

MARKET ANALYSIS REPORT

HOW TO CREATE GROWTH FROM THE CONNECTED HOME



LIFE IS FOR SHARING.

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FOREWORD

Dear Fellow Business Leader,

Deutsche Telekom has set out a clear strategy to be one of the leaders of the connected home – or smart home – market.

The number of households with some form of smart home system – connected entertainment, energy, appliance, security or healthcare systems typically controlled remotely via the Internet – will surpass 100 million worldwide by the end of 2015 and nearly triple in the next ten years' time to over 300 million. Why? People like to be connected. Witness the widespread adoption of the Internet and all the applications that engage people daily from banking to social media and online forums. Why not enable people to connect with their homes if these connections enhance their convenience, peace of mind, security, save them money and are "cool".

Most homes with smart systems currently have a single function device, such as a thermostat or camera and some lighting controls. Most operate independently of each other. This will change as integrated systems built on platforms dominate, like Deutsche Telekom's, which provide a unified experience across all device types. Consumers do not want different systems. They want one system for all their devices and for their homes to operate as seamlessly as their cars – where actions happen based on their preferences.

Heating and cooling systems vary widely from one country to the next as do door-lock mechanisms, preferences for window coverings, security systems and whether we own or rent our homes. Due to different individual products and multiple single point solutions, no one company can assemble all the pieces of the intricate smart home puzzle. Partnering is essential.

Why do companies like Deutsche Telekom care? The smart home market will be big; it will foster new business models and impact any company providing services to consumers in their homes. How big, when and for whom? These are the questions we at Strategy Analytics are focused on. Consumer spending on smart home products and services will hit €90.90 billion globally by 2018 and accelerate from there to €122.77 billion by 2020. Fewer than 25 percent of homes with broadband connections will have acquired any of these products and services by this time. The reason for this is disintermediation in the market: the elimination of an intermediary between two parties in a transaction. The Internet has fostered disintermediation in media consumption, retail sales, travel, real estate and numerous other businesses. The smart home market will change how energy suppliers, communication service providers, insurers, installers and maintenance technicians – anyone selling products and services to consumers for and into their homes – do business. New

technologies have a way of doing this and there are many new advancements nurturing this nascent market and many companies with different strengths addressing the opportunities. As mentioned already, no one company has all the necessary pieces of the puzzle.

As Holger Knöpke says in the Introduction, "Life's for sharing"; I respond: "Business is for partnering". I would add, "the time to act is now!"

Yours



Bill Ablondi
 Director, Smart Home Strategies,
 Strategy Analytics

ABOUT STRATEGY ANALYTICS

Strategy Analytics, Inc., a global research and consulting firm, provides timely insights and strategic business solutions to companies operating at the convergence of information, communications and entertainment technologies.

INTRODUCTION

Dear Fellow Business Leader,

Driving growth, strengthening customer relationships, increasing revenue and profitability is a priority for all of us. Of all the prospective strategic growth spaces, the Internet of Things (IoT) is increasingly being seen as one of the most attractive means of achieving growth. IoT in the home – the 'connected home' or 'smart home' – is often cited as one of the most compelling opportunities.

A growing number of companies from many different sectors are exploring opportunities in the connected home market. These range from telecoms operators, energy suppliers, consumer electronics, home emergency assistance providers, security companies, construction firms and property management companies. Leading players from many of these sectors are now either in the process of defining their strategy, having defined it, or having launched the first generation of products and services into the market. However, there are also many who have held back from investing in the market, viewing it as still too nebulous, and have adopted a 'wait and see' strategy.

Industry analysts' predictions, coupled with the excitement generated at major industry trade shows, have helped all firms appreciate the valuable opportunity that IoT in the home can create. With thousands of new connected smart devices now being launched, it is becoming increasingly clear this opportunity is no longer just hype. However, to ensure we really start to experience growth – and engage with the mass consumer market – the industry needs to put aside its differences and start collaborating. We need to end fragmented and siloed thinking; we need to start putting consumers first! We need to move away from a 'technology for technology's sake' mindset to one that looks at how IoT can be translated into meaningful consumer propositions by deploying new and innovative business models that will transform our markets and create new growth.

This paper outlines the principal opportunities that can be exploited and some of the more interesting models that we have identified. What we have found to be essential is a partnership-based approach, the establishment of an ecosystem focused on mutual collaboration. For this market to realize growth, partnerships and industry-wide collaboration are crucial. At Deutsche Telekom, it is an approach that is central to our strategy and to all that we do – so it plays to one of our core strengths. Fundamental to achieving this is the open architecture that we have implemented in our connected home platform, as well as the utilization of open source software and third party developers via Eclipse SmartHome.

This paper is for senior corporate leaders – whether they are in the telco, utility, retail, insurance, consumer hardware or related industries – who control the key business levers and have responsibility for identifying commercial opportunities and strategic threats facing their organisation. If you would like any further information, define or strengthen your own connected home plans, or to become a partner to the ecosystem we are building, then please get in touch.

Together we can shape the future.
 Life's for sharing.

Yours



Holger Knöpke
 Vice President, Connected Home,
 Deutsche Telekom AG



EXECUTIVE SUMMARY

1. **CONNECTED DEVICES WILL TRANSFORM OUR HOMES OVER THE NEXT DECADE.** Over the past two decades, the Internet brought about the first digital revolution; the Internet of Things (IoT) will bring about the second digital revolution. With IoT, connected devices will add powerful new capabilities, including the personalisation of use cases, but more importantly the ability to leverage the 'cloud', bringing increased processing power, remote prognostics, as well as the ability for consumers to interact with devices via apps. With more devices becoming connected and aware of other devices, the connected home ecosystem will become greater than the sum of its parts. IoT is set to transform the way you do business and engage with consumers.
2. **THE MARKET WILL BE WORTH BILLIONS OF EUROS.** Strategy Analytics claims that the home market in the EU could be worth over €15.46 billion annually by 2019, with 50 million Western European homes having installed IoT technology.
3. **THE THREAT OF DISINTERMEDIATION IS VERY REAL WITH INNOVATIVE PLAYERS SET TO ENTER THE HOME FROM ADJACENT MARKETS.** After many years (or even decades) of hype, we are now finally witnessing the emergence of highly original ways to make money from the connected home. IoT has the potential to reorder the balance of power for telcos, utilities, insurers, retailers and manufacturers. It will give competitors, including new and innovative starts-ups, as well as players from adjacent markets, the opportunity to disintermediate them.
4. **MAJOR PLAYERS NEED TO 'STEP UP TO THE PLATE' IN ORDER TO DRIVE GROWTH FROM IoT.** The market is still to be defined, so now is the time to enter the market, to test new strategies, explore potential alternative partnerships, routes to markets and innovative new models, as a means to drive growth. The risk takers will be the ones who succeed. Try, fail, learn, and try again...
5. **TO ENGAGE CONSUMERS, FOCUS ON MEETING THEIR REAL NEEDS.** We have identified ten key principles for success, and foremost amongst them is securing early stage traction with consumers, and that must start with a single, simple, compelling and needs-based proposition which can evolve one step at a time. Take customers on a journey; ensure that on the journey the connected home is part of a broader and more persuasive sales story.
6. **THE ULTIMATE VALUE FOR SERVICE PROVIDERS, RETAILERS AND MANUFACTURERS WILL BE IN SERVICES.** Initially, the market may be 'kick started' by an impulse purchase of consumer hardware, but for the connected home market to realize its potential, it will need to move from 'just selling' consumer hardware to hardware-based services, and from just one connection to connected services.
7. **THE MARKET IS NOT HOMOGENEOUS, IT IS DISTINCT AND REGIONAL AND SEGMENT NEEDS MUST BE MET.** It is critical that providers reflect what can often be very different market needs by region; a proposition that may resonate in one market will not necessarily work in another. This insight relates to specific domains, propositions, products, channels to market, and the consumer brands that are selected.
8. **CREATE A WIN-WIN RELATIONSHIP WITH PARTNERS.** Build partnerships with brands that strengthen your overall proposition in certain areas and develop commercial propositions that benefit everyone. Players need to articulate clearly how early-stage propositions – such as app-driven connected hardware – can expand and extend beyond the immediate value they create to enable incremental services and partner ecosystems. The foundations of any success will be found in open and agile platforms that support multiple partners and provide the means to realize and monetize the connected home.
9. **NO ONE STANDARD WILL MEET THE ENTIRE NEEDS OF THE MARKET, AND HENCE AN OPEN ARCHITECTURE WILL BE A PREREQUISITE.** The standardisation of technology will be one of the greatest challenges of the connected home market. Currently, there are many mutually incompatible solutions, both at a connectivity and at platform level. Based on this situation, Deutsche Telekom assumes there will be no market-dominating technical standards and the many standards will coexist for years to come. As such, an open and flexible platform supporting many different standards and technologies is the only solution to this 'Babel-like' confusion.
10. **PLATFORMS THAT SUPPORT MULTIPLE USE CASES WILL BE THE ONLY ONES THAT SUCCEED.** Evidence from many different technology markets – be it hardware or software – support the view that so far platform-based approaches have been the only ones to cut through and reach scale. In particular, what has been shown is that platforms that leverage developer communities to enable enhanced features and capabilities and foster innovation are the ones that achieve the greatest success. This is why Deutsche Telekom supports the Eclipse Foundation developer community with contributions of its own and integrates the Eclipse SmartHome project's open source technology in its own connected home platform.

A VISION OF THE CONNECTED HOME

A VIEW OF THE NOT TOO DISTANT FUTURE

- It's 6:30 a.m. and the alarm clock sounds – an automatic trigger to ensure, on the basis of pre-defined scenarios, that the hot water is at the right temperature for a shower, the lights slowly turn on, your preferred morning playlist starts, the coffee machine begins to heat the water, etc. No longer do you need to set devices individually, they are all linked and able to communicate seamlessly, and you can intuitively schedule simple scenarios.
- When you all leave your home, the alarm automatically switches on without the need for keypad entry, and should there be an unauthorized entry or unexpected movement, you, your neighbours and/or a third party monitoring station can be immediately alerted. You can also be alerted if one of the back bedroom windows has not been properly shut or the side door to the garage is not locked.
- At the same time as you leave your home, the heating is turned down or off, and non-essential appliances are switched off.
- Now, when your home is unoccupied and the evenings become dark early, lights, music or TV can be turned on, based on your usual routine – to create the impression someone is at home. When you are away from home, digital door locks enable access, based on either remote authorization or someone being present. You can also be alerted when the children have returned home from school.
- On the way home, the heating comes on automatically at a certain time and when you arrive home, the lights switch on, the garage door opens and the front door unlocks. The connected home learns about your preferences for heating and cooling, adapts to meet your preferences and in the process helps reduce energy consumption and costs, while ensuring that you are always in control.
- In the event of smoke being detected, a warning siren sounds, smart phones, tablets and smart watches vibrate. If it is night time, lights turn on and, if the sensor is not reset, the emergency services can be immediately alerted.
- Remote sensors throughout your home monitor temperature, as well as your location, to ensure energy consumption is managed optimally. Should your smart watch sense that you or anyone else is feeling cold, it will trigger the thermostat to automatically turn on the heating. Based on data from temperature sensors in different rooms, you could be offered advice about reducing energy consumption, based on the installation of insulation or more energy efficient windows. Should the external temperature change unexpectedly, the heating is turned on or off, eliminating the possibility of wasted energy.
- Should water, carbon monoxide or gas leaks be detected, either as a result of unusual usage patterns or unexpected water demand, an automatic stopcock shuts off the water and/or gas and alerts you and a third party about the situation. Your insurer can act more quickly to ensure damage does not get worse, potentially act as an intermediary to recommend approved local tradesmen to undertake a rapid repair.
- Lights, temperature, a TV or music can be controlled via your smart phone, smart watch and presence or altered to meet your predefined or personalized scenarios and be simply linked to other devices.
- In your connected kitchen, smart packaging on consumables, food and non-food products can help determine what you need to order, automatically creating shopping lists and even suggesting meals based on ingredients you have in stock.
- You can keep a close eye on your elderly mother or father, living on their own, to ensure everything is OK without intruding on their privacy. However, when they fail to follow their normal pattern, do not come downstairs in the morning or leave the gas on the cooker on for longer than expected, you can be alerted and act immediately.
- Based on your schedule, your electric car can be ready for use when it is required and through integration with the smart meter ensure effective energy management. On site generation – whether PV (photovoltaic) panel or heat pump – is seamlessly integrated with your smart meter and on-site storage to ensure you efficiently utilize whatever energy or heat you generate.
- You no longer need to concern yourself with the servicing and functioning of the HVAC (heating, ventilation and air conditioning) system, kitchen or other appliances. At the slightest possibility of a fault developing, you can be alerted. The manufacturer can contact you, advising you of a potential fault and arrange a site visit to replace a part. There is no longer a risk of turning on the washing machine to find it is not working – remote prognostics has made this a thing of the past. Nor is there any need for service engineers to make repeat visits. The system will already have notified them which part needs replacing, so they will bring it with them.
- A personal automated assistant can integrate with other functions around your home to further automate mundane domestic chores. Using voice recognition, gesture or touch you can easily interact with your home.

Although the above scenarios may, in some respects, appear extreme or even fanciful, the connected home will offer these opportunities in the not too distant future. Given the range of use cases, the potential can be only partially imagined today; in much the same way as when we hypothesized about the arrival of broadband in our homes 10–15 years ago, or even the first generation GSM mobile phone. In fact, the majority of these services are already available either in silo or proprietary solutions – what we believe is holding back wider adoption is silo-thinking. That is a failure to deploy standards-based solutions, a lack of openness at a device level, and limited cross-platform approaches. However, more importantly, as an industry, we have also overlooked the needs of the consumer, have failed to create propositions that are truly consumer-led, that resonate in the market and bring distinct benefits.

Unless we make the changes as described above, the risk we face in the near future is limited market traction. It has become increasingly apparent to us that companies need to work more closely together in order to create truly intuitive and seamless experiences for consumers as well as to bring about the necessary economies of scale.

MARKET CONTEXT

A BRIEF HISTORY

KEY TAKEOUTS:

- The vision of the connected home has long been debated – the first concepts are now almost seven decades old – yet most attempts to realize them have failed due to the level of complexity involved and the fact that they have not been grounded in reality
- The issue to date is that most solutions have been exclusive to particular brands or closed communities. This is set to change, as the range and type of devices in our homes become connected, as part of the overall Internet of Things trend
- Many analysts are forecasting significant growth in this market, across a broad range of domains. Yet all this is at risk if players do not put the customer first, understand their needs and the relevant market drivers

The concept of the connected home is not new. As long ago as in 1950, General Electric (GE) unveiled its vision of the 21st century home, with a kitchen complete with pop-up fridge, ice dispenser, plastic plate maker, and ultrasonic dishwasher. For decades there have been many demonstrations of future homes and multiple commercial offerings have been brought to market envisioning a higher degree of automation in different areas of our homes. They range from the US animated sitcom The Jetsons,

to the more recent advent of smart fridges from the likes of Electrolux and LG. In the early 1980s, we saw the first concrete steps taken, with firms such as Unity Systems launching its Home Manager, an early touch screen device which made it possible to control the home using simple screen-based controls. Yet, for the most part, despite consumers' general interest in the concept of the connected home, it has failed to gain acceptance in the mass market. Deutsche Telekom's analysis shows that some of the principle reasons have been due to the failure to provide for a real consumer need, pricing that is too high and an inferior overall customer experience and the fact that solutions have operated in siloed worlds.

THE MARKET TODAY

Today, consumer awareness of the concept of the connected home is still low. A recent study in Germany by GfK for Deutsche Telekom found that 72 percent of households had never heard anything about the connected home. However, when the concept was explained and specific use cases were outlined, 98 percent of consumers were extremely positive about the benefits that it could bring. The connected home can – and will – enable many mundane activities to take place without one having to give them a second thought. Within the next decade, we believe people will view the connected home in a very similar way to how they view indoor plumbing today.

WHY NOW?

Much about how our needs are met – and the contents of our homes – has changed a great deal over the last few decades. Broadband is now almost universal, and the mass adoption of smart phones and tablets – and increasingly wearables, such as smart watches – is enabling us to connect and interact wherever we are. We are also now starting to see the first generation of smart home devices; from lights, thermostats, kitchen appliances to HVAC and security systems; enabling new capabilities and enhanced experiences. These are mainly being driven by the decreasing cost of the core connected components, and the opportunities to further differentiate hardware offerings and increase margins, or customer lifetime value by bringing to market new subscription-based services and increasing customer loyalty or 'stickiness'.

We are also seeing these developments now increasingly resonating with consumers, who have an ever greater desire to remain connected to the people, places and things they love. Along with this, we see a heightened concern amongst home owners about energy saving. We are also seeing that people have more interest in technology which enhances and assists how the elderly live and enables them to stay in their homes for longer. Mainly this is being driven by many of the demographic and societal changes that are impacting us all.

Finally, more importantly, we see the huge strategic focus, which can now be seen by the world's largest companies, and the level of investment which is now being made in this new market. Just as the last ten years have seen a radical change in our homes the next ten years will see even more dramatic changes. We foresee that over the coming decade we will witness an explosion in the range and type of connected devices – beyond just personal and media-based devices to include a broad range of large and small appliances, boilers, radiator valves, to smart meters, telecare devices, door locks, through to previously inanimate objects, such as furniture and children's toys. Samsung announced in early 2015 that 90 percent of everything that it manufactures will be Internet connected by the end of 2017. Gartner claims that it expects to see a wide range of domestic equipment becoming 'smart' – in terms of gaining some level of sensing and intelligence combined with the ability to communicate – with the result that "... a typical family home, in a mature market, could contain several hundred smart objects by 2022." It makes this claim even though a mature smart home market will not exist until 2020-25. By 2019, Strategy Analytics predicts that nearly 30 percent of Western European homes will have a type of smart system, with revenues from connected home related hardware, services and installation reaching nearly €15.46 billion. Many similar forecasts have been published all pointing at the fact that growth of the connected home is about to commence.

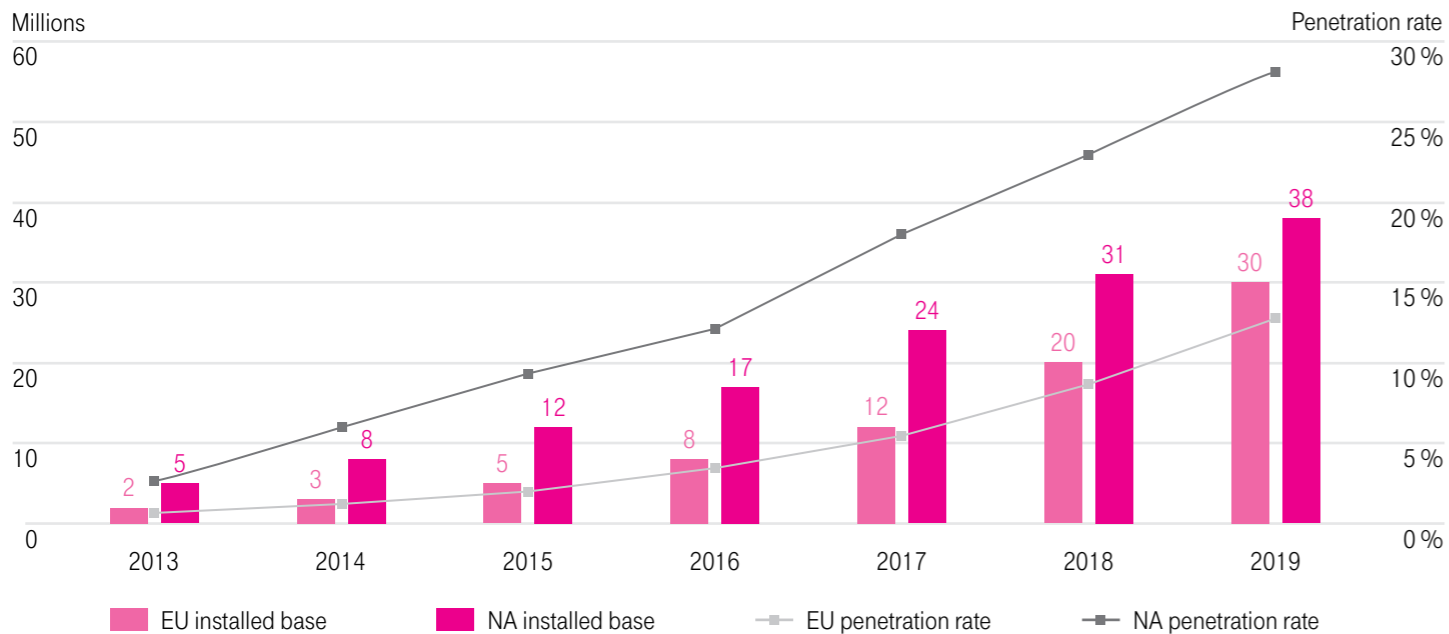


Chart 1: Connected home installed base and penetration EU and NA (North America) 2013-19

Source: Berg Insight: Smart Homes and Home Automation, 2014; Note: Smart home installed base excl. overlap

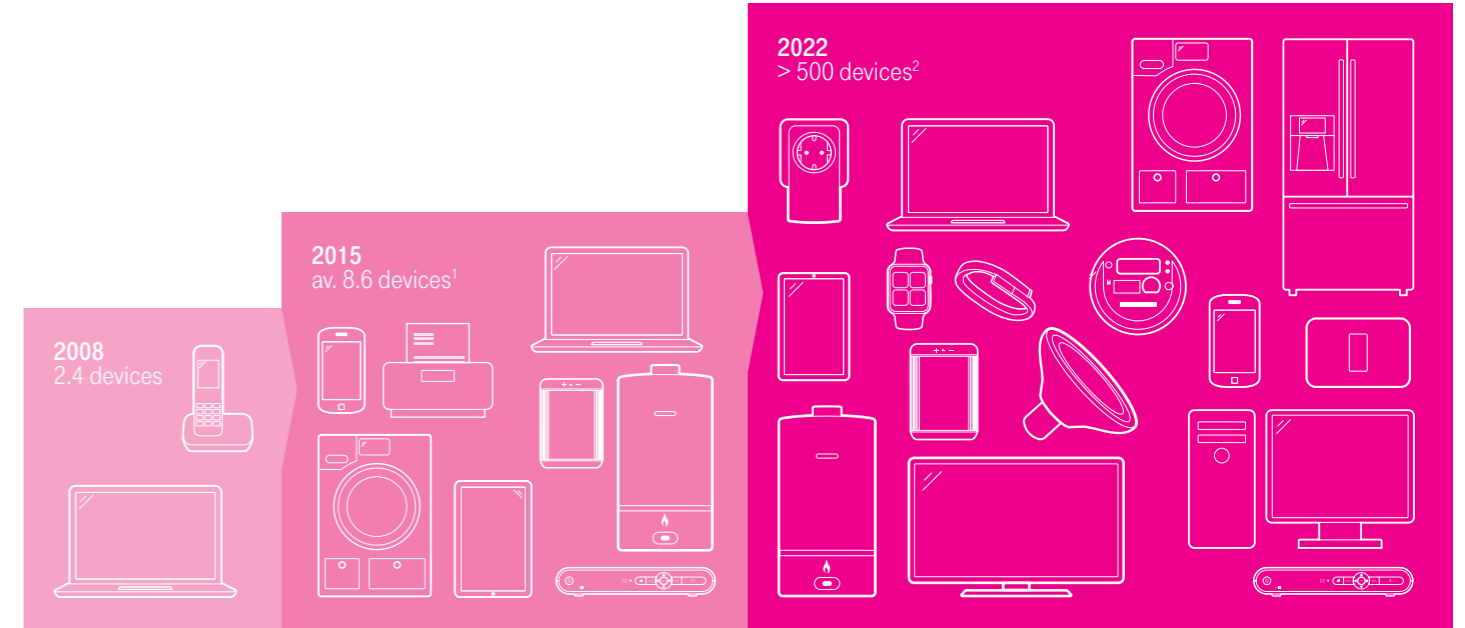


Chart 2: A timeline of device connectivity

Source: 1. Strategy Analytics; 2. Gartner

THE INTERNET OF THINGS

The rise of the connected home is closely related to the rise of IoT and to a growing network of connected objects, places, and people. Former US Vice-President Al Gore has claimed that the IoT will be one of six drivers of global change in the coming decade. Gore describes it as a “fast growing web of sensors being embedded ubiquitously throughout the world, and to increasingly intelligent devices, robots, and thinking machines.” MIT Technology Review predicted in July 2014 that in the next few years the number of objects connected to the Internet will exceed the number of PCs and smart phones put together.

Cisco Systems claims that the ‘Internet of Everything’ – connected products ranging from cars to household goods – could in total be

a €17.3 trillion opportunity. Cisco has long predicted that by 2020 the number of devices connected to the internet will be over 50 billion worldwide, a Compound Annual Growth Rate (CAGR) of over 30 percent from where we are today. At a macro level, based on these forecasts, only 0.06 percent of ‘things’ that could be connected to the Internet currently are(!), which means 10 billion things out of the 1.5 trillion that exist globally are currently connected. Connected homes will be a huge part of the IoT phenomenon. According to Gartner, by 2019 companies will ship 1.9 billion connected home devices, generating about €446.6 billion in revenue.

Globally, by 2020, Strategy Analytics forecasts that global spending on systems and services will reach €91.1 billion, with almost 10 billion connected devices.

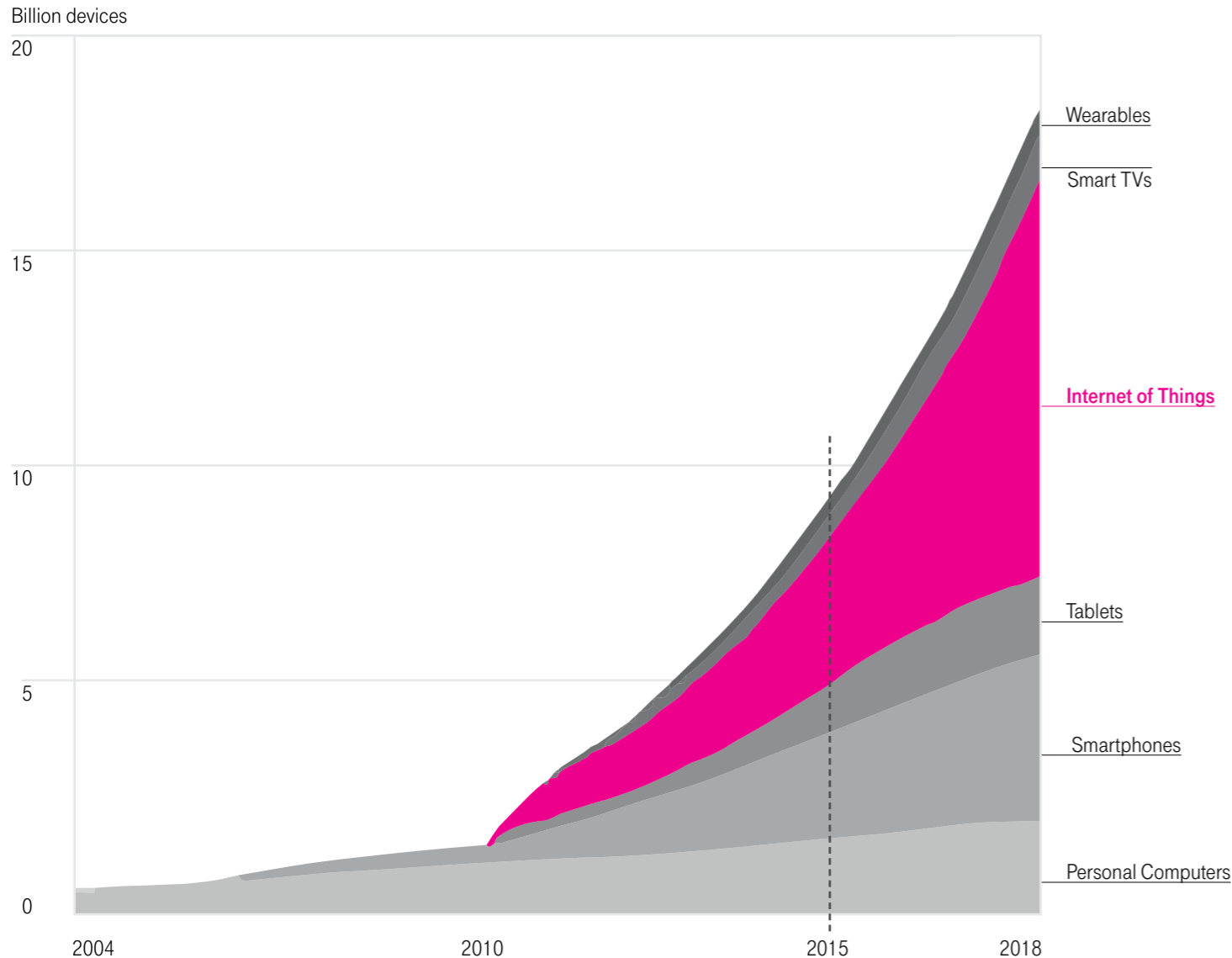
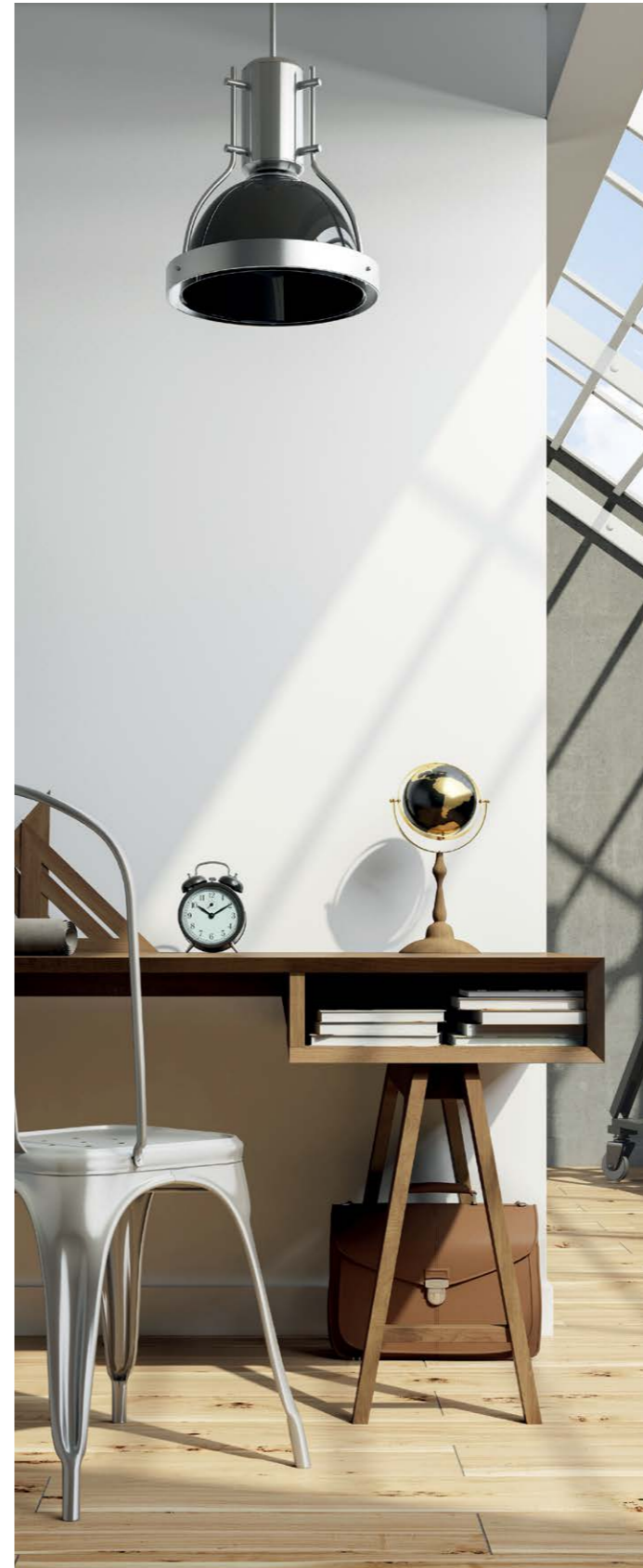


Chart 3: The rise of the Internet of Things (IoT)

Source: Business Insider, 2014



MARKET DIFFERENCES

The growth in the connected homes market will not be homogeneous across Europe. Not only are different markets at different levels of maturity but there are wide variations in terms of building stock, including size, age and quality (i.e. in terms of the energy efficiency, inherent structure, security, etc.). Comparing the UK with Germany, many of the distinctions are quickly apparent. In the UK, according to Delta-EE, 80 percent of homes are heated with gas, 9.3 percent by electricity, 0.7 percent by district heating and 8 percent by other sources, including oil, solid fuel and LPG. In Germany, according to the Bundesverband der Energie- und Wasserwirtschaft (BDEW), 49 percent of homes are heated with gas, 29.3 percent by oil, 12 percent by district heating and 6 percent by electricity. In parts of Northern and Eastern Europe and particularly the Nordics, these distinctions become ever more extreme, where between 50 and 90 percent of all households are currently served by district heating. Furthermore, trends in home ownership differ greatly. According to the UN Economic Commission for Europe, in much of Eastern Europe home ownership ranges from 80 to 96 percent. However, in other parts of Europe, notably in Italy, the UK and France, the number of people who own their own homes ranges from 64 to 73 percent of the population. In Germany, fewer than 50 percent own their own home. Another point of difference is the household demographics. According to Delta-EE, in the UK 29 percent of households are occupied by single people and 20 percent consist of four or more, whereas in Germany 40 percent are single-person households, of which 65 percent are single women. These disparities continue when one also examines the age of the occupiers and compares this with the size of the property, etc. All these factors greatly influence the connected home market, what the initial propositions will be, who will provide them and the channels to market.

IoT REGULATION, SECURITY, PRIVACY & DATA PROTECTION

In some European countries, such as Germany, privacy groups have expressed growing concerns about the implications of IoT. They consider the increasing monitoring of our behavior as a serious intrusion into our personal privacy. Fears about reducing data privacy have also been identified as the major barriers for customers who are interested in the connected homes. This is especially the case when it is considered that many IoT-enabled devices, whether they are CCTV cameras, refrigerators, thermostats or light bulbs, will come with terms of service that grant manufacturers access to all of the customer’s data. The challenge is that the real value of a connected device is that it learns about you as it is used, and it is functionality can be enhanced over time. As such, that learning, intrinsically involves some sort of data logging in the cloud. To overcome these concerns and satisfy European data protection regulations, building trust with consumers will be fundamental. To achieve this, companies will need to be transparent about the types and proposed use of data they collect. Furthermore, when one considers that the connected home will be an attractive target for hackers, it is clear that security is of critical importance.

BUSINESS OPPORTUNITIES



Currently, the most valued connected home applications are security and safety-related. It is important to reiterate that the market is still at an early stage in its development. However many analysts are now forecasting that the market will soon explode. In Western Europe, the research firm Strategy Analytics claims that Germany will be the largest single connected home market (with 11.6 million households), followed by the UK (7.7 million), France (7.3 million), Italy (6.8 million) and Spain (4.5 million) – followed by the rest of Western Europe (12.1 million).

There is growing interest from consumers in systems that monitor and automatically adjust energy usage, including devices such as smart thermostats. Consumer appetite for 'home automation' is also on the increase, in part linked to the more attractive pricing of devices. Beyond these core examples, we are witnessing a number of related developments, such as home insurance, remote diagnostics and warranty, as well as remote and on-site services. There is also growth in the area of ambient assisted living for the elderly. Much of this is underpinned by data analytics, which – with the customers' approval – can support the development of enhanced features and services.

HOME SECURITY AND SAFETY

KEY TAKEOUTS:

- Repeated studies have shown that consumers are most interested in home security and safety propositions because they meet a clear need, linked to their desire to stay connected to the people, places and things that are important to them
- For many in the industry, security and safety are often seen as the 'low hanging fruit' or entry strategy into the connected home market – and the means by which to capture value in the short to medium term
- A number of highly innovative proposition opportunities exist in this category, including integration with monitored security, social media, as well as with new connected devices, such as digital door locks and new sensor technology

Consumer needs and pain points:

- "I often need to be in more than one place at the same time, so I can't keep an eye on the kids and know whether they've got home safely."

- "Help me have greater peace of mind, especially when it comes to the safety and security of my loved ones, especially our children."
- "I want to know that everything is alright at home, and especially those things that are most important to us."
- "I need some means of keeping an eye on my holiday home... it's not just about security, it's about being alerted if there is a burst pipe when the heating fails, etc. ..."

Market adoption and forecast growth: The levels of adoption of home security and safety-based propositions vary noticeably by country, region and segment; as does consumers' readiness to accept more advanced forms of security. Currently, across Europe, according to the EU Crime Prevention Monitor, an average of ten percent of homes has some form of security alarm. However, based on Strategy Analytics' quantitative research, monitored alarms systems protect on average of just over six percent of the total housing stock across Europe.

The strongest growth has been in the Nordics. In Finland penetration grew from 2 percent in 1989 to 9 percent in 2004, while Norway jumped from 9 percent to 28 percent over the same period. In addition, there are many self-installed systems which just ring, or alert the householder. In the UK and specifically in England 30 percent of households had alarms (both professionally monitored and self-installed), up from 25 percent in 2001

according to the 2012 English Housing Survey. Despite the different levels of adoption, Europe remains significantly behind the USA, where adoption of monitored alarm systems range from 17 to 26 percent, according to different market reports.

In every European country, the rate of adoption also differs by house type. In the UK, for instance, there are multiple variances, with different rates of penetration by building type, e.g. 36 percent of owner occupied households have an alarm system, as do 54 percent of detached houses. Furthermore, the type of alarms systems employed across the Continent varies greatly. In the UK, about a third of alarms are monitored by a professional third party organisation, and the majority of the rest are 'bells-only' systems, which either alert nobody, just the home owner or a predefined list of neighbours, friends and family.

MarketsandMarkets has recently forecast that the total European home security market will achieve a CAGR of over 25.4 percent over the next five years, driven by new and innovative developments in monitoring, the growth of digital door locks, wireless sensors and more sophisticated integrated cameras, with the latter contributing the largest share of overall growth. MarketsandMarkets predicts that the total video surveillance applications market will reach €23.22 billion by 2016, and evolve towards video-as-a-service – where movement analysis takes place in the cloud.

All online households

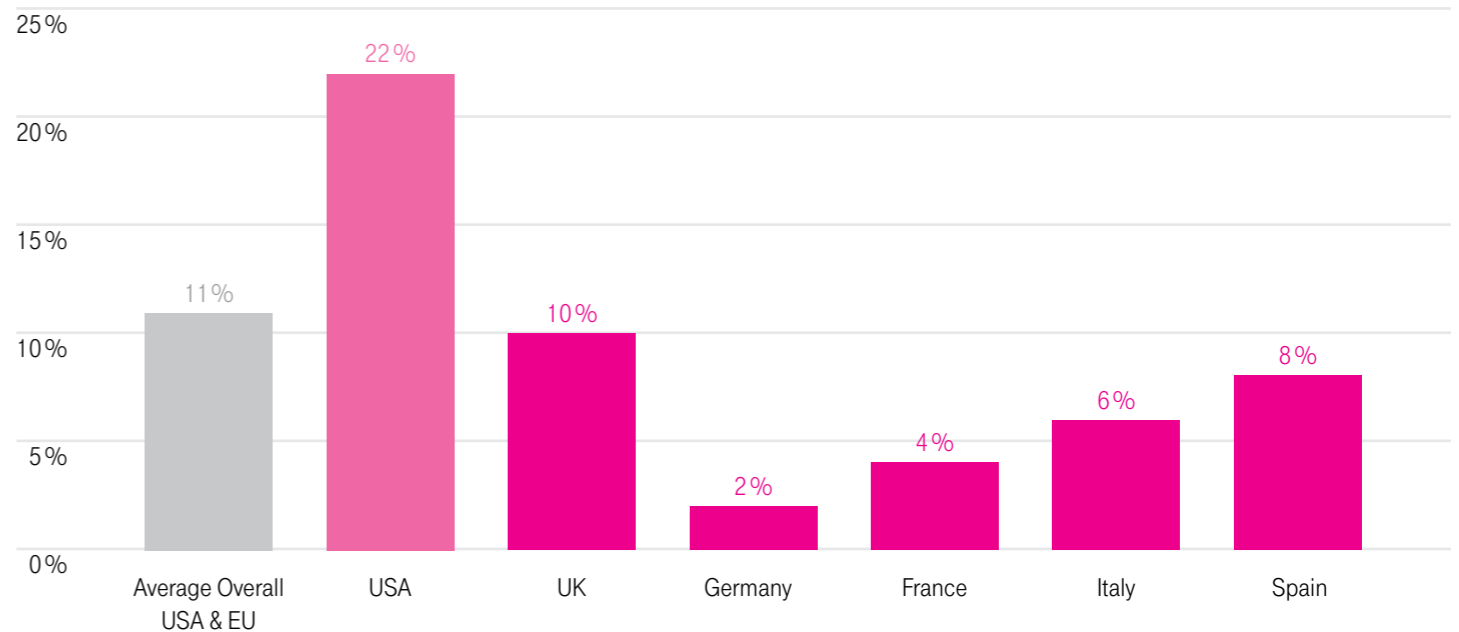


Chart 4: Strategy Analytics: Residential Monitored Security (4Q 2014)

Source: Strategy Analytics, Inc.

Insights and perspectives: Today, consumers face a complex choice: either a self-install, self-monitored home security solution, with multiple drawbacks in terms of the ability to respond in the event of an incident, or mid-value consumer electronics-branded camera solutions, again with limited ability to take action, or costly professional monitoring solutions, of which many actually offer no guaranteed response. It is also clear that much of what has held the market back over the last few years is now being overcome in terms of the lack of pervasive distribution, i.e.: availability in high street stores; the simplicity of the offer; mass market pricing, as well as the flexibility of pricing options; the complexity of set-up; and the challenge of responding to an emergency situation. The use cases that interest consumers mostly range from the remote monitoring of the home via cameras and the ability to remotely open and close doors to being alerted at the event of power outage, leak or flood event, fire or during severe weather, such as freezing conditions.

We believe that the market potential for monitored security alarms is significant and represents one of the most attractive routes into the connected home market. Whilst it is an established market answering a clear consumer need, current industry models are not working. Prices are too high and the services are too flexible for example, some people might only want monitoring when they are on holiday. There is also a lack of products available on the high street. There is no doubt that in the realization of such services, many players including security providers, telcos, energy providers, as well as insurers, have a strong role to play, as they bring a level of trust and credibility to such propositions and can also support the realization of more innovative business models.

The different types and levels of response have been seen as one of the areas for innovation. For instance, in Norway, the idea of a social community network has been successfully deployed by Sfty. The system alerts not only the authorities, but also friends, family and neighbours, in the case of an alarm. A rapid response is critical to solving most situations and in less serious situations in which the authorities may not prioritize a fast response those who are in close proximity to your home and family are more likely to be relied upon. This social safety network is a new connected take on the old neighbourhood watch concept, and has the potential to transform home security. In the USA, nextdoor.com is another example of how a social networking service for neighbourhoods is allowing users to connect with people who live nearby, particularly in emergency situations.

Deutsche Telekom's experience: Our German retail business offers a smart home proposition which enables self-monitoring via IP cameras and a range of connected sensors, including motion sensors, smoke/carbon monoxide sensors and water leak detectors. At a platform level, we are actively working to enhance the capabilities that we support in this area. We have also provided integration to third party monitoring services, enabling our partners to offer a broader range of services.

HOME ENERGY MANAGEMENT

KEY TAKEOUTS:

- Energy management represents a clear growth opportunity for utilities, manufacturers, retailers and installers that goes beyond protecting the environment through reduced energy consumption
- Smart thermostats are the first step on the journey to enabling a broader vision of energy efficient homes that will also see innovative new value added services, and in the future on-site generation and storage
- Smart meters and demand disaggregation capabilities will provide consumers with the means to visualize their energy use, and enable utilities to develop closer relationships with their customers. But they also represent a very real threat of disintermediation to utilities, as adjacent players will seek to develop innovative propositions using this data

Consumer needs and pain points:

- "Help me save energy and money."
- "Help me reduce my carbon footprint."
- "Take away the hassle of controlling my home's energy use."
- "Help me keep the temperature and comfort level optimized in my home."
- "Help make all aspects related to energy easier to understand."

Market adoption and forecast growth: Delta-EE market analysis suggests that in 2014, 500,000 smart thermostats were installed in homes across the EU. Berg Insight claims that in 2014 the number of smart thermostats increased by 105 percent to 3.2 million across both North America and Europe combined. Berg forecasts that by 2019, the number of smart thermostats will grow at a CAGR of 64.2 percent across both markets. When one considers that in Northern Europe about 60 percent of household energy is consumed through central heating, it is clear why thermostats that can control energy usage will see such traction.

According to Navigant Research, global revenue attributed to home energy management products and services is expected to grow from €533 million in 2014 to €2.18 billion in 2023.

Insights and perspectives: Visualization, monitoring and controlling of energy use represents a convincing opportunity, not just for utilities, but for manufacturers and retailers alike. Solutions such as smart thermostats are also an important means towards helping consumers better understand and manage their energy costs. Between 2006 and 2013, US electricity prices rose by 17 percent, according to the US Energy Information Administration, whereas in the EU they rose by 40 percent. Connected home solutions provide a means to offset energy price rises, by enabling consumers to better control the energy they use.



Chart 5: Home Energy Management Services represent a broad growth opportunity

At the same time, research by Accenture has found that consumers spend on average six to nine minutes each year interacting with their utility, and when they do, four out of five of the reasons are negative. From a utilities' perspective, beyond reducing energy spend, solutions such as smart thermostats provide a means for them to positively engage customers and improve the interaction. However, to date, adoption of smart thermostats has been limited across Europe. Despite strong growth forecasts, the European market for smart central thermostats has been slower to take off than in the USA, in part due to the requirement for a professional installation in many countries, such as the UK, limiting the potential for an impulse purchase.

From market insights across the EU, few consumers today are prepared to make a proactive decision to purchase a smart central thermostat or related service unless the proposition is heavily discounted or, as in many cases, is offered free of charge as part of a bundle with a commodity tariff. Even then, the volumes have often failed to meet the initial expectation. Where there has been notable success, it has been because it has been used as a save tool in retention, or as a result of leveraging existing boiler installation and maintenance operations, and bundled as part of the service. One of the principal challenges is that consumers do not expect their energy provider to sell them smart thermostats. Today consumer interest

in standalone energy management products remains low, and the majority of utilities have struggled to develop messaging and introduce the necessary cross-selling processes into their organisations.

Across the EU, the type of thermostat varies widely, with many regions expected to maintain room-based or zoned solutions rather than centralized ones. Furthermore, as in all categories or use cases, we believe that the value becomes even greater when there is an interconnection with other adjacent categories. For instance, the linking of heating or energy management and security brings with it many intrinsic advantages for many different providers. When no one is left in the property – perhaps when a security alarm is set, the heating system automatically turns off. When one considers that in the UK research has shown that 10 percent of homes with central heating do not have a timer and a further 25 percent with a timer do not use it, resulting in 7.8 million homes being heated when they are empty: the energy saving opportunity is clearly significant.

Depending on the local market structures, there is a real opportunity to use real-time demand and generation data to better utilize the network and power stations. Such developments have immense implications for the industry. For the energy bill payer, multiple studies have demonstrated the benefits of putting greater power into the hands of consumers and

allowing them to choose to use energy when it is cheaper. For utilities, the potential is just as great, as they will be able to increase trust and transparency in the market. There is also an opportunity to add more value for customers by means of other services. For instance, we believe utilities could consider expanding their offer to include subsidized appliances, HVAC, insulation (leveraging subsidies where applicable); and thereby improve customer loyalty and retention.

Real-time data on energy usage (whether it be at 1 or 5 second intervals), especially when allied with demand disaggregation capabilities, provides a potentially interesting feature for consumers, providing insights into their detailed energy use in their home and its devices. This is especially the case, given that the UK's Energy Saving Trust claims that by switching off high energy consuming appliances at peak/super peak hours and placing unused appliances on standby, there is an opportunity for consumers to save between €70 and €130 per year. This energy data also represents a compelling opportunity for utilities, as it will enable them to build more attractive connected home propositions using detailed customer insights. A smart meter that provides real-time energy visualization gives the utility the means to build a positive relationship with a customer, assuming it fully uses this data. However, it also offers utilities the means to change today's paradigm with the relationship between energy retailer and customer ending at the meter. In many EU countries, regulators are seeking to provide an open environment to stimulate greater competition and innovation. For instance, in the UK, the DECC (Department of Energy and Climate Change) has created the DCC (Data Communications Company), which as part of its mandate will allow authorized third parties to provide services direct to consumers – once they have granted permission to use their energy consumption data – offering new routes for consumers to receive energy services and advice on how to reduce their energy usage. Despite the many benefits that can be derived from data on energy consumption – for consumers and utilities – there is a risk of disintermediation for utilities from retailers and price aggregators. For instance, in the UK, once the DCC is in place, any authorized third party can have access to a customer's smart meter data – whether it be price aggregator or retailer – not only to provide consumers with energy insight, but also the best tariff based on their energy use. Utilities could become nothing more than pure commodity providers – particularly given upcoming legislation that will see in-day switching, i.e. near real-time migration, meaning aggregators could guarantee consumers have the cheapest tariff moving to different providers through the day, based on their energy needs and the energy mix.

Deutsche Telekom's experience: In Germany and Austria, Deutsche Telekom's connected home platform has enabled utilities including Vattenfall, RheinEnergie, EnBW, Entega and eww Gruppe to offer customers heating and energy management services, leveraging connection to a range of devices, including thermostats and smart plugs. Deutsche Telekom is now engaged with many other utilities across Europe to explore how they might also benefit from the capabilities of its connected home platform.

HOME AUTOMATION

KEY TAKEOUTS:

- The ability to simplify tedious and unnecessary tasks, and for our homes to seemingly intuitively respond to our needs, has long been held out as the 'nirvana' of the connected home – to date the areas of most interest from consumers relate to entertainment
- The arrival of many major consumer device manufacturers like Philips hue, Sonos or Miele into the market – for the most part enabling automation capabilities – will bring with it much of the buzz and education needed and help increase consumers' appetite for such developments
- To date, most devices in this category are silo-based, single use cases, yet all our insight suggests that consumers will increasingly demand 'cross-functional' use cases that can create scenarios for multiple devices, i.e. IFTTT (If This Then That) functionality

Consumer needs and pain points:

- "Make my life easier."
- "Take away the hassle and make things more intuitive and seamless."
- "Simplify the mundane and routine tasks around my home."
- "Make my home more responsive to me."
- "I'm a bit of a gadget freak!"
- "I like to show off and have the latest cool toys in my home..."
- "Everything that the connected home promises, I want!"
- "When I set my alarm, I want my heating to automatically come on 30 minutes before the alarm rings so that I'm guaranteed a hot shower, and for my coffee machine to kick into life 15 minutes later!"

Market adoption and forecast growth: According to MarketsandMarkets, the global home automation and control market was worth €5.18 billion in 2013 and is expected to reach €11.6 billion by 2020; and the market is projected to grow at an estimated CAGR of 11.36 percent between 2015 and 2020. In a survey commissioned by the Internet of Things Consortium (IoT) and conducted by IDC in late 2014, two thirds of US respondents said they are "moderately or extremely interested" in adopting such smart home devices, with 71 percent claiming recommendations made by retail store employees are most likely to influence their purchase decision.

Insights and perspectives: Today, the market acceptance of home automation solutions, including control of lighting, door locks, music systems, blinds/shutters or appliances, remains relatively small, at least in Europe. We believe that the arrival of a number of major consumer electronics manufacturers in the connected home space – for the most part enabling convenience and control – will bring with it much of the buzz, excitement and education that this industry requires to mature and grow. It will also enable retailers and telcos to engage consumers about the possibilities a connected home and life can deliver. For telcos especially, there is a clear opportunity to link connected home devices with apps on wearables, smart phones and tablets.



The range of use cases that a connected home enables will increase the more devices are added. Central to success in appealing to consumers will be ease of set-up and interconnection across devices, but also pervasive distribution. Parks Associates claim that during the 2014–15 holiday season multiple retailers in the USA expanded their shelf space devoted to smart connected devices, with most notably BestBuy allotting over 75 square meters in some locations to its connected home initiative. There is no doubt that the retail environment will be a key channel for app-based smart connected devices. Beyond in-store execution is critical for both simple and benefits-led messaging and staff training. For retailers to benefit from the projected growth opportunity, it will no longer be acceptable to only train a sub-set of store staff on the capabilities and potential that the connected home offers.

Within this broad category of automation, we consider the development of new technologies that seek to increase direct sales through 'push to order' to be an area of increasing importance, especially for both retailers and CPG/FMCG manufacturers. One of the first examples of this is Amazon's 'Dash Button', which is a mini WiFi device that enables genuine one-click ordering of regular products. It is a single-function plastic controller the size of a pack of chewing gum with a distinct, brightly-colored brand logo on every button. We believe that it represents a trend in the development

of dedicated devices, as well as integrated functions within appliances or devices that will make it easy for customers to seamlessly purchase new replacement consumables.

We also expect a wide range of innovative devices to be brought to market that further simplify mundane tasks and as well as interface with the many connected devices around the home. We expect an ever-increasing range of robotic devices to enter the market, such as robotic vacuum cleaners and lawn mowers that seamlessly link with the connected home. We also expect innovative devices, such as Jibo, which has been described as the world's first social robot for the home, to further extend the appeal and reach of the connected home. Jibo, which is a personal assistant robot, uses an innovative interface to provide alerts and controls that could be included in connected home devices and services.

Deutsche Telekom's experience: Deutsche Telekom is working with many leading consumer brands, including Samsung, Sonos, Miele, Philips, Osram, eQ-3 and others, supporting their individual initiatives by providing an open platform, which integrates multiple devices from different manufacturers and enables consumers to create their own scenarios.



REMOTE OR ON-SITE TECHNICAL SUPPORT

KEY TAKEOUTS:

- Despite immense industry effort to enable intuitive set-up and use of connected devices, it is clear that given the level of technical complexity involved, there will always be some segments requiring a level of third party support, whether it be remote or face-to-face
- Technical support represents a means whereby both telcos and retailers can deepen and strengthen their relationship with customers by proactively resolving customers issues and extending the range of services that they provide
- Companies that currently operate in the high-end custom electronic design and installation industry can leverage the capabilities that the connected home will enable to provide enhanced features to a broader range of consumers, and players that currently operate in PC support or even HVAC installation and maintenance could potentially consider broadening their range of capabilities

Consumer needs and pain points:

- "Help me; I don't understand how to do it."
- "It doesn't work – I'm struggling to see what to do."
- "I don't have the time or energy to do this myself."

- "The biggest fear I have of the whole concept of the connected home is what happens when it all goes wrong!"
- "Since my son has left to go to University, I'm completely lost when it comes to resolving technical problems on my own!"
- "What happens when the broadband line goes down...?"
- "I can't stand it when I'm trying to resolve a technical problem and I'm speaking to technical support on the phone and they don't understand me and I don't understand them!"

Market adoption and forecast growth: According to Parks Associates, between 20 to 30 percent of connected devices are covered by an extended warranty or a subscription technical support plan. Research by the firm has identified that almost 25 percent of US broadband households with smart connected devices experience problems with a device on a monthly basis. Frost & Sullivan claim that the remote technical support domain for IoT and mobile devices will grow to reach €2.4 billion by 2020, a 12.1 percent CAGR. Often referred to as support interaction optimization (SIO), the category combines customer guided problem resolution, remote support, sophisticated analytics and performance management to deliver highly streamlined and effective technical support. In the provision of these services, Accenture has found that the majority of consumers would welcome the opportunity to have one company providing technical support for most or all of their home and mobile consumer electronics

devices – whether they describe themselves as being a heavy, medium or low user of such devices.

In late 2014, research by Parks Associates found that 16 percent of US broadband households own a smart home device and one-third have experienced at least one technical problem with their devices. Among these households, 56 percent are willing to pay up to €9.09 per month for a technical support service, and 43 percent are willing to pay up to €33.19 per month.

Insights and perspectives: Despite 'plug and play' set-up and the increased simplification of the overall user experience of connected home technology, the consumer need for remote and on-site technical support is set to increase. DIFM (Do It For Me) is becoming an increasing factor in many advanced Western societies, whether that is related to automotive service and repair through to household repairs, and all the evidence suggests that it will be the same with the connected home.

Offering in-home technical support for both installation and in-use, either directly or through partnerships, can enable providers to up-sell other services, such as the installation of added security peripherals, including cameras, etc. One of the specific opportunities we have identified for service providers is offering a portfolio of home technical services, integrated with a connected home service, an extension of a GeekSquad-type service that is offered by BestBuy in the USA. From our analysis, one of the critical success factors in the connected home market will be leveraging on-site assistance. These assistance services not only provide incremental value to an overall offering but will also engender greater customer loyalty. This range of services includes the ability to assist customers in the installation process, including the up-sell of incremental products and services, through to on-going support and assistance – in the event of a technical incident – to remote diagnostics, potentially tied to an extended warranty agreement. The importance of on-site support is even more important when one considers that the perceived benefits of many connected home propositions can be relatively complex for many consumers to fully appreciate, and access to a trusted remote or on-site engineer can bring considerable advantage. We believe there is a related opportunity for more entrepreneurial organisations to provide enhanced customized installation services, sometimes referred to as 'digital plumbing', enabling home owners to further personalize their homes using connected technology – an extension to what CEDIA (Custom Electronic Design & Installation Association) firms do today in more high-end homes. Using developers who can create bespoke features and functions in a consumer friendly way may enable further differentiation and value.

Deutsche Telekom's experience: In Germany, Telekom has launched a full installation service for its Smart Home starter packages, with a predefined set of devices. We have also integrated our "Telekom Computer Help" and the "Telekom Smart Home" hotline, which provides customers with a choice of pay as you go and charged for plans, including 30 minutes of hotline support and up to three on-site field service visits per year.

HOME INSURANCE

KEY TAKEOUTS:

- Connected home insurance is a major development which is set to have a profound implication on the industry – in the way that policies are set, incidents are resolved and consumers pay for protection – it represents a considerable opportunity for innovation
- This innovation represents a huge potential for insurers, resolving many of the inherent challenges in their market, in terms of creating customer loyalty, but also managing risk. It also represents an immense threat from disintermediation, as players from adjacent spaces could exploit it to enter the market, leveraging sensor data to create new models/propositions
- The challenge for insurers – as has been the case in the area of pay as you drive insurance – will be to create propositions that resonate in the market and increase customer lifetime value: we believe that in many markets this is only likely to be achieved by capturing value in adjacent markets

Consumer needs and pain points:

- "When it comes to home building and contents insurance, I really feel that I'm forced to buy products I don't actually need."
- "I was forced to buy expensive add-ons to ensure I was fully covered."
- "I don't feel that the policy I have fully covers me for the full extent of all my requirements."
- "I never trust insurers, I don't know if I'm being fairly charged..."
- "I'm someone who always worries. If I could know that there was something in place to protect my home and my loved ones against whatever risk, it would give me much greater peace of mind..."
- "I sometimes feel that insurance is like a tax – I wish there were other alternatives available! If there were, I'd be the first to stop paying insurance!"

Market adoption and forecast growth: Currently, there are no relevant market forecasts for the adoption of connected home insurance policies, but given the challenges that many insurers are facing in their core general insurance markets, it might see a rapid introduction. It should also be noted that beyond providing a means to optimize costs, it also represents a means to expand to adjacent markets, notably monitoring, emergency assistance, response and warranty services.

Insights and perspectives: In most markets, insurance is viewed by home owners as a 'grudge purchase' – and not something that is positively taken up. At the same time, insurers face an increasing range of issues impacting their ability to price risk effectively and engender loyalty. For the most part, this is impacted by the lack of direct communication, which reduces their understanding of their customers. When there is customer contact, it is often limited to just a few minutes a year, which often is more negative than positive, either because of the claims process, the fact the excess is higher than expected or the annual renewal has increased above

inflation. At the same time, insurers in most markets are finding it increasingly difficult to acquire and retain customers. For a market, where profitability is often directly linked to the weather, there is a need to reduce the level of uncertainty. In the UK, research by the Association of British Insurers (ABI) has shown that consumers are also increasingly willing to drop insurance cover to save money; e.g. 22 percent have stopped taking out contents insurance during the recession of 2008–13. Research in the UK by Consumer Intelligence has also shown that 91 percent of consumers claim they are likely to use price comparison sites for their next insurance purchase; resulting in 47.5 percent of consumers more likely to switch provider on renewal.

While the connected home can bring about a higher level of security, curtail fraud, reduce incidents, and provide insurance companies with better risk management data, it can also enable them to optimize their costs so they can either lower premiums or improve profit margins. In the not-too-distant future, the connected home will offer the potential to play a greater role in the way that home insurance policies are set. The lack of interaction with consumers can – for the most part – be overcome by leveraging the capabilities of the connected home.

We believe that sensor data enabled by the connected home could cause significant change within the insurance industry. As our homes become increasingly connected, the immense amounts of data they produce will reveal the flaws in insurers' actuarial models and will force insurers to change the way they set premiums. Some are even suggesting that the implications will be so seismic, that the industry will have to completely reinvent itself, no longer providing insurance policies, but rather assistance and maintenance services.

Evidence for this can be seen in the automotive sector, where usage based insurance (UBI) – also known as 'pay as you drive' (PAYD) insurance – has already started to gain momentum in an increasing number of countries across the world. Motorists no longer pay a flat-rate insurance premium, instead premiums are based on where, when and how they drive. Motorists with a low mileage, who drive safely, pay lower premiums than those with a high mileage that constantly accelerate abruptly and take corners sharply. In Europe, there are about 4.8 million PAYD insurance policies, according to market research firm Berg Insight. Berg claims that the market is currently growing at 42.4 percent CAGR, and is set to reach €28.1 million by 2019.

Deutsche Telekom believes that the connected home will provide insurers with significantly more reliable data on risk management as well as and more real-time data. Insurers will have the means to prevent a potentially traumatic home experience from occurring – for instance a collapsed ceiling as a result of a water leak. The opportunity for an insurer to solve a problem before it causes a disaster is one of the principal benefits of a connected home. Not only will it enable them to optimize their costs by reducing their risks, but it will represent a means to enhance and improve their relationship with customers, and hence customer loyalty.

According to Insurance Europe, in 2013, across the EU, property premiums totaled €89 billion, of which €55 billion was paid out in claims. The majority of these claims were dominated by a few specific issues: water leaks; burglary; fire and smoke damage. All of these areas can be monitored either by deploying low cost smart sensors, potentially preventing an event in the first place, or at the very least reducing the impact, or by linking to the increasing number of connected devices that are set to enter the home.

According to the ABI, losses resulting from burst or leaking pipes or faults in a property's plumbing system have a significant impact on the UK insurance industry and its members pay out around €3.6 million a day to customers in what they term 'escape of water' claims. A significant proportion of this damage is due to pipes bursting during freezing temperatures in the winter months, but much of this damage can be prevented by taking a few easy preventative measures. At the height of the cold spell in 2010, insurers dealt with 3,500 claims for burst pipe damage every day. The typical cost of household damage caused by burst pipes averaged up to €9,900 during that cold spell, but in some cases costs were significantly higher, reaching into tens of thousands of pounds – particularly for multi-storey blocks of flats. However, by deploying low cost water leak detectors or flow meters, home owners, landlords and insurers can identify the possibility of a water leak event before it becomes a very costly pay out for them, as well as a traumatic experience for all concerned. We believe technical innovations determining an escape of water represent a huge potential boon for insurers.

In the UK, research by consumer group Which? claims that malfunctioning household appliances caused almost 12,000 fires in just over three years, from January 2011 to March 2014. We consider that by ensuring that appliances are connected, both manufacturers – but more importantly insurers and warranty providers – can be alerted about any product recall, and also potentially identify when there are anomalies such as power surges (see later section). Providing more personalized policies also increases customer loyalty and enables insurers to generate new revenue streams. This can start with simple bundling and affinity deals, as has been seen in the USA, where a number of insurers already offer discounts to households with home monitoring systems. Allstate Canada offers 25 percent with the Rogers' Home Monitoring system, State Farm in the US offers 10 percent with ADT Pulse and Lowe's Iris, NRMA in Australia offers a discount with its home monitoring service. In the future, we believe that the connected home insurance market will have even broader appeal than automotive UBI. However, being a relatively new concept, we expect in the near-term it may face some challenges unless the value proposition is directly answering to customers' needs.

Deutsche Telekom's experience: Deutsche Telekom has been active in the automotive UBI space for many years and has developed partnerships with OEMs, telematics providers and insurers. In 2014, Deutsche Telekom announced a partnership with DriveFactor, the global platform provider for UBI to enable motor insurers to offer their customers special benefits

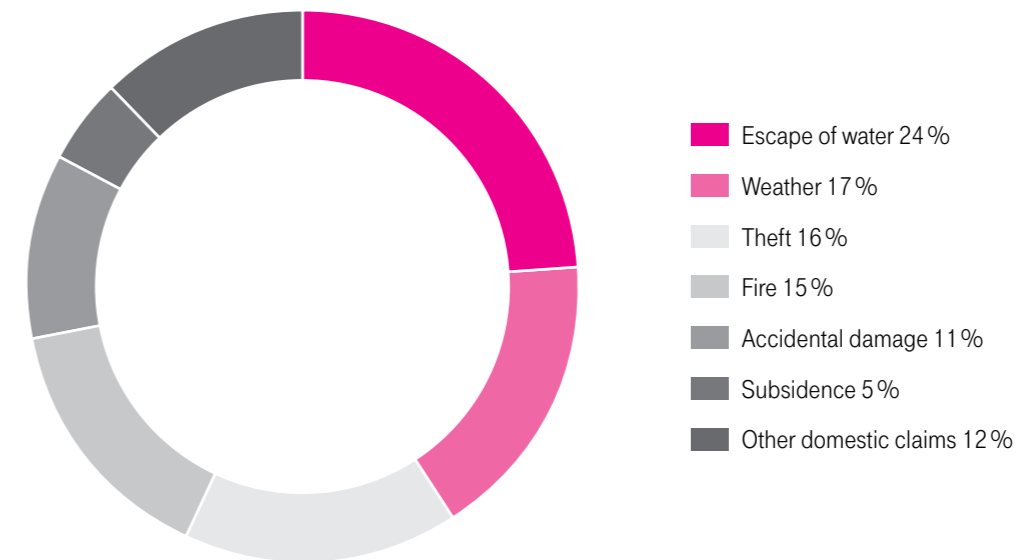


Chart 6: Domestic property claims by type of claim, 2013 (percentages based on value of claim)

Source: ABI Key facts 2014 based on data from 2013

for driving safely. Deutsche Telekom is currently actively working with a number of partners on how to bring to market connected home insurance services.

HOME SERVICES, INCL. ASSISTANCE, WARRANTY AND REMOTE DIAGNOSTICS

KEY TAKEOUTS:

- As the range of devices in our homes becomes connected, so the way that they are managed, maintained and replaced will change
- Prognostics capabilities will enable new business models, optimize costs, enhance the customer experience, and enable innovative players to develop new propositions that extend and strengthen the customer's lifetime value
- Both manufacturers and retailers will be able to move between a once every X years purchase experience to build deeper relationships with their customers, transforming warranty and emergency assistance contracts – and increasing attachment rates

Consumer needs and pain points:

- "I want to know that if anything goes wrong with it, it will be fixed quickly and without any big bill shock."
- "I can't take the hassle of my heating breaking down in the middle of the winter – I need peace of mind that someone will come and fix it within a matter of hours..."
- "I want some sort of home emergency assistance so that no matter whether it is my heating, plumbing or electricity, I have someone to call should it go wrong."

- "In the event of a crisis in my home, such as a burst pipe, I want to have access to immediate support from an emergency helpline."

Market adoption and forecast growth: According to Finaccord, the home emergency insurance and assistance market in the top ten EU countries was valued at €3.65 billion in 2013 up from €3.09 billion in 2009 (CAGR of 4.28 percent). The principal services include the installation and maintenance of devices, such as a boiler and central heating, through to plumbing repairs and services, electrical wiring, as well as dedicated insurance cover for kitchen and gas appliances. In addition, Finaccord claims that the extended warranty market in the top twenty countries in Europe was valued at about €7.12 billion in 2014, including mobile devices, white goods and consumer electronics. The white goods and consumer electronics segment is projected to grow by 8.3 percent per year over the next few years. Today, the UK market is said to represent around a third of the total value in Europe, followed by Germany, although Finaccord projects a narrowing of the divide between these two most established markets. In the UK, attachment rates for extended warranty range from 18 to 67 percent, depending upon the category. According to Assurant Solutions, one of Europe's leading providers of device protection solutions and extended service contracts, up to 47 percent of consumers purchase an extended warranty, further reinforcing the value of prognostics.

Insights and perspectives: Connected devices play greatly into the hands of warranty providers, manufacturers, retailers and insurers, with both emergency assistance and extended warranty expected to be an increasingly important revenue and profit stream. For retailers, the warranty business is growing in importance as the level of competition from low-cost e-commerce sites increases. By connecting the device,



which is covered by the warranty, parties can optimize the profitability of that agreement. For instance, the ability to monitor a device's status remotely, and in the event of a claim determine if all the requirements for replacement are met, or if a certain component part fails and needs to be repaired or replaced, validation without a site visit, can dramatically reduce the cost of servicing that customer.

This same principle can potentially be applied to the majority of household appliances and devices, from smart TVs to dishwashers and HVAC systems. These kind of value added services provide a multitude of benefits for consumers, but also for manufacturers, warranty providers, retailers, etc., as they enable them to optimize costs by providing services such as remote maintenance and bringing incremental revenues to their core business.

Across Europe, the market for home emergency and assistance, particularly in the heating and plumbing space, is highly fragmented, with thousands of small national, regional and local tradesmen doing the work. However, an increasing number of branded national providers offer on-site assistance services ranging from utilities that have their own branded field service engineers (many of them franchised businesses) to dedicated home assistance providers offered as part of an insurance policy and retailers and manufacturers that have built their own network of engineers, as part of a differentiated service offering. We believe that on-site support will be a key differentiator in the evolving market and provide a persuasive means to increase the value offered to customers, especially for retailers, utilities and insurers.

Today, extended warranties and emergency assistance are generally sold by a number of different firms: the manufacturer, utility, insurer, home service provider or retailer, depending on what is being covered and how and when it was purchased. Over the coming years, with replacement cycles expected to shorten in many product categories, warranty services are predicted to become increasingly important and valuable, especially as many European markets remain immature and penetration is still low. With that in mind, insight suggests that the extended warranty model represents another highly attractive route to drive the growth of the connected home. Deutsche Telekom believes that the opportunity to link remote diagnostics with extended warranty represents a persuasive means to improve the customer experience, enhance loyalty, optimize costs, manage the replacement/recycling process, as well as support the move towards service-based subscriptions. We believe that a broad range of B2C firms, including manufacturers, utilities, retailers, insurers and home assistance providers, will seek to exploit such capabilities to monitor the performance of household devices and optimize maintenance costs. Our analysis suggests that such a facility will help home emergency assistance providers to further differentiate their maintenance propositions, notably in boiler and heating care. More importantly, providers can significantly improve profit margin of maintenance products by optimizing the effectiveness of engineers, for example, through proactive maintenance and response, first time fix and more. These value added services will improve the customer experience which in turn will help the utility to maintain the customer loyalty for their core commodity products. We also expect manufacturers to use these capabilities to gather information to improve their products and services. When one considers that in many markets,

such as Germany, there is a legal obligation to service boilers annually – to test that the exhaust conforms to legal norms. The opportunity to fix a boiler at first time of call and have the correct parts brings with it many incremental benefits. Beyond the everyday home services that we see being developed – which will leverage many of the features and services that already exist today – we expect to see a broader range of more innovative services that will be enabled more seamlessly with the arrival of the connected home. We believe that start-ups such as TaskRabbit, an online marketplace that allows users to outsource small jobs and tasks to others in their neighbourhood, could interface with the connected home to provide support and automated assistance services to home owners as and when they are needed.

Deutsche Telekom's experience: In Germany, Deutsche Telekom's retail smart home offer has trialed a number of different services in this area to test customer appetite and appeal. One service offered customers a 24/7 emergency and assistance helpline for instant support when they were away, and if necessary, on-site support in case of emergency such as a burglary or flooding incident or fire. As part of the service, approved tradesman could be sent to the customer's home to undertake repairs, whether that be unblocking pipes or electrical work. Deutsche Telekom is currently working with various partners to offer further such enhanced capabilities.

AMBIENT ASSISTED LIVING – TELECARE

KEY TAKEOUTS:

- There is a clear market need for ambient assisted living (AAL) technology – or telecare – in Europe and the Western world. The challenge will be to determine the right propositions, products and services, routes to market, business models and fundamentally, how to engage consumers, so they appreciate the benefits
- This market has received attention for decades but remains small and immature as a result of multiple challenges, including an inverse correlation between needing care and being comfortable using technology, but more importantly determining who pays
- One of the major challenges to be overcome is the often complex delivery model – generally country dependent – and what is often a complex health and social service landscape – with boundaries between 'health' and 'social' aspects of monitoring often blurred

Consumer needs and pain points:

- "As I get older, I want to be able to stay in my home for as long as is possible."
- "I want to be cared for in my own home as I get older."
- "I want to stay in my home, surrounded by the things and memories of the past."

- "I'm really concerned about my elderly mother, she's fiercely independent, she would never leave her home, but I'm simply not able to pop in and see her every day to check that everyone's really OK..."
- "I'd like some way of checking on Dad without interfering, but just giving me some peace of mind that he's alright... he's not good at sharing things and telling me when he's not feeling too good..."

Market adoption and forecast growth: The European market is fragmented with skewed market competition and high growth opportunity. According to Frost & Sullivan, the market was valued at €143 million in 2009 and is estimated to grow to €485 million by 2015. The growth forecast is attributed to four major markets, Germany (32.9 percent), the UK (27.8 percent), France (16 percent) and Scandinavia (14.7 percent). This major contribution was mainly an outcome of high adoption rate and receptiveness for such technologies and the high percentage of an elderly population. The other geographies (Italy, Spain and Benelux) made a very limited contribution: €12.2 million and a market share of 8.6 percent. This was due to factors such as low penetration of AAL, and a relatively low population of the elderly against the respective national totals. The market dynamics remain favorable to AAL and meant that a CAGR of 22.6 percent was seen between 2010 and 2015. A large number of opportunities are expected to attract new market participants and aid in the market development.

Insights and perspectives: The increasingly ageing population is a global phenomenon affecting almost the entire Western world – frequently described as a 'perfect storm'. Multiple research bodies in Europe have reported that over 50 percent of the elderly (aged >75) now live alone, with many reporting acute loneliness and the lack of social interaction making them more vulnerable to depression, ill health and poor diet. At the same time, the younger generation is struggling to care for elderly relatives – both in terms of time and financing. Concurrently, the cost of elderly care continues to escalate, with pensioners' life savings now increasingly being viewed as the means to cover the huge costs of residential care. Today the awareness and adoption of AAL technology is low. Across Europe, the average rate of adoption is between 10 and 12 percent. The potential is so much greater, yet today the concept does not resonate well with many elderly people.

The opportunity to leverage connected home technology is significant. The assimilation of multiple sensors around a home provides a means for family, friends and third parties to be alerted of any potential issues, i.e. an elderly person not following a typical/expected pattern of activity. The opportunity is even greater, given that the majority of the devices and sensors that could be leveraged to enable such services do not require explicit regulatory approval (i.e. the EU's Medical Devices Directive), as there is no intention to capture and communicate vital signs-based data (i.e. temperature, respiratory rate, pulse, blood pressure, etc.).

It should be noted that many attempts to drive adoption and shake up the market have as yet failed. One of the prime challenges has been the immaturity of the self-pay market, given that there is, so far, no natural channel for such services. One of the key learning points is the need to establish an ecosystem of partners that legitimizes the offer and create the necessary confidence amongst consumers, whilst also expanding the potential channels to support such offers.

We expect that the most interesting drivers of new solutions in the telecare market will integrate the new generation of sensors that are starting to enter the equation, including passive, wireless and wearable sensors that can also be woven into fabrics; together with convergence with mobile technology enabling geo-localization services. Leveraging such technologies will enable loved ones or care providers to determine whether the elderly person has failed to get up in the morning, has fallen over, is not following his or her standard routine, etc. Furthermore, by aggregating with data analytics, very slight changes in an elderly person's daily pattern can be observed so that before a major incident occurs the relevant parties can be alerted. For instance, more infrequent visits to the toilet, less movement during the day, through to changes in the 'sleep-wake cycle' can provide extremely powerful insights into the onset of conditions such as dementia.

Further work needs to be undertaken to simplify the user experience, given the inverse correlation between people needing care but not being comfortable using technology. In many countries, the delivery model is also too complex, with the costs, benefits and services shared across different agencies in what is often a complex health and social service landscape – with boundaries between 'health' and 'social' aspects of monitoring often blurred.

Deutsche Telekom's experience: Deutsche Telekom is currently actively working with a number of partners to bring to market services in this space. Over recent years, we have undertaken many different research projects to test consumer appetite and AAL-based services. In Sarstedt, a town near Hanover, we partnered with Johanniter-Unfall-Hilfe – a social and charity organisation – to jointly test an intelligent assistance system that lends a helping hand in many practical situations. To make its use as easy as possible for senior citizens, various scenarios were defined on the tablet computer – such as the "Service Call", which establishes a direct connection to the Johanniter service center, and "Leave home" and "Night light". When the corresponding icon was tapped, the system automatically shut down all unnecessary or potentially hazardous electrical appliances and activated motion sensors that turned on or dimmed lights for the nightly trip to the bathroom.

DATA ANALYTICS

KEY TAKEOUTS:

- There is rarely a conversation on the subject of the connected home or IoT that does not simultaneously include data analytics: often it is seen as synonymous with one of the prime drivers, both of manufacturers and service providers to capture sensor data
- The commercial value that data analytics represents is no doubt immense, with the opportunity – given the customers' approval – to develop more personalized products and services that align more closely to their needs and so engender greater customer loyalty
- Despite the many advantages, analytics raises concerns. Consumers want their data to be respected and know how it is being used. If companies are not transparent, then there is a risk consumers reject the connected home and all the benefits that it brings

Consumer needs and pain points:

- "As the kids get older, my needs are constantly changing."
- "I've spent ages trying to find the thing that was right for us, but in the end I was forced to make a compromise as nothing was exactly what we needed."
- "I don't really know what I'm looking for, I need help and advice about what would be best for me."
- "I don't want my personal data being used or exploited... it's my data, no one else's...!"

Market adoption and forecast growth: According to Research and Markets, there is a significant emerging business opportunity for cloud service providers and data analytics within the connected home market. The market research firm forecasts that the management of unstructured data in the connected home will be a €6.3 billion market by 2020. This market opportunity will grow with a CAGR of 27.7 percent through to 2020. It foresees that the fastest growing segments through to 2020 will be home energy conservation with a CAGR of 49.4 percent and utility monitoring with a CAGR of 59.8 percent.

Insights and perspectives: It has become difficult for manufacturers, retailers and service providers to understand their customers' needs and habits. The connected home gives B2C organisations greater customer insight so they can respond to changing customer needs and gain a competitive advantage. This will become increasingly important as the adoption of connected technology increases.

We believe that platforms designed to support the commercialization of data which respect that the customer should determine if and how data can be accessed will be the ones that succeed and achieve scale. The first step on this journey starts with the acceptance of the need to collect data and be prepared to enable its analysis for potential use cases. The benefits of data analytics will come from extrapolation of the information

from traditional "small data" that focuses on the realization of simple triggers by creating rule engines or IFTTT (If This Then That) type scenarios. For instance, if there is movement in the house at night, then turn the light on. However, the goal on which much of the industry is now focused is the aggregation and analytics of the multiple streams of device and sensor data to create insights and realize new value. Today, it may be stated that the IoT is an enabler of data analytics and vice versa. Whilst there may not yet exist the volume of sensors to deliver highly sophisticated data analytics, this will automatically change as more and more of the things around our homes are connected.

Despite the many commercial benefits that data analytics is set to bring businesses, the needs of different consumers must not be overlooked. While consumers appreciate the convenience that comes with increased connectivity, they are keenly aware of the potential risks. According to Parks Associates, nearly 50 percent of US broadband households report having privacy concerns about using connected devices. Based on many market surveys in Germany, many consumers have repeatedly reiterated their concern about internet surveillance and 'Big Data' and the use of their personal data for commercial gain.

Deutsche Telekom believes that it is absolutely critical that – as an industry – we ensure customers' data is treated with respect, allow customers to determine the privacy of their data and are transparent about what data is used. The concerns raised by consumers must be listened to, and at every step of the way consumers must have the right to opt out of having their data shared. We believe that if this option is not provided, then the industry risks losing consumer trust and restricting the potential growth opportunity. One of the significant opportunities that Deutsche Telekom perceives exists in this market is to leverage cross domain data, including data from outside the home, as a means to create both new value to consumers and approved partners.

We expect entirely new opportunities to arise from leveraging such data. We see considerable value being derived from contextual device data, essentially the application of all aspects and interrelations of device use. Why is the device used? Who is using it? What are their preferences and motivations? When is it being used? How is it being used? What else can this tell us? Aggregating data to create insights has intrinsic value for manufacturers. It can enable them to enhance the user experience and hence improve stickiness; it can support the development of new features,

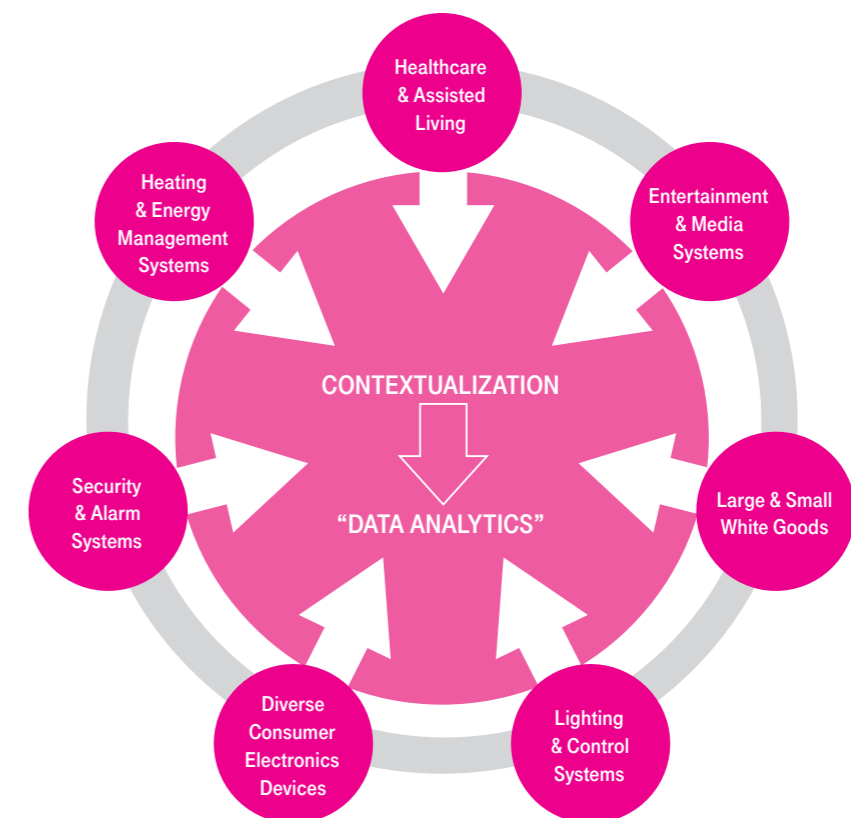


Chart 7: Data is the glue that links the connected home

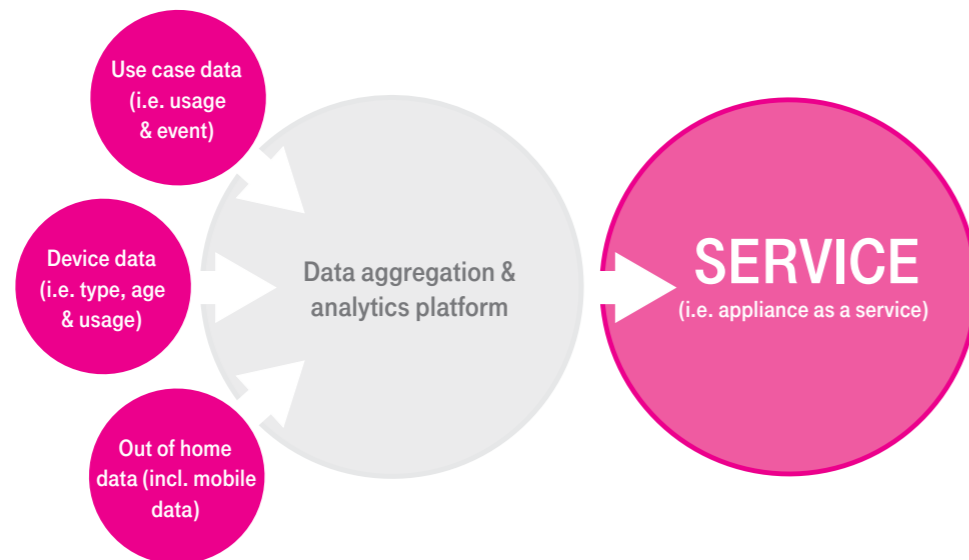


Chart 8: Data will become the essential element of the connected service offering

functions and additional services to increase volume, as well as create cross- and upselling opportunities.

For a manufacturer of connected devices, usage data can greatly improve product development. It may reveal weak spots in components and make products more robust for daily use. Connected devices produce more reliable and up-to-date data than any market research institution ever can. Knowing about product success factors and shortcomings provides manufacturers with an entirely new basis for making business decisions. For instance, Wink, a start-up connected home platform in the USA, has built a large part of its business model on the aggregation of data from OEM devices, which it then intends to sell back to the manufacturers to support their new product development processes. To achieve success, such models require a huge scale in order to derive the necessary value.

Data, once analyzed, can create commercial value in many ways, from increasing customer loyalty to identifying use drivers, patterns and customer motivations to enable a recommendation engine. Already we have seen companies, such as Opower and PlotWatt, achieve significant success by adding a 'gaming' element to their services (the former now has over 50 million households and businesses across nine countries using its services). These companies have got customers to start thinking differently about energy and compete with their neighbours to have a more energy efficient home. We believe data analytics will become core to a new generation of solutions and services, particularly as platforms integrate with social media, such as Life360 or Nextdoor.com.

Another example is that of an independent service company specializing in energy management, which could, for example, analyze data from sensors throughout the home and make recommendations for insulation measures or energy sources such as solar-thermal panels. A precondition for services of this kind is data sharing across devices – another case in point of the need for vendors to adopt open APIs. From an energy perspective, contextual data can enable providers to build customer profiles as a means to understand preferred ambient temperatures at different times of the day or night, based on specific activities, the external climate and mood and motivation, which could improve comfort and enhance the customer experience. As referenced earlier, such data will enable utilities to sell comfort and not simply kilowatt hours, or even just heating. There is no doubt that the future of utility companies will increasingly depend on access to and analysis of such data, both to improve customer loyalty and also, more importantly, to better optimize the grid.

Smarter use of energy data will enable utilities to advise customers when it might be time to invest in a more efficient boiler, tumble dryer or refrigerator. It could also help utilities to sell additional products and services – most likely through partnerships – which will open up many new opportunities for both them and their partners. We envisage a scenario in which utilities might consider partnering with banks to enable them to offer financing terms for buyers of more efficient appliances in much the same way as many governments provide financing to improve the energy efficiency of buildings. All our extensive studies prove that data is where much more strategic value lies, and nowhere is this seen more clearly



than in the energy space, especially in real-time analysis of data from smart electricity meters, smart appliances or smart thermostats. For instance, understanding energy use by appliance, through demand disaggregation, and leveraging this insight to support customers in their purchase decisions, as well as helping manufacturers to improve the energy efficiency of their products offers considerable intrinsic value. Leveraging smart meter data and third party device data, including home security systems, will enable providers to create more targeted offers for customers and by anonymizing data to consider selling it on. For retailers and aggregators, the opportunity to leverage both publicly available information, such as smart meter energy data, with pertinent in-home energy usage data from connected appliances, realized through disaggregated demand technologies (again assuming the customer's explicit permission), could enable personalized recommendations to be provided on the most relevant next purchase.

We also envisage that in the coming decade the most entrepreneurial players will look to integrate such data within their existing customer relationship management (CRM) systems to create new customer insights and create new value by personalizing advice and information, beyond the revenue and margin generated from device sale and services, and so develop deeper, 'stickier' customer relationships. This can be strengthened further in a partner ecosystem in which data from an even broader mix of devices can be assimilated – with the customers' approval – to create even greater strategic value, enabling even more sophisticated and insightful services.

Propositions that embrace these new possibilities and follow the logic of IoT and data analytics will create new and greater value than segregated and standalone offers that continue to operate in isolation. One of the areas where the greatest value can be realised is in predictive analytics. Over time, by extracting information from existing data sets and leveraging different techniques in machine learning and data mining, a provider can analyze current and historical facts to determine patterns and predict possible future outcomes and trends. For instance, a care worker or family could be alerted to a potentially serious situation of an elderly relative, should their typical daily pattern change very slightly over time. As such, the relationship between consumers and providers could become more interactive. This is another example of why we believe an open ecosystem, with the possibility of collaborations between multiple players, is so important.

Deutsche Telekom's experience: We have built a 'Data Factory' at the heart of a centre of excellence in data analytics. This platform hub stores data from varied and multiple sources. Sensor data is ingested, processed, analyzed, anonymized and aggregated where appropriate for data analytics applications. It is a carrier grade fully supported (24/7) platform with Deutsche Telekom Group Security and Privacy full support. European customers are given web based analytic tools and APIs (permission based). By means of these capabilities we have enabled our regional operations to gain new insights into their customers' buying patterns.

BUSINESS MODELS

KEY TAKEOUTS:

- As in all markets, the adoption of innovative business models is one of the principal means of creating new value – the connected home is no different
- The range of models that will be deployed in this market will be highly varied, in part because in many categories consumers will not necessarily be willing to purchase upfront for the apparent benefit that connectivity brings
- The models that we expect to be deployed will need to support the development of multiple capabilities, many of which will often rely on a number of third party firms, from financing, maintenance, connectivity, prognostics, insurance and installation companies

Business model innovation will become increasingly important, and we believe it will turn out to be one of the principal means of creating value in this new market. Without greater innovation of the model, there is a very real risk that the market will not realize the projected growth potential. New go-to-market models and different partnership structures need to be established and ways of thinking defined, and where the value lies for the respective players in the value chain will – by default – change. One of the key developments that we expect to see driving these new models will be the move from connected devices to connected services.

Given that the connected home market will increasingly be characterized by a diverse set of players, technologies and business opportunities, the form and type of models employed will be critical for the creation of new value. It is clear from our analysis that the market cannot and will not be defined by ‘one’ model, but multiple models, and in the majority of cases these will no doubt run in parallel. In many respects, the model employed will be determined by the type of relationships being employed – B2B, B2C and B2B2X – which in turn will be defined by the role a company wants to play in the value chain.

Today, the primary models behind connected home propositions are easy to understand: based around margin from hardware sales, or a basic subscription. In the latter case, some providers have achieved success by blending a subsidized upfront charge with a monthly subscription, while others have moved entirely to a monthly fee. Other providers have driven initial success by aggressively bundling their connected home offer with an existing service, such as video-on-demand, as a means to differentiate in the increasingly competitive TV content space. However, to drive broader adoption of the connected home we need to see the market adopt more innovative models, such as those realized by aggregating third party data or through affinity relationships built around an ecosystem. It should also be noted that in many areas of the connected home market, the models still remain unclear, particularly in the area of energy management and assisted living – where we expect they will differ by region and segment.

CONSUMER HARDWARE SALES

To date, the most recognizable model for connected home providers is the ability to generate margin from the sale of associated connected hardware and peripherals. It is clear that today consumers do not buy connected homes; they buy connected devices. They place value on the product, the brand, the user experience, and its features and functions. Recent industry trade shows underscored the fact that the connected home market is still very much a gadget-based market.

Retailers have the most to gain from such models, but key to success in exploiting this opportunity will be deploying advanced customer relationship management (CRM) systems that directly integrate with connected devices to enable retailers to either directly recommend them to the customer or advise the sales agent of the ‘next best action’. Leveraging these capabilities and integrating connected devices directly with retailers’ CRM systems will create multiple new growth opportunities by enhancing loyalty (Net Promoter Score) and by creating more personalized offerings. They could also potentially provide a step towards more enhanced offerings that could link to energy management, leveraging demand disaggregation technology; or prognostics linked to extended warranty agreements.

PAY-AS-YOU-GO AND PAY MONTHLY SUBSCRIPTION-BASED SERVICES

Any connected device can be an entry point for creating some kind of revenue generating subscription service, whether it is pay as you go or pay monthly. Services based on a subscription constitute a primary means of raising ARPU (average revenue per user)/customer lifetime value from the connected home. However, we expect a significant evolution from the subscription services that have been made available to date. For instance, we predict the realization of multiple different micro subscription services, such as washing machines automatically re-ordering powder, to shavers or coffee machines monitoring consumables, ordering razor blades or coffee beans. We also expect flexible pricing models to drive greater adoption of revenue-based services, such as cameras and motion sensors, which are only remotely monitored by a professional control room on an ad hoc basis such as during the annual summer holiday or weekends away. The flexibility of the service and the payment structure will be critical for gaining the broadest appeal, and all with the aim of providing consumers with greater levels of flexibility, convenience and peace of mind.

PRODUCT AS A SERVICE

This trend is spreading into all kinds of domains and it has far reaching implications for the connected home market. One change that we consider will gain traction over the coming years will be the development of an ‘pay-as-you-use’ services for appliances, including financing, remote diagnostics, extended warranty, the replacement of parts and a full

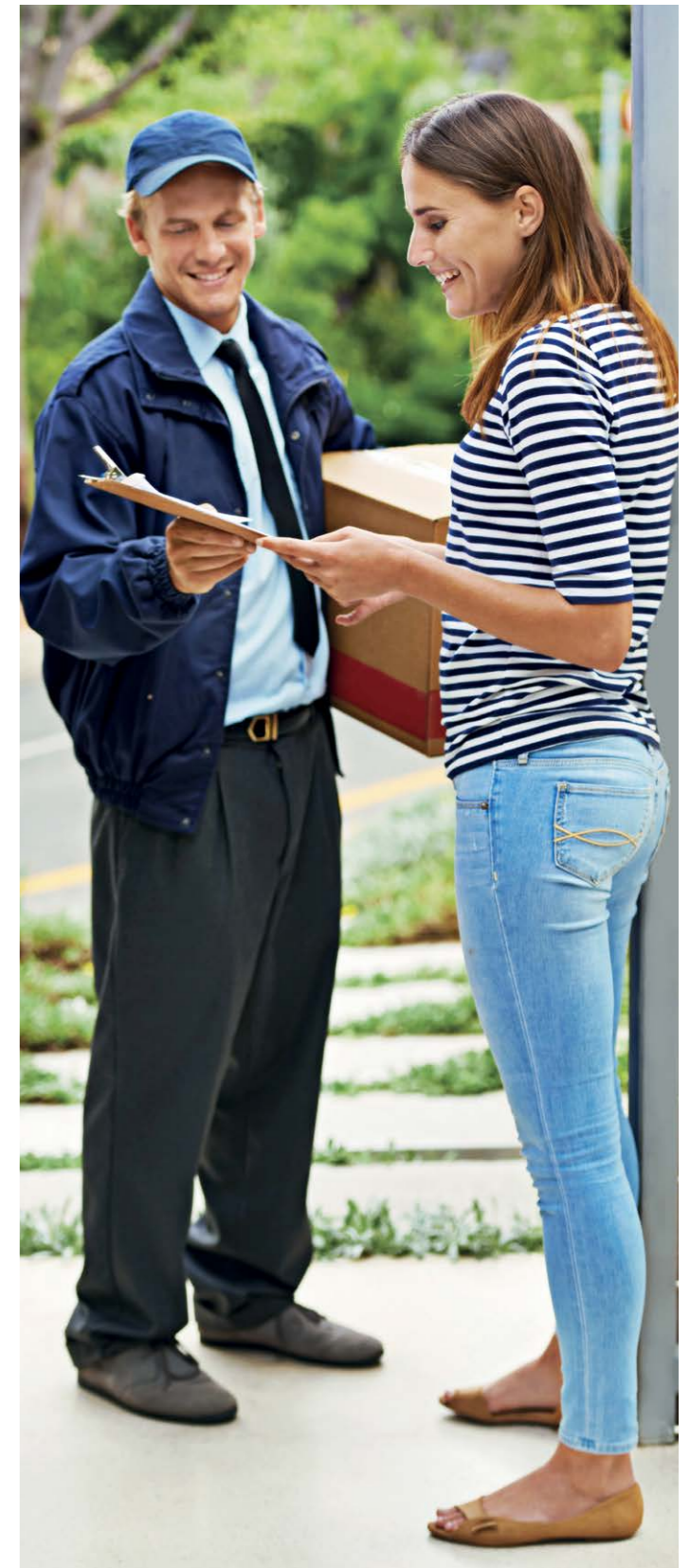
replacement when the appliance reaches the end of its life. Rather than purchase a one-off appliance, we believe consumers will increasingly prefer to pay for it to be serviced on a continuous basis.

We expect that typical examples of subscription services will be the replacement of consumables and repair services linked to a financial offering or as an extension to an extended warranty. Increasingly, we anticipate that kitchen appliances such as dishwashers or HVAC systems will be financed, and as part of that agreement will be connected and subject to continuous remote diagnostics to monitor usage and ensure all components are fully functioning. In the event of an expected defect, customers can call the service engineer to replace the faulty part. The services could include monthly fees, flexible on demand charges or payments for demand-based deliveries of supplies. When capabilities such as demand disaggregation are enabled and providers can identify that specific appliances are using an increasing amount of energy the opportunity might exist for manufacturers, utilities or retailers to advise customers to upgrade their appliance to a more efficient and newer model, based on an understanding how much energy could be saved. Today, we are already seeing this in the automotive market, where in the UK for instance, 75 percent of new cars are now purchased through a finance agreement, with customers essentially paying for the personal experience of ‘owning’ a car rather than paying the one-off, upfront price, or sharing a ZipCar/CiteeCar (car sharing providers) with other people in their locality. To realize these kinds of service-oriented business models, higher levels of collaboration across the value chain will be required beyond the normal relationship that exists between the manufacturer, installer and warranty service provider.

In the future, we believe in some markets utilities could go so far as to provide a complete ‘heating-as-a-service’ offering. Instead of simply providing a commoditized kWh of energy they could contract with customers to provide a predefined temperature, which could include a boiler provided under a finance agreement and, leveraging prognostics, providing a maintenance and emergency assistance service in the event of breakdown. This would use flexible energy tariffs via advanced smart meter functionality as well as retrofitting insulation. In return for such an innovative model, customers would benefit from lower and more controlled energy costs.

SERVICE BUNDLES

Bundling several products and services as a complete package is a natural progression in a service-oriented business environment. It simplifies complex propositions and makes them more attractive to customers. Instead of having to manage multiple contracts with several vendors, customers benefit from a single contract. An adjacent example is that offered by T-Mobile in the USA with its JUMP proposition, an upgrade program distinct from the core voice and data tariff. For a monthly fee of €9.10 JUMP enables customers to upgrade their phone and tablet any



time they want and bundles this service with device protection and mobile security features. It offers customers protection and greatly simplifies the choice of devices as customers have to stick with the same device for two years as part of their contract. We believe that service bundles represent significant opportunities for telcos and utilities in the context of the connected home. It is clear that the connected home is an ideal up-sell/cross-sell journey from phone, broadband and TV (quadruple play), or dual fuel energy tariffs. As the number of connected devices grows, establishing powerful interactions between them is likely to become a service sector of its own, relating to management, maintenance, assistance and on-site support.

LOYALTY BASED MODELS

In the home energy management market, new and innovative models and more attractive pricing are needed to enable consumers to realize the benefits of smarter heating, greater energy efficiency and energy savings. The basic assumption of improved loyalty and churn prevention/customer retention of core commodity tariffs has been proven. For instance, one of the most successful European utilities has seen the majority of its smart thermostat sales secured through churn prevention, using the device as one of its most successful 'save tools'.

REGULATORY BASED MODELS

Models that leverage regulatory funding mechanisms – whereby customers pay indirectly for the benefits of greater energy efficiency through higher kWh unit charges – can again be a stepping stone. However, in a number of countries, such as the UK, government initiatives, such as Green Deal and ECO (Energy Companies Obligation), are designed to reduce the UK's energy consumption and support people living in fuel poverty – and these can also be leveraged. In the UK, ECO will levy fines on utilities – up to 10 percent of their turnover – if they fail to implement energy efficiency schemes in customers' homes. Variants of this approach have been deployed across much of the EU under the EU's Energy Efficiency Directive, but mechanisms differ by region. By deploying a smart thermostat, a weather station, a smart energy monitor (such as Smappee), as well as a smart meter, a utility can determine the level of energy saving that can be achieved and so help to achieve its energy obligation targets. Regulators in some countries allow smart thermostats to be included within their energy obligation targets, which has enabled some other European utilities to be very successful in signing up many customers to such devices. Once this data has been captured, the insights can then be exploited to support a broader range of new business opportunities, leveraging further models. For example,

if an energy provider could capture data revealing that the south wall of a customer's home is poorly insulated, and that the home owner could possibly reduce their heating bill by 5 percent during winter by installing double glazing or wall insulation, a new range of value added energy services could be created.

ALTERNATIVE MODELS

The range of models the connected home will support is both rich and diverse – we have yet to even 'scratch the surface' of the potential. We believe that beyond those models described above, we will also see others as distinct as gamification, micro-transactions, affiliate programmes, metered use and freemium also playing a role. We believe, given the reticence that many consumers have shown to sign up to monthly subscriptions to connected home services – as well as the issue many might have with paying the higher costs often associated with connected devices – the industry must think differently about how it is to create value.

With developments in energy around demand disaggregation and new capabilities, such as prognostics, it is clear that there is a high probability that how the value is captured and who captures it will change in the mid to long term. One such prospective opportunity might relate to providing

consumers with advice about how much energy their washing machine is consuming that day, week, month or year; and when it is time to replace it – based on the increasing energy use due to wear and tear – recommend an alternate model. As energy markets evolve to in-day switching and as retailers, OEMs and price recommendation engines capture even greater insights into their customers' energy and heating patterns, utilities will need to respond in new and innovative ways, particularly in the models they adopt. In the same way that homes will become more connected, people will be able to take greater control over their security, safety and general protection. Traditional players will find their existing business models challenged. Furthermore, service providers – such as insurers – will have to evolve their roles or they will risk companies operating in adjacent markets moving in with models that offer their customers lower prices and more flexible terms. There are a number of further models which we believe could be adopted by the insurance and warranty industry as a means to cross-fund the associated costs of deploying the required sensor and connectivity technology.



SECURING MARKET TRACTION

The connected home market is characterized by an increasingly diverse set of players, from utilities, telcos, retailers, insurers and manufacturers with different technologies and market entry strategies and targeting different business opportunities and models. Over the last few years, we have seen more and more companies bringing to market new consumer propositions and products along with B2B solutions for this as yet largely untapped market. However, to date, across Europe, no matter which

country one turns to, most efforts have failed to cut through to the extent that was once envisaged. Furthermore, if certain organisations have achieved some success in terms of customer numbers, there remain many outstanding questions as to the sustainability of the core model. It has been suggested that winning in the connected home market is similar to the work of alchemists: with everyone single-handedly struggling to discover the formula for turning the connected home into gold.

What is clear is that something needs to change as we cannot all continue down a route that has failed to deliver success to date, given there is little evidence that it will be successful at any point in the future. Deutsche Telekom believes that collaboration is the key to developing not one, but multiple approaches to realize the full potential of the connected home market.

With this in mind, the following 10 'principles for success' highlight some of the key elements that we believe need to be considered to achieve a breakthrough. These are based on our own experience and analyzing the best of breed offerings here in Europe and around the world.

KEY PRINCIPLE	WHAT THIS MEANS
1. CORE TO STRATEGY	<ul style="list-style-type: none"> • Exec team has a clear understanding why it needs to be in the connected home market • Key stakeholders buy into the strategic drivers (i.e. competition, disintermediation & growth) • Clear and coherent strategy with mandate from the top to achieve success in the market
2. A SINGLE, SIMPLE & COMPELLING CUSTOMER PROPOSITION	<ul style="list-style-type: none"> • A customer proposition that is desirable on day one and meets a clear and specific need • Target early adopters to drive volume that will ultimately capture appeal of the mass market • Provide means to 'live' use cases to focus on the right needs – iterate and innovate
3. INNOVATIVE BUSINESS MODELS	<ul style="list-style-type: none"> • Partner with key brands to create new value and ensure customer adoption and stickiness • Exploit existing or new revenue streams to cross-fund subscriber acquisition cost • Leverage retention and subsidies (e.g. energy efficiency obligations) to fund offers
4. A BRILLIANT CUSTOMER EXPERIENCE	<ul style="list-style-type: none"> • Provide a seamless experience and where applicable simple access to all devices • Make set-up 'plug 'n play' and intuitive to ensure operational support costs are minimized • Ensure new devices can be instinctively and easily paired, and scenarios simply created
5. BRAND PROMISE THAT INSTILLS TRUST & DELIVERS A BROADER VISION	<ul style="list-style-type: none"> • Ensure brand supports the realization of such a vision – consider a separate brand • Deliver a customer promise – not an optional extra, but a crucial part of the offering • Provide customers with the confidence and trust needed to adopt a connected home offer

KEY PRINCIPLE	WHAT THIS MEANS
6. EXISTING CHANNELS AND NEW ROUTES TO MARKET	<ul style="list-style-type: none"> • Combine the connected home proposition into an existing offer to create a sales story if possible • Leverage installation as a means to up-sell peripherals and incremental services • Try innovative sales approaches with offline/online channels that support assisted selling
7. BUILD A DEDICATED CONNECTED HOME UNIT	<ul style="list-style-type: none"> • Set up a new unit with top management access to define and implement strategy • Provide the means to achieve success, given the need for new skills, new processes, etc. • Bring in outside expertise into the company (i.e. app UI design, data analytics)
8. A FULLY OPEN PLATFORM & PARTNER ECOSYSTEM	<ul style="list-style-type: none"> • Base your offer on a leading open, standards-based platform with open API/SDK • Contribute to building an open ecosystem of partners (third party devices and services) • Share opportunity and cost of platform build and development with range of partners
9. LEVERAGE DEVELOPER COMMUNITY	<ul style="list-style-type: none"> • Support and foster third party developers and invest in a business model that supports them • Leverage developers as a means to create differentiated services and features • Give consumers more reasons to buy your products by allowing them to enhance them
10. DATA ANALYTICS	<ul style="list-style-type: none"> • Manage data privacy and security in a way that ensures customers maintain trust • Ensure clear ownership of and accessibility to all data that is collated and aggregated • Build analytics capabilities by leveraging partnerships with best-of-breed specialists

Chart 9: Key principles for success

PREREQUISITES FOR BUILDING A CONNECTED HOME OFFERING



A PLATFORM-BASED APPROACH

In all technology industries – whether PCs, mobiles, apps, CRM, etc. – only platform-based approaches have been successful. They offer (de-facto) standards, making them more cost-effective at developing services and connecting devices. In a world where scale is critical to success, such platforms bring about huge efficiencies. Customers value the choice and the innovation that they can realize. They also appreciate the intuitive feature set that they enable, allowing everything to be controlled in a consistent way as well as the cost benefits they provide, with each additional use case realized at marginal cost. From a connected home perspective, no new consumer hardware is necessarily required for each new use case, e.g. the same sensors can be used for security, safety and energy management.

Today, the market is made up of a combination of either so-called ‘point solutions’ or platforms. The former range from IP camera solutions to digital door locks and smart thermostats. However, to date many of these do not integrate with other devices and so limit the potential customer value. To achieve the necessary market traction, all our analysis supports the view that a platform-based approach is critical. Relying on any single technology to deliver smart devices brings with it too much uncertainty. Not everyone will necessarily want or need a central thermostat, and as a result your strategy can quickly unravel. All the evidence suggests that consumers rapidly grasp the benefits of a platform-based approach, once they start with a single use case and then add multiple discrete use cases creating rules across many different devices.

BUILDING AN OPEN ECOSYSTEM

We are currently seeing many companies race to build or adopt their own connected home platform; the challenge is the high cost associated with this if it is done properly, and few of these platforms are open. When we refer to open, we mean offering APIs and software developer toolkits (SDKs) to allow easy interoperability with other products within the ecosystem. Opening up a platform to third party developers will further enhance the offering and also further extend the reach of the proposition. The Android platform is the prime example of an open environment that has triumphed because it allowed others to build on its products. The Android platform has enabled other companies – manufacturers as well as app developers – to build their own solutions for the market. This openness has worked to the advantage of Google, the development community it has fostered, manufacturers, and consumers. We believe that something similar will also happen in the connected home market to help spur the creation of new products and extend the usefulness of old ones. In turn, that will give consumers more reasons to buy connected home products, growing the market.

With that in mind, Deutsche Telekom is supporting the OSGi (Open Services Gateway initiative) specification, which is an open modular system and service platform for the Java programming language that implements a

complete and dynamic component model and ensures a flexible and agile approach to the creation of new connected home services. Beyond this, Deutsche Telekom has been proactive in moving the OSGi specification beyond the original focus of service gateways to support for the open-source software Eclipse IDE (integrated development environment). Promoted by the Eclipse Foundation, which has strategic members including IBM, Oracle and SAP, this is a not-for-profit, member supported corporation that has gained increasing support from a wide range of major corporations and alliances. Eclipse also supports Deutsche Telekom’s ambition to build a large developer community given that there are already over 10,000 developers actively developing for this environment. Related to this is the need to provide an open platform to support start-ups and entrepreneurial enterprises to trial and test new concepts and propositions in the market. Another significant challenge is the multiplicity of wireless protocols from leading standards such as ZigBee to Bluetooth Smart and WiFi Direct to proprietary standards, such as Z-Wave and HomeMatic, all fighting to be the standard for the smart, connected home. Whilst different technical approaches may be beneficial for covering different application scenarios in the best way possible, the challenge increases as the range of incompatible technologies grows. Deutsche Telekom will adopt the most relevant technologies within its connected home platform to ensure all these diverse technologies can communicate with each other and offer a seamless customer experience and consumers do not become frustrated managing a heterogeneous set of connected devices.

Deutsche Telekom believes the only solution for solving this ‘Babel-like’ predicament is an open, agile platform that allows manufacturers and service providers from all industries to connect together. It offers translation services between different devices – an ‘Esperanto’ of connected smart things. For customers, an open platform provides much better usability than several closed systems with limited features. For companies, a common foundation greatly accelerates the development of products and services with the benefit that a virtuous circle can be created as multiple innovations arise from within the ecosystem. All participants – customers, manufacturers, retailers, telcos, utilities, insurers and home assistance service providers – benefit from the network effects of an open ecosystem of this kind.

We believe that ecosystems, such as Alphabet’s Google (incl. Brillo/Weave) and Nest, Apple’s HomeKit and Amazon’s Echo will play a significant role in the global connected home market. As such, we think that the only way to deal on relatively equal terms with these ecosystems and provide the necessary balance in the market will be to bring together activities into complementary open software communities and alliances. This is why Deutsche Telekom is actively engaged with Eclipse SmartHome and is keen to support open source software communities and alliances. Deutsche Telekom will obviously also support the most popular devices which work on Apple and Google, but will not limit its solution to any one operating system or leave any uncertainty in the minds of customers with regard to what it is doing with their data.

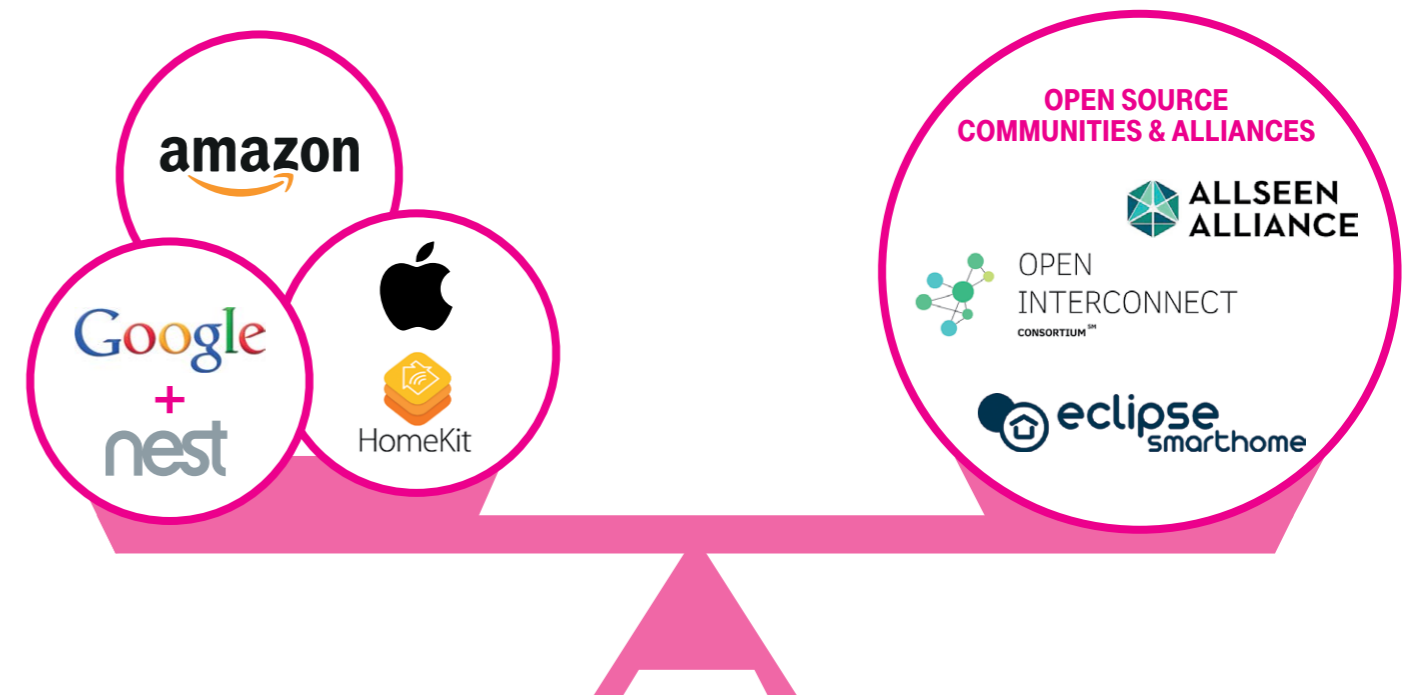


Chart 10: Deutsche Telekom is seeking to provide balance and ensure that all players secure a fair share of the value in this new market

CONCLUSION

Almost all of us live in a home of some shape or form. Many own one, others rent or share one. They are all as unique as we are. They form the backdrop to our earliest memories. They are often a space which we share with others, whether loved ones or just passing acquaintances. For many of us, they are the protective shelter where we nurture our children. They are where we seek to relax, to unwind, to switch off and to enjoy the company of loved ones, family and friends. They often say more about us than anything else. And yet, what is forecast to happen to our homes over the coming decade is potentially more transformative to the way we live in them, how we interact with them – and the objects in them – than anything that has taken place over the last half century and beyond. In our increasingly connected world – in our ever more connected lives – our homes are about to undergo a transformation. They will no longer be connected simply for entertainment and communication. Increasingly, more and more of the other devices in our homes will also become connected with the outside world. They will also interconnect with other devices in our home as well as with our cars, tablets, smart phones and wearables. While more and more cross-connections will be possible, new opportunities and innovative business models will emerge which as yet we can only partially start

to imagine. The prize is huge. However, as with many other new and fast changing markets, there is no one 'killer app' although there are multiple 'silver bullets' which if correctly executed can bring immense value to customers as well as manufacturers and the providers of many consumer focused services.

For all the opportunities and models identified, we believe a new type of thinking is required. We as the 'connected home industry' need to abandon previous proprietary and closed approaches or 'gated communities' and open up to a higher level of collaboration. In the long run, no company or brand can establish the connected home alone – those who think that they can will not succeed. Our homes are too personal to all of us, and no consumer wants to be told what products or brands he or she can or cannot buy. We are convinced that kick-starting the market requires a 'community effort' that key players must work together to drive greater value for all. There also needs to be an appreciation of the need to adopt innovative business models, based on partnerships and new go-to-market strategies – not just amongst major corporates, but also start-ups, as well as engaging immense and increasingly powerful developer communities.

If we, as an industry (telcos, utilities, retailers, as well as manufacturers, etc.), do not, then we will fail to take a fair share of the available value, as over-the-top players from adjacent markets, will enter this market, leveraging existing customer relationships and powerful consumer brands to further strengthen their own P&Ls. Potentially more significantly, one must not forget that innovative new start-ups will exploit the IoT opportunity.

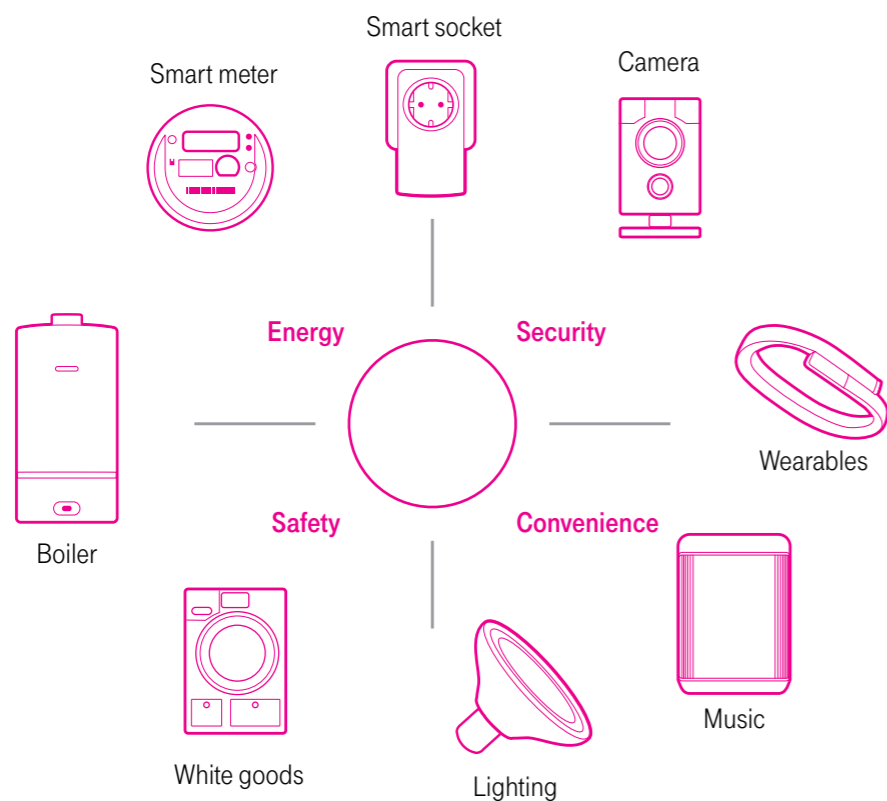
Now is the time to join forces, combine industry-specific know how and drive the connected home forward to realize new growth for everyone. Our vision is an open ecosystem in which partners play to their core strengths, benefit from multiple synergies and the significant investments that we have made, leverage new routes to market, enhance the experience they offer their customers, deepen consumers' loyalty to their brand, and create new growth for their business. Now is the time to invest in the connected home – the growth opportunity is real and presents a significant opportunity for a diverse range of organisations. The most important thing to be prepared for in such a future is to maintain an open, agile and flexible course. Only then will we – as a broad and eclectic range of businesses –

be able to drive the connected home market forward and realize that long desired growth and that new and incremental growth.

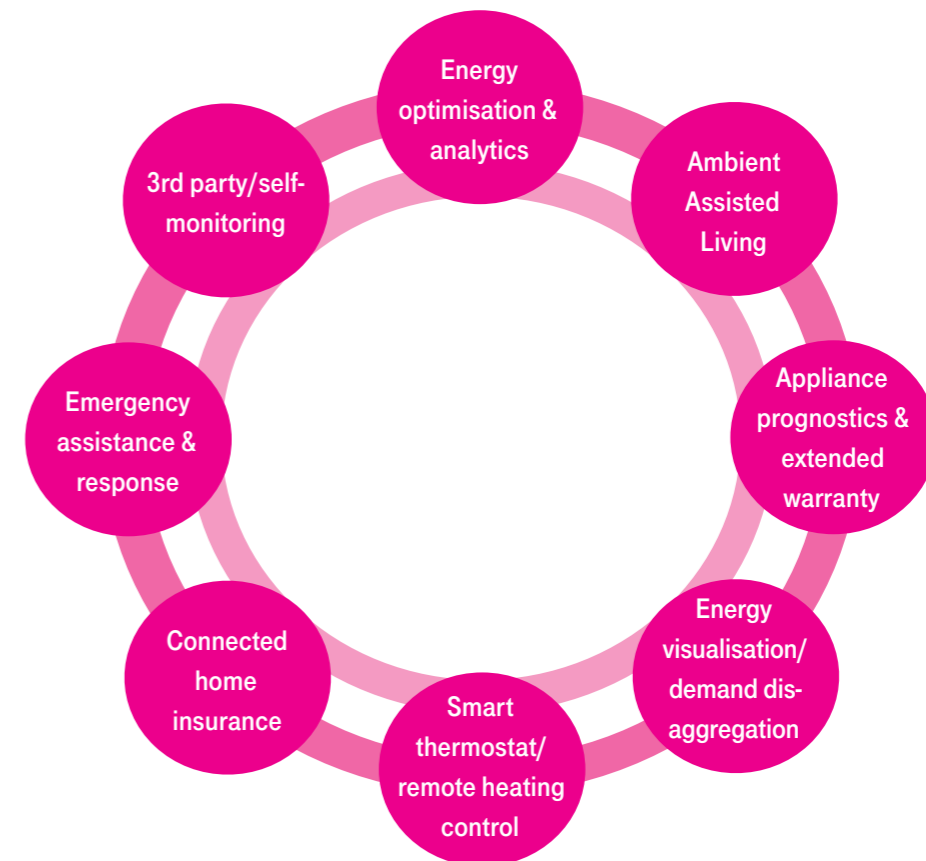
Finally, we firmly believe that a platform-based architecture is the only sustainable approach to this market. We also think that there will only be a handful of scaled and winning platforms in the coming years and that the market will shortly experience a significant round of consolidation, the first wave of which we have recently seen. Key success factors to drive growth in the connected home market include strong partnerships based on win-win business models, brands that customers trust, access to large customer bases, a flourishing developer community, and last but not least, a strong strategic commitment and the financial strength to invest in the business for the long term. Deutsche Telekom has been a first mover in the market – we have gained much insight into what it takes to be successful, and as such, we work closely with our partners and customers to share the knowledge and learnings that we have gained over the last few years about what we believe will be necessary to secure traction in this fast evolving market.

Chart 11 and 12: Deutsche Telekom has built a platform to support multiple use cases – both device connectivity and services (see right)

SELECTION OF SMART DEVICES



EXAMPLES OF REVENUE GENERATING SERVICES



ABOUT DEUTSCHE TELEKOM



Deutsche Telekom is one of the world's leading integrated telecommunications companies with around 151 million mobile customers, 30 million fixed-network lines and more than 17 million broadband lines (as of December 31, 2014). The Group provides fixed network, mobile communications, Internet and IPTV products and services for consumers and ICT solutions for business customers and corporate customers. Deutsche Telekom is present in more than 50 countries and has approximately 228,000 employees worldwide. The Group generated revenues of €62.7 billion in the 2014 financial year – more than 60 percent of it outside Germany. www.telekom.com

DEUTSCHE TELEKOM'S CONNECTED HOME PLATFORM

In order to move the connected home to the next level, over the last three years, Deutsche Telekom has built an open, white label, connected home platform. It was successfully launched in Germany in late 2013 and is now available internationally, and it is a foundation for multiple connected home initiatives. The platform features an interoperable, expandable and scalable architecture that makes it easy for companies from all industries to realize their connected home products and services and integrate them into a larger ecosystem. The platform supports the OSGi (Open Services Gateway initiative), Eclipse Foundation/openHAB, and open source software is a core component of the architecture. It is also aligned with the Home Gateway Initiative architecture and standards. Being a part of Eclipse and providing an open API and SDK is ensuring broad adoption of the platform. TPM chip integration and secure SSL encryption guarantee that the platform has robust end-to-end security. Eclipse SmartHome is providing access to a rapidly expanding developer community.

Over 30 partners utilize the platform, including notable manufacturers, Philips, Osram, Miele, eQ-3, Sonos, Samsung, Urmet, Huawei, Netamo, Bosch Junkers, DOM, Provedo, Kärcher, Assa Abloy and many more. In Germany and Austria, it has also partnered with leading utilities, including EnBW, Vattenfall, RheinEnergie, Entega and eww Gruppe to provide a range of home energy management services designed to meet the needs of consumers and the regulatory environment.

In 2014, Frost & Sullivan selected the platform for its European Visionary Innovation Leadership award. In the same year, Analysys Mason stated that of all the platforms it has evaluated it is "the most mature initiative." www.qivicon.com

There are also a number of key business units across Deutsche Telekom that supports this core strategic initiative: They include:

T-Systems: A global IT services and consulting company headquartered in Frankfurt. Founded in October 2000, it is a subsidiary of Deutsche Telekom AG. As of 2012, T-Systems is the largest German and one of the largest European IT services companies, serving customers such as WestLB, Old Mutual, Daimler, Volkswagen, Royal Dutch Shell, Sanlam,

Murray & Roberts, BP, TUI AG, De Agostini, Philips, MAN SE, Airbus, E.ON and British American Tobacco. With approximately 47,800 employees worldwide, T-Systems generated revenue of around €8.6 billion in the 2014 financial year. www.t-systems.com

hub:raum: The incubator of Deutsche Telekom offers seed financing, mentoring, co-working and Telekom's leverage to help early-stage startups build and launch their product. www.hubraum.com

Deutsche Telekom Capital Partners (DTCP): Established in November 2014, with a fund volume of €500 million for a 5-year period on top of

the existing investments in T-Venture, it will double the Group's commitment to investments in ventures and innovation. DTCP will be one of the largest investment funds in Europe. DTCP will also advise Deutsche Telekom on existing investments in STRATO, Interactive Media, Scout, Deutsche Telekom Innovation Pool (TIP) and T-Venture. DTCP is supporting Deutsche Telekom's strategy as an external innovation engine through investments in venture capital, with a special focus on Germany's exciting and growing start-up scene. On top of that, DTCP will expand its activities to include private equity investments in existing undertakings to foster operational cooperation between over-the-top companies and Deutsche Telekom.

Chart 13: Deutsche Telekom's open connected home platform supports a broad range of use cases



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