galaxy Gear line of smart wearable devices and quickly capturing an increasingly larger share of the devices purchased. The Galaxy Gear Live represents a significant leap in capabilities and form factor compared to other smartwatches (although the Android Wear experience is understandably a bit rocky still).



SMARTWATCH AND ACTIVITY TRACKERS OBTAINED BY BRAND OVER TIME

(N=1,700, MAY-JUNE 2014, U.S. CONSUMERS OVER 18)

The competitive landscape is beginning to shift quickly, and the eventual fate of the small and medium sized smart wearable OEMs that dominate the market today is far from certain. Some percentage of the device manufacturers will either be acquired or will go out of business. Those that remain will need to carve out defensible positions in niche areas of the market or find new ways to participate in the evolving wearables ecosystem.

The larger players will likely continue to lead with wrist-based smartwatches that absorb the functionality of activity trackers, provide an increasingly interesting array of bio-sensing and interaction capabilities, and attract developer ecosystems that will drive innovation.

	Google	Apple	SAMSUNG	All others
Developer ecosystem	ANDROID	Apple iOS Developer	Emerging	Emerging
Operating system / SDK	ANDROID wear	iOS	Tizen SDK for Wearable TIZEN	Proprietary RTOS / SDK
OEMs	htc, ASUS, SAMSUNG, LG, FOSSIL	Apple	SAMSUNG	In-house / Contract manufacturers
Chipsets / Reference designs	QUALCOMM, BROADCOM, MEDiatek, intel, BASIS, Imagination	Apple	SAMSUNG	Multiple
THE MAJOR EMERGING PLAYERS IN THE SMART WEARABLES SPACE BRING DEEP RESOURCES TO BEAR				

Apple and Google are particularly well-positioned given the fact that they can leverage large, existing developer ecosystems. These developer ecosystems will eventually be responsible for creating vast amounts of additional benefit for consumers. While Apple's and Google's strategies are distinctly different, they are particularly well-positioned to succeed.

While Samsung does not yet have a captive developer ecosystem around Tizen, they have deep engineering and manufacturing capabilities at both the component and product level. Also, they have refined a set of powerful capabilities around marketing and channel management. If they can succeed in their platform and developer ecosystem ambitions, they will continue to be a strong contender.

4

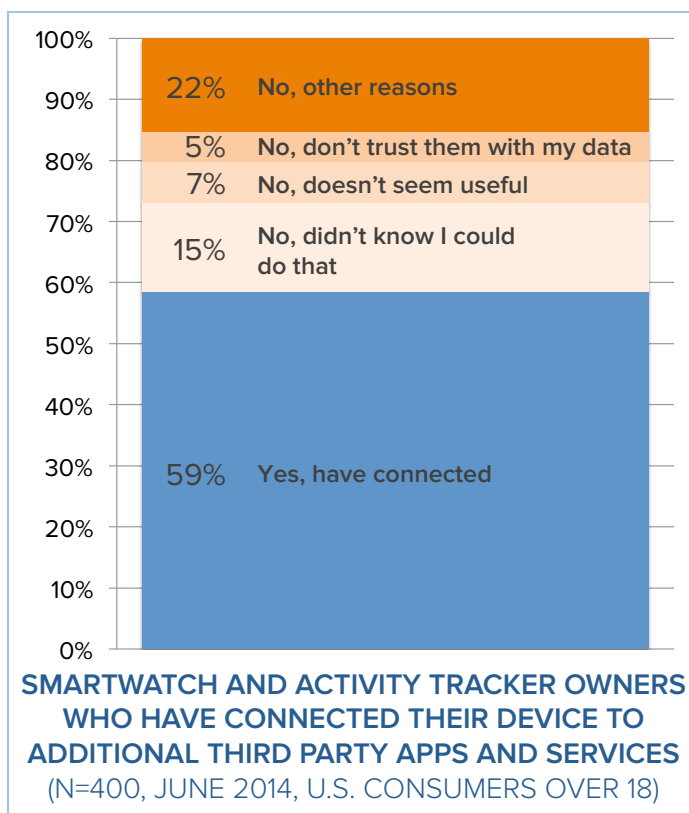
Expansion of the ecosystem and emergence of new business models

An emerging business ecosystem will allow several categories of players (beyond hardware providers) to create value, drive innovation, and make money

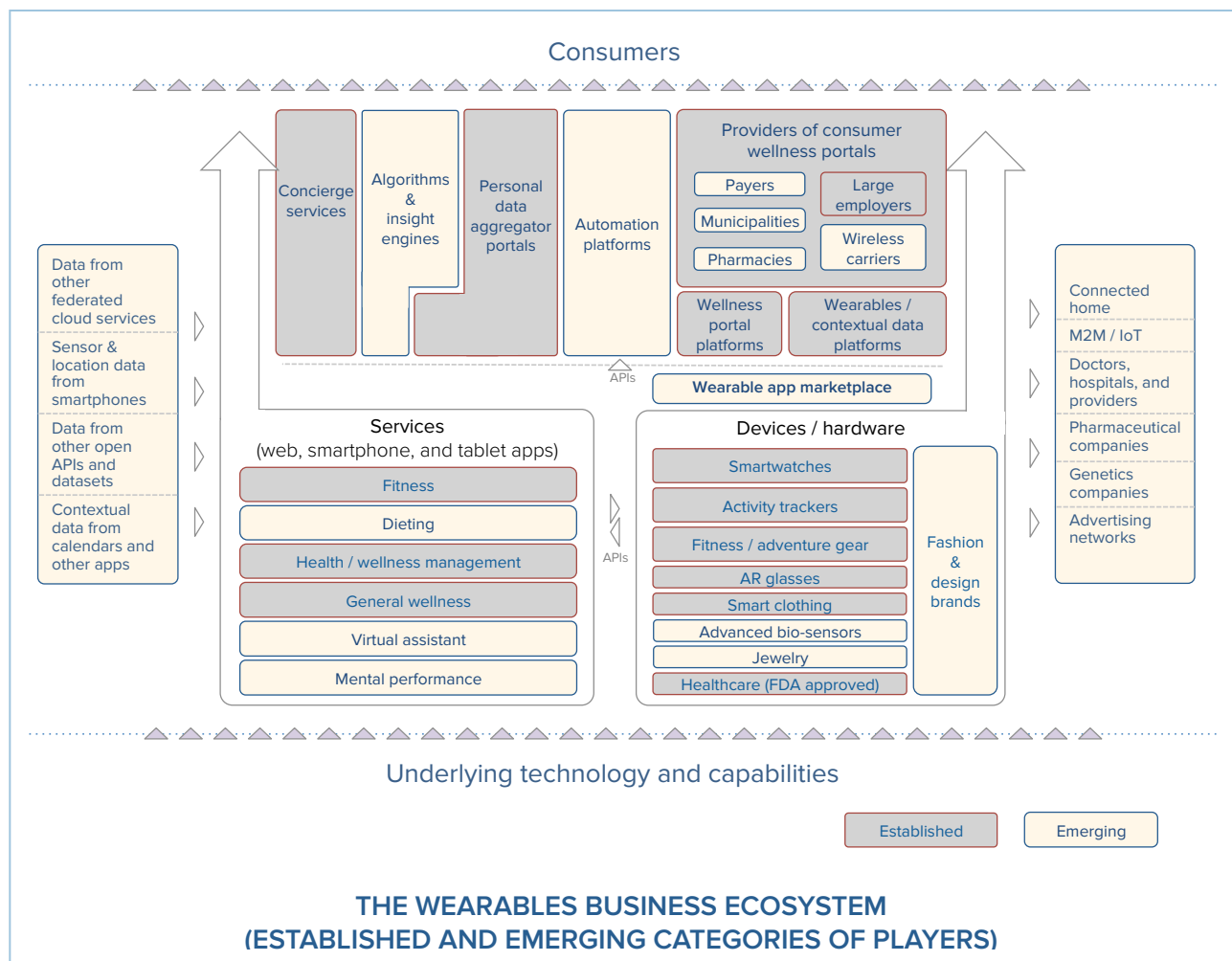
At the center of the wearables business ecosystem are the device manufacturers who make money primarily through the sales of their devices. However, unlike many other consumer electronics categories, the smart wearables business ecosystem extends well beyond the hardware providers. There are now several types of players in the broader wearables ecosystem creating unique value for both consumers and other businesses.

The expanse of the ecosystem is primarily driven by the fact most of the smart wearables on the market have an open API (Application Programming Interface). This means that owners of these devices can allow other applications and services to access the data from their wearable devices and do other useful things with this data. For example, if an individual is using MyFitnessPal to track his diet and calories, he can allow MyFitnessPal to retrieve calorie and step data from his Fitbit account.

Despite known data privacy concerns, a surprisingly high number of consumers who own smart wearable devices are already connecting their smart wearable devices to other applications and services that can provide benefits above and beyond what they are getting from their wearable devices and the apps and services provided by the OEMs. In a recent survey of wearers of smart wearables, more than half reported that they have connected their smart wearable devices to other third party applications and services.



As the data from wearable devices becomes richer over time with better sensing technology, the ecosystem of players creating new benefits from the aggregation and analysis of this data will expand. A diverse collection of large players like Google, Apple, Samsung, Microsoft, AT&T, and Walgreens are standing up platforms and services that can leverage this data. Several small to medium sized players are also beginning to provide increasingly important capabilities. Validic, for example, creates value by aggregating, normalizing, and combining data from a broad array of wearable devices and providing it to the healthcare system in a HIPAA compliant manner.



Moving forward, we can expect to see an increasingly diverse and vibrant ecosystem which will create additional, unique consumer benefits that will extend far beyond the benefits provided by their specific devices. Furthermore, as more sophisticated wearables like smartwatches begin to support applications (such as Pebble and devices running Android Wear do), the developer ecosystem will drive an increasingly large amount of the innovation.

5

Improvements in the underlying technology

The underlying component technology is relatively immature and is a major gating item that is preventing the industry from realizing a more ideal user experience; the pace of innovation is intensifying and these issues may begin to resolve in the next 2-3 years

The underlying component technology upon which smart wearables are being constructed is still relatively nascent, resulting in some key limitations in the user experience. However, this is improving quickly. Component vendors are investing heavily in this space as there is a shared belief that this segment will drive significant volumes of components in the future.

The two areas in which the component technology limitations are most pronounced today are battery / energy technology and bio sensing technology.

Battery / energy

Smart wearable devices have limited space for batteries, and thus the batteries in smart wearable devices today need to be small. An iPhone 5S, for example, contains a battery with a capacity of 1900 mAh while the Samsung Galaxy Gear 2 contains a 300 mAh battery. The Samsung Galaxy Gear 2 is one of the more sophisticated smartwatches on the market. An iFixIt teardown of this device reveals a battery that, while small, is still relatively large in size compared to the device.

Designers and engineers must address a very challenging set of design tensions between 1, the battery life of the device, 2, the device capabilities and functionality, and 3, the size and aesthetics of the device. Most smartwatch manufacturers have been able to optimize for one of those, and some like Samsung, Metawatch, and Pebble have approached two. But no smartwatch manufacturer has been able to deliver a device that provides all three.



A TEARDOWN OF THE SAMSUNG GALAXY GEAR 2 SMARTWATCH FROM IFIXIT.COM

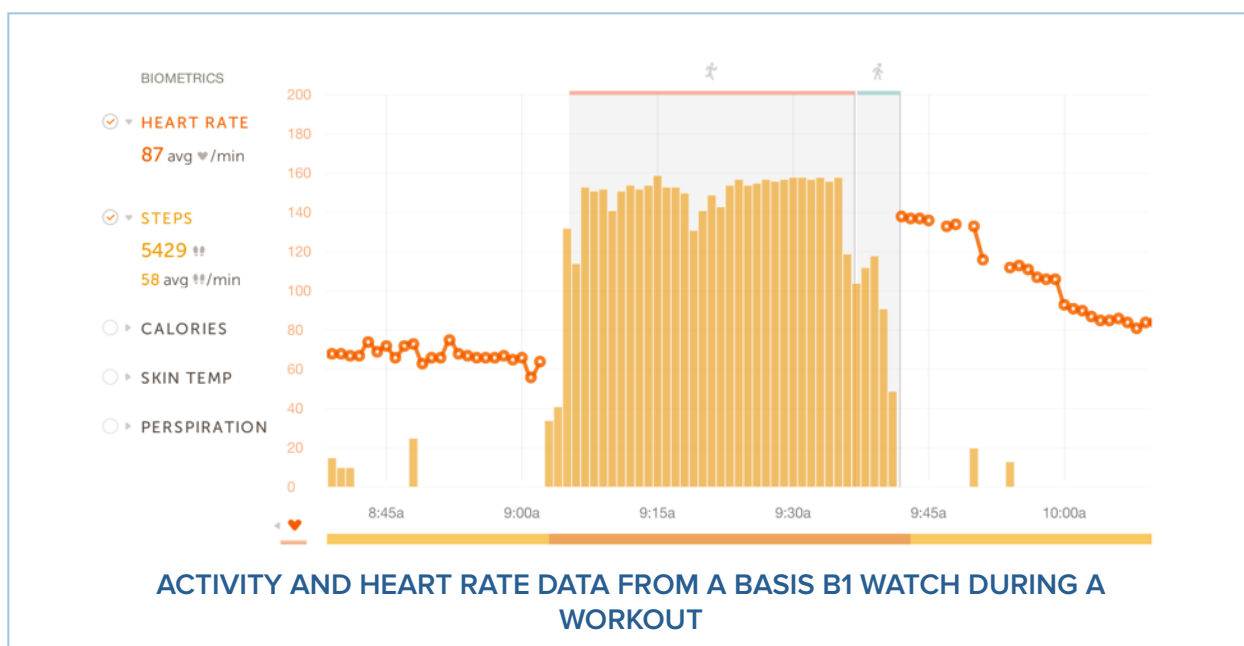
The industry is currently working on three approaches for improving the battery life of smart wearables. The first is improving battery technologies that can store more energy within a given volume of space. The second is developing lower power components that are more optimized for wearable devices (size, functionality, and power dissipation). And the third is optimizing the software running on these devices to consume as little power as possible. While energy harvesting technology such as solar, kinetic, and thermal energy show long-term promise, it's unlikely that these technologies will be mature enough in the next 2-3 years to help much, particularly in devices that consume more power like smartwatches.

In the next 2-3 years, we will begin to see the emergence of smart wearables that are increasingly able to provide rich functionality in the right form factor with good battery life (certainly greater than 1-2 days). This likely won't come from a radical break through in one area but strong incremental improvements across the three factors mentioned above and a systems-level strategy for power and energy management.

Bio-sensing

The second major technical impediment for wearable technology is the availability of robust, non-invasive, low-power bio-sensing component technology. Persistently and robustly capturing bio-signals opens up several powerful use cases for smart wearable devices. Players higher up the technology stack are extremely excited about the types of benefits that can be provided to users based on these types of data.

The challenge today is that robustly measuring biological signals, such as heart rate, blood oxygen (SpO2) levels, or perspiration, in a non-invasive manner represents a significant engineering challenging that the industry is currently working through. First, there are several constraints on *where* these parameters can be effectively measured on the human body. Second, variables like body composition, body hair, and skin color further complicate things. Third, today's bio sensing technology is only reliable under certain physical conditions. For example, optical heart rate monitoring, the present state-of-the-art approach for measuring heart rate from the wrist, doesn't work reliably when the user is moving their arms (small movements of the sensor over the surface of the skin create noise that masks the small heart rate signals). The Basis B1 watch (in my humble opinion, still one of the most uniquely useful wearables on the market today) can't track my heart rate when I run, arguably a time when I'd be most interested in this data.



Component companies like Analog Devices are making great strides in the underlying sensor technology, but the engineering challenges to be worked through remain significant, and it's going to take time for these to resolve.

While we are waiting for the component technology and low-level signal conditioning algorithms to improve, we will see smart wearable manufacturers find new and novel ways of sensing bio data. For example, wearables startup Quanttus is developing a wrist band that uses a combination of optical and inertial sensors to determine heart rate and blood pressure. Samsung's SIMBAND reference design examines changes in electrical resistance deep within the skin to measure heart rate and blood flow.

There is a great deal of investment and energy being poured into sensor technology as well as low-level algorithms that can help clean up this data. As this technology improves and these smart wearables can more robustly and persistently measure more bio parameters, we will see an explosion of health and wellness related devices, apps, and services that provide a far greater breadth of utility than what we see today.

Implications for the future

Smart wearable technology will eventually provide meaningful, inimitable benefits to mass market consumers. But over what time horizon?

As noted earlier, we are effectively at an important transition point with smart wearables.

We are beginning to see the emergence of use cases that are genuinely useful (not just convenient). The universe of compelling use cases will expand rapidly as developer ecosystems begin to grow around these emerging platforms.

The design aesthetics of these devices are improving, diversifying, and generally becoming appealing and acceptable to a broader population of potential users. A design centric approach to product development and the involvement of more design brands will yield far more compelling and stylish designs in the near future.

As larger players enter, they will certainly help to catalyze mass market demand through a combination of well-engineered and well-designed offerings, and strong marketing and channel capabilities. Their initial product offerings won't be perfect, but we can expect these players to iterate quickly towards better products as Samsung has been doing.

The ecosystem is expanding quickly, and several other players beyond the hardware manufacturers are providing additional utility to consumers of wearable technology as well as to other players in the ecosystem. There remains a series of challenging software and hardware problems that will need to be addressed to realize some of the emerging, idealized user experiences that are being conceptualized; this rich, expanding ecosystem will provide at least some of the capabilities needed to realize these.

Finally, companies developing the underlying technology are excited about the prospects of a new category of consumer products that could drive significant volumes and are thus investing heavily. The rate of innovation is high both within the component manufacturers and the hardware vendors.

The five developments presented in this paper, we believe, will have a significant impact on the rate at which we begin to realize meaningful mass market adoption and sustained engagement. While there is still a great deal of uncertainty, the transitions taking place in the industry should help usher in a new generation of wearable technology that will be genuinely useful and desirable to a far greater population of people than what we see today. We remain very optimistic despite the challenges ahead.

About the author

Dan Ledger is a Principal at Endeavour Partners where he has led a great deal of work and research on wearable technology. He has advised numerous startups, larger service providers, and OEMs on product definition, service design, ecosystem strategy, and go-to-market planning within this space. Dan has appeared on NPR and CNN talking about the future of wearable technology. His research in wearable technology has been covered by GigaOm, The New York Times, The Guardian, Fast Company, Fortune, Forbes, TechRepublic, and CBS.

Prior to joining Endeavour, Dan worked in the semiconductor industry for 15 years in engineering and marketing roles where he developed a deep working understanding of many of the underlying technologies that are driving the wearables market. Dan holds a Masters degree from the Massachusetts Institute of Technology and bachelors degrees from Washington University in St. Louis in Electrical Engineering and Computer Engineering.

About Endeavour Partners, and how we can help

Endeavour Partners is a boutique strategy consulting firm / think tank with deep expertise in mobile and digital businesses and technologies. We are a diverse team of passionate practitioners including MBAs, engineers, data scientists, behavioral scientists, economists, and programmers. We help our clients anticipate the future, navigate the resulting opportunities, and develop creative and innovative strategies for growth.

For more information about Endeavour Partners, please visit our website at www.endeavourpartners.net. Or, if you are interested in discussing the future of wearables, contact Dan Ledger at dan@endeavourpartners.net.