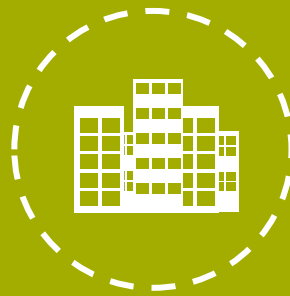


# INSPIRING

# ICT

# 2015





## *Contents*

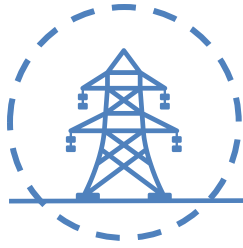
Introduction	1
Smart Energy	2
Smart Cars	6
Smart Homes	13
Smart City	18
Smart Innovation	21
Smart Data	28
Contributors	31
Other Sources	33

## Introduction

This year's *Inspiring ICT* report looks at all things 'Smart' - energy, driving, living and how companies can be Smarter in the way they innovate. 'Smart' is the new must-have, for OEMs, car makers, energy providers and anyone in communications. 'Smart' means growth and profit, progress, better safety, health and development opportunities for people everywhere. Smart enables green energy and transport, unprecedented control over our homes, increased convenience and effectiveness in our personal lives and elderly people staying in their homes, fully supported by a range of solutions.

But what is 'Smart' and what is not? How does it affect how we use energy, get around, live and interact with the environment around us? How can it help companies to be successful in the future? We spoke directly with some key industry experts about these and other 'Smart' topics, and we present their views, alongside extensive background research, into the 'Smart' mega trend.

A big thank you goes to our contributors: **Florian Herrmann**, of Germany's Fraunhofer Institute, **Dr Joachim Quantz** of ART.COM and the Connected Living Project, **Dan Ledger** of Endeavour Partners and **Paul Wagorn** of IdeaConnection. More details on these interesting thinkers, researchers and solution seekers can be found in our Credentials section at the back of the report.



***“We have the technologies and resources to reliably produce at least 40 per cent of our electricity from renewable sources within the next 20 years, and 80 per cent by 2050”***

*Union of Concerned Scientists, USA*

## ***Smart Energy***

Producing and using energy more smartly is a shared, global issue in the face of depleting fossil fuels and the increasingly threatening effects of climate change. Many nations have set targets for producing energy from sustainable sources and now consumers are being brought more actively into the cycle by issuing them with devices that tell them about their energy use and allow them to adapt and control it in new ways. However, what seemed like something of a no-brainer to start with is turning into a complex challenge for governments, electricity providers and consumers alike.

The European Union (EU) aims to replace 80 per cent of all standard electricity with Smart meters, reducing emissions and household energy consumption in the EU by up to 9 per cent. To help them decide, all EU countries conducted cost-benefit analyses (CBAs) based on guidelines provided by the European Commission. A 2014 report issued by the same commission foresaw average annual electricity savings of around €300 per year. However, when conducting their CBAs, several countries found that the investment necessary would not be offset by the benefits gained and decided against installing Smart meters\*. Others have already rolled out 100 per cent of installations and work with a fully operational set of Smart grids, combining sustainable energy production with efficient consumption management. Bringing the EU – let alone the world – into alignment will be a task for many years to come.

Added to this is the fact that ownership of and responsibility for installing these meters, for collecting and analysing the data they generate and protecting it from unauthorized access is by no means a straightforward matter. Different countries have chosen different ways to approach this\*\*, but all struggle with the question of privacy and none have a good answer at this stage. Yet it makes eminent sense to improve the capabilities of our electricity (and other energy) networks to monitor and guide consumption and answer the crucial preservation question.

---

\*Belgium, Czech Republic, Germany, Latvia, Lithuania, Portugal and Slovakia have opted out of the Smart meter roll-out at this point, as the calculable benefit does not offset the necessary investment. Sweden completed 100 per cent roll-out in 2014.

\*\*In Sweden, the Distribution Service Operators (DSOs) have used their own funds to finance the Smart meter roll-out (which is complete), recouping their investment through tariff increases over time, whilst in the UK, private investors will pay for the installation of the meters, which is the responsibility of electricity retailers.

As Florian Herrmann explains, his Fraunhofer Institute built its own Smart grid, including a full management capability for electricity distribution and storage, charging for their electric vehicles (EVs) and the ability to take unused electricity back into the power units, maximising efficiency of use. Quite a few big companies are becoming interested in this, thinking how they can connect their fleet into a system of their own to use their electricity much more efficiently, both to even out the spikes in usage, as well as production through storing their own electricity.

He feels that Smart metering is a real opportunity to raise awareness of how we use – and possibly waste – energy. *“A kilowatt-hour (kWh) of electricity still costs a lot less than a litre of fuel from the petrol station, but many consumers are not really aware of the amount of electricity they use and how much that costs them – they are charging their mobile every day, they have all manner of devices ‘on’ and use energy without really noticing.”*

*“It would be great if Smart metering could provide feedback on how we can use electricity more efficiently; what we can change to save energy and costs.”*

Mr. Herrmann believes that the use of tidal energy is just around the corner. There are several start-ups looking at the development of sensors for specific types of devices, and they are pretty close to finalising a lot of these solutions. The other part of this is internet connectivity, not just to support the Smart meter in its information gathering and distribution to Smart appliances, but the third link in the chain: the Smart device that lets the appliance communicate with the owner of the house. The element of control is very important in making this a reality. By contrast, Dr. Joachim Quantz only has limited confidence in the reality of Smart devices using dynamic energy prices to optimise the cost of energy for their operation.

*“The cost you can save through this type of solution is negligible compared to the investment required to enable it in the first place.”*

He goes on to argue that Smart meters can be expensive to develop and install, especially if they need to enable this type of control – the energy experts that his company works with on the Connected Living project certainly emphasise the importance of a solid cost-benefit analysis. As already shown, there are several EU countries where this analysis has not returned a significant benefit at this point in time.

Nonetheless, he is certain that the presence of a Smart grid combined with modernised energy production opens up a lot of possibilities. The biggest energy savings will probably be made in the heating segment – Dr. Quantz points out that field tests have shown that 25 per cent or even 30 per cent of energy can be saved\*\*\* using Smart system controls, which is more than what would be saved through insulating your house.

---

\*\*\* RWE Feldtest Sep 2014; <http://www.borderstep.de>

Innovation linked to Smart grids and meters is progressing rapidly – opening up new opportunities to save energy through providing information and ‘talking’ to Smart devices. Smart energy inspires a host of events, projects and working groups inviting the latest ideas from established and new thinkers, all coming up with innovative solutions to produce and preserve energy in new ways, and wireless communication is a key for many of these.

Italian company Sertec is using the heat from server networks in data centres to heat buildings or water, UK start-up q-bot has invented a small robot to fill previously inaccessible spaces with insulation material, Sea Wave Energy takes wave power directly off the surface of the sea with its WaveLine Magnet, Store Electric even uses compressed air storage in salt caverns to offer sustainable energy on tap. Dow Chemicals has revolutionised solar panels for the home, sometimes rejected for their intrusive appearance, by designing a photovoltaic shingle which is simply placed on the roof.

Smart energy innovation also reaches out to the developing world, with Azuri Technologies’ pay-as-you-go schemes for customers in Africa, allowing them to start with \$10 payments for a solar panel to be installed, and small payments of \$1.50 a week for service thereafter. Supported by Barclays, this idea enables consumers in areas with no electricity infrastructure to charge their phones and light their homes.

Also thinking along the lines of new financing models for solar energy, Mosaic is connecting investors with solar projects, effectively crowdfunding for them for the benefit of those investing, and for the communities, to reduce their energy bills. On the consumption side, there are a myriad Smart devices offering information on, and control of, electricity consumption. We look at some of these later on in the report.

*“Once I have produced renewable energy I need to make sure it will not go to waste”* – as Dr Quantz highlights, energy storage is a central issue for Smart energy distribution. Whether this is at the household level or at the DSO end, it makes instant sense that any energy produced should not be lost if we want to optimise how we use it.

Florian Herrmann also sees this as a major branch of innovation: *“There has been a lot of innovation in storing electricity, a lot more is possible now through new lithium ion batteries, or through using second and third-life car batteries, which can be combined into storage modules. He points to an electric car maker as a pioneer in this area, with Tesla offering this as a scalable idea with their Powerwall.”*

He envisages the goal as one Powerwall per household, with each storage module scaled to the needs of that user. This, he explains, is quite easy to do as each unit consists of lots of individual battery cells which you combine into the module you need. *“This is how the idea is coming to market, with all the size options available, so in the end price will decide. That is where Tesla is also in the lead, as you can buy a storage unit from them for \$3,000 – which is far more affordable than the units offered by manufacturers in Europe.”*

Some electric car manufacturers, Herrmann points out, have created a very interesting tool in the gauge that tells you how much further you can travel on your current charge and how much electricity you are using with the way you are driving at any given time. This helps you to be as efficient as possible. The Nissan Leaf even has a little tree growing on your display if you are driving in an energy efficient manner – and that is the sort of device that he would like to see in consumer households, to encourage people to think about the energy they use.

But before we take a look at the Smart solutions that may improve our homes, a closer look at one of THE Smart innovations – well, revivals, really – of the last 50 years: the Smart car. The idea of an electric vehicle is by no means new, of course, but it is only with recent advances in electricity storage, charging processes and charging stations that it has become possible to consider an electric car as a genuine alternative to a vehicle powered at least in part by widely-available fossil fuel. By bringing connectivity and even automated driving into the picture, we are looking at a completely new concept of motoring.





*“The cars of the future may not have side and rearview mirrors, steering wheels or pedals”*

*The AutoAlliance*

## **Smart Cars**

The undoubted pioneer of the hour in the electric car market is Tesla, widely hailed as one of the most innovative companies around, tearing down the barriers to widespread adoption of electric cars by the general population. Although Smart cars are much more than ‘just’ electric, the connected electric car embodies the greatest set of Smart automotive innovations.

What makes Tesla so remarkable is the emphasis on the electric car as a system, made up of modern, high-performance vehicles, a workable network of high-powered charging stations\*\*\*\* (to avoid the waiting times so off-putting to many travellers) and an in-home solution that will make charging your car (as well as other uses of electricity) even more cost-effective (the Powerwall).

As Florian Herrmann sees it, Tesla have shown considerable courage – yes, they have been given tens of millions of dollars from public funds and by various car manufacturers, the CEO also put in some of his own capital, putting them in the unique position to go down their path with all this capital to support them. But what they did was think big – they did not approach this in little, incremental steps, they went for it full pelt, including the charging infrastructure.

Herrmann goes on to describe Tesla’s approach as pioneering: *“They had developed their cars and the super-chargers for them, what could possibly come next? And then they brought out the Powerwall, really engaging the imagination of people all over the world. And they were the first to do it. What they are doing right, alongside other successful companies like Apple, is bringing in the next innovation and the next one, so that long-term, they will always be able to increase their market capital whenever they need to, because they have the imagination.”*

He also admits to being a bit of a fan, and shares a personal experience when he says, *“Once you have driven a Tesla, you really know what you are missing when you have not got one – it does trigger emotions, it is great fun to drive them.”*

---

\*\*\*\*Now 70 in all, permitting a coast-to-coast drive across the United States

Even in their marketing, Herrmann says, they are different from the rest, *“Tesla does not even use traditional marketing, really – most of their breakthroughs and launches were pushed out through blogs and Twitter, with more impact than any big poster wall at the airport”*. Having a blank sheet to start with has surely helped in this, he thinks: *“They never had to think about the conversion of traditional cars into electric vehicles. They could start from scratch with a purpose design which is always better than a conversion, using only those elements it did not make sense to re-invent”*.

When it comes to the distribution of electric cars, and particularly Tesla’s, Herrmann feels that there is a very uneven distribution of incentives to drive these types of vehicles: *“Other countries offer huge subsidies for companies and consumers for switching to electric vehicles. An example would be Norway, which has a very high density of Tesla owners. It is probably a lot cheaper to drive a Tesla in Norway than a Mercedes. There are several places where there are currently additional benefits to driving these cars and that is where you will find the greatest density of ownership.”*

Norway is indeed the world leader in Smart Electric Vehicle Policy. Although it only has a population of around five million people, it boasts almost 50,000 registered electric vehicles. Norway also produces more sustainable electricity than any other country in Europe, so surely one to watch for the evolution of a complete system of Smart energy and transport.

Charging vehicles on the road remains an issue in most countries. Yet even here, innovative thinking helps to smooth the path: The PlugSurfing application will enable drivers in Germany and the Netherlands to find the next charging point for their car. Payment is managed via the app, making it a straightforward experience to top up your battery, and a feedback feature allows new charging points to be added to complete the map.

This type of new idea, coupled with increasing support from governments, should help the electric car to achieve more acceptance and greater sales. The UK Society of Motor Manufacturers and Traders (SMMT) announced that sales of alternatively-fuelled vehicles (AFVs) – including electric cars and hybrids – rose by 58 per cent in 2014, with 51,739 new AFVs registered, bringing total market share of 2.1 per cent. Although still low, this represents an increase of 1.4 per cent on a year earlier. Sales of AFVs are rising in Europe and continue to grow in the US, with Asia closing the gap with transport solutions like the Wuzhoulong Hybrid Electric/Diesel – this bus can recharge its propulsion battery during driving (e.g. while going downhill or decelerating, when power generated exceeds power required) and then uses the electricity that’s been generated to power the vehicle.

Projects like iZEUS (intelligent Zero Emission Urban System) make the link between Smart driving and Smart energy. Their energy management system plans charging times and durations to use the ‘best price’ available throughout the day and prioritises the vehicles that are needed the most. Mirroring this in a macro network means that demand-side management (DSM) gives feedback on the energy needs of the consumer, allowing the network operator to plan how much energy will be needed where and when, thus avoiding shortfalls or surges. Approaches like these can revolutionise commercial fleets and set important signals for organising feasible models for converting city traffic as a whole to electric fuel.

Florian Herrmann is convinced that this driving concept has a bright future: Electric cars are emission free, quiet and less complex in their make-up than traditional cars – they have a simpler gear box, for example – which makes this a much more comfortable form of mobility.

Dr. Joachim Quantz is less convinced, but stresses that the final outcome is hard to predict at this point: The future of the chargeable electric car is not entirely certain. With fuel cell vehicles (FCVs) emerging as a competing alternative to getting around and inadequate numbers of charging stations for EVs, it might be wiser to invest research resources into such new possibilities rather than keep refining a concept with limited development potential. With so many external factors in play, however, this is a hard one to call at this point in time.

## ***“Connected cars will be the ultimate Internet of Things”***

*World Congress on ITS*

The prime focus of those innovating in ICT is, of course, the connected car. A vehicle that can, by means of mobile internet, receive and send information, communicate with other vehicles, give its driver warning of impending dangers and information on the best Greek restaurant in the area. Not forgetting important birthdays, shopping lists or directions to obscure addresses.

According to Gartner, Connected Cars will be a major part of the Internet of Things (IoT), with 250,000 million vehicles connected by 2020. As James F. Hines, research director at Gartner, says, *“The connected car is already a reality, and in-vehicle wireless connectivity is rapidly expanding from luxury models and premium brands to high-volume midmarket models”*. Smarter computers and handheld devices have revolutionised what is possible in mobile communications, the cloud allows data access and storage anywhere and additional connectivity as a standard feature will be in place for 62 per cent of all new cars in 2016, according to ABI Research.

A study by McKinsey Global Institute found that the auto industry will be the second largest data producer by 2015. Much of that data will come from the car itself, through sensors and integrated devices. Additional data will come from connected devices used by a vehicle’s occupants or from third-party sources like traffic reports and weather sites. This will not only place unprecedented demand on data networks and cloud solutions; it will also generate a truly big body of data for analysis.

So with cars communicating with each other, with traffic management features like barriers and traffic lights, with their maintenance mechanic and with their drivers, the opportunities for improving traffic flow and road safety seem obvious (*see IBM’s project with the city of Eindhoven as part of the Smarter Cities® challenge*). What is also apparent is the potential for exploiting vulnerabilities of an entirely wireless system. There have been numerous articles and blogs about hackers taking over connected cars, causing accidents and stealing data. Although these stories may suffer from a little hyperbole, the issues of privacy,

security and safety are key to a successful future for the connected car, especially once they start moving autonomously.

Increased monitoring by the authorities will also cause concern to some, the 'transparent citizen' being on display at all times with his 'talking' car. Parking and speeding fines, road and car tax, congestion charges and even police monitoring will be able to use the car's SIM cards to locate and bill the driver.

For now, connectivity delivers information and entertainment, with car makers working hard to find the functionalities that will add value to their products. Be it Jaguar's JustDrive, Mercedes' mbrace or even the Tesla S, connecting the driver constantly with the services and contents they desire is becoming an important premium feature. Creating and consuming digital content while in the car needs increasingly sophisticated solutions, both in terms of hardware and software, e.g. new interfaces taking into account the potential risks of distraction and the need for constant connectivity. Also, as for other Smart products – when reliability is compromised, user fatigue quickly follows.

Imagining what type of applications might be valuable, Florian Herrmann thinks of house hunting as a drive-by experience: You could be travelling through the inner city and an app could display on your windscreen, as you drive by, which properties along this road might be available for sale. This is one of the things under current discussion. This and similar options would eliminate the need for obtaining information elsewhere, making a list and finding the addresses. You could simply drive through town and look at each property as you go.

He goes on to explain that there is no clear roadmap yet for the way Smart devices and Smart cars will work together. There are a lot of joint projects on various topics, where car manufacturers and the big IT players work together, but there is as yet no news of a viable prototype – with some way to go before the standardisation of in-car solutions for charging and using Smart phones – the car manufacturers know that they have to work with a big information and communications technology (ICT) player to make this happen, but there is concern that their influence might exceed a level the car manufacturers are comfortable with. So this is under negotiation right now, in different ways for different manufacturers, but the solution will take a little while longer to arrive. The main driver for this is consumers who demand that they can use any phone and any app in the car of their choice.

Herrmann adds that we have a process now where large amounts of data are uploaded to the cloud, processed and then made accessible – this is perfectly feasible for household-related data. *“So this is what will enable me to control my household with my Smartphone, no matter where I am. To what extent this becomes part of my car's functionality will depend on a number of factors, not least the car makers.”*

How quickly this might be possible also depends on the speed of change the automotive industry is able to adopt – as Herrmann says, traditional car manufacturers tend to work on change in a very incremental way, revealing innovations as late as possible to protect them

from being copied. That stands in total contrast to the Googles and Apples of this world, who want to push ahead and grab as much market share as they can.

Gartner also sees different approaches to mobility arising from greater car connectivity: New concepts of vehicle usage will lead to new business models and expansion of alternatives to car ownership, especially in urban environments. As Herrmann says: *“It might just not be necessary to own a car when you live in a city.”* Uber and blahblahCar are just two examples of companies making use of that very idea – wireless connectivity as the platform for car hire on the go.

He is himself active in researching the optimisation of EV fleet management and feels that a very interesting aspect of Smart mobility is that different areas are coming together now. For several years, the focus was very much on the electric vehicle and the differences between this and traditional propulsion which we have used for the past 130 years. What would the vehicles of the future look like? The key questions around this have been pretty much answered now and the original equipment manufacturers (OEMs) have a good idea of where to go next with this. The big question now is how to realise automated driving, which we see as linked to electric mobility.

***“You’ll be able to tell your car ‘take me home,’  
or anything, and it’ll just do it. It’s just going to  
become normal. Like an elevator”***

---

*Elon Musk, Tesla*

Autonomous driving is a concept that is hard to imagine and widely seen as scary but it is also a major opportunity. Florian Herrmann expects this to become reality, although perhaps not as quickly as Elon Musk. Florian argues that yes, ultimately, we will have a car that can drive itself autonomously – but we expect this to be a reality no earlier than 2025 and even then it will be in its early stages. In our area of applied research, we are looking at solutions for the next four to six years, and there are a lot of automated functions either in place or under development right now.

He goes on to say that motorways are most pre-destined for automated driving, so you will see highly-automated vehicles performing that part of the journey almost entirely by themselves as soon as 2018, perhaps. You would drive onto and off the motorway yourself, but once you are on it the car can drive autonomously if you choose that mode. Theoretically, you could even turn your seat around to chat to your passengers or do your work.

According to a July 2014 survey conducted by the Institute of Electrical and Electronics Engineers (IEEE), more than 200 researchers, government agencies and IEEE members

expect that the cars of the future will not even have rearview mirrors, horns or steering wheels.

Florian Herrmann goes on to explain that despite the much higher speeds, the motorway is a fairly predictable and comfortable setting for an automated vehicle – speed varies little, there are no obstacles or sharp bends, and you can think of it like travelling on a high-speed train. One of the key considerations in all of these developments is actually to improve the safety of road travel. That is our prime motivation in pushing this forward. Other benefits, like being able to work or relax are in the equation, of course, but they are not the most important.

Furthermore, although you would never leave the idea of connectivity completely to one side, you could have a fully automated vehicle without it, based on a range of sensors and links to satellites. However, in reality these ideas live side-by-side and one will drive the other – if the car is fully connected, I can get an overview of the traffic situation much more quickly. In addition, connectivity opens up a host of exciting new opportunities for functionalities and services.

Gizmag also shares this fundamentally optimistic view of automated driving:

*“Self-driving autonomous vehicles have gone from sci-fi fantasy to actual reality in a very short space of time, and manufacturers say some form of automobile automation will arrive by 2020 or even earlier.”*

In their article, they highlight the many advantages of entrusting your drive to an autonomous vehicle. *“They don't get tired at the wheel, or distracted by kids in the back seat. They're not prone to daydreaming, and thanks to the bank of sensors and equipment at their disposal, they're much better than human drivers at spotting trouble coming from all directions – danger can be spotted from farther away and reacted to more quickly.”*

Then there's the actual driving: Computer software can calculate stopping distances, breaking speeds and junction spaces with mathematical precision. Traffic should flow more smoothly, congestion is likely to be reduced and fuel efficiency rates should rise once the robot drivers take over for good. Vehicles will be able to talk to each other too, meaning earlier warnings about traffic jams or accidents.

Dealing with busy urban environments and the many pieces of visual and auditory information a human driver can process is still a big challenge for an automated car – yet even this will be achievable in time, says Google. However, hacking is a particularly great concern when the driver hands over control to the vehicle, because no matter how poor the driver might be, he cannot be controlled remotely and he often has many years of experience in judging traffic situations correctly, predicting what others might do next.

Elon Musk is confident that system security will provide solutions that can effectively protect all vital functions of the autonomous car in the near future, but even he is very clear on the potential dangers of not taking this seriously enough. An adapted Audi fitted out with equipment from automobile specialists Delphi recently completed a coast-to-coast drive in the United States – a human being was at the wheel at all times, but Delphi says the car did 99 per cent of the driving. Six long-range radars, four short-range radars, three vision-based cameras, six lidar sensors, a localisation system, intelligent software algorithms and a full suite of Advanced Drive Assistance Systems were all fitted to the car.

Nissan and NASA have also partnered together to work on autonomous driving technology. Nissan President and CEO Carlos Ghosn says self-driving capabilities will start appearing in its cars from next year, starting with the simple (like parking assistance) and moving on to the more complex. NASA of course wants to use the same kind of technology for unmanned, deep space exploration.

In the next year or two, you'll be able to buy kits to convert your car into a self-driving motor for around US\$10,000. They consist of a sensor and camera pod on the roof, a computer sitting in the boot, and a device under the chassis for controlling steering and speed. Kyle Vogt, chief of the Cruise Automation company selling these kits, thinks they'll be commonplace in the next three years. (*Gizmag*)



*“One thing we do know for sure:  
if you’re failing to plan for a future  
in which everything’s different,  
you’re planning to fail”*

*VertoHomes*

## *Smart Homes*

In a recent report, Gartner Research states that Smart home technology is set to add \$1.9 trillion to the global economy by 2020. ABI Research points out that currently, less than 1 per cent of homes employ full Smart home technology, but by 2018 (as predicted by HIS Technology, a research firm), 45 million Smart home devices will have been installed, and the annual business volume will have grown to \$12 billion or even \$14 billion dollars (ABI Research). The market research firm Allied Market Research projects that the global Smart homes and buildings market will grow at a compound annual growth rate of 29.5 per cent through 2020, at which point the market will be worth \$35.3 billion. Another even more optimistic report from Juniper Research, predicts that the market will grow to \$71 billion by 2018. Much of this is guess work, but what all agree upon is that this is a market with serious growth potential.

Counts and predictions of the number of things connected to the internet vary wildly, from five (Gartner) to 25 (Federal Trade Commission) billion things connected in 2015. What they all have in common is the very reasonable conviction that the number of connections to the Internet of Things will grow, constantly and rapidly, to reach many billion devices by 2020, with consumer devices easily the biggest category (all figures from siliconanglecom).

The big names fighting it out for pole position in capturing this market are the usual suspects: Apple, Google, Samsung and, to some extent, Amazon. Samsung and Google have opted for open source for Smart homes, whilst Apple and Amazon only work with and within their own systems. So although Apple’s HomeKit is a major influence on home automation right now, the intrinsic link to iPhone and iPad may limit future prospects for this system. Partnering with big brands like Philips may go some way to alleviate that, but there are doubts about the ability of Apple’s system to expand sufficiently into all areas of the Smart home market.

Samsung, with its SmartThings division, offers its own home automation products, including hardware (HW) and software (SW). The platform links all types of Smart devices via a central platform, making them easy to set up and control. Google has not progressed that far but is most likely to focus on Android, with an option to support iOS devices through acquisition of small players already supporting Apple’s operating system. Partnering with third parties seems unavoidable to make a stand in the Smart home segment, although Amazon seems to have chosen a very narrow, sales-focused route which may make this unnecessary for them at this point.



In the rush to cut a slice of the Smart home cake, it is easy to forget who you are doing it for – Dan Ledger sees much innovation aimed at no one in particular, in a market where adoption lags far behind the many options available already. He says:

*“There are many neat things people can and do build with technology that end up having very little meaningful benefit to people they’re trying to help. A quick walk through CES each year is a great way to experience this phenomenon. Just because you can build it, does not mean you should.”*

He goes on to point out: *“If you think about the Smart home, much of that underlying technology has been in place for a decade. The majority of consumers has been and continues to be rather lackluster about the prospect of automating their home. While there is a lot of novelty in automation, it either doesn’t really save much time, or it doesn’t work reliably and here’s why: our lives are incredibly complex and full of corner cases. It is very difficult for a device to infer our intent. While there are people out there dreaming up idealised user experiences about how a home might be able to anticipate what a user might want next, it’s almost impossible to deliver this experience reliably. You need algorithms that not only can deal with all the irregularities in our lives but also have the necessary context to recognise variations in a user’s intent.”*

He gives an example: *“A technology enthusiast may describe a scenario where you walk into your living room and turn on the TV, so now your home knows to turn down the lights and your oven pre-heats because you will want to make popcorn. How annoying would it be if the lights turned down every time you turn on the TV, because maybe you just wanted to check something quickly? And your oven is on, even though you do not want to use it. Whenever people present these scenarios to me, I ask them to take that thinking a step further and think through all of the potential false positives that would make the experience miserable for most – you realise how complex it is from a contextual perspective to get this right because you have to correctly infer the intention of the user. This is one of the reasons why only certain niche products that provide a very well-bounded value proposition, like NEST, are being adopted more generally.”*

He feels that NEST (a Smart thermostat solution) has a simple value proposition for most homeowners: they will have more money at the end of the month. When people compare something like this – which will save them money – with things like automated light switches, saving them a few seconds, the benefits of NEST are obvious. The Smart thermostat ‘tado’ does a very similar job, and there will be an increasing number of devices focused in heating control.

So how far have we come toward the truly Smart home? Joachim Quantz points out that you can have a Smart home built right now, if you have the necessary funds but at present, these are one-off projects with solutions developed for that person and that property. Smart home kits are on sale now, but it is not yet possible for anyone to go into a DIY store and buy all the parts needed to turn their home into a Smart one. That will have changed in ten to 15 years, perhaps, but mainly for new buildings or those being extensively upgraded. Then you should be able to install a lot of these technologies for a reasonable cost. He feels

that the exciting thing to watch is the development of the wide variety of services on offer, with Smart phones as the preferred devices to carry them.

*“The Smart phone pretty much determines the shape and scope of what we can do right now – it takes us away from the PC, so it make us mobile, but we are still pretty touch screen and display-driven. Possibilities like walls changing into displays, or controlling devices through gestures, all those types of things demand a broader interaction with Smart technology – and these exist right now and will come onto the general market before too long.”*

To meet the needs of their target audience will be difficult for more ethereal ideas, but when it comes to saving money, he reckons appeal should be pretty universal: *“Having a lot of options within a system, all of which offer me a direct benefit, is the way to go. My favourite example is a heating system I can control remotely through my Smart phone. It makes sense instantly because I won’t come home at the same time every day, but I do know each day when I set out for home and hence roughly when I will get there, so I can then turn on the heating an hour or so before my arrival. That is something I would pay for because it makes perfect sense and will save money.”*

Dr. Quantz believes that there will be different target audiences for the Smart home, each with their own priorities: *“One group will focus more on security, automated opening of blinds, lights switches on timers an so on, to deter potential burglars, while another will be interested in multi-media entertainment solutions, whilst a third really concentrates on energy savings for their home. And with the increasing average life expectancy, assisted living solutions are also becoming more important.”*

Florian Herrmann agrees: *“The best solution is no good if it does not focus on the end-user and how they will want to use the idea you are working on.”*

Thinking about designing Smart solutions, an important question is that of the platform you will use to enable all of the device applications making up your Smart home package:

*“There are two opposing ideas in play at the moment. On the one hand you have the option to install cables and wire up the home, with a central gateway into that micro-network to address security concerns and ensure control over the communications function. The alternative is a wireless solution, which means you have none of that upfront installation or much investment, but you have a more vulnerable system because you are basically working with the public internet, with all the problems that entails.”*

He also highlights security as an issue, which may favour particular players in backing Smart home networks – incumbent telecom operators, with wireless network equipment already installed in people’s homes may well have a much easier start than new players without these assets:

*“You get suppliers like Deutsche Telekom, who have their routers in most people’s homes already, they have a fairly trustworthy brand and can offer a pretty high level of security backed up by a lot of experience. That is comparatively tricky for a little start-up company, who may nonetheless have the better idea for a Smart home solution.”*

Zigbee, ZWave, Bluetooth and Wi-Fi are perhaps the most feasible solutions currently in play for enabling the Smart home. Joachim Quantz would bet on Wi-Fi as it requires the smallest upfront investment and is mostly provided by trusted telecom brands. *“OK, you have to modify your heating thermostat to become ‘Smart’ and the same goes for any other appliance, but costs vary a lot and it requires a much lower upfront investment overall to go wireless.”* But a case can be made for all four, and each of them is grabbing and defending market share.

Samsung has decided to go with ZWave and Zigbee, both working through their central hub for the SmartThings products. As low power mesh networks, they are highly efficient and can reach even the furthest corners of your home to communicate with the sensors placed there. Zigbee is open source and non-profit, run by an alliance of programmers and interested companies to expand the possibilities of in-home Smarts. ZWave also belongs to an alliance of companies, albeit with a commercial purpose, touting the great advantages of their idea of their main competition – Zigbee.

Both can run thermostats, window and door locks, motions sensors and pretty much any other appliance or function within the home – provided someone has made the necessary kit. They are low energy, tried-and-tested and almost without signal loss – partly because they are very low-bandwidth to begin with, perfect for on-off type functionalities. The big BUT lies in the fact that their signals are not directly compatible with any mainstream computing device, like a Smartphone, tablet, or laptop.

This is offered by Bluetooth and Wi-Fi, which also have an advantage in consumer awareness and experience, yet each of the four has a particular role to play in enabling the Smart home. As John Pullen of time.com puts it:

*“Why do we need so many different technologies that essentially do the same thing? On the face of it, that’s a reasonable question, but it’s also analogous to asking the difference between a ball-peen and a sledge hammer — both are used to bang on things, but you wouldn’t drive a fencepost with a mallet. Likewise, the various wireless networks that make up a Smart home each have their own use”.*

Bluetooth builds secure close proximity connections, but is limited in range. The new generation Bluetooth LE (low energy) has even dispensed with its previous power intensity. Wi-Fi is the least secure and most power-hungry wireless platform, requiring devices to have a direct connection to a power source (completely unlike ZWave and Zigbee) but it allows easy connectivity for all manner of devices and contents. Also, both of these tend to be there already in today’s home, at least via Smart handheld devices.

Aimed at the same general applications, ZigBee and Z-Wave are still not the same - ZigBee is more versatile in its ability to be configured for any short-range wireless task, with the open source approach giving easy access to all necessary development information. Profiles are readily available to minimise development time for common applications, although this may be longer due to protocol complexity. Z-Wave's protocol is far simpler, so development can be faster, but it is not open source.

All of this can be highly confusing for end-users, who would tend to run all of their Smart home applications through a hub which deals with the various signals needed. Logitech's Harmony or the mentioned Samsung SmartThings hubs do this already, and any future product offering in this area will have to be equally versatile to be successful, as simplicity for the end-user will be essential in attracting customers.

Where it is important to clarify the control of different functions in the Smart home is when it comes to the central issue of security. Awards in the Smart home sector regularly go to devices like Smart locks and alarms, alongside thermostats, LEDs and air conditioners. Increasing home safety is a big selling point, instantly compromised if the Smart solution was not safe from outside interference. The same applies to essential functions like light or heating, central to the comfort of the home.

A recent study by Hewlett-Packard revealed that 250 different security flaws existed in 10 popular Smart home devices. Concerns over personal details, password security, unencrypted communications and weak credentials are cause for concern. Addressing these will be key to making Smart home systems a feasible option for all consumers, especially when the concept is still struggling with the intrinsic restrictions that the current system imposes on their users. As a recent Microsoft study reveals, initial enthusiasm is often replaced with severe disenchantment as Smart solutions fail to reflect the user's personal preferences and lifestyle.

On top of all this, the Smart home is an integral part of a wide system. As Dr. Joachim Quantz points out:

*When you talk about Smart Homes you get to Smart Cities pretty quickly – you cannot have a Smart home system in isolation, really. It needs the link to the outside world and is only truly Smart when it can function as part of a bigger intelligent network around it. Mobility and energy are also part of this, of course.*

One thing seems certain – it is only by taking a systemic approach, linking all the elements that embed Smart solutions in actual real-life contexts, harmonising standards and protocols that the 'Smart revolution' can truly take off. One area where this type of thinking is fairly advanced is in the Smart city concepts springing up all over the world, as in our examples in the next section.



*“Smart living means nothing without a sustainable supply of affordable green energy”*

*Fujisawa SST*

## *Smart City*

In the public space, it is relatively easy to see the growth potential for Smart technology, improving services, environmental management and energy consumption. VINCI Energies focuses entirely on creating Smart urban environments, providing a rather neat summary of the goal of Smart cities:

- 1) Improve the comfort of inhabitants
- 2) Provide more efficient transportation
- 3) Respect the environment

Their aim is that of many organisations, to construct buildings with positive energy coefficients, install insulation in existing properties, optimise waste management, create no-emission transport solutions and develop high-speed public broadband solutions giving access to a wealth of real-time services. This makes Smart City development a major growth area for Internet of Things (IoT) devices. This is a global phenomenon, with Europe, Asia and the Americas all developing showcase projects and competing for the Smartest, most functional and efficient designs.

In France, Issy-les-Moulineaux has been a successful technology testing site for Smart solutions for a number of years now, with the stated objective of ‘making life easier for its inhabitants through digital technology’. Aiming to develop a holistic Smart living concept for city dwellers, the community tests – and feeds back on – new technology developed by Issy and partners from all over the world.

Issy boasts a Smart grid, Smart data networks and Smart mobility, including information systems on public transport, traffic movement and up-to-date car parking options. As part of the European project RADICAL\*, a new app called TellMyCity allows users to report an issue or suggest new ideas to the City via their Smartphones or desktops.

RADICAL stands for ‘Rapid Deployment for Intelligent Cities And Living’ and aims to expand social networking and IoT opportunities to design solutions which can be used by any Smart City to improve its sustainability and services for citizens. It stands for the increased

international collaboration on Smart technology, not only in the energy and public services sector, but also in ensuring privacy and safety for citizens, as well as providing access to learning and new experiences.

Interesting examples include Aarhus in Denmark, where cycling safety has been improved through fitting chips onto bicycle wheels which turn traffic lights at particularly junctions green for the cyclist as he approaches. The town also uses Smart bins, which help citizens understand waste management with the help of a dedicated website.

In Genoa, in Italy, environmental consciousness amongst citizens is increased through a web application providing relevant information, and the CO2 footprint of the city is decreased through optimising traffic routing. This is based on observing traffic movement through a series of sensors so that high pollution scenarios like traffic jams can be avoided through rerouting.

There is also a series of augmented reality projects for tourists helping them learn about local history, in Spain, France and Denmark, to name but a few.

A very different Smart city example is Japan, where Panasonic has used one of its old factory sites to create an entire town as a display case for its Smart living products. The Fujisawa Sustainable Smart Town (SST), roughly 50 km west of Tokyo, was opened at the end of 2014 and houses around 3,000 people. The designers of the town stress the importance of real people's lifestyles and their feedback on the Smart features of the town as the main driver for its development.

Based around a Smart Grid, the energy needs of the town are met through sustainable production and usage management, to maximise efficiencies and minimise waste. Solar panels on every house generate electricity for hot water and heating the house, which in itself is done Smartly, differentiating spaces in the house and times of day to determine how much heating is needed when and where.

A central energy production plant uses a hydrogen/oxygen fuel processor to deliver larger amounts of energy at a lower environmental cost. It is hoped that this will reduce the typical CO2 output of a town of this size by 70 per cent.

The houses have been earthquake-proofed to the latest standards and the energy supply will bridge any gap in production for up to three days, to account for potential natural disasters. Another energy generator, a large solar farm, operates outside the town and along the highway.

Even the street layout has its job to do in minimising energy consumption – by choosing an organic, leaf-inspired design, every breeze is channeled through the town, reducing the need

to use air-conditioning in the summer. Security systems monitor the streets 24/7, Smart sensors control LED street lighting, electric cars and bikes are available to citizens to help them get around. Citizen services are fairly basic, but the concentration on sustainable living creates an interesting showcase for what could be city design of the future.

However, as with many Smart ideas – adoption can be slower than expected. A year after the first people moving in, Fujisawa has around 1,000 inhabitants instead of the expected 3,000. Those who live there seem to like it, but empty houses make for unengaging neighbourhoods, so extra efforts are being made to engage existing and potential tenants in ‘community life’.

Smart services that make city living more pleasant abound already – from India to the US, there are many transport information schemes, citizen services and information. As Dr. Quantz points out, Smart technology in public spaces will certainly lead to greater individualisation and personalisation of services. You have this already as a trend and even right now, my Smart phone could send and receive information when I get to a service point.

He suggests that airports have thought about personalised digital signage systems which display information relevant to the people walking by, based on their electronic boarding cards. There will be personalised screens on public displays, and the transport information we already have on when the next bus or train is coming is already pretty good, but this could be tailored to the user looking at it.

Predicting hold-ups in traffic and giving up-to-the minute information on delays through accidents and roadworks could certainly be improved. Nokia users are already connected into a system that can predict, based on their current speed, exactly when they – and others – will reach a certain point on the map and make predictions based on that. This should soon be available across the board for all Smart phone users.

Reflecting the way people do and want to live remains a crucial aspect of designing successful Smart products and services. Finding the ‘next big thing’ in the deluge of ideas is a challenge for companies, who are also faced with the need to ‘Smarten up’ their own operations in many areas to meet new standards and the demands of increasingly critical customers. How innovation can ‘Smarten up’ what companies need to learn about their customers, and how they can use their own data to do so, is covered in the final section of this report.



***“The way we were taught to think and act works well when the future is predictable, but not so much in the world as it is now”***

*Forbes.com*

## ***Smart Innovation***

There is no doubt about it – innovation is changing. In the past, companies could think up new products and services behind closed doors and then present them to an enthusiastic market. Today’s world is too demanding, complex, interwoven and competitive to work only with the skills available in-house, especially when it comes to any form of technology. Making the decision to go with a particular technology is more and more a strategic decision, which needs to be informed by a deep understanding of ICT. Specifically, in more and more sectors, there is virtually no innovation without communication technology of some kind.

In order to have impact, innovation should be disruptive, game-changing, transformational, and always – of course – increase a company’s standing with its customer base (unless it can cut costs by a significant margin, that is useful, too). Add to that the increased cost pressure produced by growing competition and rising costs, and you have a recipe for sleepless nights at the executive top.

*“Most companies are caught in the middle between what their suppliers believe to be viable and what their end-customers want them to deliver. Innovation under that much pressure is certainly a challenge.” (Dr. Joachim Quantz)*

Finding genuinely new, disruptive ideas is hard, particularly when they come from small companies or even individuals, and how can you know what will be the next great innovation for you if you cannot judge what is out there? The reverse side of this is solving problems relating to existing products and services. This can require highly specialized skills and lateral experience to produce solutions that really tick the box, but it is just not feasible to have an eclectic team of scientists on stand-by – and the collaboration with academic institutions can be lengthy and difficult. Fortunately, the market reacts, to changed needs and circumstances, and produces new solutions ideally just as they are required.

Quirky is one such example, relying on an online community of inventors working on Smart products, no matter which category they fall into. Quirky invites submissions from anyone with bright ideas, supports the inventor in making a case and then runs online evaluation events to pick out the propositions with the greatest potential. Prototypes, manufacturing and marketing follows, and teaming up with GE has meant enough backing to produce viable – and exciting – products. One example is the Aros air conditioner.



Quirky's mission is to release ideas 'locked inside people's heads' to make inventions accessible to anyone. IdeaConnection, on the other hand, exists to bring together teams of specialists as and when needed to solve specific problems. As Paul Wagorn of the company explains, *"IdeaConnection offers an extensive network of experts who are available at very short notice, to solve difficult problems. We put these experts into multidisciplinary teams to tackle the really tough problems. By using this network, companies do not have to find the right consultant, hire them and negotiate a contract. Instead, they can get access to brilliant people for very short periods of time, to develop disruptive solutions."*

He feels that particularly in today's R&D-heavy environment, smaller companies can face big obstacles in getting innovation off the ground. This is where his organisation can help, *"A start-up can risk 30 per cent of their company on a brand new technology, but a Fortune 500 company cannot do that, so they have to outsource the innovation – and the risk – to smaller entities. And that is the reason why companies like ours exist, to facilitate that in many different ways."*

Being inclined to hold onto the status quo can be an issue particularly for bigger companies with an established staff of researchers. *"Another challenge is also that big companies may have scientists who have been working for them for 20 or even 30 years, who have a ton of experience and can make good decisions often just based on their gut feeling – but the flipside is that this thinking can be prejudicial to some extent, as it makes it less likely that strange new ideas will be considered."*

Yet considering odd ideas and asking silly questions can be just what is needed. *"Experts with an academic background often refuse to ask stupid questions – their careers are built on increasing the equity in their own personal brand and that does not sit well with seeming silly, yet a lot of innovation comes from exactly that. By using a third party like us, they can outsource and get access to this type of thinking."*

IdeaConnection mainly works with businesses engaging in scientific research of some kind, chemistry, pharma, food science, biotech, consumer products, engineering or material science *"the kind of thing where there you come across scientific problems that are narrow and specific in scope"*. But the concept has much potential for innovation in any sector – and the need to cooperate and utilise external expertise has never been greater.

Florian Herrmann sees closer cooperation for ongoing innovation as inevitable. *"The automotive sector is a good example – the convergence of competencies is ongoing and easy to see."* Now you have the classic car builders, together with IT, and energy production and distribution companies, working together on solutions for the electric car, for instance. The same applies to makers of household appliances and Smart devices.

He says, very traditional companies will find it harder to open up to new types of partnerships with IT and communications companies, but generally speaking, they are all thinking about how to do this as it has become an inevitable part of getting ready for the

future. They all realise the obvious innovation potential in working with players from other fields, be it through creative workshops, think tank events or start-up sponsorships.

This also changes the extent to which innovation can be proprietary – as Mr. Herrmann continues to explain, *“Owning big new ideas the way they used to be is now almost impossible – with the convergence of competencies across sector and sometimes even competitive boundaries becoming so common, you need others involved in making the ideas a reality, and at that point, it is very difficult to maintain exclusivity. Electric cars need charging stations, OEMs need to cooperate with energy distributors, and so on.”*

*“You can achieve so much more when all parties are open to a genuine dialogue about new ideas. True, no one owns ideas exclusively, but you will get much faster and more transformative innovation.”*

Dr. Quantz agrees that ‘the exclusivity of Smart innovation is tricky’ – Apple is perhaps THE example of someone managing to keep big, disruptive innovations completely under wraps, but they are a pretty unique example. Maximum creativity comes from connecting with as many creative minds and projects as possible. *“It is almost impossible to innovate in an ivory tower, turned away from the world – it is for the world that you want to innovate, so you will need to open up to the outside at some point fairly early on in the process.”*

He goes on to argue that, although openness will have disadvantages in losing competitive edge, this is far outweighed by what you gain by bringing in more outside ideas. *“And the speed of change is breathtaking – you will not be able to keep up using just your own resources.”*

Dr. Quantz also believes that the fear of losing out quickly dissipates once the first joint projects are successfully underway. When companies first start to work in peer and competitor groups, they tend to be worried that someone will steal their ideas, but they notice fairly quickly that not only is no one doing that, they actually benefit enormously from all the input they can get, especially in sectors like ICT, as the budgets are available to move forward with concrete projects and everyone will have enough resource to make a valuable contribution to the process.

As he says, everyone is trying to become more agile, to react more quickly and be more service-orientated, especially where there is a revenue opportunity. The other aspect is the customer relationship, which many companies are actively seeking to strengthen – Apple did a very good job with that, they have a very loyal customer base, and not everyone can be like Apple, obviously, but *“all companies in similar markets have realised by now that technology is moving on constantly, forcing them to innovate or die.”*

Joint development takes many forms, from commercial project-based work to bigger ventures like RADICAL, mentioned earlier, or initiatives like ConnectedLiving, which emphasises the importance of human needs as the driver for viable Smart innovation. In the view of the 50+ members of ConnectedLiving, the potential for networking household appliances like radio, TV, PCs, heating, cookers and fridges is far from reached. A stated goal of the group is to create common standards and controls, binding the various single components into one coherent solution. Automated home, infotainment and communication

technologies are converging, requiring future-oriented perspectives to be put in place now so all relevant sectors can work together on the best possible solutions for the people who will be using them. For them, co-innovation and co-creation are the first principles of how this will work.

AllThingsTalk is a group of 'enthusiastic developers from around Europe', working on redefining home automation in similar ways – towards more intuitive, coherent and intelligent solutions. Their guiding principle is an improved quality of a life lived Smarter, through IoT building blocks used for creating tailored solutions for any audience and any company, using web 3.0, open source and an open system. Their simple statement 'We make things talk' again highlights the core of Smart innovation: communication. They also focus strongly on creating solutions that reflect what people actually want.

As Paul Wagorn points out, a lot of companies out there want to design Smart products, not because there is a need but because they believe that's what they need to do to compete. So they have a product and start thinking about how they can make it Smart, maybe just by hooking it up to the internet, and that is the wrong attitude. *"Truly Smart ideas are borne out of the need to solve a problem rather than just keeping up with the competition."*

To achieve this, companies need to work with other entities to make innovation a reality. As Dr. Quantz confirms, *"We now see increasing interdisciplinary convergence and diversity in the expertise brought together to solve the latest problems, making innovation a lot more interesting and productive. This is especially important for smaller companies who could not employ the resources they need. On the down side, it does mean that there is less long-term employment and more free-lancing than ever before, decreasing job security."*

There is still some way to go before this is the norm, as he goes on to point out, *"The biggest barriers to innovation are a company's history and culture – if you are in a sector that has not needed to change much in the past and your employees are pretty content to leave things exactly as they are, you have an uphill battle on your hands. But even these players are starting to move their thinking forward."*

Paul Wagorn comes across many struggles with innovation, *"There are a lot of companies out there who are working on replicating the idea of interfacing with smaller entities themselves. One of the goals of open innovation is to successfully outsource intellectual horsepower, creativity, and risk – but what these companies are doing is creating separate divisions within their company with the goal of replicating start-up mentality. So they hire someone known for being innovative, give them some money and latitude to spend it. From what I have seen, this can sometimes fail because the company does need to manage this project in some way – they need to report on it, it comes out of somebody's budget, and that defeats the objective of the truly independent entity."*

This is where access to providers for specialist innovation expertise comes in handy. For a large company to behave like a small start-up is a very tall order, and typically, it does not

work. So the way forward can be an intermediary who acts like a buffer between a big company and the very small companies, as they are just too different.

IdeaConnection addresses just this issue, as Paul explains, *“We exist in the world of open innovation, where companies collaborate with their suppliers, for example, to come up with something new. That can work very well, but the challenge is that it can be very expensive for everyone involved and that it is often such a long process just to engage – you need to set up and sign agreements and pre-define what the work will entail and so on. And that slows you down, which you cannot afford. Nimbleness is a pre-requisite for innovation and you lose that when it takes all these steps and all this effort just to engage with outside capabilities. Once again, you will often not develop disruptive ideas; you will simply come up with incremental innovation.”*

Dan Ledger’s EndeavourPartners also sees mobile and digital technology as a vital area for innovation, but something many companies struggle to implement.

*“Possibly the biggest failure in big companies when it comes to innovation is that they talk about how important it is for the company, but people at the most senior levels don’t understand what it means. They don’t invest properly in it. What they have is a bunch of disjointed activities like Idea Challenges, Innovation Labs or a Small Venture Team, but these are not woven into the fabric of the company. They exist as satellites to the main business activity. So they have ticked the box next to ‘I have an innovation initiative’, but the rest of the company is ill equipped to do anything with what this lab produces.”*

Typically, he says, companies hire some interesting people who bring creativity and new ideas to the table, but end up totally frustrated because the senior management and the culture of the company is so squarely anchored in the old way of doing business that all of these innovation initiatives end up being incredibly superficial.

Yet there is no way around addressing these challenges – Mr. Wagorn points out that a lot of industries are becoming more and more competitive, so for larger companies especially there is huge pressure to release new products, be disruptive, and be innovative. This pressure comes from their competitors, customers and the media, and working with external sources of insight and inspiration will be unavoidable, but this is far from being a smooth process.

He says, *“For small companies to get through to the big ones is a challenge – most have to go out and try to find a home for their product, and that is very difficult. Many large companies do not want unsolicited ideas for fear of intellectual property contamination. So to get around that, some have created open innovation portals, Procter & Gamble’s Connect + Develop is one classic example. Anyone can go and submit their ideas, which is good, yet the challenge is that it is very hard to make this successful because companies often lack the insight into their target company’s mind set, whether it’s small companies, research institutions or academics, so they struggle with wording and presentation, and even defining their target audiences.”*

Yet, in his view, this is exactly where a lot of potential lies dormant, *“The interface between large and small companies is a very rich area but is a long way from being fully managed. A big company acting like a small one is just not going to happen, a dog cannot act like a cat, so the big companies should focus on what they do best – efficiencies and incremental development – and consider leaving some of the big risk-taking, breakthrough innovation and the stupid questions to other people. The opportunity for positive growth lies in making that interface better and using it more productively.”*

*“One way they could start thinking more like a small company (even if they cannot behave like one), is to prevent projects from getting mired in red tape. They will have to find an external partner like us or smaller companies to work with directly, assign a budget and then be ready to make some quick decisions. And they have to understand and accept the risk involved. The project owner cannot be a committee – it has to be one person who can move forward without consulting with five other people every step he or she takes. Delegate authority to someone who is a bit of a visionary and let them try out different methods for solving their problems.”*

Mr. Wagorn sees the typical development cycle as companies grow, as a perpetual movement away from designing new technologies towards becoming efficient administration machines, *“Their focus shifts and they become really good at efficient administration and they have left behind what got them started in the first place, and there is no going back.”*

He goes on to stress that companies are under pressure to do more with less – so how do you come up with new products but spend less money doing so? R&D and discovery are very expensive, and those costs are constantly increasing. Combine that with the fact that organisations, as they get bigger, increasingly focus on efficiencies, plus managers are rewarded for saving costs and creating incremental profit gains, so disruptive and innovative thinking are bred out of their systems. Yet they do need to innovate – so how can they do that? All of this pushes them to go external as one of the very few ways you can do this.

Which is the very reason for the existence of companies like his - it is critical to help companies find a way to deal with these challenges to enable them to survive increasingly difficult times. The stakeholders who have the most to gain and the most to lose really need to act on this. Instead of worrying about incremental changes they will have to think a bit bigger and work out how they are really going to transform what they do.

*“There is a lot of anxiety about innovation and that is something they can outsource, alongside the risk and the creativity, so they can continue to be good at administration.”*

Dan Ledger further adds to the discussion the thought that new products may not even be the answer, *“Many companies think that what they need is more innovative products, so they hire a team to come up with the most exciting ideas. What they fail to realise is that innovation is happening now at the level of user engagement and the business model which may be more compelling and interesting than creating new products. There are a lot of very successful examples of business selling exactly the same thing but just differently packaged.”*

*Uber is one example, bringing together passengers and hire vehicles, or the Dollar Shave Club which delivers high quality razors to your house once a month, directly attacking Gillette's monopoly by selling exactly the same thing in a completely new way. There are many great examples out there of companies being really innovative in the way they engage with customers, in the experience they design and with completely new business and payment models, using what are essentially ho-hum products."*

He says, especially big companies are still so focused on products, they are not spending anywhere near enough time on thinking about how they can reimagine the business model for their existing products, re-engaging their customers, and getting a lot more for a lot less money. *"Be Smart with what you already have because the basis for competition over the next ten years will be to do more with less."*

*"Consumer choice also needs to be considered in this – if you have ten similar products, none of which clearly deliver a benefit to the consumer, he is likely to choose not to choose and walk away. By contrast, if you have three very clearly differentiated products, with an obvious purpose, you are much more likely to get a positive buying decision."*

Smart data analysis is the key to continued success for many consumer-facing companies, as their opportunities to invent and launch the next big thing are diminishing in the face of increasing product density and competition in their market places. Knowing what customers want is largely based on knowing how they behave and what choices they make – and with the masses of individual data records at their disposal, the opportunities for learning about your customers are almost unlimited. But how to go about doing this effectively? We take a look in the final section of our report.



***“Big data has enormous potential.  
But we need to accept that we’re still  
very much in the eye of the storm”***

*Mark Godley, SalesPredict.com*

## ***Smart Data***

Paul Wagorn sees Smart data analysis as a key piece in his company’s offering: A big growth area for us is big data and decision analysis. *“There are companies with databases containing billions of data points and they don’t know how to get the answers to their questions but perhaps even more importantly, they don’t know which questions to ask.”* And that is where they need creativity, to identify these questions.

So what are the main things to bear in mind when working out how you should make the best of the big data opportunity? Mark Godley (of SalesPredict.com) warns us not to get distracted by the sheer ‘volume, velocity and variety’ of data we are capturing even now (a staggering 2.5 quintillion bytes per day) and sets out a series of steps to follow when dealing with big data.

He points out that focusing on amassing data is not going to produce better results; it will not deliver the best prospects, the strongest sales opportunities or the greatest ROI. *“It is, and always has been about the right data.”* Which is the data that will deliver the right leads? *“Yes, big data can help us spot trends, calculate averages, build personas and identify patterns. The problem is, we don’t sell to trends. We don’t market to averages. We don’t engage personas. And patterns are not customers. We sell to people. Individual people.”*

Finding the right way to profile your customer base, designing the optimal marketing approach and message content to engage their positive attention and tailoring your offering to meet the needs of each group as closely as possible – all of that is enabled by good analysis of big data.

*“Big data has enormous potential, but we need to accept that we’re still very much in the eye of the storm...a storm of disruption and metamorphosis. ... Data is the means to empower sales teams with more informed opportunities that will shorten sales cycles and increase ROI.”*

Outlining why it is important to stay focused, Mark continues to say, *“Presented with limitless data, it is easy to fall prey to feeling like kids in a candy store. We are so excited by the amount of information we can aggregate that our vision of what is possible clouds our ability*

*to focus on the right data. As the industry shakes out, we need to focus on the right combination of data, tools and time-tested selling techniques.”*

#### **Five points to bear in mind are:**

1. Think about your customers as single individuals – that is who you will be selling to, not the patterns and trends in your data.
2. Use what you know by selecting those sales opportunities that have yielded good results in the past. Work with your data to identify new instances of similar opportunities.
3. Identify your best prospects by understanding the key traits of your best customers – predictive analysis can help you do that. Focus on your best – rather than any – sales opportunity.
4. Use external skills and even external data to verify what you are learning – this will help you avoid being overwhelmed by the mass of records you are looking at.
5. Never forget the basics of good selling – identify the micro-segments that hold your best prospects and educate and engage them to maximize your ROI.

Dan Ledger is familiar with the increasing search for ways to monetise the health data already amassing through, and in connection with, Smart devices. Yet this is not as easy as it sounds and needs to be considered carefully, both from an economic as well as a viability perspective.

*He states, “You get companies who look to data science to make money – so their starting point would be to collect as much health data as possible and then try to monetise it. But the step they’re missing out here is how you can take that health data and turn it into something that is meaningful. Machine learning and pattern recognition do work really well but when it comes to human physiology, everyone is different. And even if your algorithm works pretty well for nine out of ten people, that becomes a problem when you are working with thousands of people, because that one becomes hundreds for whom it returns incorrect information, and that could get dangerous, and that is where the industry is stuck because we lack the models to do that accurately and reliably for everyone, and while we are figuring that out, we’re stalled.”*

In the realms of the connected car, big ‘anonymous’ data has a definite role to play in improving traffic management and services for drivers, says Dr. Joachim Quantz.

*“Big data gives us the ability to see patterns and connections invisible to us before. It gets around the privacy issue by looking at huge datasets rather than individual profiles, and it is a completely different approach to look at traffic data or other public behaviour to optimise*



*public spaces or services, for instance, compared to applying tailored marketing to individuals. No-one would mind if your car is logged as a vehicle moving on a given road to create better traffic predictions for everyone, as long as no one tracks you personally.”*

So being Smart is producing and using energy in an efficient and sustainable manner, helped by a host of Smart devices which monitor and adjust the way we consumer power. It is driving connected cars which offer services and increased road safety, cutting pollution through alternative fuels and better traffic management.

Smart homes in Smart cities make us more engaged citizens, living in cleaner environments. Smart is using technology to help us cope with the less pleasant tasks in life, making us more effective every day, yet not so obtrusively that there is no more personal, ‘non-digital’ time to relax.

‘Smart’ is to understand that data streams ideally clarify the needs and preferences of separate individuals, as the increasing demand for tailored solutions dominates consumer (and increasingly business) demand.

So Smart is good – Smart enables improvements and growth. As long as we do not lose sight of the purpose of it all.

## *Credentials*

### **Florian Herrmann**

Head of the Competence Center Mobility Innovation at the Fraunhofer Institute for Industrial Engineering IAO. Within this department a group of interdisciplinary researchers is working on mobility issues like electro mobility or autonomous driving. Based on a broad technology management approach new business models and innovations are explored.

He received his Master's degree in industrial engineering from Karlsruhe Institute of Technology (KIT), Germany. His research interests include topics related to the automotive value chain, production- and technology management.

Since 2011, Herrmann is the project manager of the innovation network "FutureCar". Within this cooperative project of the Fraunhofer Society a large number of partners from industry, especially automotive suppliers and research organisations, work together on aspects related to technological change within the automotive industry (e.g. new mobility concepts, alternative propulsion systems, Car-IT and autonomous driving, new materials etc.).

### **Dan Ledger**

Principal at Endeavour Partners. Since joining in 2011, he has helped clients across the spectrum of mobile and digital businesses, directing numerous engagements focused on strategy and innovation management. Dan has led the wearables and IoT practice for Endeavour and has advised numerous OEMs and service providers on areas from market strategy to product design.

Dan holds a Master's degree from the Massachusetts Institute of Technology, and a dual bachelor's degree in engineering from Washington University in St. Louis.

Endeavour Partners is a strategy consulting firm with deep expertise in mobile and digital businesses and technologies. They work with top executives of companies impacted by the business and technology forces at play in the mobile and digital sectors and help clients anticipate the future, navigate the resulting opportunities, and innovate for growth.

### **Dr. Joachim Quantz**

Studied Computer Science (Diploma 1988, PhD 1995) and Linguistics/Philosophy (M.A. 1992), at Technische Universität Berlin. He has more than 25 years of experience with national and international client and research projects and has joined ART+COM as Head of Research in 2008. He is also the CEO of the Berlin-based network Xinnovations (previously xmlcity:berlin). His areas of expertise include Human Computer Interaction, Semantic Technologies, Smart Home, Business Process Management and Mobile Apps.

ART+COM is been a member of Connected Living, a network on Smart Home Solutions and has been actively involved in several German research projects on Smart Home funded by the Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Ministry of Education and Research (BMBF).

Before joining ART+COM, Joachim worked as Head of Medical Services for inubit (now Bosch Software Innovations), as an Associated Senior Analyst for Berlecon Research (now

part of Pierre Audoin Consultants, PAC), as a Professional Services Manager for Shinka Technologies (a start-up developing a web service platform), as the Head of Content Management for IKV++ Technologies from 1998 to 2000, and as researcher and project manager at the Technische Universität Berlin.

### **Paul Wagorn**

President of IdeaConnection and has more than 18 years of experience in the information technology industry, including more than 11 years of Internet and e-commerce experience. Previously, Paul served as the chief operating officer of Worldbid Corporation, where he was instrumental in developing the patent-applied-for technology. He is also the founder of MerchantSense Consulting, where he created a software solution to the massive issue of online credit card fraud. In addition, Paul worked as a marketing and search engine consultant at Online Legal Marketing.

IdeaConnection teams are working every day on solving challenges for companies of all sizes – from Fortune 10s to single individuals. IdeaConnection has been solving problems since 2007 by assembling multidisciplinary teams lead by world-class facilitators, who develop intensely researched, innovative, and detailed solutions. Using this approach, IdeaConnection has achieved a best-in-class solve rate for problems ranging from food science, chemistry, engineering, biology, crop science, packaging, consumer products and much more.

## Other Sources

Personal interviews with our contributors (see Introduction and Contributor sections)

<http://forbes.com>

<http://ses.jrc.ec.europa.eu/Smart-metering-deployment-european-union>

<https://ec.europa.eu/energy/en/topics/markets-and-consumers/Smart-grids-and-meters>

<http://www.theguardian.com/environment/2015/jan/08/green-vehicle-demand-revs-up-uk-electric-car-sales-quadruple>

<http://www.gartner.com/newsroom/id/2970017>

<https://openideo.com/blog/renewable-energy-challenge-announcing-our-top-ideas>

<http://www.gizmag.com/self-driving-cars/38601/>

<http://www.landroverusa.com/our-story/news/justdrive.html>

<http://www.insurancejournal.com/news/national/2015/07/07/374258.htm>

<http://www.izeus.de/>

<http://www.hngn.com/articles/50019/20141119/jaguar-land-rover-introduces-justdrive-voice-control-app-for-2015-models.htm>

<http://www.autoalliance.org/auto-innovation/advanced-technologies>

<http://www.businesswire.com/news/home/20060420005328/en/AFV-Solutions-Announced-Today-Hiring-Nelson-Barba#.VfO4GZ2qqko>

<http://www.wired.co.uk/magazine/archive/2015/06/features/Smart-town>

<http://www.knowyourmobile.com/devices/Smart-home-appliances/22897/best-iot-Smarthome-products>

<http://www.Smarthings.com/>

<http://www.fastcompany.com/most-innovative-companies/2014/industry/energy>

[http://www.goodenergygroup.co.uk/media/BAhbBIsHOgZmlh01Mjl5ZTRmZjhiZTdkODAwMDIwMDA3ZjY/GEY1\\_137\\_FactSheet\\_17.pdf?suffix=.pdf](http://www.goodenergygroup.co.uk/media/BAhbBIsHOgZmlh01Mjl5ZTRmZjhiZTdkODAwMDIwMDA3ZjY/GEY1_137_FactSheet_17.pdf?suffix=.pdf)

<http://pulse.edf.com/en/plugsurfing-the-community-charging-system-for-electric-cars>

<http://pulse.edf.com/en/tortellino-hpc-using-the-heat-from-it-servers-to-heat-homes>

<https://en.wikipedia.org/wiki/Z-Wave>

<http://www.z-wave.com/>

<http://www.zigbee.org/>

<http://time.com/3745059/Smart-home-wireless-networks/>

<http://electronicdesign.com/communications/what-s-difference-between-zigbee-and-z-wave>

<http://www.evunion.eu/>

<http://www.theguardian.com/environment/2015/jan/08/green-vehicle-demand-revs-up-uk-electric-car-sales-quadruple>

<http://www.vinci-energies.com/en/its-already-tomorrow/towards-a-Smarter-city/living-in-a-Smart-city-what-does-it-mean/>

<http://www.vertohomes.com/Smart-home/sustainable/electric-vehicle-charging-point>

<http://www.cnet.com/topics/Smart-home/best-Smart-home-devices/>

<http://www.samsung.com/us/showcase/Smart-home-appliance-washer-dryer-and-refrigerators/>

<http://www.knowyourmobile.com/devices/Smart-home-appliances/22897/best-iot-Smarthome-products>

<http://qz.com/249489/will-the-internets-crowd-sourced-inventors-take-over-ges-appliance-business/>

<http://www.connected-living.org/>

<http://www.sophia.com.de/>

<https://www.quirky.com/>

<http://www.allthingstalk.com/>

<http://siliconangle.com/blog/2014/11/06/Smart-home-wars-google-vs-apple-amazon-samsung/>

<http://www.techmeme.com/140802/p4#a140802p4>

<http://www.entrepreneurial-insights.com/Smart-home-intelligent-home-automation/>

<http://panasonic.net/es/fujisawasst/>

<http://www.issy.com/>

<http://www.radical-project.eu/>

<http://www.salespredict.com/blog/big-data-less-is-more>

