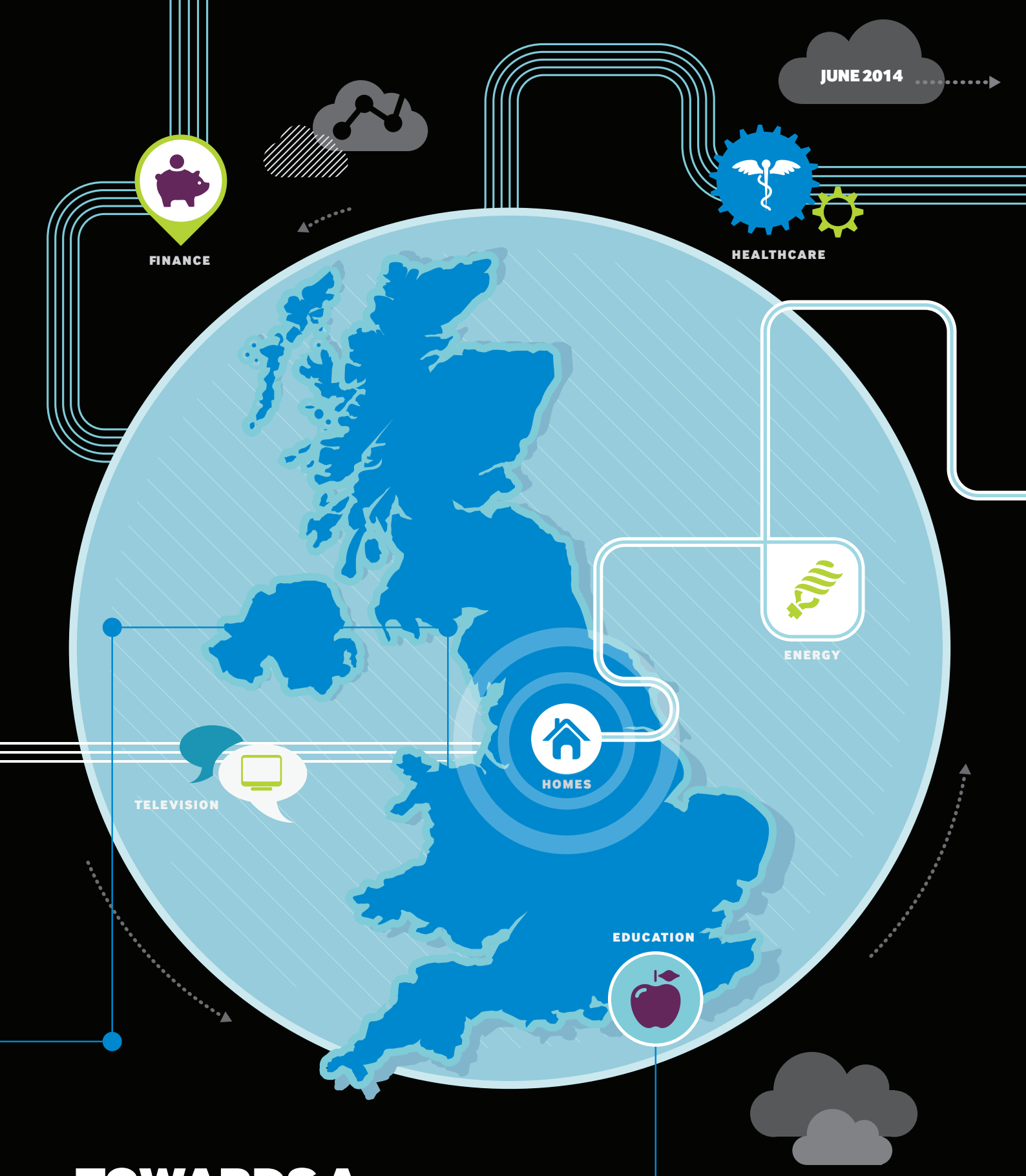


TOWARDS A SMARTER SOCIETY

Written by: Charles Levy, *Senior Economist* and David Wong, *Researcher,* in partnership with Samsung UK.

BIG INNOVATION CENTRE

SAMSUNG

"It is clear analogue Britain is no more, it's digital Britain, and at Samsung our role in this evolution is to empower people through technology."

Andy Griffiths, President, Samsung Electronics UK and Ireland

"Smart society will see the acceleration of the internet of everything..."

Will Hutton, Chair, The Big Innovation Centre

About the Big Innovation Centre

Launched in September 2011, it brings together a range of companies, trusts, universities and public bodies to research and propose practical reforms with two ambitions: to make the UK a global open innovation hub, as part of the urgent task of rebalancing and growing its economy; and to build a world-class innovation and investment ecosystem by 2025.

For further details, please visit www.biginnovationcentre.com.

Towards a smarter society...

"Being smart is a moving target..."

The rise of digital technologies is transforming almost every aspect of modern life. Data on everything from our health to the location of the 53 bus can be used to improve our day.

The Internet of Things, M2M (machine to machine) hyper-connectivity, wearable technology, intelligent living and ubiquitous computing are all increasingly important areas.

The common underlying agenda here is around new forms of connectivity, new types of digital relationships, and opportunities presented by the greater integration of connected technologies into everyday live.

A smart society is one which has found ways to maximise these opportunities. A smart society 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; and ultimately to improve health, wellbeing and the quality of life.

Our research confirms that the UK is becoming smarter. Our citizens are incredibly open to exploiting the benefits of the digital world. Our design strengths and the quality of our institutions means that we excel at bringing together many of the key players needed to exploit the new and unpredictable opportunities presented by digital.

However, being smart is a moving target. As one of the individuals we interviewed for this project put it: "there will be no moment of promised land". This research identifies five key enablers for the future development of our smart society.

About this report

This is a provocation paper produced by the Big Innovation Centre and is the first product of a year-long collaboration with Samsung UK. It reflects the views of a panel of 20 experts and commentators. These panellists were selected following an extensive review of existing evidence on the impact of digital technologies on our lives. Each has expertise in a particular area of the smart society.

This paper is intended to provoke discussion of these issues at a project workshop on the 12 June. Further outputs from the research will include two case study papers focusing on particular areas of smart, and a final summary report.

Overall our programme of work focuses on three interrelated questions:

1. *How far towards a smart society has the UK progressed? And how far can it go?*
2. *What are the barriers to the development of a successful smart society in the UK?*
3. *What do we need in place to give us the best chance of developing a smart society in the UK in the future?*

We would like to thank those who contributed to this report.

Their contribution has been invaluable – and we would welcome other contributions to this important debate.

Ben Hammersley, *Wired*

Charles Cotton, *Serial Tech Entrepreneur*

Charles Leadbeater, *Author and opinion leader*

Clare Reddington, *iShed and The Pervasive Media Studio*

Derek White, *Barclays*

Ed Tallis, *GSK*

Ella Jaczynska, *GSK*

Martin Garner, *CCS Insight*

Martin Hall, *Salford University*

Mike Short, *Telefonica*

Professor Irene Ng, *Warwick Manufacturing Group*

Raj Sivalingham, *TechUK*

Roland Harwood, *100%Open*

Steve Bevan, *Director, The Work Foundaiton*

Tim Brooke, *Future Cities Catapult*

Volker Buscher, *Arup*

Will Hutton, *Chair, Big Innovation Centre*

Wilson Wong, *Chartered Institute for Professional Development*

“ WE ARE A DIGITAL SOCIETY IN THE PROCESS OF BECOMING A SMART SOCIETY.”

The UK is becoming smarter

The digital opportunity is simply enormous. Global social and economic systems are being re-configured at an incredible rate. Connectivity is increasingly reshaping our world and in many ways is redefining the way we work, live and play. It takes some effort to find many corners of the world today not touched by the internet. Newly released figures from the United Nations International Telecommunications Union show that the uptrend on internet penetration and mobile phone use will continue.

Digital networks are now reaching far beyond our computers and handheld devices at a rapidly increasing rate. This agenda is about the development of a digitally linked network of objects sharing information. Gartner estimates that by 2020 we will have 26 billion devices connected to the internet excluding PCs, smartphones and tablets. ABI Research suggests that this figure could be in excess of 30 billion.

> “In the past 8 to 10 months we have seen the same amount of data on our UK networks as we saw delivered between 2000 and 2010.”
>
> **Mike Short,** *Telefonica*

This shift reaches far beyond technology. Its economic impact is almost too significant to quantify. Many have attempted to measure the value of the digital economy and estimates vary depending on what is being measured. Booz & Co data shows that the connected digital economy contributed £860bn to world GDP between 2007 and 2012.

But digital, data and connectivity are much more than a market. It is best thought of as a general purpose technology. As outlined throughout this paper they are things which are impacting on and changing every industry and every occupation and are likely to be the biggest source of economic growth over the next decade or so.

In many ways it appears that the UK is at the forefront of this change and are exploiting these opportunities to improve people’s lives. Our panellists were clear that the UK is becoming smarter. Some contended that we had become a digital society and that we were now in the process of trying to convert that into a smart society.

The UK is already the most internet-based economy of the G20.[1] This is a great starting point for embracing the next generation of digital technologies. It shows that our population is perhaps more willing than anywhere else in the world to explore the possibilities and embrace the benefits associated with digital technologies.

17% OF UK RESIDENTS

would be more willing to give up showering than using the internet for a year.[2]

Our research also identified a further set of drivers underpinning the UK’s strengths as a smart society. These revolve around our status as a hub for ideas. Many panellists identified the UK’s creativity as a driver of our success. Design and design thinking were identified as core commodities for the smart society. As a global design hub and a leading location for related creative industries, the UK has an opportunity to be a leader here.

Our deep institutional architecture for knowledge sharing was also identified by the panel as a key UK asset for the smart society. Academic-industry relationships have been invested in strongly and exist at depth. As with any area there is always room for improvement, but recent research from the Big Innovation Centre confirms that university-business collaboration is a key UK strength.[3] The UK was also identified by panellists as having a culture for multi-disciplinary working which is truly enabling of collaborations.

> “The UK’s strength is in joining things up in smart ways.”
>
> **Martin Hall,** *Vice-Chancellor of Salford University*

This was identified as key for exploiting a smart agenda which is cutting across such a diverse range of areas. Smart appears to be equally important for the future of motorsport, advertising and healthcare. This means that suddenly there are many more lessons to be learnt from looking across different domains of live.

In looking at the smart society this project focuses on the impact that the changes associated with digital advance are actually having on people’s lives. Through six deep-dives we explore how digital technologies are changing how we live, work and play.

> “We are on the right track, as the UK is very well positioned. We have a cosmopolitan society, we are strategically located between the East and the West, and we have a strong heritage in science and technology, as well as a diverse and creative economy.”
>
> **Roland Harwood,** *100% Open*

1. How we live is changing

Smarter homes and the empowered individual

Most people welcome smart automation of 'mindless' (i.e. routine and low discretion) tasks, such as lights that work based on sensing human presence in the room and dishwashers that automatically turn on during cheaper tariff periods and when fully loaded. But most people wish to remain in control of their lives and have the final say in making choices.

Few want a pizza automatically ordered this weekend just because they happen to be at the same location and having broadly similar conversations on Facebook and Twitter as when one was ordered for each of the past three weekends.

The concept of a smart home is one which makes us us smarter and more empowered, rather than just making things smarter. Most people have two major concerns regarding smart homes. The first is that they fear connected devices will enable firms to collect by stealth even more data about themselves and their behaviours, thus infringing on their 'right' to data privacy.

> "The HAT holds data generated by us and, most importantly, **owned by us.**"

There are clear worries about digital visibility and exposing our personal data – the fear of firms knowing too much about us and using, sometimes abusing, that knowledge for commercial gains. There is also the unwelcome and already much loathed situation where we are constantly bombarded with an ever increasing barrage of offers and recommendations of products or services that we neither need nor want.

The second is that, they fear the loss of autonomy and homogenisation of choice and behaviour. Having smart appliances do everything for us – from automatically switching to our favourite television channel at a given hour and determining the right mix of detergent and conditioner in our washing machine, to suggesting what we should wear today based on information from our diary and the weather forecast.

The smarter, more empowered 'we' will be made possible by the Hub of All Things **(HAT),** which is both a personal data warehouse and a multi-sided market platform.[4] Smart sensors embedded in multiple home devices and appliances, as well as placed in appropriate and strategic places within the home, collect personal data that represents our 'quantified selves'. The data collected is different from secondary data generated by companies, such as supermarkets (through our loyalty cards), e-tailers (through our online buying and browsing behaviour), programme streaming providers (through our watching behaviour) and internet giants (through our search and browsing patterns). This is siloed, vertical data on a relatively small part of our lives, but to which we are not usually accorded access in return.

The **HAT**, on the contrary, creates a repository of data about us, generated by us and, most importantly, owned by us, so that we can apply our own data onto new services and offerings. Because the personal data collected is in essence highly contextual, and because we own it and control how it should be used, it becomes valuable for trading with companies in exchange for highly customised and personalised products and services that better meet our needs. For example, contextualised data that integrates how much (e.g. five tubs a week) and which brand of yoghurt we consume (Alpro), when and where we consume (usually during Eastenders and in the living room), what we do at the time of consumption (usually while also watching television), how frequently we replenish the stock in our refrigerator (once a week) and what other food products we usually consume (dairy-free and organic products) can be mashed with demographic/household data – but they are all on our fingertips; we decide if we would like to share it with the likes of Tesco, Sainsbury, Alpro, Müller, Netflix, Amazon, Google, Aviva, Barclays, or even our own GP.

The **HAT** therefore augments digitally sophisticated smart homes by empowering the individual to participate in the 'personal data economy', make better everyday decisions, and generate smarter monetary and time savings. As the **HAT** is obviously a very appealing concept to individuals and households, its adoption is widely anticipated to dramatically escalate once launched, thereby creating huge network effects. Birmingham City Council is already embarking on a 18-month £485,000 project to trial the HAT with volunteer households and individuals.[5]

> "A smart society is an empowered society. Most research inevitably focuses on technology. For some reasons, the human being is excluded. I'm very keen not on the smart 'thing', but the 'smart me'."

Professor Irene Ng
University of Warwick

Smart homes are creating opportunities for both business and individuals. Connected and intelligent devices make our lives easier, more productive and more delightful; data owned by individuals preserves privacy, put us in greater control of our lives and enables us to make better and more autonomous decisions; a market for exchange of data and commercial offerings can emerge, leading to innovative business models and new markets; and we are all incentivised to generate more data with confidence.

This is an area of global growth. Ove Arup have identified a Smart City opportunity of
£400BN GLOBALLY BY 2020.[7]

Smarter healthcare and health management

Digital technologies are not only creating new health products, but smart is facilitating a change in how we manage our health. Smart is supporting a shift from a focus on cure towards a broader view of wellness management and healthy living.

One vision of the future would be a world in which digital sensors scan your body, and communicate remotely with healthcare professionals who are able to use massive health datasets to analyse the information. Based on this, highly personalised and daily set of medication could then be 3D printed as a pill for you to take with next to no interference in your daily routine.

Shifts such has these are requiring a re-thinking of how our healthcare system is configured. New sets of collaborative relationships between technology companies, pharmaceutical and medical device manufacturers, and healthcare professionals are emerging and will be required to further advance this agenda.

A key enabler of these relationships will be trust around how these players use and share our data. But health data is highly personal and sensitive. Panellists contended that we will need a new generation of smart health consumers to advance this agenda.

Smarter cities

Intelligent systems are improving how we interact with the urban environment. We now have buildings which monitor pollution. We could have buildings which can offer their users personalised, real-time and location-specific updates on dust or pollen levels across a site helping to mitigate health issues. We now have up-to-the-minute data on our transport networks and systems which can not only tell us exactly where the nearest bus to work is, but can chart the best route for us to work today given the road works around the corner, the knock-on effects of a broken track 10 miles away and our preference for longer walks to work on sunny Fridays, but not cloudy Tuesdays.

The notion of a smart city is a well developed narrative. The smart city agenda was described by panellists as 'the use of technology to shape a better world'. It involves the capture of data to make our urban systems more efficient. By measuring more things, and by measuring them more accurately it is possible to optimise the system to perform more strongly.

Looking internationally we see examples of digital technologies being used to tackle issues as diverse as energy management technology, water management systems, transport management, waste management, and assisted living.[6] The key theme here is using digital technologies to join up better link services and operations at the urban level.

The Transport Systems Catapult estimates the global market for intelligent mobility and integrated transport solutions could be worth £900bn by 2025.[8] Our research has identified that the UK is widely seen as a global leader in developing smart cities. This is perhaps a surprise, given that unlike in many of the examples above, we are not currently building new cities. However it appears that we do have a critical mass of individuals with expertise in many of the key areas for the development of the smart city agenda. The Future Cities Catapult has recently been established with a view to linking up these strengths. Their initial assessment identifies these assets.

> "The UK has a business ecosystem full of top companies in project management, data analysis, engineering, architecture, energy, the digital economy, finance and professional services – all the expertise needed to develop workable solutions is here. It also has world-class research capabilities in the built environment and city systems. And a unique culture of innovation."

Future Cities Catapult (2014)
Who we are and what we do

A UK example cited by a number of participants was the Oyster card system in London. The introduction of a single digital payment technology hasn't just saved passengers the hassle of buying tickets, it is helping to improve how the London transport system runs. For example data on how we use the system makes it possible to plan maintenance in ways which minimise disruption by focusing on routes when most users have an alternative.

Panellists suggested that better building a sense of play, fun and creativity into the design and development of these systems could help to engage users by delivering a human side to understand technological opportunities. As Leadbeater argued in a recent paper from the Centre for London,[9] smart cities work best when they combine systems and empathy. Systems are needed to ensure effective and efficient running of the repeatable, transactional and quantifiable.

2. How we work is changing

Smarter jobs
The presence of digital technologies is opening up new areas of work. Digital technologies are creating new industries – for example the UK employs 850,000 information technology and telecommunications professionals[10] – and throughout this paper we have offered examples of digital technologies driving increasing value across other industries.

In the past the technological limit for computerisation appeared to be the ability of machines to handle highly variable, non-routine and cognitively complex tasks. There is no simple set of rules for how to manage a legal practice, for example. However, it appears that digital technologies are entering a new era of complexity. Massive data sets, machine learning and other advances mean it is increasingly possible to break down large problems, such as driving a car into manageable challenges which can be modelled by computers. Dr Carl Benedikt Frey argues that this is already and will increasingly place a premium on three types of work in our society:[11]

- *Perception-rich activity – our ability to rapidly discern between objects and ideas in highly complex environments.*
- *Creative Intelligence – computers and digital networks struggle to discern between and value creative ideas. Eric Schmidt put it that "There's something about humans that technologists always forget. Humans are creative and unpredictable".*[12]
- *Social intelligence – our ability to understand people and the subtlety of their messages means that we can add the greatest value to computers when roles focus on understanding people.*

These are the activities where human activity and digital technologies show the greatest complementaries. The significance of perception, creativity and communication-based work is important. It implies that training in arts and humanities, our ability to understand people, to think imaginatively, could be just as much of an enabler for the smart society as a good grasp of science, technology, engineering and maths.

Smarter coordination at work
Digital technologies are allowing us to re-think how we manage our workplaces.

A trend identified by panellists was the increased use of digital to augment and improve people management practices.

Recruitment appears to be changing most quickly. It appears that using automated systems for applications and even algorithms to scan CVs is changing the role of the human resources department from delivering a recruitment process towards managing a process. This is freeing up resources to invest when recruiting for a non-standard position, to invest in more in each face-to-face meeting with candidates or to look for the truly creative or distinctive individual. Panellists suggested that this change on the side of employers is being matched by applicants embracing new technology. It was suggested that together this shift is improving the functioning of our labour market and delivering better matching between roles and employees.

Panellists suggested that data driven metrics are also becoming more significant performance management tools. Metrics reach far beyond estimates of the value of productive capacity and span indicators as diverse as company/sector networks, locational information, as well as health and wellbeing measures. Termed human capital metrics, over the next five to ten years we can expect the digital information which some managers have and use to support decisions will become the organisational norm.

Panellists also identified a second trend. Many organisations report a new generation are entering work is seeing new opportunities to introduce digital technologies. Often termed 'Millennials' many are keen to use these to work more flexibly than before. There also appears to be a very high willingness among younger workers to either use their own devices (a trend known as Bring Your Own Devices, BYOD) or to invest their own money on technology to improve how they work.

This trend was identified as an incredible opportunity for many organisations to unlock user-led solutions and to improve productivity. It appears that unlocking the next level of gains from this agenda will require major reconfiguration both of IT support infrastructures, but also in line management support. Survey evidence indicates that high users of technology are also likely to be caused the greatest stress by it.[13]

A vision of a future smart world of work has often been articulated. A combination of connected work devices, smart joined-up reporting systems and intelligent sensors can usher in a truly post-bureaucratic workplace, where, instead of hierarchical supervision and overly intrusive monitoring being the norm, everyone takes responsibility for the success of the whole and trust replaces suspicion as the default behaviour.[14] Technology can be a 'leveller' by democratising the organisation and empowering employees at all levels with information – the frontline sales representative is not only equipped with all the real-time information that he needs for performing his job and making decisions on the spot, but also has as much access to information as senior management. Open book organisations can now truly live up to the billing. These enhance the sense of parity and increase the motivation to participate and engage. Smarter coordination through platform technology fosters stronger collaborative organisational cultures, and thereby enhances commonality.

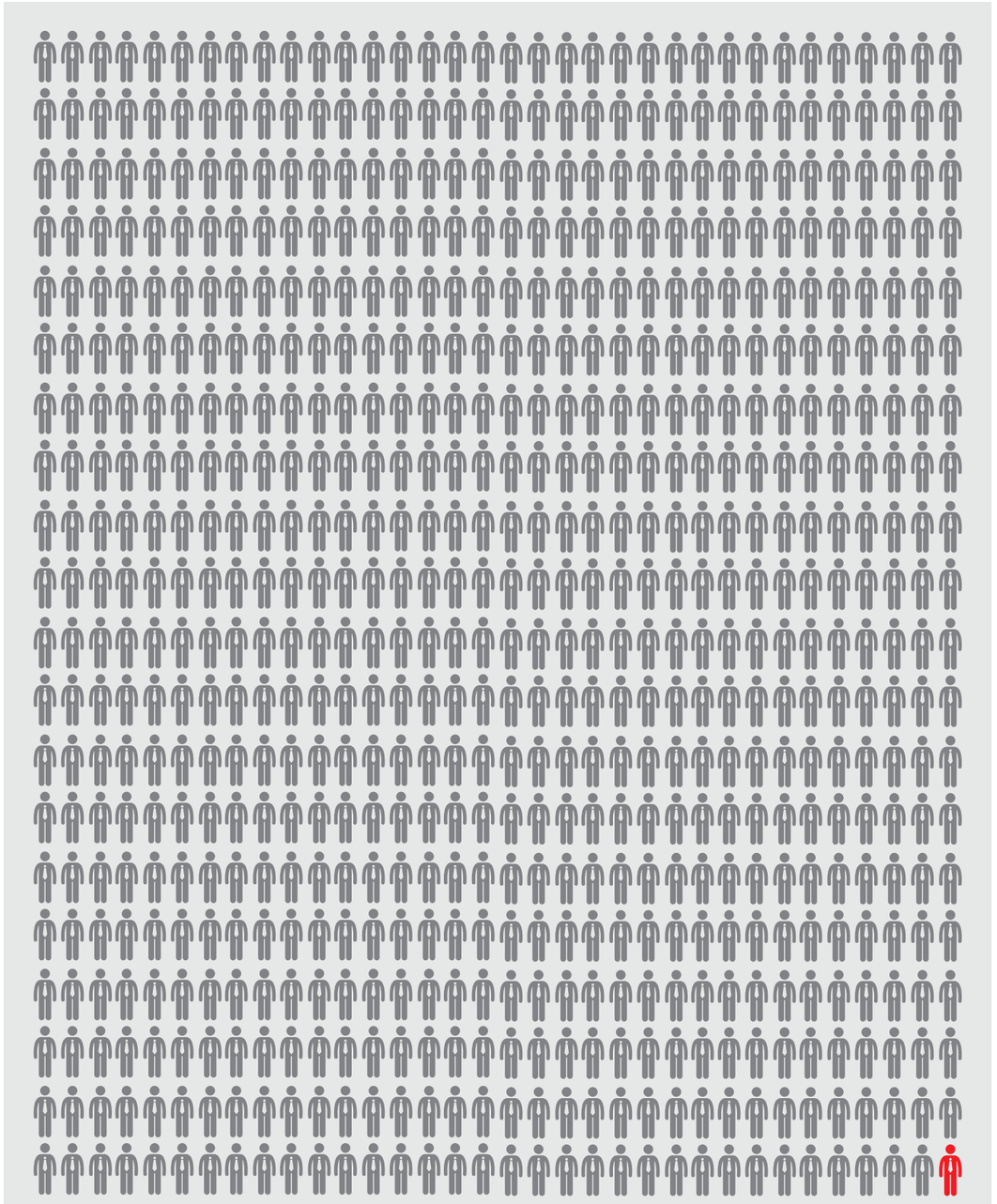
3. How we play is changing

Smarter socialising through social media
The emergence of on-line virtual communities is creating new opportunities for us to socialise and connect. The use statistics for UK social media hint at how highly people value these services. Facebook has 31.5 million UK users (24 million of whom log on each day), [15] Twitter has 15 million,[16] and LinkedIn 10 million.[17]

These mass-use platforms offer people new ways to keep in touch with the people they are interested in. Here, or on blogs, we are able to passively push out information about our lives offering others the choice to interact with us or to ignore. Now when we meet up our friends already know that we went to Hong Kong last month and can jump straight into discussing how it was.

Panellists contended that it would be down to users to ensure find ways to get the greatest benefits from the next wave of advances in social media. Key enablers identified here included users building a deeper appreciation of privacy implications associated with social media use as well users finding ways to prioritise and manage the flow of information from multiple social media platforms.

Chapter Two: *The Uk is becoming smarter*



850,000 PROFESSIONALS

number of information technology and telecommunications employed in the UK

= 1250 people

How the smart society is improving our lives

Smart is enabling new ways for us to relate to each other. Relationships are at the heart of the notion of smart society, and digital technologies appear to be changing the ways we relate to each other. Whether it is about the way we connect with each other, the spatial and temporal dimensions of our communication, the breadth and depth of our connections, or the meanings that are conveyed and experience shared, the use of new connected technologies and networks changes the dynamics of our relationships through the following five levers[18]:

Directness
We can see and interact with each other more directly in real time as a result of digital technologies that enable real-time visuals such as video conversations via smartphones or conferencing devices. Richer, non-verbal cues detectable in face-to-face contact enable candid and quick exchange of ideas, and minimise the possibility of messages getting lost in interpretation or being wrongly decoded, thus avoiding future misunderstandings. For example, Corning, the manufacturer of glass and ceramics, discovered that 80% of their innovative ideas came from face-to-face contact, and that the engineers were only willing to walk a maximum of 100 feet from their desks to talk to somebody else.[19]

Continuity
Digital technologies also allow for continuous and more regular interactions, particularly when it is neither possible nor desirable to meet in person, or when we are geographically dispersed. Think about still being able to call home to wish mum happy birthday when one is unable to get home due to work commitments, or to hold routine weekly catch-ups with a client based in another region, or enable our GP to monitor our condition without us stepping into the surgery. The increased continuity in interactions that communication technology promotes can be instrumental in strengthening family bonds, as a study shows that three quarters of teenagers feel having a mobile phone makes them closer to their parents.[20]

Multiplexity
Increased directness and continuity in relationships often lead to higher levels of multiplexity, that is having deeper knowledge of others and wider understanding of situational contexts in relationships. Because of the health devices we choose to use, our GPs are able to monitor our health conditions more closely and regularly. This makes it possible for healthcare professionals to better understand our health history and lifestyles, and re-purpose the relationship towards a deeper discussion focusing on potential interventions, management of conditions and education. The wise and prudent use of social media, for example, allows us to regularly keep loved ones and friends informed of each other's activities or whereabouts.

Teachers at all levels are also able to use increasingly sophisticated student performance data, new communication platforms and advanced digital tools to better connect with their students. Smart sensors and connected devices and systems Smart systems that enable automatic performance logging and data reporting cut out paperwork or bureaucracy, thus freeing up time for teachers to interact with pupils and to build a stronger relationship and understanding.

Parity
Digital technologies are a leveller – they enable all sections of society to engage with each other on equal footing. Digital technologies in personal banking are changing the relationship we have with our banks. We are moving towards a culture of DIY in banking where we can take more control.

Commonality
We are increasingly able to focus our relationships on striving towards common goals when there is shared purpose in our relationships. In the workplace our managers have increasingly large amounts of information about our performance which can be used to better support development. The use of technology within teams means that individual roles can be more specialised with an improved division of labour among colleagues, or even across our labour market.

Smart is opening up new business model possibilities

The most radical effects of technological innovation are nearly always associated with new business models, yet this is often the part of innovation we understand least well. Our evidence suggests that smart technology creates 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 characterised by the following five interrelated key features.

Platforms and networks
Because the Internet of Things and machine-to-machine communication technologies will underpin hyper-connectivity that is the crux of the smart society, business models that harness the power of platforms and networks will be increasingly common. Platforms create multi-sided networks, where consumers, businesses and government interact in smarter ways to create value. [21] This will have profound implications on the way we live, work and play.

For example, the smart home augmented by the Hub of All Things platform effectively creates smart households. Businesses use the HAT platform to provide more personalised and tailored products and services to households. Armed with real-time information and being in control of our personal data, households will be able to make better everyday decisions, including spending on food and non-food items, energy usage, choice of diet and amount of exercise to be undertaken. Social media that are already so pervasive in our society today are essentially platform-based business models that enable the creation and spread of networks.

Big data
If platforms and networks are the engine of smart applications, big data is the fuel that powers that engine. Business models where platforms are an integral part harness the potential of huge amounts of data to deliver products and services that improve our quality of life.

Autonomous vehicles combine high volumes of real-time structured and unstructured data – 1GB per second, or 2 petabytes a year[22] – and predictive algorithms through Complex Event Processing (CEP) to afford us the convenience of getting around safely without actually driving,[23] an undoubtedly welcome assistance in heavy rush hour traffic. Similarly, the HAT combines massive amounts of our personal data collected by smart sensors, and layers them with context through triangulation, to help us make better decisions and obtain products and services that better meet our needs.

Deep personalisation and mass customisation
Digital technologies enable fresh approaches to the manufacturing, design and delivery of almost everything, hence allowing products and services to embed digital interfaces for personalisation and connectivity. Smart defies paradox – the emergence of novel business models that allow the masses to custom-purchase by deeply personalising their acquisition means products and services can better fit our lives.[24]

Deeper personalisation and mass customisation generate new ways for individuals to receive different experiences from a common platform, whether it be the use of 3D printing to create individually tailored shoes, or using an algorithm to tailor the experience of a video-on-demand service such as Netflix. Our smartphones are arguably the most deeply personalised device we own. High-end hotels similarly offer highly tailored hospitality down to the minute details. But in the era of smart, this trend becomes the norm, and is accessible to the masses, as it will commonly extend to personalised healthcare services, energy tariffs, financial products and even dining and leisure experiences

Horizontalisation
Thanks to connected devices and smart platforms, business models of the future are also able to increasingly transcend verticals and provide a previously unimaginable array of services on a single hub. The smartphone is the catalyst of this revolution. While we previously needed to purchase and carry the camera, alarm clock, calculator, DVD player, laptop, mp3 player, maps, satnav and notepads as separate items, they all now form a neat, and easily obtainable, collection in our smartphone. There is no doubting the convenience and efficiency gains we enjoy from a one-stop shop.

The era of smart living will usher in many more of such hubs. For instance, our smart TVs and tablets, too, can be the 'control centre' of the HAT at home, enabling us to adjust everything from radiator levels and lighting to washing machine and dishwasher timers. Perhaps even more engaging for the family is the role of the smart TV in further enhancing our omnichannel shopping experience. Not only can we use the smart TV for online shopping similar to the way we currently do so on the PC or mobile devices, we are also able to identify a dress seen worn by our favourite actress and instantly discover where we can purchase it, place an order and arrange for collection – all these while sharing the joy of discovery, and perhaps even some banter with the family. Smart TVs with smart sensors, or those connected to other smart devices, can also perform a quick scan of our iris, or read data from a diagnostic patch applied on our wrist, and produce basic diagnoses of our health condition every day, and thereafter provide a range of lifestyle options we can choose from.

Co-creation and democratisation of production
Our role within production networks and value chains in a smart society is radically transformed. No longer are we passive buyers of goods and services that firms roll off the production line and market to us. Because of the boundless possibilities enabled by a combination of connected devices, big data, digital technologies and smart platforms, we are able to actively participate in the production process and engage more closely throughout the value chain. The era of smart is the era of co-creation.

Through the HAT, for example, we can co-create products and services that fit our needs and wants almost perfectly by supplying our context-rich personal data to businesses of choice and public services.

The smart society will also experience a democratisation of production as a result of deep personalisation and co-creation that is enabled by 3D printing. Smart additive layer manufacturing technologies have the potential to place production choices much more in the hands of individuals, resulting in disruption to traditional supply chains in similar vein to what happened in the music industry. The individual will enjoy an unprecedented level of autonomy and choice.

Five enablers of smart society UK

The evidence presented earlier confirms that the UK is becoming a smarter society. To date three factors have been highlighted as underpinning our progress: our consumers' willingness to embrace the digital revolution, our capacity for design and creativity, as well as our ability to link up, join or combine multiple agendas to create value. But, as with any technical, economic and social shift on this scale society will need to evolve to keep on benefiting.

Progress in the last decade has been immense, but this research has identified five areas which we will need to focus on if we want to maximise the gains from the next wave of smart society developments:

1. A data friendly culture, reinforced by trust and responsibility

Data is the currency of the smart society. Flows of information are at the core of almost all of its benefits. The rise of data is creating countless possibilities, but these will not be realised without a culture of trust and confidence about how data is used.

2. Empowered and digitally literate citizens as enablers of the smart society

A key element of building trust is developing understanding and knowledge. It is important that consumers understand the benefits when they share data. That they know when they are taking risks. And they know how to avoid sharing data with organisations which they do not trust. This ability of citizens to be in control of their own data was highlighted by a number of panellists as a vital enabler of greater trust in data and a way to drive the responsible use of data across our ecosystem. This may require us to think very differently about data ownership.

The smart society and digital technology in general has the potential to be an incredible force for inclusion. The internet is an incredible open source of knowledge and many digital markets have low barriers to access and require low levels of capital for start-up. [25] Delivering empowered and digitally literate citizens will be crucial for realising this opportunity.

3. Empowered public institutions offering smart leadership

Smart is much more than a technology question. The case of smart cities outlined earlier shows the complex interactions between technology, citizens and democracy. There are increasing opportunities for governments to help invest in the platforms, relationships and networks to open up new opportunities from the smart society.

4. Enabling infrastructures

The rise of digital technologies is inevitably making increasing demands on our infrastructure. Increasing public and private investment will be required to meet these demands and to put in place an environment in which creativity and innovation can flourish.

It is important to consider both hard and softer enabling infrastructures. A number of panellists identified one area of data management as a key enabler.

5. Enabling open platforms and open markets

Connectivity, a theme that is central to a smart society, is not just about technology. It is also very much about people; in fact, it is ultimately all about people. Success in building a smart society will depend on our ability to bring people together. This agenda is not about citizens in isolation, nor businesses, governments or universities on their own. It is not even about the bilateral interactions alone. It is about engagement in smart networks. The collective efforts of all are needed to co-create open platforms, new products and services, and new markets that will ultimately serve the purposes and needs of society.

Next steps

Smart is an evolving and an aspirational concept. As a society we need to continue evolving and aspiring towards a better, smarter future. The UK is on the right track, although the future development of our smart society will only be secured if we can build a data friendly culture, deliver truly empowered digital citizens, develop the capacity of our public sector to support this work, invest in key elements of infrastructure, and collaborate to unlock new open platforms and open markets.

This paper reflects the views expressed to us in interviews with our panel of experts as well as our supporting research. This work has drawn on the Big Innovation Centre's three core themes: work to map innovation ecosystems, to enable open innovation and capturing value from the rise of general purpose technologies.

The next steps for this project will be for us to test these messages with our panel of experts as well as a wider number of stakeholders. We will be selecting a number of topic areas to go into in more depth and will be reporting the findings from our research later in 2014.

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