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Smart Britain 1.0

The seven drivers of a connected and empowered society

David Wong



A smart project par excellence

David Wong's report, with Smart Scorecard, exploring **Smart Britain 1:0** builds upon our previous work on "The New Normal: Competitive Advantage in the Digital Economy" and "Towards a Smarter Society" as well as our weekly column called "The Innovators" in the Guardian.

The next step in this focus on business strategies and models is our Big Innovation Map project, an attempt at mapping the UK innovation landscape and putting this insight to commercial use. Smart societies and consumers need innovative companies to serve them, so in this initiative we aim to measure how innovative UK companies truly are. The work is led by **Innovator in Residence, Eva Karagianni-Goel** who can be contacted at: e.karagianni@biginnovationcentre.com.

To a degree everybody is flying blind about how the evolution of digitalisation and open innovation is going to impact on business and society in the round, and the experience their organisation needs to be informed by – and to inform – what is happening elsewhere.

The Big Innovation Centre hub of innovative companies and thought leaders act as co-catalysts in co-shaping organisations' innovation and business model strategies, in ways that are both practical and intellectually grounded.

We would like to thank all the individual contributors to the report from various organizations for providing the evidence base and their thought leadership.

*Birgitte Andersen, CEO and CoCreator
BIG INNOVATION CENTRE*

Launched in September 2011, Big Innovation Centre brings together a range of companies, universities and public bodies with the aim of enlarging their innovative capability and creating global innovation hubs. Big Innovation Centre is the 'go-to' place in the UK where commercial and public sector ideas are shared, tested and realised in a non-competitive and neutral environment. Our vision is to build a world-class innovation and investment ecosystem by 2025. For further details, please visit www.biginnovationcentre.com.

Executive summary

Britain is well on the journey from digital to smart. At the heart of 'smart' is the implied **harnessing of the potential of technology and connectivity to improve people's lives**. This is not a denial of the sometimes unintended side-effects of technological advancement, but an acknowledgement that a nation that is truly smart is one that is able to find ways to maximise opportunities afforded by technology and connectivity. Instead of being bewildered laggards trailing in the wake of technological progress, or obstinate Luddites preferring to live in a time warp, a smart nation leverages the power and the potential of technology to make human beings more productive; to allow us to focus our resources on activities and relationships that matter; to create new value through innovative business models; and ultimately to improve health, wellbeing and the quality of life.

In our previous report *Towards a Smart Society*, we set out how digital technology and connected devices are changing our lives through the way we live, work and play. We have also shown that the age of smart ushered in by digital technology and connectivity can improve our lives through three broad routes, namely increased efficiency and effectiveness, new ways to relate to each other, and new business model possibilities.

In this short report, we seek to explore **what will get us there**. While 'smart' will always be a moving target, it is possible to capture at a particular point in time the key drivers that make a nation smart based on current aspirations and existing understanding of what a smart future looks like. We have therefore reached out to a carefully selected panel of 23 experts, each an authority in a particular area of practice that is integral to catapulting Britain into the age of smart.

Based purely on the outlook from today's vantage point, the experts' collective views reveal seven key drivers of Smart Britain 1.0, or in other words what will enable Britain to become smart:

Driver 1: Smarter technology

- Advances in machine-to-machine communications, or the Internet of Things, that will form the centrepiece of a multitude of smart applications
- Application of technology in solving everyday real-life problems and improving quality of life
- Joined-up, seamless integration of modular systems or technologies
- Ubiquitous and on-demand availability of technology
- Advanced technology in the form of machines that will be part of the Internet of Things

Driver 2: Smarter culture

- Increased openness, in both attitudinal and practical terms, to data-sharing
- A data-friendly culture reinforced by trust, responsibility and good data stewardship
- A generally more open attitude and predisposition towards open innovation and co-creating solutions

Driver 3: Smarter regulation

- Data protection legislation that strikes the right balance between proper protection and enabling data-driven innovation
- Legal and regulatory frameworks that are appropriate for the age of machine-to-machine communications (e.g. reform of road traffic laws and insurance liabilities to cater to autonomous vehicles)
- Short- (e.g. immigration) and long-term policies (e.g. education) that can more effectively address the shortage of higher level data skills

Driver 4: Smarter literacy

- General digital literacy, covering basic aspects such as proficiency in using digital devices, online skills and digital communication skills
- Higher-level data literacy, which is about being aware of where and how our data is collected, stored and used, and knowing the implications of these
- Enhanced user empowerment, that is being able to make the most of digital technology and applications for our everyday living and to solve problems
- Professional data skills developed through the education system
- The norm of lifelong and multi-mode learning (formal, informal, through multiple resources)

Driver 5: Smarter infrastructure

- Ubiquitous access to the internet and high-speed broadband
- Reliable, ubiquitous and high-bandwidth mobile coverage that is fit for purpose in the age of the Internet of Things (e.g. 5G, white space)
- Coordinated, joined-up infrastructure in cities

Driver 6: Smarter standards

- Common protocols and standards that enable the interoperability of machines and systems
- Operating systems for the Internet of Things

Driver 7: Smarter business models

- New and sustainable business models that can justify the investment required to participate in the market for the Internet of Things
- Large-scale demonstrators to show clear value in investing in frontier technologies, and thereby inspiring others to join in

- Attractive value propositions to encourage wider population take-up of connected devices and appliances and innovative services
- Business models that are characterised by deep personalisation, mass customisation, horizontalisation and co-creation

It is quite clear that we have some way to go before we can call Britain ‘smart’ – there are still obvious gaps within each of the seven drivers that need to be addressed. Although we now have an idea of what Smart Britain 1.0 looks like and what will get us there, there is currently no **mechanism to measure our progress** towards becoming a smart nation. Our consultation reveals the need for a simple and intuitive tool to periodically gauge how smart our society has become.

By integrating expert insights on the seven drivers and the earlier evidence on the three domains (work, live, play), we introduce a ‘Smart’ Scorecard for this very purpose. The Scorecard, designed to be intuitive to the entire adult population, can be further developed into an app-based tool to crowdsource the population’s response, and therefore gauge progress. An early prototype of the tool can be reviewed here:

https://qtrial2013.qualtrics.com/SE/?SID=SV_9Tt4wkD8IFNK8Yd

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1. Where we are as a nation

In our previous report *Towards a Smart Society*,¹ we set out how digital technology and connected devices are changing our lives through the way we live, work and play. The age of hyper-connectivity is heralded mainly by the Internet of Things, which enables machine-to-machine communication and presents a multitude of opportunities for intelligent living and higher quality of life – as well as a swathe of challenges and risks associated with implementation and diffusion.

Britain is well on the journey from digital to smart. At the heart of ‘smart’ is the implied **harnessing of the potential of technology and connectivity to improve people’s lives**. This is not a denial of the sometimes unintended side-effects of technological advancement, but an acknowledgement that a nation that is truly smart is one that is able to find ways to maximise opportunities afforded by technology and connectivity. Instead of being bewildered laggards trailing in the wake of technological progress, or obstinate Luddites preferring to live in a time warp, a smart nation leverages the power and the potential of technology to make human beings more productive; to allow us to focus our resources on activities and relationships that matter; to create new value through innovative business models; and ultimately to improve health, wellbeing and the quality of life.

We are becoming smarter

The world is becoming ‘smaller’ – thanks to increasing connectivity. Very few places in the world today remain unaffected by the internet. Global figures confirm an uptrend in internet penetration and mobile phone use. There will be 2.9bn internet users and 2.3bn mobile broadband subscriptions worldwide by the end of this year, while 43.6% of households globally will have internet access.²

There is no doubt Britain is likewise becoming increasingly connected, as the following statistics prove:³

- The proportion of households with broadband has increased from just 16% in 2004 to 77% today.
- An increasing percentage of the population has now gained access to next-generation telecommunication services such as superfast broadband and 4G. The

¹ See Levy, C. and Wong, D. (2014), *Towards a Smart Society*, London: Big Innovation Centre.

² United Nations International Telecommunications Union Statistics, <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>, accessed on 7 May 2014.

³ Ofcom (2014), *The Communications Market Report*, London: Office of Communications.

proportion of all UK broadband connections classed as superfast has increased to 26.7% from 17.5% in just the previous year. Approximately 8% of all active mobile subscriptions now are 4G, while the figure was just less than 0.5% a year ago when the service was first introduced.

- 61% of adults now claim to own a smartphone, while household take-up of tablets has almost doubled over the past year to 44%.
- Due in part to the increasing popularity of smartphones, some 57% of the population access the internet from their mobile phones, up from 49% a year ago.

While those figures tell us something, they do not show how digitisation and connectivity translate into 'smart' in more practical terms. The UK is already the most internet-based economy of the G20,⁴ which implies that Britons are considerably open to exploiting the benefits of the digital world and connectivity. We have previously shown that the UK is indeed becoming smarter in the way we live, work and play.

Live smarter

The way we live is radically changing. Smart homes of the future will be fitted with connected devices that are powered by the Internet of Things. From smart televisions, refrigerators, dishwashers and washing machines to intelligent thermostats, smoke detectors and security systems, connected devices are set to escalate in the next five years, and are capable of making our lives more pleasant and productive. Through smart platforms such as the Hub of All Things,⁵ we can also be empowered through ownership and control of our own data, which we can determine how we want to use in exchange for better or more personalised services.

Beyond the home, smart cities operate more effectively and efficiently, thanks to the intelligent capture and use of data. Integrated, accurate and comprehensive real-time information can be used to optimise modular sections of the entire city system to perform in a more joined-up and efficient manner. Intelligent mobility, integrated traffic control, distributed energy and waste management systems, and collaborative consumption (e.g. car-pooling, letting out private parking spaces) are just some examples of how the smart cities concept can translate into more efficient living.

The age of smart is also changing how we manage our health by supporting a shift from a reactive focus on cure towards a more proactive view of wellness management and healthy living. For instance, remote monitoring enables real-time detection of health issues and rapid intervention, online systems offer remote consultation and diagnosis, digital sensors and patches afford deeper personalisation of healthcare services, and social media listening can potentially lead to early detection of an epidemic affecting the population.

⁴ The Boston Consulting Group (2012), *The Internet Economy in the G20*, The Boston Consulting Group.

⁵ The Hub of All Things is a project led by Professor Irene Ng of the University of Warwick. See <http://hubofallthings.com/>.

Work smarter

The way we work, too, is becoming smarter. Technological advancement and increased connectivity is giving rise to the 'agile organisation', where physical and temporal boundaries become blurred, thus calling into question the strict role of the traditional office. Depending on the nature of the job, workers may be able to adopt flexible, multi-mode and multi-location working, which has resulted in the growing popularity of the home office and even 'coffice', i.e. coffee shops where people work while on the move. Connected devices, cloud computing and ubiquitous access to the internet are not only shaping how work is done, but also interaction with customers and delivery of services.

Despite popular perception, this applies not just to the so-called 'knowledge workers', but also to an increasing number of professions. For example, the sales assistant at M&S is able to provide better customer service with the aid of a tablet and real-time information on stocks and approximate in-store ordering times. The waitress, armed with a handheld or even wearable device, can process orders and forward them to the kitchen immediately, and be alerted to an order that is ready for serving. While these developments can undoubtedly help enhance efficiency and productivity, optimise work schedule and reduce downtime, they also raise legitimate concerns such as invasion of privacy and the blurring of work-home boundaries.

Play smarter

Our leisure is also increasingly affected by digital technology and connectivity. While table and board games, and subsequently arcade, video and CD-ROM-based computer games, defined children's playtime in yesteryears, today's kids take to game consoles and online games, many of which are powered by cloud technology. But perhaps interestingly, these pastimes are no longer a staple of children, as adults, too, take to them in droves. Instead of requiring companions to be physically present, gaming has become increasingly virtual and global. The multi-screen experience is now very much the way many of us consume entertainment. No longer do we watch programmes the traditional way, i.e. at fixed broadcast times on television, but often on demand and moving from one device to another – we may begin on the desktop at home but finish on the tablet on the train.

We now use social media for purposes beyond merely keeping in touch with friends and family. We also use them in smarter ways, such as to mobilise communities for action (e.g. a neighbourhood clean-up), to crowdsource opinions and advice (e.g. the best Indian restaurant in Stoke-on-Trent), and as an alternative to mainstream media for obtaining breaking news from the ground (e.g. the latest on the Arab Spring). The popularity and use of social media are increasingly more intensive and widespread. 16–24 year-olds who use social media spend almost one and a half hours on it a day, while adults' use of social

networking sites accounts for a quarter of all time spent communicating.⁶

What smart means in our daily lives

We have also shown that the age of ‘smart’ ushered in by digital technology and connectivity can improve our lives through three broad routes, namely increased efficiency and effectiveness, new ways to relate to each other, and new business model possibilities.

Increased efficiency and effectiveness

Connected devices, digital networks and smart systems enable us to get domestic and everyday tasks completed more quickly and in ways that better meet our needs. They are also capable of achieving increased productivity at work, as well as enabling the reduction of stress and hassle that detract from our leisure. Intelligent thermostats, smart home energy management systems and the smart grid promote energy efficiency and help us save on energy bills, while mobile payments increase convenience and allow us to skip the queue at the till. Similarly, online public services delivery can be so much quicker and more convenient. Remote monitoring enables quicker and more effective intervention when health issues emerge.

New ways to relate to each other

Although technology plays a pivotal role in any nation worthy to be called ‘smart’, it is but a means, though an important one, to some ends – people and relationships remain at the heart of the matter. Technological advancement and connectivity affect not just the *directness* of our relationships, i.e. the degree to which our communication is mediated, but also their *continuity*, i.e. how frequently we can communicate and how long interactions can last. Because there is so much personal data and information generated, we can build greater *multiplexity* in relationships, be they personal or business, through enhanced knowledge of each other. But the risks and challenges brought about by digital technology and connectivity may also affect *parity* in our relationships, such as in the perceived fairness of how our data is used by commercial entities. Our ties may also be strengthened through greater levels of *commonality* as technology enables us to discover more about our common interests or some shared values.

New business model possibilities

Digital technology and connectivity in the era of smart can create new value through novel business models that are capable of unleashing meteoric efficiency improvements and allowing for stronger and more meaningful relationships. Business models in the era of smart are most likely to be characterised by platforms and networks, the application of insights

⁶ Ofcom (2014), *The Communications Market Report*, London: Office of Communications.

from big data analytics, deep personalisation and mass customisation, horizontalisation of products and services, and co-creation of new value propositions.

Where do we go from here?

We have set out in our previous report what ‘smart’ means to us in terms of how we live, work and play. We have also examined, by integrating disparate themes from homes and healthcare to cities and work, the combined effects of digital technology and connectivity on people. Having painted an evolving picture of how a smart Britain may look, we now seek to take our nascent understanding of ‘smart’ a step further by asking **what will get us there**.

We believe the best way to do this is by consulting with people who are at the cutting edge of the many constituent areas of smart. We have therefore reached out to a carefully selected panel of 23 experts, each an authority in a particular area of practice that is integral to catapulting Britain into the age of smart. In order to capture the broadest possible range of views, we have kept sectoral representation as wide-ranging as possible, with these experts coming from sectors and functional areas as diverse as transport, health, automotive, digital, universities, government, strategy, human resources, research and data science.

This short report seeks to answer two overarching questions:

- What are the **drivers** of a connected and empowered, or as we say, ‘smart’, Britain?
- How can we **track progress** and gauge how smart Britain has become?

We answer the former question by synthesising context-specific evidence and a wide array of input from the panel of experts to analyse for common themes and recurrent constructs. Our analysis, presented in the next chapter, reveals that there are seven key drivers that will enable Britain to make the quantum leap into the era of smart.

We then answer the latter question by drawing conclusions from expert input on the best way forward to continuously measure our progress towards a smart nation. Insights from the experts point to the need for a simple and intuitive mechanism to periodically gauge how smart our society has become. We therefore introduce a ‘Smart’ Scorecard in the following chapter, developed by combining expert insights on the seven drivers and the earlier evidence on the three domains (work, live, play).

This report is not about brandishing endless amounts of statistics to make a case; there are numerous publications elsewhere that offer valuable insights on certain aspects, or silos, of ‘smart’ backed by rigorous quantitative analysis. While numbers tell an important story, they nonetheless tell only part of the story. This report is designed to complement available statistics and existing analyses by synthesising qualitative insights to provide a more holistic view of that which constitutes a smart nation.

Experts who contributed to this consultation

Andrew Everett, Chief Strategy Officer, Transport Systems Catapult

Ben Hammersley, Editor-at-Large, Wired

Chander Velu, Lecturer, Institute for Manufacturing, University of Cambridge

Charles Cotton, Chairman, Cambridge Phenomenon and serial tech entrepreneur

Chris Nott, Chief Technology Officer, Big Data and Analytics, IBM

Ella Jaczynska, Vice-President, Corporate Strategy, GlaxoSmithKline

Harvey Lewis, Research Director, Analytics, Deloitte

Hasan Bakhshi, Director, Creative Economy in Policy and Research, Nesta

John Mathers, Chief Executive Officer, Design Council

Jonathan Mitchener, Lead Technologist, Innovate UK

Justin Anderson, Chief Executive Officer, Flexeye

Martin Garner, Senior Vice President, Internet, CCS Insight

Maurizio Pilu, Partnerships Director, Connected Digital Economy Catapult

Nick Fell, Director and Head, Tata Motors European Technical Centre

Nick Trigg, Innovation Manager, Science and Technology Facilities Council

Professor Irene Ng, Director of the International Institute for Product and Service Innovation, University of Warwick

Professor Paul Newman, Head of Mobile Robotics Group, Department of Engineering Science, University of Oxford

Rob McNamara, Associate Director, techUK

Roland Harwood, Co-Founder and Networks Partner, 100%Open

Steve Bevan, Director, Centre for Workforce Effectiveness, The Work Foundation

Tim Brooke, Creative Technologist, Future Cities Catapult

Will Hutton, Chair, Big Innovation Centre and Principal, Hertford College, University of Oxford

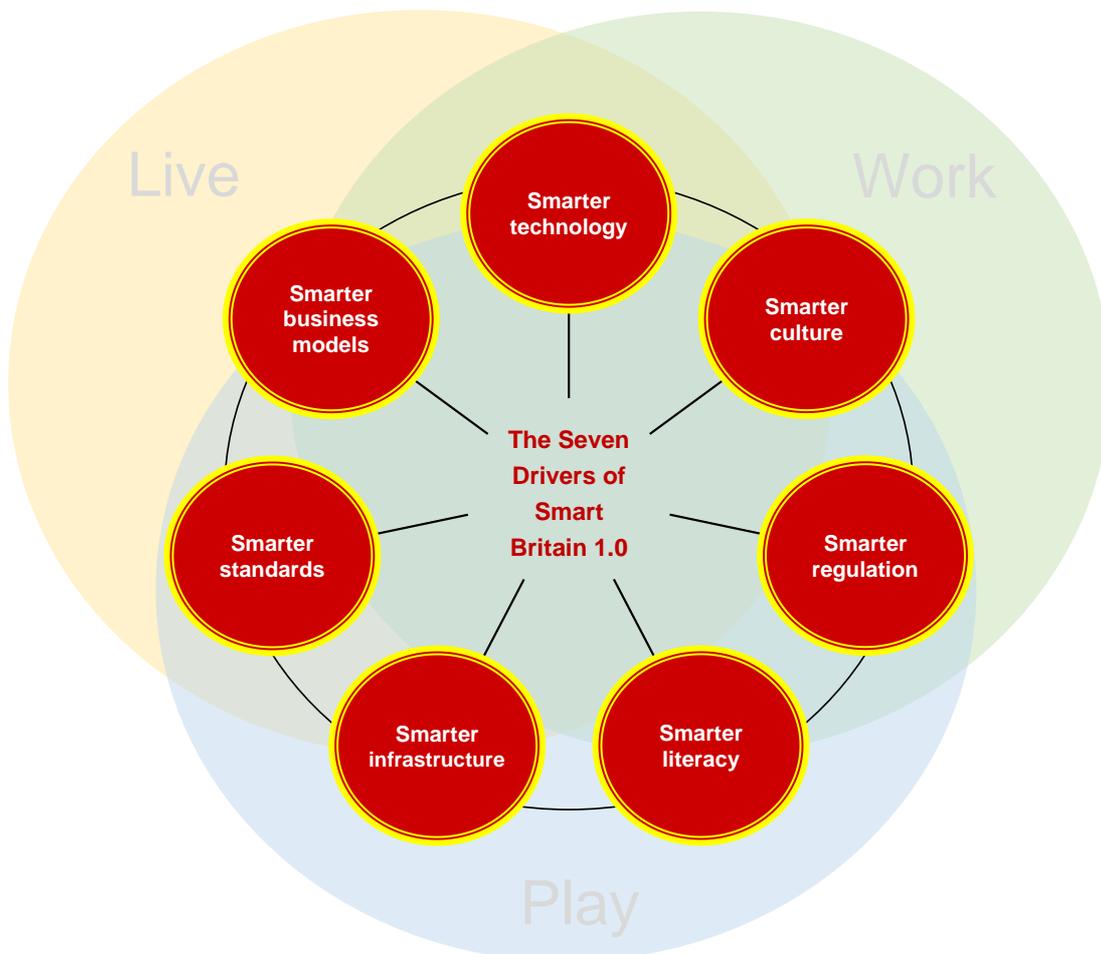
Wilson Wong, Head of Insight and Futures, Chartered Institute of Personnel & Development

2. What will get us there

There is no doubt that 'smart' is a constantly evolving concept. What is considered smart today may no longer be held in similar esteem or ascribed similar aspirational value tomorrow. For example, back in the early 1980s futurists envisioned mobile phones that could allow us to do more than just talking to be the epitome of a technologically sophisticated future. That future is the present, and we continually raise the bar.

While 'smart' is a moving target, it is possible to capture at a particular point in time the key drivers that make a nation smart based on current aspirations and existing understanding of what a smart future looks like. For this reason, and based purely on the outlook from today's vantage point, we present the collective views of our panel of experts in the form of seven key drivers that characterise Smart Britain 1.0.

The seven drivers of Smart Britain 1.0 and the three domains of a smart society



Smarter technology

In brief: what will enable Britain to become 'smart'

- Advances in machine-to-machine communications, or the Internet of Things, that will form the centrepiece of a multitude of smart applications
- Application of technology in solving everyday real-life problems and improving quality of life
- Joined-up, seamless integration of modular systems or technologies
- Ubiquitous and on-demand availability of technology
- Advanced technology in the form of machines that will be part of the Internet of Things

Technology will undoubtedly play a pivotal, if not the most important, role in a future that one would call 'smart'. However, the one type of technology that will be the centrepiece of a multitude of smart applications is machine-to-machine communications, or more commonly known as the Internet of Things. Serial technology entrepreneur Charles Cotton says that sensors connected to the cloud will provide the basis for much of M2M communications. Early manifestations of the Internet of Things can already be seen in the gradual take-up of wearable devices such as smartwatches (e.g. Apple Watch), internet-connected eye glasses (e.g. Google Glass), and apparels with chips that transmit data to other devices (e.g. Lechal smartshoes).

However, one technology expert argues that wearables are no more than part of a much bigger picture. They will eventually evolve beyond the consumer space to affect almost every area of our lives. Take healthcare, for example. Next generation smartwatches, fitness-tracking wristbands, Google Glass, smart earbuds and smart contact lenses will drive change in the way healthcare services are delivered and used, as described briefly in the previous chapter. Ella Jaczynska of GlaxoSmithKline envisions advanced sensor devices will turn smartwatches into platforms for healthcare services, the most basic of which will include heart rate, oxygen and calorie monitoring.

But wearable technology itself is barely scratching the surface of the smart age. The development of smarter technology powered by the Internet of Things is necessary to ensure being smart isn't just about owning and using swish gadgets like smartphones and wearable devices. Rob McNamara of techUK believes that to be a truly smart nation, technological advancement must increasingly affect areas as diverse as energy (e.g. smart metres, smart grids, energy-efficient connected home appliances), local government services (e.g. waste management, parking) and transport (e.g. connected cars, electric vehicle charging), thus enabling us to achieve higher energy efficiency, attenuate climate change, reduce traffic congestion, ease pressures on public transport networks and generally improve quality of life. Chander Velu of the University of Cambridge echoes similar views, particularly on data from mobile banking and payments that can unearth insights on

lifestyle choices, which can in turn be used to better personalise services.

Another form of smarter technology that is essential for enabling a smart Britain is joined-up, seamless integration of modular systems or technologies. Take smart mobility, for example, which is the ability to plan and use the best combination of modular transport systems in a way that adapts to changing travel circumstances and even when the journey is under way. Andrew Everett of the Transport Systems Catapult warns there is much more work to be done here, as current applications have yet to offer the traveller choices based on information and data from multiple sources being analysed and combined. Despite the existence of PC-based travel planning tools and smartphone apps, he suggests:

“There needs to be a much more interactive systems-based approach which answers to the needs and wants of the traveller and is able to act predictively and reactively with real choices in a way that can be easily understood.”

These technologies and their applications, however, are only as good as their availability on demand. State-of-the-art M2M technology that fails to empower users to perform their jobs at the point of need, or that is unable to provide real-time information, defeats its own purpose and stifles the agility that the Internet of Things is meant to enable. Steve Bevan of The Work Foundation believes technology that serves up information on demand, provided there are prudent safeguards against the darker sides such as invasion of privacy, is crucial for the immediacy of customer service, retrieval of operational information and transaction processing.

But the Internet of Things as a concept and a systems-enabling technology is useless without the machines, whose communications it powers. Britain also needs complementary advanced technology, and is best placed to develop and pioneer technology where it has a strong science, engineering and industrial heritage. Automotive technology is a good example. The autonomous vehicle, or the self-driving car as it is usually called, is considered one of the most advanced engineering technologies of the smart age. One expert engineer in autonomous vehicles says Britain must leverage its strengths to “build engines, not upholstery”. He adds:

“We need to build the fundamental technology and not leave this to just California and Germany.”

Although Britain is one of the most technologically advanced nations in the world, we mustn't be lulled into complacency to think that there is no stopping the diffusion of the Internet of Things. Maurizio Pilu of the Connected Digital Economy Catapult warns there are still good, old fashioned technology-related challenges, such as battery life and cost of adoption, that may impede progress.

Smarter culture

In brief: what will enable Britain to become 'smart'

- Increased openness, in both attitudinal and practical terms, to data-sharing
- A data-friendly culture reinforced by trust, responsibility and good data stewardship
- A generally more open attitude and predisposition towards open innovation and co-creating solutions

In broad terms, a smart nation must be driven by a culture that is more open in both attitudinal and practical terms. Specifically, though, this can mean a few things. While not quite referring to a culture of unfettered emancipation, a smarter culture is nonetheless needed to drive Britain into the smart age. A smarter culture manifests itself in three specific ways.

The first is increased openness to data-sharing. The Internet of Things and data, or increasingly big data, go hand in hand – one is useless without the other. The Internet of Things may be viewed as a vast network of pipelines, while data is the actual oil that flows through it. If oil, rather than the pipelines, has been the treasured commodity in the world's production-orientated economy, data should now be held in similar esteem in the digital economy. The increase in the volume, velocity and variety of data makes for more meaningful applications, such as personalisation of services, integration of modular systems and M2M communications. But such increase is often made possible by people's willingness to share personal data, which is usually generated as a by-product of everyday activities.

"Britain does have a critical mass of early adopters and a culture that is disposed to experiment with smart technology. The problem is that the gulf between it and the wider culture is too large."

Will Hutton, Big Innovation Centre and University of Oxford

"Large swathes of the digital/internet economy rely, without explicit consent, on personal data."

Maurizio Pilu, Connected Digital Economy Catapult

Britain is moving in the right direction in this regard, according to Pilu and IBM's Chris Nott. Most people are willing to share some relevant personal information when they know they are receiving an improved service in return. For example, sharing location

information through smartphones in exchange for more relevant transport information appears to be a reasonably widespread practice. Many shoppers, too, are happy to reveal their purchasing patterns through loyalty card schemes in return for relevant money-off vouchers or savings on fuel purchases. Irene Ng of Warwick University concurs by pointing out that Google has long shown that people are willing to share their personal information for search results that are more targeted. Wilson Wong of the Chartered Institute of Personnel

and Development meanwhile argues that data-sharing is all the more important in the delivery of value-added services, which are a key feature in Britain's services-dominated economy.

The second cultural manifestation is trust and responsibility, which are relatively more difficult to inculcate. However, the willingness of society to share data hinges to a large extent on the level of trust people have in how their data is handled and used, which calls for the exercise of responsibility and good stewardship on the part of those who collect, store, analyse and use personal information. Pinduoduo believes that sections of society that withhold explicit consent to the sharing of their personal data do so because they feel a lack of control over the eventual use of the information or fear that their data may somehow be leaked.

Likewise, Ng stresses that the current situation where firms hold increasing amounts of personal data without being transparent on its use is only making consumers nervous, which can in turn hamper future data-sharing. Data-sharing isn't exclusive to the private sector. The increasing digitisation of public services

relies heavily on the supposition that users are willing to put their personal data in the hands of the government, or the private entities tasked with implementing the online systems. Harvey Lewis of Deloitte foresees the most likely factor that may hold people back from accessing public services online when all 25 exemplar services are rolled out next year will be the lack of confidence in data security.⁷

"Data subjects need to be reassured that they can trust the organisations holding it and that its use will be ethical."

Chris Nott, IBM

It is therefore essential for all sections of British society to join forces in building a culture of trust and responsibility in data-sharing. As Roland Harwood of 100%Open suggests, any party, private or public, that wishes to benefit from people's sharing should first demonstrate

"I believe organisations should be open by default, but individuals should also have their privacy protected by default."

Roland Harwood, 100%Open

value to build trust, and thereafter grow a trusting relationship. Lewis calls for greater transparency, in that private and public sector organisations should ensure consumers and citizens understand what personal data is collected and how it is used, as this helps to build trust, which in turn increases engagement. Trust can also be

strengthened by evidence of responsible use of personal data. This may involve finding new ways of giving control to people. A pioneering way forward may be Ng's Hub of All Things concept, which, through partnership and a digital market platform, enables companies to create a data exchange relationship with consumers.

The third is a generally more open attitude and predisposition towards co-creation. To all intents and purposes, democratising access to data by making data open and free is an important step in the right direction. Open data that is rich and relevant enables everyone to

⁷ For more information on what these 25 exemplar services are, see <https://www.gov.uk/transformation>.

access and use it to understand more about society, the economy and the things that interest them. It also encourages co-creation, as data providers make available a virtual sandpit for developers to experimentally build on. An alternative to free open data would be developer-friendly licences at reasonable costs. Tim Brooke of the Future Cities Catapult underscores the importance of co-creation in the development of smart cities. Precisely because it is difficult for most people to imagine innovative and feasible solutions for future urban living, society's participation in open trials and prototypes can not only demonstrate the value of joined-up solutions but also spawn innovations that fit well into people's lives.

Smarter regulation

In brief: what will enable Britain to become 'smart'

- Data protection legislation that strikes the right balance between proper protection and enabling data-driven innovation
- Legal and regulatory frameworks that are appropriate for the age of machine-to-machine communications (e.g. reform of road traffic laws and insurance liabilities to cater to autonomous vehicles)
- Short- (e.g. immigration) and long-term policies (e.g. education) that can more effectively address the shortage of higher level data skills

To be smart, Britain must support frontier technologies and an enabling culture with smarter regulation. This refers to policy, legal frameworks and legislation that drive our march towards the era of smart, not impede it. They must empower society to make informed decisions, but also at the same time afford adequate and reasonable levels of protection for privacy and security.

Given that a data-friendly culture, i.e. one where sharing and responsible stewardship are the norms, is absolutely critical for the Internet of Things to flourish, a strong and clear legal framework that allows people to understand who is responsible for what is the minimum requirement. On more specific levels, and by virtue of being part of the European Union, this will require clear European data protection legislation that strikes the right balance between proper protection and enabling data-driven innovation. Hasan Bakhshi of Nesta warns that British and European policymakers must also ensure that the intellectual property regime does not hamper the efforts of European data businesses to compete with their US counterparts, whose regime is far more enabling. Given that Britain and Europe are already way behind the US, overzealousness in data protection may eventually prove penny wise, pound foolish.

Similarly, legislative shortcomings may hold back progress in other areas that are expected to characterise smart living. The autonomous vehicle is one of such areas, where a motor industry expert argues that, for self-driving cars to fulfil their potential to be part of an

intelligent transport system, legislation will need to allow them on public highways without driver supervision. Justin Anderson of Flexeye adds that legal issues and insurance liabilities in the event of an accident will also need to be established if the Internet of Things technology that underpins the autonomous vehicle were to succeed. While Britain is expected to begin trials of autonomous vehicles on public roads in 2015,⁸ we are already way behind the US, where legislation for driverless cars has been passed in Nevada, Florida, California and Michigan.

Another key policy area that is critical for progress has to do with skills. It has been widely documented that UK businesses already face severe skills shortage in the data economy. Addressing this will require both short- and long-term measures. In the interim, it is clear we need to reconsider some recent policies on immigration that have exacerbated the shortage by making Britain unattractive to foreign data talent. In the longer term, however, there needs to be wider systemic change in Britain's education system from schools to universities, primarily with the aim of producing a workforce with higher level data skills, as well as more scientists and engineers.

In brief: what will enable Britain to become 'smart'

- General digital literacy, covering basic aspects such as proficiency in using digital devices, online skills and digital communication skills
- Higher level data literacy, which is about being aware of where and how our data is collected, stored and used, and knowing the implications of these
- Enhanced user empowerment; that is, being able to make the most of digital technology and applications for our everyday living and to solve problems
- Professional data skills developed through the education system
- The norm of lifelong and multi-mode learning (formal, informal, through multiple resources)

Smarter literacy

Britain is without doubt a highly literate nation, with 99% literacy rate, insofar as literacy is defined in traditional terms, i.e. population aged 15 and over with five or more years of schooling.⁹ But the types of literacy that are needed to propel us towards becoming a smart nation are quite different.

⁸ BBC News (2014), "UK to allow driverless cars on public roads in January", *BBC*, 30 Jul, <http://www.bbc.co.uk/news/technology-28551069>, accessed on 21 Oct 2014.

⁹ *The World Factbook*, Central Intelligence Agency, United States of America, <https://www.cia.gov/library/publications/the-world-factbook/fields/2103.html#xx>, accessed on 21 Oct 2014.

One is general digital literacy. This refers to very basic digital skills, including those such as proficiency in using digital devices (computers, mobile and smartphones, tablets, smart TVs, wearables), online skills (web browsing and searching) and digital communication skills (texting, emailing, using social media). Many of these have been championed by Go ON UK and given considerable attention by the Digital Skills Committee in the House of Lords. With our ever growing generation of digital natives, it is not inconceivable that Britain's general digital literacy will soon catch up with our traditional literacy rates. There are already clear signs we are heading in the right direction, as more than one in ten children aged 3-4 now have their own tablet, and twice as many children aged 5-15 are now using a tablet to go online compared to last year.¹⁰

“Too many people lack the self-confidence and self-belief to engage with ‘smart’. They think it is geekish.”

Will Hutton, Big Innovation Centre and Oxford University

But what Britain really needs to develop is higher level data literacy, which is about being aware of where and how our data is collected, stored and used, and knowing the implications of these. Being data-literate at a higher level means the individual can exercise choice, insofar as it is within one's power to do so, in determining what personal data one should share, when and where it is safe to reveal certain personal information, and how to reasonably safeguard one's privacy online. Nott echoes this by emphasising the importance of being guarded in the information one provides or offers, overtly or implicitly, through digital footprints because of the ease by which it can be shared and reused once it is in a public or semi-public digital domain. For example, sharing location data through smartphones in exchange for real-time travel information may be useful, but announcing to the world on Twitter one's regular travel patterns may compromise personal and household security. Similarly, performing online banking transactions on encrypted sites and WiFi connections may be far more prudent than doing so on unsecured public hotspots. Higher level data literacy enables people to be confident that their data brings them some value and is handled ethically, and makes them aware of what they need to do to protect themselves.

“Social media in the context of the presence of the rest of the internet allows for citizens to learn, consider, develop, and discuss new ideas.”

Ben Hammersley, Wired

Another form of smarter literacy is in the aspect of user empowerment, or simply put being able to make the most of digital technology and applications for our everyday living and to solve problems. Our use of social media illustrates this point. People use social media (Twitter, Facebook, Instagram, LinkedIn etc.) for a variety of reasons.

But that which makes society stand out as smart is using social media to achieve a higher purpose. As Ng suggests, these may include using them as a sounding board for ideas, to curate real-time news and on-the-ground information, to crowdsource opinions from buying food to choosing holidays, to keep in touch with friends and family, to mobilise groups or communities for action that may range from a neighbourhood clean-up to street parties, and

¹⁰ Ofcom (2014), *Children and Parents: Media Use and Attitudes Report*, London: Office of Communications.

even for creating serendipitous opportunities to connect with friends of friends who could contribute to different pursuits. Jaczynska points out that social media is also transforming the provision of health services. Through ‘social media listening’ (e.g. FluTracker on Twitter) useful data in unstructured conversations may be collected and insights derived on certain potential side-effects of drugs or the possibility of an epidemic developing.

The fourth type of smarter literacy has to do with professional data skills developed through the education system. As discussed in the previous section, the data economy that to a large extent forms the bedrock of a smart nation requires professionals highly proficient in data science. Towards this end, both Lewis and Nott argue Britain needs a new national curriculum that teaches children as young as five about algorithms and computer programming, practical handling and exploration of data, and the practice of using insights from facts and evidence in decision-making.

A critical aspect in developing smarter literacy, though, is to consider the way contemporary British society learns. While traditional literacy can be developed primarily by schooling, literacy for the smart age requires a mixture of both formal (e.g. education curriculum, professional courses) and informal methods (e.g. behavioural modelling, trial and error), as well as the norm of lifelong learning. Learning resources, too, have moved on considerably from the days when print materials were dominant to an age where people increasingly learn through a combination of print and digital (offline and online), both in real-time and on demand. Will Hutton of the Big Innovation Centre and University of Oxford, however, sounds a note of caution by warning that Britain still lacks a system of lifelong learning that allows individuals to escape cultural, educational and skill traps. This, though often glossed over, has warranted little attention and may be an institutional impediment that slows progress towards a smart nation.

Smarter infrastructure

In brief: what will enable Britain to become ‘smart’

- Ubiquitous access to the internet and high-speed broadband
- Reliable, ubiquitous and high-bandwidth mobile coverage that is fit for purpose in the age of the Internet of Things (e.g. 5G, white space)
- Coordinated, joined-up infrastructure in cities

Even if we have a highly literate society with an open, data-friendly culture, and where the Internet of Things and other enabling technologies are supported by fit-for-purpose regulation, Britain may still fall short of becoming a smart nation due to a common Achilles heel – infrastructure. Without widely available, reliable and high quality infrastructure, no amount of good ideas and projects will get off the ground. While it may sound implausible to some, as Britain is a nation blessed with more than decent infrastructure from

telecommunication networks to roads and the built environment, the lack of infrastructure *appropriate* for the smart age in pockets of Britain is a very real problem that warrants serious attention. This refers specifically to all the relevant infrastructure necessary for M2M communications to flourish.

Lewis warns that another probable factor that may hold people back from accessing public services online when all 25 exemplar services are rolled out next year is simply internet access. In very rural areas of Britain regular and reliable access to the internet or high-speed broadband remains scarce. A mobile communications expert warns that while mobile coverage in Britain is better than in many other parts of the world, it is still not up to scratch if we are to consider deploying Internet of Things technology. For example, a voice call will invariably drop between Waterloo and Wimbledon stations, let alone data connectivity. There are also still many black spots – even within London and Greater London – where attempts to get a mobile signal are often futile.

In order for machines to communicate with each other over mobile spectrums, there has to be ubiquitous and high-bandwidth coverage – even in tunnels. It is expected that in due course, 4G will no longer be adequate to carry gargantuan amounts of data, hence the need for Britain to invest in 5G or alternative technology such as television white space. Just as in the development of autonomous vehicles, we are already somewhat behind others. The South Korean government has already invested \$1.5bn in upgrades that should see a trial 5G network rolled out in 2017, with a view to connecting the rest of the country by 2020.¹¹

“We need a world class communications infrastructure. techUK are therefore supporting the Government’s Digital Communications Strategy consultation.”

Rob McNamara, techUK

Another important aspect is the degree to which infrastructure is joined up. This is particularly pertinent for the development of smart cities, where much hard work can be undone by poorly coordinated infrastructure. Brooke calls for decision makers to make more holistic, joined-up decisions on infrastructure and the built environment within cities, much of which is currently siloed. For instance, traffic-related infrastructure and systems may be focused on improving traffic flow while missing the implications for the environment.

Smarter standards

In brief: what will enable Britain to become ‘smart’

- Common protocols and standards that enable the interoperability of machines and systems
- Operating systems for the Internet of Things

¹¹ Gross, D. (2014), “South Korea spending \$1.5 billion for ‘5G’ network”, *CNN.com*, 22 Jan, <http://edition.cnn.com/2014/01/22/tech/mobile/south-korea-5g/>, accessed on 21 Oct 2014.

Infrastructure without appropriate supporting standards will be less effective, if not altogether unworkable. To become a smart nation, Britain needs protocols, standards and systems that support the Internet of Things. At this nascent stage, there is understandably fragmentation of standards and a lack of any common ones, thus preventing interoperability of machines. In fact, Pilu warns that fragmentation and a lack of standards and interoperability are holding back the market and innovation. Various companies have thus far created connected devices or appliances using different codes. The thermostat talks to the blinds, but not necessarily to the car. Samsung connected devices may not be on talking terms with, for example, those from Nest Labs. Or put simply, machines that are supposed to communicate do not speak the same language.

“Open standards that allow things to work simply and without requiring people to buy into different manufacturers’ ‘worlds’ are crucial for the diffusion of the Internet of Things.”

John Mathers, Design Council

While there is a World Wide Web for the internet, some common programming languages and several computing operating systems, there is currently nothing common within the Internet of Things. Anderson believes that the network effects of publishing data in a common format that could be easily read by machines can dramatically unleash the

potential of the Internet of Things and spawn new business models. The Government’s £8m funding for the development of the HyperCat standard specification, backed by a consortium of 40 technology and communications companies,¹² is a step in the right direction, as is ARM’s development of the mbed operating system for the Internet of Things.¹³

Cotton foresees that the Government and the British Standards Institution will face the usual contention between advocates of licensed and unlicensed wireless technologies, but there will certainly be requirements for new standards and protocols in the most critical areas, such as security. While history has shown that standards will inevitably follow new technology, Britain, just as in the days when Sir Tim Berners-Lee invented the WWW, is well placed to play a leading role in developing smarter standards and protocols that will define the Internet of Things, and by extension the smart age, for years to come.

¹² Athow, D. (2014), “UK government injects £1.6m to finance HyperCat IoT standard”, *Techradar*, 21 Aug, <http://www.techradar.com/news/internet/data-centre/business-software/world-of-tech/future-tech/software/applications/uk-government-inject-1-6m-to-finance-hypercat-iot-standard-1262388>, accessed on 8 Oct 2014.

¹³ Kelion, L. (2014), “ARM creates operating system for ‘internet of things’”, *BBC*, 1 Oct, <http://www.bbc.co.uk/news/technology-29410999>, accessed on 2 Oct 2014.

Smarter business models

In brief: what will enable Britain to become 'smart'

- New and sustainable business models that can justify the investment required to participate in the market for the Internet of Things
- Large-scale demonstrators to show clear value in investing in frontier technologies, and thereby inspiring others to join in
- Attractive value propositions to encourage wider population take-up of connected devices and appliances and innovative services
- Business models that are characterised by deep personalisation, mass customisation, horizontalisation and co-creation

All things considered, the one missing driver that may stunt Britain's progress towards a smart nation is new and appropriate business models. Many of the current popular business models are based on asset sale and value exchange. For instance, car manufacturers sell us cars and pharmaceutical firms, drugs. In the age of autonomous vehicles and smart healthcare services, it may be more appropriate if we were sold mobility and integrated health solutions. We may not necessarily need to own driverless cars to meet our travel needs, and a combination of drugs and technology-enabled personalised services may better achieve desired healthcare outcomes. Business models in the era of smart will most likely include, as highlighted in our previous report, features such as deep personalisation, mass customisation, horizontalisation and co-creation.¹⁴

The need for smarter business models is a recurrent theme in our consultation with our panel of experts. A leading technologist and McNamara, for example, both believe that sensible

"An openness to potential new business models is definitely needed."

Andrew Everett, Transport Systems Catapult

business models wrapped around innovative technology are the main driver of the Internet of Things, as sectors such as utilities, healthcare and public services need compelling ways to create, deliver and capture value from new propositions offered to consumers. Pilu warns that the lack of business models that provide clear incentives to invest is slowing the diffusion of the Internet of Things. By using intelligent transport systems as an example, a motor industry expert concurs that the most critical enabling factor will be the creation of a sustainable business model that justifies the investment required to establish the operating system for a smart travel network.

Velu and Jaczynska meanwhile believe healthcare services will be one of the key areas where new business models are fundamental for the Internet of Things to take off, with far reaching implications on the delivery and pricing of health services. Velu adds:

¹⁴ See Levy, C. and Wong, D. (2014), *Towards a Smart Society*, London: Big Innovation Centre.

“Innovative business models will be necessary, particularly as new ecosystems of medical professionals, pharmaceutical firms, food manufacturers and technology providers could emerge to form close-knit networks for the provision of integrated health solutions.”

In order to spur business model innovation, Anderson and Pilu suggest large-scale demonstrators are needed to show clear value in investing in frontier technologies, and thereby inspire others to join the bandwagon. In the context of smart transport systems, Everett believes there must first be an appreciation by industry members (e.g. vehicle manufacturers, infrastructure providers, data and analytics providers) that there is a future market to play for and that they must be willing to invest for the long term. However, this must come with a long-term and holistic approach to legislation that allows for the trial and application of new ideas, fundamental solutions to the legal and insurance liabilities, and regulatory frameworks that support the development and exploitation of intellectual property.

“Many fewer concerns seem to be expressed when there is an explicit value exchange which returns some benefits to the data subject.”

Chris Nott, IBM

While most of the discussion has centred on new business models that provide compelling reasons for businesses to invest and participate in the development of technologies, products and services that revolve around the Internet of Things, due consideration must also be given to the demand side of the

market. Consumers may still be very reluctant to accept new propositions or adopt new technology applications if they fail to see the value in doing so. Returning to the theme of data-sharing, which is central to future business models whether in healthcare, automotive, utilities or retail, Ben Hammersley of Wired believe some are still apprehensive about sharing personal information even in return for personalised products or services because they perceive the value exchange to be insufficiently convincing. Similarly, value propositions attached to connected appliances (smart TVs, fridges, washing machines, etc.), autonomous vehicles and integrated health solutions have to be convincing enough to encourage adoption on a scale feasible for the wider diffusion of the Internet of Things.

3. Gauging our progress: The ‘Smart’ Scorecard

From the expert insights presented in the previous chapter, it is quite clear that we have some way to go before we can call Britain ‘smart’. There are still obvious gaps within each of the seven drivers that need to be addressed in order to make the quantum leap into the smart age. What is also clear, though, is we have today an idea of what Smart Britain 1.0 looks like and what will get us there.

The journey towards smart has begun, but how far we have travelled when all the disparate aspects of smart are put together remains unclear. There is therefore a need to continuously **measure our progress towards becoming a smart nation**. This points to the need for a simple and intuitive mechanism to periodically gauge how smart our society has become.

By integrating expert insights on the seven drivers and the earlier evidence on the three domains (work, live, play), we introduce a ‘Smart’ Scorecard for this very purpose. The Scorecard has been developed to reflect the most salient points raised by the experts, as well as the most pertinent and practical aspects that, taken together, determine the degree to which we have become smarter. The Scorecard can be further developed into a simple app-based tool to crowdsource the population’s response, and therefore gauge progress. An early prototype of the tool can be reviewed here:

https://qtrial2013.qualtrics.com/SE/?SID=SV_9Tt4wkD8IFNK8Yd

The ‘Smart’ Scorecard

QUESTION 1

Please rate the quality of internet access on your smartphone where you live.

- Connectivity (i.e. signal strength)
5: Very good 1: Very poor
- Speed (i.e. how quickly pages would load)
5: Very good 1: Very poor

QUESTION 2

How many wearable tech devices do you have (e.g. smart watch, fitness-tracking wristbands, Google Glass, smart earbuds, smart contact lenses)?

- Four or more
- Three
- Two
- One
- None (to supplementary question)

If you don't have any, how likely are you to own one or more of these in the next 12 months?

- Very likely
- Quite likely
- Undecided
- Quite unlikely
- Very unlikely

QUESTION 3

How many connected devices or smart appliances do you have at home (e.g. smart fridge, smart washing machine, smartphone-controlled light bulbs, smart TV, intelligent thermostat)?

- Four or more
- Three
- Two
- One
- None (to supplementary question)

If you don't have any, how likely are you to own one or more of these in the next 18 months?

- Very likely
- Quite likely
- Undecided
- Quite unlikely
- Very unlikely

Note: 'Smart' appliances, also known elsewhere as connected devices, are those that are connected to the internet, meaning they can be controlled from your smartphone/tablet or can communicate with other appliances, or both.

QUESTION 4

How often do you use mobile banking or mobile payment (i.e. banking transactions or paying for purchases on your smartphone)?

- All the time
- Very often
- Sometimes
- Rarely
- Never (to supplementary question)

If you haven't used mobile banking or mobile payment, how likely are you to use it in the next 12 months?

- Very likely
- Quite likely
- Undecided
- Quite unlikely
- Very unlikely

QUESTION 5

How often do you use smartphone apps to help plan your travels or commute (e.g. to find the shortest route or quickest combination of transport)?

- All the time
- Very often
- Sometimes
- Rarely
- Never (to supplementary question)

If you have never used these apps, how likely are you to use them in the next 12 months?

- Very likely
- Quite likely
- Undecided
- Quite unlikely
- Very unlikely

QUESTION 6

Given the opportunity, how prepared are you to travel in a self-driving car?

- I would jump at the first opportunity
- I would seriously consider
- Probably, but I would let others try it first
- I remain to be convinced
- Thanks, but no, thanks

QUESTION 7

How willing are you to share information about yourself on websites in order to receive personalised services?

- Very willing
- Quite willing
- Undecided
- Not very keen
- Will never do so

QUESTION 8

How much do you trust companies to use and manage your personal data responsibly?

- I trust them completely
- I trust some of them
- I'm not sure who to trust
- I do not trust most of them
- I do not trust any of them
- I'm hopeless

QUESTION 9

How confident are you of your ability to protect your own data?

- Completely confident
- Very confident
- Somewhat confident
- Not very confident

QUESTION 10

Of all the public services that are available online (e.g. benefits, driving licence, GP appointment), how many do you use?

- More than five
- Three to five
- One or two
- None (to supplementary question)

If you don't use any, how likely are you to use one or more in the next 12 months?

- Very likely
- Quite likely
- Undecided
- Quite unlikely
- Very unlikely

QUESTION 11

Whatever your occupation, how equipped are you with the relevant technology or devices to access on-demand all the information you need to perform your job?

- I am well equipped
- I am adequately equipped
- I can be better equipped
- I need so much more
- It is simply impossible to get my job done most of the time

QUESTION 12

Which of the following do you use social media/networks for? (select as many as relevant)

- To keep in touch with friends and family
- To make personal or work-related announcements (e.g. wedding, product launch, publication)
- To obtain breaking news/information, as an alternative to mainstream news media
- To research the background or activities of someone or a group
- To mobilise communities or groups of friends to do something collectively (e.g. for a BBQ, for a local village event, to launch a campaign, to raise funds)

QUESTION 13

How do you usually learn?

- Through print materials such as books and magazines
5: All the time
1: Very rarely
- Through digital resources such as the internet, apps and dedicated software
5: All the time
1: Very rarely
- By using a combination of devices such as a computer, smartphone, tablet and TV
5: All the time
1: Very rarely

QUESTION 14

Do you watch television programmes on multiple devices? (select as many as relevant)

- Computer
- Tablet
- Smartphone
- Smart (internet-connected) TV
- None of the above – only on my traditional television set

SUPPLEMENTARY QUESTION 1

What is the main reason that is holding you back from using/owning (more) connected devices or smart technology?

- Cost (too expensive)
- Data privacy and security
- Lack of proficiency (don't know how to use them)
- Infrastructure (e.g. lack of high-speed broadband or 4G)
- Scale of adoption (I'll use when the majority of people are using it)
- Don't see the need (happy with what I have)

SUPPLEMENTARY QUESTION 2

Which age group do you belong to?

- Under 20
- 20-29
- 30-39
- 40-49
- 50-59
- 60 and above

SUPPLEMENTARY QUESTION 3

What is your gender?

- Male
- Female

SUPPLEMENTARY QUESTION 4

Please provide the first part of the postcode where you live (e.g. PE3, SW19, SW1P).

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