

To Ubiquity and Beyond

Bluetooth Smart and the Growth of Appcessories



What is an Appcessory? Think of a cuddly toy for your three year old which interacts with the story on her tablet. Think of the stylus you use for sketching on your iPad, where squeezing it changes the thickness or colour of the lines you're painting. Or a motor and rudder you clip on a paper plane which lets you control its flight by tipping your smartphone from side to side. LED lights that come on when you enter the room, which you can program the colour of, or which even sense your mood from the way you're walking. Armbands that know you're about to point at the TV and tell it to change channel before you even move your finger. Clothes that tell you they need washing. In fact many things that until recently were the preserve of science fiction are about to become possible and eminently affordable.

They're the source of an explosive new market. It's based on the new Bluetooth Smart wireless standard and is predicted to have annual sales of over \$130 billion by 2020.

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To Ubiquity and Beyond - Bluetooth Smart and the Growth of Appcessories

Introduction

Every so often technology analysts miss a new trend. That generally happens when different technologies and service models come together to produce something that's more than the sum of the parts. The fact that these are missed isn't unexpected; most of the industry and those that watch it concentrate on evolution or disruption, both of which tend to happen in straight lines. That gives them a blinkered approach as they look at a single variable at a time. So it's not surprising that amalgamations resulting from the confluence of different technology strands can pass under the radar. It's a phenomenon that has been described as "more than Moore's", when the result of these interweaving strands of technical evolution push the market forward even faster than its normal frenetic rate.

The last major change like that was the success of Apps. Nobody predicted the meteoric impact of phone apps that happened after Apple launched its AppStore, not even Apple. Phone apps were not new – they'd been around since 2002 when Nokia launched its first Symbian phone – the 7650, five years before the iPhone appeared. But they'd failed to gain popular traction. The AppStore brought together the user interface of the iPhone, a service delivery platform, a revenue model for developers and an accessible programming interface, lowering the knowledge barrier for apps developers, which allowed many more to innovate. The other important ingredient which led to their success, which the analysts forgot to factor in, was the fact that they were, and still are, intuitive and affordable. That's in stark contrast to most other products coming out of the PC or phone industry.

These same elements that produced Apps' success are coming together in a new market – that of Appcessories, which has the potential to be even more explosive and disruptive than the advent of Apps. I'm not sure who coined the term, but Appcessories is a good description. They are devices which connect to mobile phones and tablets. They differ from things like headsets because they are intimately linked to an app on the phone.

They are not just accessories which replicate a phone function, but a whole new experience. They're things that are not only fun or useful in their own right, but doubly so when intimately combined with a compelling app. In itself, that's not new, as we've had sports and fitness products from companies like Nike and Polar that do just that. The difference in this new generation of Appcessories is the enabling presence and availability of Bluetooth Smart technology, which make them easy to design and cheap to produce.

Unlike other technology successes – PCs, TVs, mobile phones and tablets, Appcessories are a broad market. Think of a cuddly toy for your three year old which interacts with the story on her tablet. Or the stylus you use for sketching on your iPad, where squeezing it changes the thickness or colour of the lines you're painting. Perhaps a motor and rudder you clip on a paper plane which lets you control its flight by tipping your smartphone from side to side. LED lights that come on when you enter the room, which you can program the colour of, or which even sense your mood from the way you're walking. Armbands that know you're about to point at the TV and tell it to change channel before you even move your finger. Most of these have already been announced and will be on the market this year. In fact many things that until recently were the preserve of science fiction are about to become possible and eminently affordable as we enter the era of Appcessories.

Bluetooth Smart, previously known as Bluetooth low energy, is the latest version of the Bluetooth standard which makes all of this possible has been a long time coming, but it's finally here in volume. It has been specifically designed to allow all sorts of devices to be connected up to mobile phones. It's not about voice or audio, but about control and data, allowing your phone to turn things on and off, or to send information. As we'll see in the Ubiquity Explored section, it opens up almost limitless opportunities for connected devices, with a promise of interoperability. At the start of 2013, it achieved critical mass as an embedded component within phones and tablets, alongside multiple suppliers of low cost chips, reference designs and simple programming interfaces which allow it to be built into these Appcessory devices. It significantly reduces the barrier to entry for new products, whether they be smart appliances, fitness devices, personal accessories or toys.

Bluetooth Smart's interoperability means that multiple developers can design apps for an Appcessory, getting innovation into what has previously been a proprietary, closed market. It's an opportunity which leverages all of the facility and ubiquity of the Apps environment, but extends it to hardware – more importantly, hardware that is available at a price that users will want to buy. And with it the irresistible prospect of a new and captivating experience, where the fun of a phone app can be extended to something we can throw, hold, measure, cuddle or wear.

The Market Size for Appcessories

So far, there has been no definitive analysis to estimate what the market size is for Appcessories, as it's so new. But it has stimulated a frenzy of new companies bringing products to market, aided by low development costs and a growing number of readily available development kits and reference designs. If you look at crowd-funding sites like Kickstarter¹ and indiegogo² you'll see how widely Appcessory designers' imaginations are stretching and the level of excitement there is within the market. Some concrete examples are discussed in the Exploring Ubiquity section of this report. A proportion of these new companies may fail, as the crowd-funding model and that of a hardware supply business don't necessarily go hand in hand. But every brief success that these innovators have will be closely watched and emulated by larger companies with more robust supply chains, all eager to profit from this vibrant new source of innovation. In effect, the crowd-funding model brings to hardware development what the bedroom coder brought to the world of apps.

To estimate the market, this report builds a model of the number of Appcessories that users are likely buy each year until 2020. Bluetooth Smart – the underlying, enabling technology is currently being implemented in most smartphones, including recent iPhones, Windows Phones and new Android models, as well as the latest tablets. It will inevitably percolate down to be included in feature phones, but in order to provide realistic numbers, this model limits itself to Appcessory sales to the smartphone market. The market estimates for these use Statista's figures for Smartphone and Featurephone sales³, which show Smartphone growth rising to 1.45 billion units in 2020. To these are added a conservative estimate of tablet sales which rise to 750 million in the same year.

	2014	2015	2016	2017	2018	2019	2020
Smart Phones ¹	1,024	1,349	1,555	1,764	1,991	2,222	2,454
Feature Phones ^a	1,111	944	886	818	744	656	586
Tablets	170	301	360	450	520	630	750
Bluetooth Smart devices ^b	1,194	1,650	1,915	2,214	2,511	2,852	3,204
Cumulative devices in use	1,791	2,844	3,565	4,129	4,725	5,363	6,056

^a Source – Statista
^b Bluetooth Smart enabled devices - Sum of Smartphones and tablets

So how many Accessories will each user buy every year? This year – 2013, is the foundation year in which the market starts. Although products are starting to become available, many will not ship in volume until the end of the year. Despite that, there is considerable potential for some of these to be Christmas gifts of choice, raising the public perception of the Accessory. And some very innovative and desirable Accessories are scheduled to appear within the next six months. What is uncertain is whether the channels to market for many of the new entrants will cope with a rapid spike in demand by having the ability to place enough products in the hands of consumers. Any unfilled demand will draw in larger players who will want to exploit the missed opportunity in 2014 – the first major year of Accessory shipments.

2014 offers a major reason for the start of stellar growth - the anticipated launch of the iPhone6. With Apple struggling to differentiate itself, Accessories are an obvious trend for them to latch onto. If market rumours prove to be correct and the iPhone6 comes to market at a significantly lower cost, then this leaves retailers and mobile network operators with plenty of margin to consider Accessory product bundles to tempt existing iPhone owners to upgrade. With the possibility of over 150 million iPhone6 sales in 2014, iPhone6 purchasers could easily be responsible for 20 million or more Accessory purchases. It is probably no coincidence that after decades of shunning standards bodies, Apple recently took a seat on the Board of Directors of the Bluetooth SIG.

The resulting publicity will increase sales for attachment to other smart phones and tablets. Once again, the companies supplying these devices may be confronted with delivery problems, which is why the overall attach rate has been estimated at only 4% of the total number of new smartphone and tablet purchasers in 2014. This still provides a market of 51 million Accessories in 2014 – a sufficiently large number to ensure the entry of large players who will start to dominate the market in subsequent years.

	2014	2015	2016	2017	2018	2019	2020
Bought with phone	3.9%	9.8%	13.2%	26.6%	51.2%	72.8%	86.6%
Bought with tablet	5.2%	11.1%	15.6%	33.4%	64.8%	86.3%	98.1%
Second device purchase ^a	1.9%	5.2%	22.3%	37.9%	49.8%	61.5%	85.6%
Third device purchase	0.0%	1.9%	14.1%	19.5%	26.9%	33.6%	56.4%
Four to five devices	0.0%	0.9%	3.8%	7.9%	11.2%	16.1%	24.3%
Five to ten devices	0.0%	0.0%	0.5%	2.5%	5.5%	7.3%	16.8%
More than ten devices	0.0%	0.0%	0.2%	0.8%	1.4%	2.6%	11.1%

^a Second and subsequent devices are a percentage of users with at least one device.

In 2014, the projected average price of these Accessories will be around \$50. At that level it means that most consumers will view them as desirable objects, not impulse purchases. However, all of the evidence points to the fact that they will indeed fit the “I want one of those” category, as there are some very desirable products being lined up. After 2014, market volumes will increase dramatically as costs fall and the purchaser profile broadens. It is likely that the percentage of first purchases will grow until we get to the point where at least one Accessory will be included with each phone or tablet by 2020. There are already signs of proximity tags being bundled with high end phones, signalling the start of this trend. As prices fall dramatically it is hard to see why that trend will not accelerate.

That timeline may be conservative, as gesture and remote input technology starts to be deployed in the form of Accessories. The numbers in this report considers these Human Interface Devices, which include styli, mice, keyboards and games controls as Accessories. Although they are evolutions of traditional accessories, their inclusion is justified as they will move to the same underlying Bluetooth Smart technology as other Accessories.

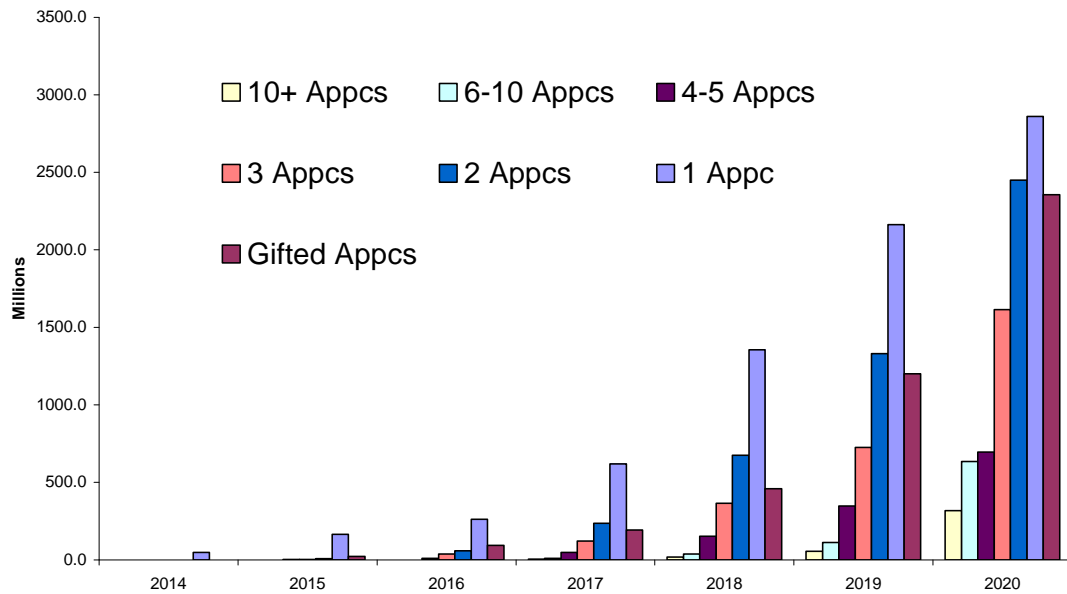
Most users only buy one smartphone and one tablet, as a second will add a subscription cost but gives little extra functionality. In contrast, each new Accessory can do new things. In 2014 with the market starting to take off, only around 5% of those who buy one Accessory will buy a second, but that number will grow as consumers gain confidence in these new products, and an ever more enticing range of products come onto the market. As Accessory prices fall they increasingly become an impulse purchase, particularly as they get integrated into household accessories and toys. This results in a growing number of users who will purchase multiple Accessories. As the market for smart home accessories, such as light bulbs becomes established (and these are already shipping), a significant number of users will emerge who repeatedly purchase five or more Accessories every year.

	2014	2015	2016	2017	2018	2019	2020
Cumulative devices in use	1,791	2,844	3,565	4,129	4,725	5,363	6,056
Accessories bought as gifts	0.1%	0.8%	2.6%	4.7%	9.7%	22.4%	38.9%
Total gifted Accessories	0.9	23	93	194	458	1,201	2,356

An interesting part of the volume projections is the growth in Accessories purchased as gifts, as opposed to primary purchases by the phone or tablet owner. These are projected to grow from 2% of sales in the early years to around 40% of sales by 2020, as both the user base of handsets and tablets increases, and improvements in interoperability give purchasers the confidence that they will work out of the box. However, the industry needs to work hard to ensure that promise of interoperability and ease of setup is met.

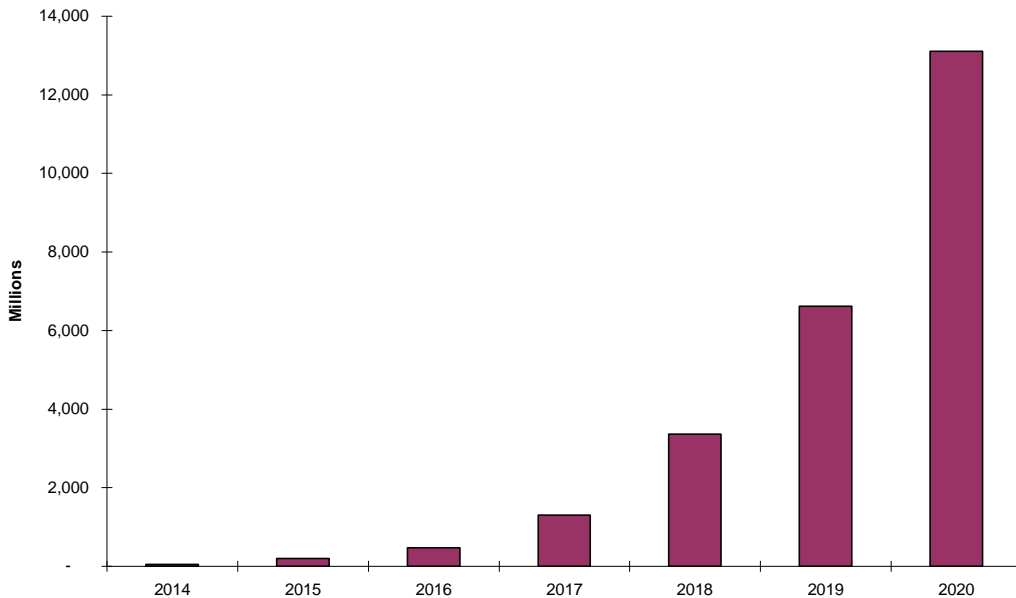
	2014	2015	2016	2017	2018	2019	2020
Bought with phone	40	132	205	469	1019	1618	2125
Bought with tablet	9	33	56	150	337	544	736
Second device purchase	0.9	8.6	58	235	675	1329	2449
Third device purchase	0	3.1	37	121	365	726	1614
Four to five devices	0.0	2.2	15	73	228	522	1043
Five to ten devices	-	0.0	3.3	39	186	394	1,202
More than ten devices	-	0.1	2.6	25	95	281	1,588
Bought as gifts	0.9	23	93	194	458	1,201	2,356
TOTAL	51	202	470	1,306	3,364	6,615	13,111

Individual Purchases of Accessories



The result of this ubiquity is an impressive growth in sales of Accessories. It starts with a base of just over 50 million devices in 2014, growing to over 13 billion products during 2020.

Annual Sales of Accessories



In the first two months of this year there have already been announcements of over 500 different Bluetooth Smart enabled devices that fall into the Accessory definition. The trend started with sports and fitness devices from the current market leaders, but has rapidly expanded into Far Eastern “me-too” products. At CES in January 2013, over 215 companies exhibited⁴ these products, and in the month since, we’ve seen a raft of other product

announcements. Prior to the concept of the Appcessory, when they were only counting personal connected devices, ABI Research predicted sales of 485 million wearable computing devices in 2018⁵, 90 million wearable sports devices in 2017⁶ and 100 million wireless health devices⁷ in the same year. As these are only the tip of the iceberg of Appcessories, these predictions more than support the phenomenal growth projections for the Appcessory.

If these numbers seems ambitious, compare them to the growth of three previous technologies which have each in turn become so ubiquitous that we no longer even recognise them – the fractional horsepower electric motor, the microprocessor and the LCD display. In the sixties and seventies, the small electric motor went from being almost unknown to endemic, as it appeared in everything from shavers to cassette players to kitchen utensils. In the eighties and nineties the microprocessor did the same, to the point where toasters use them instead of a bimetallic strip. Similarly the LCD display is now everywhere. The average home contains over a hundred of each of these components – most of them unnoticed. Bluetooth Smart, allied with MEMS sensors, is on course to become the next ubiquitous component of home and personal technology. It will rapidly establish itself in just as many devices, to the point that by 2020 we'll have stopped thinking about it, in the same way that we no longer notice small motors, microprocessors or displays in the products we buy. We'll just accept that everything from toys to toothbrushes is connected in some way. It will seem as unnatural for a product not to talk to a phone as it is today to have a phone that is connected to a cable.

Market Dynamics

The market dynamics for Appcessories will be very different to previous technology-driven markets. To understand it, it is valuable to consider two questions which will affect this growth - how long will people keep their Appcessories and how will price points change?

There is evidence of a shift in consumer attitudes to keep high value products such as phones and gaming devices longer. Part of the reason for this extended retention can be traced to the impact of the recession on personal spending and a greater personal awareness of cost and credit. But there is also a noticeable backlash against the constant learning cycle imposed by product upgrades, particularly with mobile phones. Although there will always be a segment of the population who will buy the new because it is new, that may be a fading behaviour as we enter the second decade of this century.

That change is echoed in an acceptance by manufacturers that they need to work on a longer product cycle. As the complexity of products increases, the pressure on manufacturers grows. Companies like Sony are deliberately trying to slow the cycle, as recently illustrated by Masaaki Tsuruta – CTO of their Computer Entertainment division, who recently stated that the new Vita gaming console is expected to have a ten year shelf-life.

Both of these trends are a reflection of the growing maturity of the existing, increasingly mature technology markets, where each new technical step becomes more expensive and complex, yet often feels to the consumer to be a smaller incremental improvement in functionality compared with the previous one. For both manufacturers and service providers, this increases the pressure to maintain customer loyalty between product

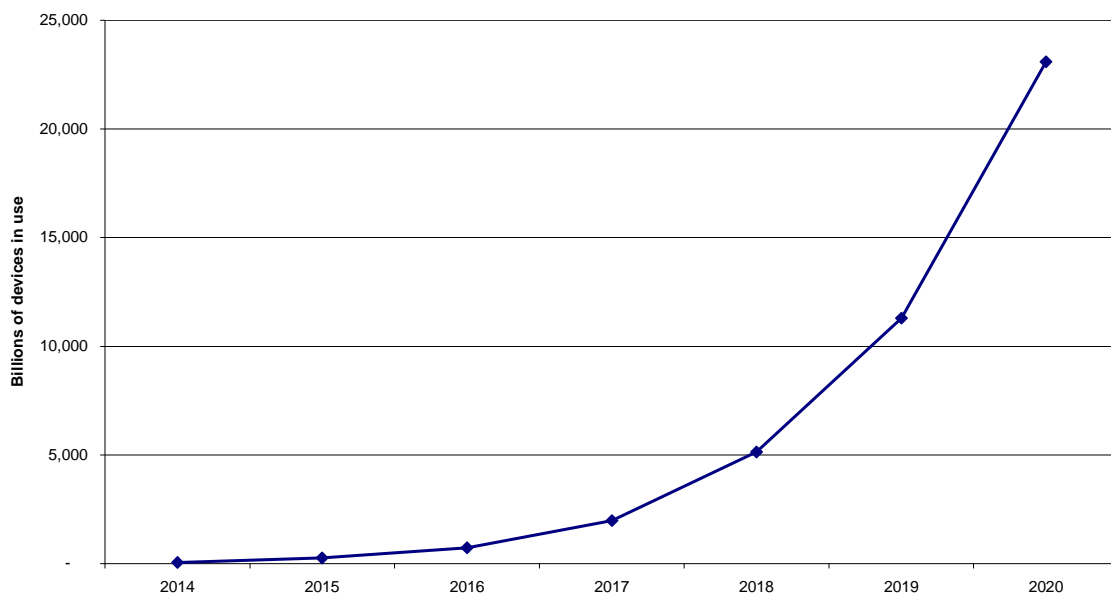
introductions, particularly where devices like phones and gaming stations act as platforms for ongoing consumer subscription revenue.

Appcessories play to this change in market dynamic, reintroducing a level of innovation to excite customers by allowing new experiences to be brought to an existing platform, refreshing its appeal. In effect the Appcessory serves the role of novelty that was previously dependent on the purchase of a new platform. For manufacturers, the development costs are much lower, the design resources smaller, the time to market much shorter and the risk decreased and more quantifiable. These Appcessories may also provide a new opportunity for revenue and product differentiation.

Some Appcessories will be short term wonders, bought as gifts with a working life of a few weeks before they are consigned to the bin. At the other end of the scale, as Appcessory functionality become embedded in appliances and static products within the home, we are likely to see a balancing expansion of product life, which in the case of household appliances, could be ten years or more. It denotes a seamless spectrum of connectivity and product life that goes from trivial merchandising at one end, through toys and personal devices to all of the connected elements of the smart home at the other end.

This diversity suggests a wide range of retention and usage behaviour, complicating the calculation of cumulative totals for the ownership of Appcessories. Despite the short life of low cost “impulse” purchases, it appears likely that the individual life and active engagement will increase on average as the sales of Appcessories like light bulbs and small electrical goods grows. Hence the assumption is that the average life of an Appcessory will grow from 24 months in the early years of the market to 36 months as the market matures and a higher percentage are built into longer life products as added, albeit minor functionality.

Cumulative Ownership of Appcessories



Here the distinction between an Appcessory as an integral part of a phone or tablet experience starts to blur. As consumers become familiar with the fact that new devices can be automatically connected to their phone, manufacturers may include Bluetooth Smart connectivity and apps to fulfil a much smaller part of the overall product functionality. At

this level it is possible to envisage Bluetooth Smart being built into major appliances purely for initial product commissioning and registration. Nevertheless, this helps to cement the widespread acceptance of the technology, and counts towards the volume shipment of silicon chips. With these assumptions, the installed base of Appcessories will reach just over 23 billion in 2020.

	2014	2015	2016	2017	2018	2019	2020
Annual Sales	51	202	470	1,306	3,364	6,615	13,111
Devices in use	51	253	723	1,979	5,140	11,286	23,091

Appcessories and the Internet of Things

Appcessories are not, per se, a part of the Internet of Things. Whether they will be connected to the web in its broadest sense is a debatable point. Most will be connected to a phone or a tablet, as that’s an essential part of their function, although for some that may only be during an initial learning or setup phase. Whether they return information to a server is moot. Many will only ever interact locally, but as the devices they interact with are connected, there is the scope to send that data elsewhere. To what extent that happens depends on two things – how compelling it is to do so, and whether there is a service model that supports storing and processing that data somewhere in the cloud. Today that remains the Achilles’ heel of most Internet of Things business models⁸ – who pays for the web storage when the hardware pricing starts to fall?

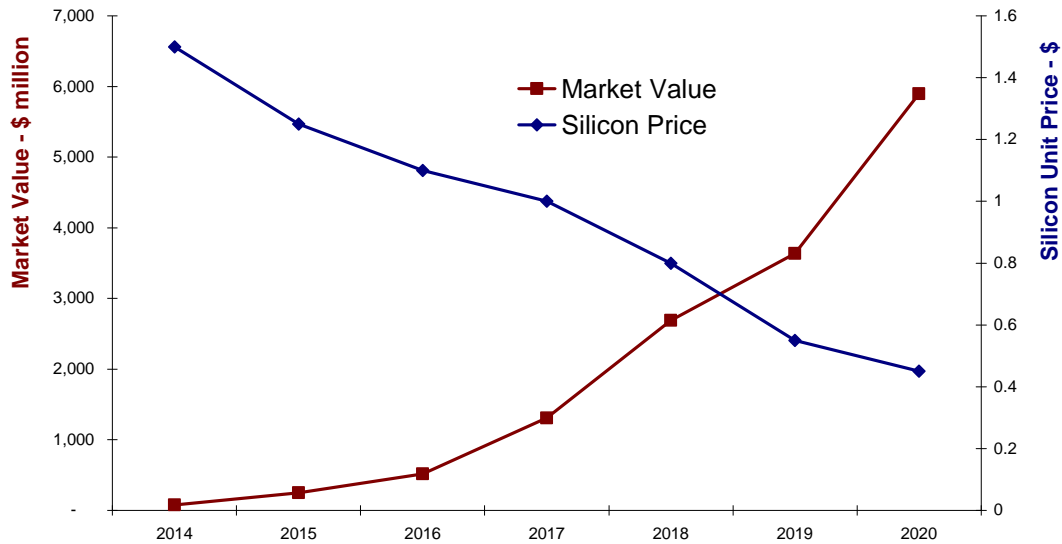
Whatever the future of IoT services, they have a limited impact on the Appcessory model, as for the most part an Appcessory’s primary appeal comes from its immediate interaction with phone or tablet. Paul Williamson of CSR described them well when he coined the phrase “The Internet of My Things” for Appcessories to differentiate them as a self-sufficient subset of the Internet of Things. In the longer term, web connectivity may help to reinforce the value of a service and provide an overlay of subscription models, which in turn helps drive a profitable sub-segment of the overall market. There is a strong possibility that Appcessories coupled with suitable gateways within the home will provide the sensing technology and data transmission which is the foundation for a smart home based Internet of Things, simply due to their cost advantage. But that is a battle that is still to be played out between competing standards. In any case, the fully connected smart home market is a long term play, as it requires a major revolution in the installation industry, its supply channel and working practices, all of which have so far largely resisted the timescales and advantages of new technologies.

The Opportunity for Silicon Vendors

The history of Bluetooth has shown us that the volumes that are being projected for Appcessories will aggressively drive down silicon prices. By the end of 2013 it should be possible to negotiate pricing for high volumes of single mode Bluetooth Smart chips with integrated application processors for around \$1.50. As volumes rise, this price will fall. Some chip vendors will find an opportunity to hold some of that price by integrating MEMS

sensors within these chips. However, by 2017, with the annual chip volumes passing the 1 billion mark, there will be enormous pressure on chip companies to respin and cost reduce to remain competitive.

Silicon Market Value for Bluetooth Smart



	2014	2015	2016	2017	2018	2019	2020
Average SoC selling price ¹	\$1.50	\$1.25	\$1.10	\$1.00	\$0.80	\$0.55	\$0.45

¹ For volume purchase (> 1 million pieces)

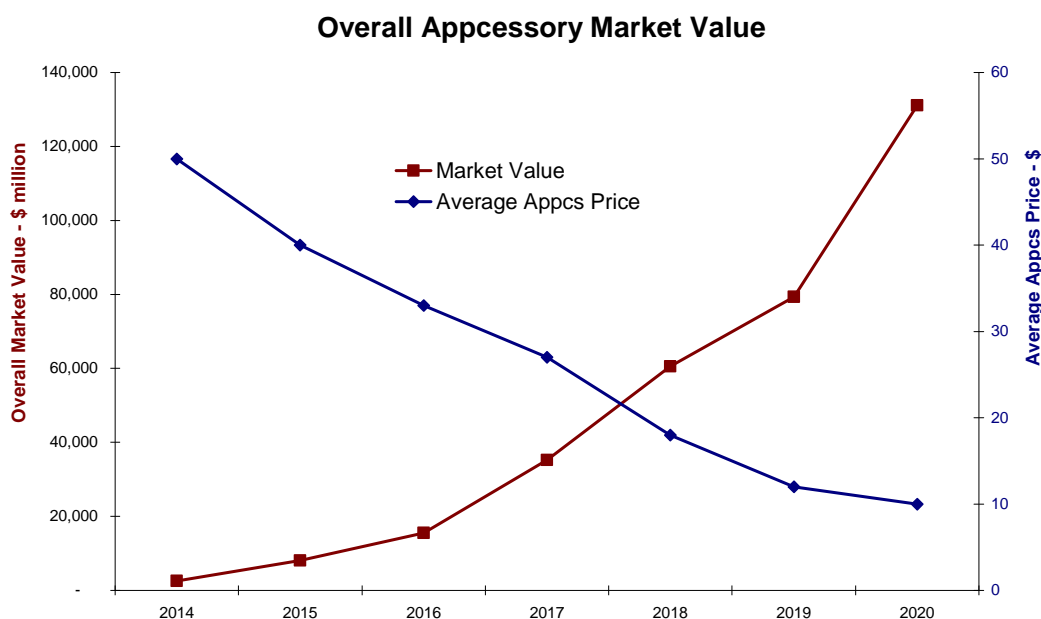
The real prize comes after 2018, when the market is big enough to support several companies each shipping over two billion chips per year. These will dominate the market, setting an average market price for a complete Bluetooth Smart chip with integrated sensors and application processor below \$0.50, enabling Accessories that can be manufactured and shipped for a few dollars. By 2020, the resulting total annual market value for silicon vendors will be close to \$6 billion.

	2014	2015	2016	2017	2018	2019	2020
Annual device sales (millions)	51	202	470	1,306	3,364	6,615	13,111
Total Market Value (millions)	\$76	\$253	\$517	\$1,306	\$2,691	\$3,638	\$5,900

Accessory Market Value

Driven by the falling silicon price, greater levels of silicon integration and sheer market volume, the effect will be a rapidly declining retail price for Accessories. However, this conceals some major variations. There will be a vast number of Accessories that follow the Apps market – starting off at a relatively high value and then falling precipitously. Whilst the physical cost of an Accessory means that they will not emulate the widespread “free” model of Apps, they will appear out of China for a few dollars. Where users are innovative with a service model, there may even be a significant market for connected devices where the hardware is given away for free.

At the other end of the scale, the technology will certainly find its way into household appliances and sensors, probably providing the technology that drives smart homes forward. The projections do not include these higher ticket prices in the overall market value, as the Bluetooth connectivity within them is not the de facto feature of these devices. Hence they can be distinguished from the true Accessories. However, by augmenting the overall volume of Bluetooth Smart chips, they help to increase price pressure on silicon vendors.



The result is a market that grows to over \$130 billion in 2020. It makes the Accessory one of the most significant technical developments ever, which has the potential to explode into a major new market. In comparison, the total handset market, which Bloomberg values at \$358 billion is nearing saturation⁹. Whilst some manufacturers are looking at connected watches to expand their revenue beyond this saturation point, Accessories provide a more attractive option for them to increase their overall revenue – something that becomes more pressing as growth and profits need to be found in a post-Smartphone world.

	2014	2015	2016	2017	2018	2019	2020
Annual device sales	51	202	470	1,306	3,364	6,615	13,111
Total Market Value	\$2,530	\$8,099	\$15,512	\$35,265	\$60,558	\$79,385	\$131,114

Exit through the Appcessory Shop

At this level of chip pricing – less than \$0.50, the Appcessory will become the new darling of merchandising, with every theme park, souvenir shop and block buster film trying to use them to buy us into their brand or their dream, pressing their latest connected products onto consumers and their kids. Used thus, Appcessories will drive a new era of promotional products that attempt to repeat a shared experience on our personal devices.

Exploring Ubiquity

For these figures to turn into reality, Appcessories need to be compelling. Technology for technology's sake will not generate this amazing level of growth. The positive news is that this nascent market has already shown greater levels of innovation and diversity than has ever been seen before. Moreover, this has already led to products being shipped.

As mentioned above, a host of Appcessories have been announced already this year. This section looks at a very few of these to illustrate the diversity of innovation. Not all of these initial offerings may succeed, but they will inspire others and certainly gain the attention of much larger players.

PowerUp Toys¹⁰

Where better to start than with paper aeroplanes. PowerUp Toys is a start-up that launched a miniature electric motor for paper aeroplanes in 2012. At the New York Toy Fair this February they announced their PowerUp 3.0 – a Bluetooth controlled motor for a paper aeroplane. The premise is incredibly simple and likely to appeal to every male who's ever thrown a paper aeroplane (and based on local research, quite a few females as well). It's a small electric motor, rudder and battery that can be fitted to a folded up plane, which you can control from your smartphone. So as you move your phone your paper plane responds in the same way. It's different, it's innovative, it's affordable at \$50 and it's very desirable. They aren't shipping until September, but they've already sold out. It's difficult to think of anything more appealing to put in most men's 2013 Christmas stocking.



GreenGoose¹¹

Green Goose is another start-up which dabbled with the Internet of Things and connected sensors around the home before diverting their attention to Appcessories. They've just added Teddo the Bear – a cuddly toy that connects to an iPhone or iPad. It's firmly aimed at kids (age 3+), who interact with Teddo, jumping and moving him about to play games on tablets and smartphones. Teddo is ridiculously cheap at \$19.95, which means that a lot of parents will consider him excellent value to keep the kids quiet for a few hours. There will be a lot more toys coming out. What Teddo shows is that Appcessories aren't



just for grown-ups. Many will be bought for kids, but if they work as promised they'll help adults consider buying Appcessories for themselves. Such pester power will work to help expand the awareness of Appcessories very rapidly throughout all layers of the potential market.

Flower Power¹²

Possibly more practical is Parrot's Flower Power – a sensor to stick in your flower pots which measures sunlight, soil moisture, temperature and fertiliser, allowing you to care for your houseplants, or provide everything that the competitive vegetable grower needs. It's described as an Eco-geek project, but Parrot is a large company with a lot of pedigree. They've long been a leader in handsfree kits for cars and the company behind the highly successful remote controlled AR drone and quadcopter. They understand desirable products and have the experience to get them to market in volume.



Smart Home Labs¹³

Smart light bulbs are a niche market at the moment, but one which is set for growth. Smart Home Labs are leading the way with their Robosmart LED light bulbs. They're designed as replacements for standard bulbs, offering the efficiency and long life of LEDs, with the advantage of control from your smartphone. They're selling on the benefits of energy savings, with the ability to program lights to turn off when the phone is not around, or to turn on or off at predetermined times. In the spirit of Appcessories, they're promoted as being the only solution that does not need internet connectivity to work, with the added benefit that "They don't even use Wi-Fi".



Smart Home Labs are not the only company in this market. ZSmart¹⁴ also announced an LED lightbulb at CES 2013, winning an innovation award. They differentiate their product by offering controllable mood lighting, so that the app can select from million of colours for your room. And there is major interest from chip suppliers. At CES at least two silicon companies were demonstrating LED lighting reference designs suitable for mass production to selected partners.

Gesture Control¹⁴

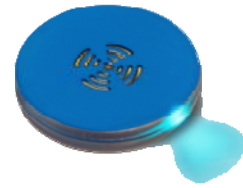
Gesture control is a growing industry as designers try to find more ways for us to interact with our devices. One of the most innovative approaches is the MYO armband. Unlike previous worn sensors which rely on accelerometers and other motion sensors to detect physical movement, the MYO also detects electrical activity in your muscles, converting this into outputs which represent you arm, hand and finger movement. It promises a granularity of control that we've not seen before.

It's due to ship in September this year and MYO are releasing APIs for product and application developers. Their strapline – "Release your inner Jedi" gives a good indication of their target markets, although the technology has a much wider applicability.



SticknFind¹⁵

One of the basic applications for Bluetooth Smart has always been proximity – the ability to determine how far away a product is. There are lots of companies coming up with keyfobs and proximity tags to help you find your phone, or raise an alert if you leave it behind, but one of the best presented is SticknFind, which have raised almost \$1million on indiegogo. They keep it simple with a range of small tags which you can stick on anything you like – from pets to suitcases, along with a phone app to locate them. You can get the tags to alert you when they come within range or go out of range, or buzz when you're looking for them. Most homes could use dozens of them. They are shipping in April 2013 at \$25 each or \$20 in packs of ten. They're another must for the Christmas stocking.



MeterPlug¹⁶

From the same design team as the SticknFind comes the MeterPlug. It's a simple plug-through adaptor that let you monitor electricity usage. It brings together some nice features which make it more useful than other similar products, including the ability to remotely turn devices on and off, activate them based on phone proximity – a useful feature for turning things off when you leave home and a vampire power shield, which turns appliances off when the MeterPlug detects that they are on standby. At \$50 each they're currently aimed more at the green consumer, but there is no reason for the price not to fall, so they could become far more widespread. It's an example of how Accessories will allow us to interact with everyday devices around the home.



Smart Activity Tracker¹⁷

Withings are one of many established companies with products in the health and fitness market. They're best known for their connected weighing scales, but they've leapfrogged their competition with the announcement of their new Smart Activity Tracker. It's a tiny clip-on device that combines a pedometer, heart rate measurement and sleep quality monitor into a single 8g device that's about a quarter of the size of a standard business card. They are one of hundreds of companies with products in this space; by the end of the year that will probably be thousands, but they are certainly setting the bar.



Smart Camera Trigger¹⁸

It won't ever be a significant market, but Satechi's smart trigger for DSLR cameras indicates how Bluetooth Smart can be used for remote control. It doesn't do much more than existing (and considerably more expensive) DSLR remote controls, but it lets you do it all from your smartphone, which means one fewer devices to carry around and one fewer to buy batteries for.



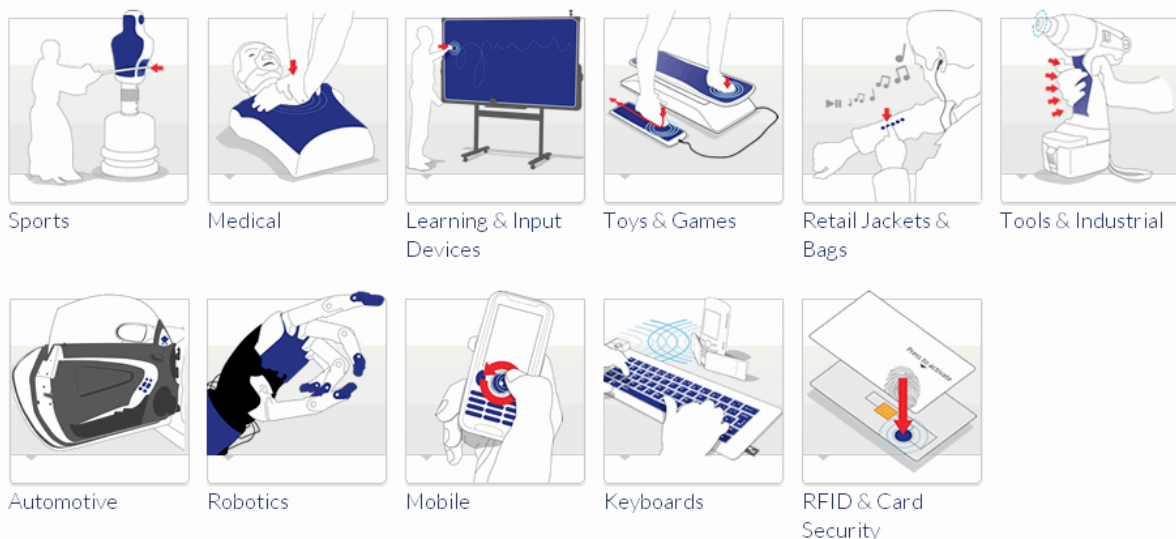
There is currently a debate raging about what technology to use for TV remote controls. Bluetooth Smart offers one very attractive option, because at the point where enough users have smartphones, the need for a remote control disappears. The faster the market for Appcessories grows, the more likely it is that the TV industry will start to incorporate Bluetooth Smart within their products. So although the DSLR trigger will probably never be significant in the overall scheme of Appcessories, it is important in highlighting the use and acceptance of the Smartphone as a remote control.

Smart Sensors – Danfoss¹⁹ and Peratech²⁰

An important driver behind Appcessories is the availability of new sensors. For many years sensor technology was largely confined to industrial applications. In recent years smartphones have embraced a new generation of MEMS based sensors (Micro Engineered Mechanical Sensors) – miniature sensors fashioned using the same technology that is used for making silicon chips. These can even be built into wireless chips, so that the cost of Appcessories using them can plummet. Now they’re being complemented with new sensor technologies that can be embedded into the fabric of devices, in some cases even as a fabric. Two examples give a flavour of the opportunities that these will bring.

Most people associate Danfoss with HVAC systems and controls, but they also have a sensor division – PolyPower. They’ve been developing fabric which can be used for wearable devices to detect movement. Although not an end product in itself, their DEAP technology (Dielectric Electro Active Polymers) has the potential to be used in many other products. To demonstrate this they’ve developed a wireless golf swing training sensor²¹.

The second is Peratech, who have developed QTC – Quantum Tunnelling Composite. It’s a material that, when deformed, switches from an almost perfect insulator to a conductor, essentially a flexible switch. The graphic below, from their website, is an excellent instance of a picture telling a thousand words, illustrating just how ubiquitous this material can be.



These are just two examples of many companies worldwide which are producing innovative new sensors. They may not make end products, but their sensor technologies allow many other companies to innovate. Each new sensor that appears on the market can generate many applications, in turn spawning opportunities for many Appcessories. We are entering a new era of connectivity where we really are limited only by the imagination of designers.

Risks

No new market like this is without risk. As yet it is nascent with the first few products only just beginning to ship. These, and the new Appcessories that are being brought to market by both established players and new start-ups, need to be compelling. The better they work and the more desirable they are, the faster the market will grow. Here, the crowd-sourcing communities behind many of the new start-ups may prove beneficial. Because many of the funders feel a part of the initial success of these companies, they can become a source of expertise to refine and improve the first offerings. If used correctly, that will help these start-ups to hone their products far more effectively than normal market pressure.

However, that same dynamic means that the market is currently enormously fragmented, not only in the supply of hardware, but also in the associated applications. We will see some Appcessories where the manufacturers keep a tight hold on the applications which run with their hardware, whilst others publish APIs to encourage third party developers. These conflicting approaches alongside the fragmentation may confuse the market, in turn delaying growth. If that occurs, then the current leaders in health and fitness device may continue their hegemony, with the growth in Appcessories pushed into the future. So it is vital for some larger players to actively acquire, amalgamate or emulate the more successful innovations.

Silicon is probably not a risk. The major chip manufacturers are releasing second generation Bluetooth smart chips at the right price point, along with reference design kits. They're being backed up by a range of module vendors who cater for small companies trying to get their first products to market.

Nor are the software apps a major risk. Apple has a well documented Bluetooth Smart API and developer tools, which is sufficient to help establish the first tranche of the Appcessory market. Android is less defined and Google would do well to ensure a tighter spec and implementation between different handset vendors. And Microsoft needs to ensure the tools are available for its phone platform.

The Bluetooth SIG needs to step up to support this new ecosystem, recognising that an inflexible certification scheme could throttle the baby at its birth. The Appcessory market is very different from any standards based wireless market that has gone before and needs a light touch if innovation is to be given its head. It also need to look at the priorities which remain – making pairing simpler for a mass market, and ensuring that the specification evolves to meet new Appcessory market requirements, which may not align with the traditional board direction set largely by major PC and phone companies.

There are key segments of the Appcessory market which are also being challenged by other wireless standards. ZigBee is desperate to own the smart home market, including the set top box. It is also hoping to be the standard for connected lighting with its Light Link specification, which is backed by Philips – one of the leaders in domestic lighting. Here Bluetooth Smart has the advantage that it exists in smartphone and tablets whereas ZigBee does not. But that in itself is not enough to win the market. Remote controls are a parallel battlefield, where smartphones need to compete with ZigBee's RF4CE specification. Wi-Fi will also challenge many of the smart home applications, citing the advantage of connecting to a Wi-Fi access point. It is not clear who will win. The Appcessory market will be most likely to succeed if the Bluetooth SIG and community actively support it to give it market advantage and scale.

Overshadowing these, perhaps the greatest risk is in the stability of smartphone and tablet operating systems. If Apple, Google or other major players change their Bluetooth Smart APIs, then millions of Accessories could stop working overnight. None of these companies have a good track record of understanding the consequences of their update actions. They need to learn about interoperability and backwards compatibility and learn that fast. Otherwise they risk killing the goose that lays the Accessory golden egg.

Conclusion

Is it realistic to predict a \$130 billion annual market based on paper aeroplanes and plugs? It sounds a ridiculous premise, but that simplistic question tells a deeper story, which is the breadth of applications for Accessories based on the Bluetooth Smart standard. The question “What’s the killer application?” for Bluetooth Smart has been asked many times and it has never been answered until now. That failure to find the killer app is because there isn’t one. But there is a killer ecosystem, which is the Accessory. That is what will propel the market to these astronomic numbers.

It may lead to throw-away hardware, where the lifetime of an Accessory may be only a few days before it’s dispatched to the back of a drawer. But that’s the natural fate of most apps today. If the price is low enough, there is no reason to believe that Accessories will not follow that same model. There will be a large number of products where the Accessory function is only used once to set them up or register them, after which the product will function autonomously for the rest of its life. But there will be many more Accessories which become friends and continue to be used for years, along with others that get subsumed into the infrastructure of our homes, leading to smart houses.

What is clear is that it is a new era of connectivity between devices. It may not be the Holy Grail of the Internet of Things, but will probably be more successful because each of these things will be more personal. And it’s that personality that will make them compelling, turning this into one of the fastest growing technology markets ever.

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