General Certificate of Education
Advanced Level Examination
June 2015

General Studies (Specification A)

GENA4/PM

Unit 4 A2 Science and Society

Case Study Source Material

To be opened and issued to candidates on or after 1 March 2015

A For use with **Section A**

- The material consists of five sources (A, B, C, D and E) on the subject of **Smart Technology**. These extracts are being given to you in advance of the Unit 4 examination to enable you to study the content and approach of each extract, and to consider issues which they raise, in preparation for the questions based on this material in Section A.
- A further Section A source (F) will be provided in the examination paper.
- Your teachers **are** permitted to discuss the material with you before the examination.
- You may write notes in this copy of the Source Material, but you will **not** be allowed to bring this copy, or any other notes you may have made, into the examination room. You will be provided with a clean copy of the Source Material at the start of the Unit 4 examination.
- You are not required to carry out any further study of the material than is necessary for you to gain an understanding of the detail that it contains and to consider the issues that are raised. It is suggested that three hours' detailed study is required for this purpose.
- In the examination room you are advised to spend approximately one hour and fifteen minutes reading a previously unseen extract and answering a range of Section A questions based on all the source material.
- The Preliminary Material is to be seen by teachers and candidates **only**, for use during preparation for the examination on Thursday 18 June 2015. It **cannot** be used by anyone else for any other purpose, other than as stated in the instructions issued, until after the examination date has passed. It must **not** be provided to third parties.

There are no sources printed on this page

Source A: Figures 1 to 5

Figure 1: A minute in the digital world

Source: Infographic by GO-Gulf.com, 2011, Copyright 2014 IBT Media Inc. All rights reserved.

Turn over ▶

Figure 2: Internet Use (data on adults aged 16+ in UK)

(a) Frequency of Internet use, 2007 to 2013

Year	Daily		At least weekly		Less than weekly		Did not use	
	(Millions)	%	(Millions)	%	(Millions)	%	(Millions)	%
2007	20.7	45	7.3	16	3.0	6	15.3	33
2010	29.2	60	6.3	13	1.7	3	11.1	23
2013	35.7	73	4.2	9	1.6	3	7.4	15

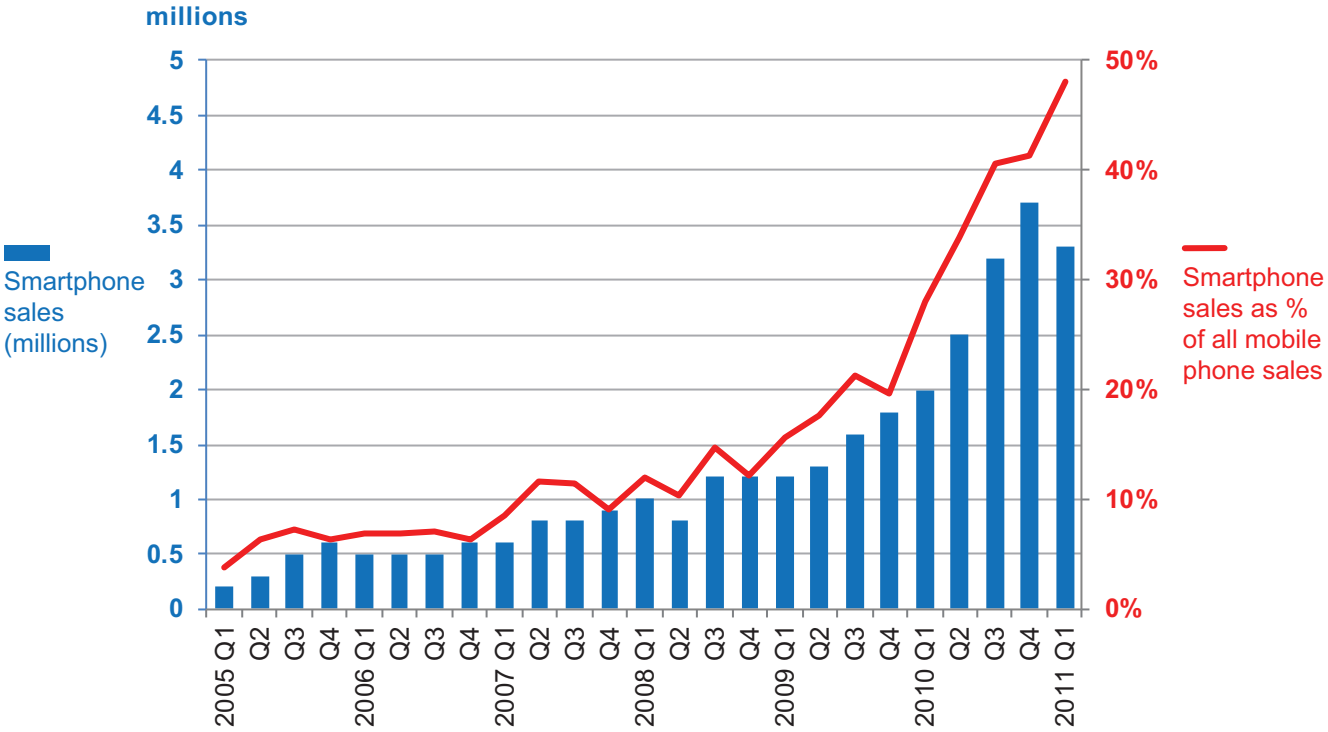
(b) Selection of Internet activities by age group and gender, 2013 (and *All in 2007*)

	16-24	25-34	35-44	45-54	55-64	65+	Men	Women	All	*(All in 2007)*
Percentages (%)										
Sending/receiving emails	87	89	86	81	72	44	78	72	**75**	*57*
Finding information about goods and services	65	77	77	74	69	41	69	64	**66**	*58*
Reading or downloading online news, newspapers or magazines	69	72	66	57	49	23	60	49	**55**	*20*
Social networking, eg Facebook or Twitter	93	84	66	50	29	11	52	55	**53**	-
Using services related to travel or travel related accommodation	46	65	58	56	51	29	50	50	**50**	*42*
Internet banking	55	76	62	50	43	23	54	47	**50**	*30*
Consulting wikis	60	55	52	44	40	18	48	39	**43**	-
Looking for information about education, training/ course offers	62	40	38	31	17	8	30	32	**31**	*25*
Downloading software (other than games software)	55	47	35	27	18	10	40	22	**31**	*16*
Looking for a job or sending a job application	45	39	30	23	12	1	25	22	**24**	*14*
Online consultations/ voting on civic/political issues	6	8	10	7	8	6	8	7	**7**	-

(c) Internet use on a smartphone, 2010 to 2013

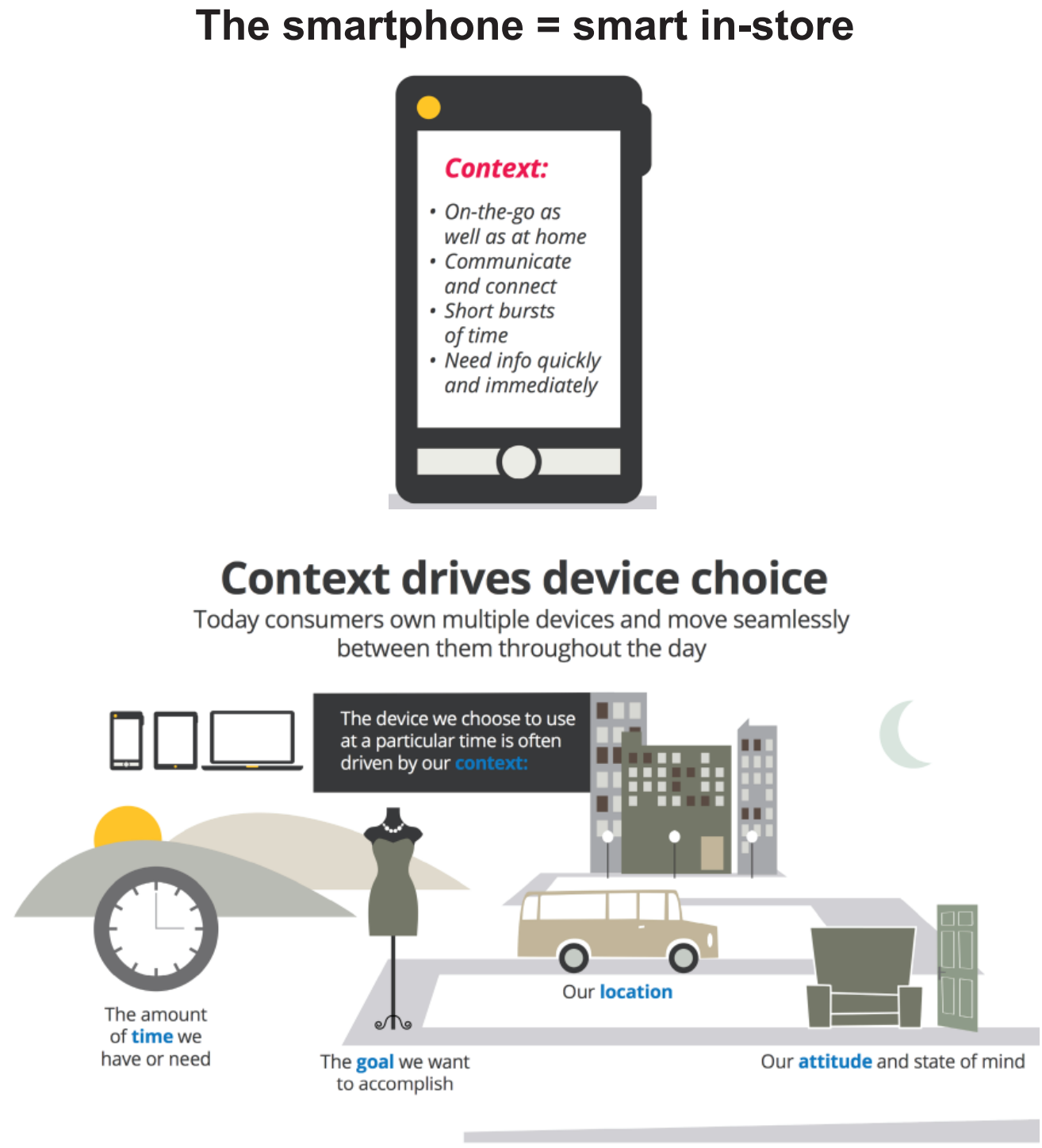
	2010	2011	2012	2013
Percentages (%)				
All	**24**	**36**	**51**	**53**
Men	29	42	56	57
Women	19	30	46	49
Age group				
16–24	43	70	87	89
25–34	44	62	81	83
35–44	30	46	69	70
45–54	21	29	46	51
55–64	9	16	29	29
65+	2	3	8	9

(d) UK smartphone sales, 2005 to 2011



Source: Figs 2a, b & c, data from ONS, © Crown copyright
Fig 2d, based on factual point-of-sale information, Ofcom © 2006–2011

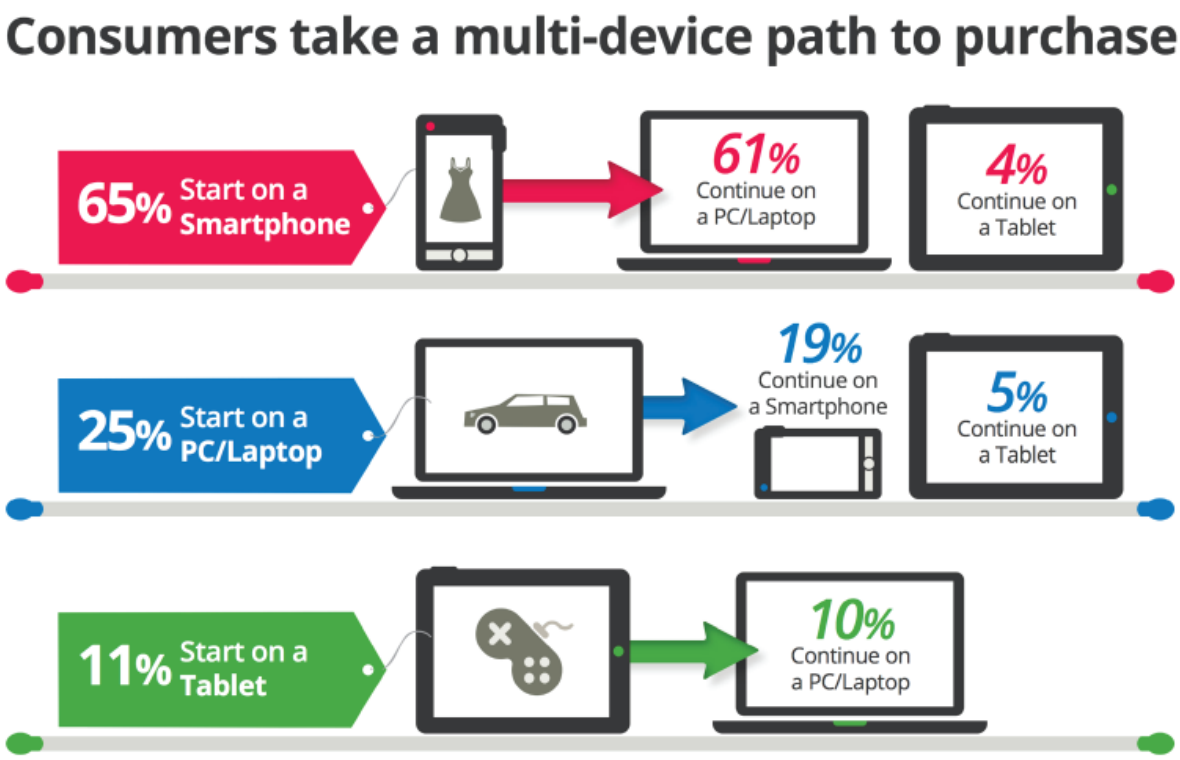
Figure 3: Smart Shopping / Smart Retailers



- Shopping with tablets and smartphones increased 18% in 2013 and mobile phones and tablet computers are now used for nearly 6% of all retail sales, as Brits embrace shopping from the sofa, the train and under the duvet.

- Easy-to-use and now cheap tablet computers are opening up online shopping to a much broader range of consumers, including the less well-off and the older shopper.

- The development of 'click-and-collect' services has accelerated the switch from the high street to online. Industry experts have predicted that in 2014 total online sales will rise by 17% to £107 billion after rising 16% to £91 billion in 2013.



- With technology that shoppers can carry around in their pocket, they can use it to compare prices at other stores or online retailers, and they can check out product reviews. 67% of those who shop online complete their purchase using more than one device.

- Shoppers under 35 are three times more likely to use social networks, call, text, or email a friend for information and advice, and 70% say they use their smartphone as a critical tool whilst shopping.

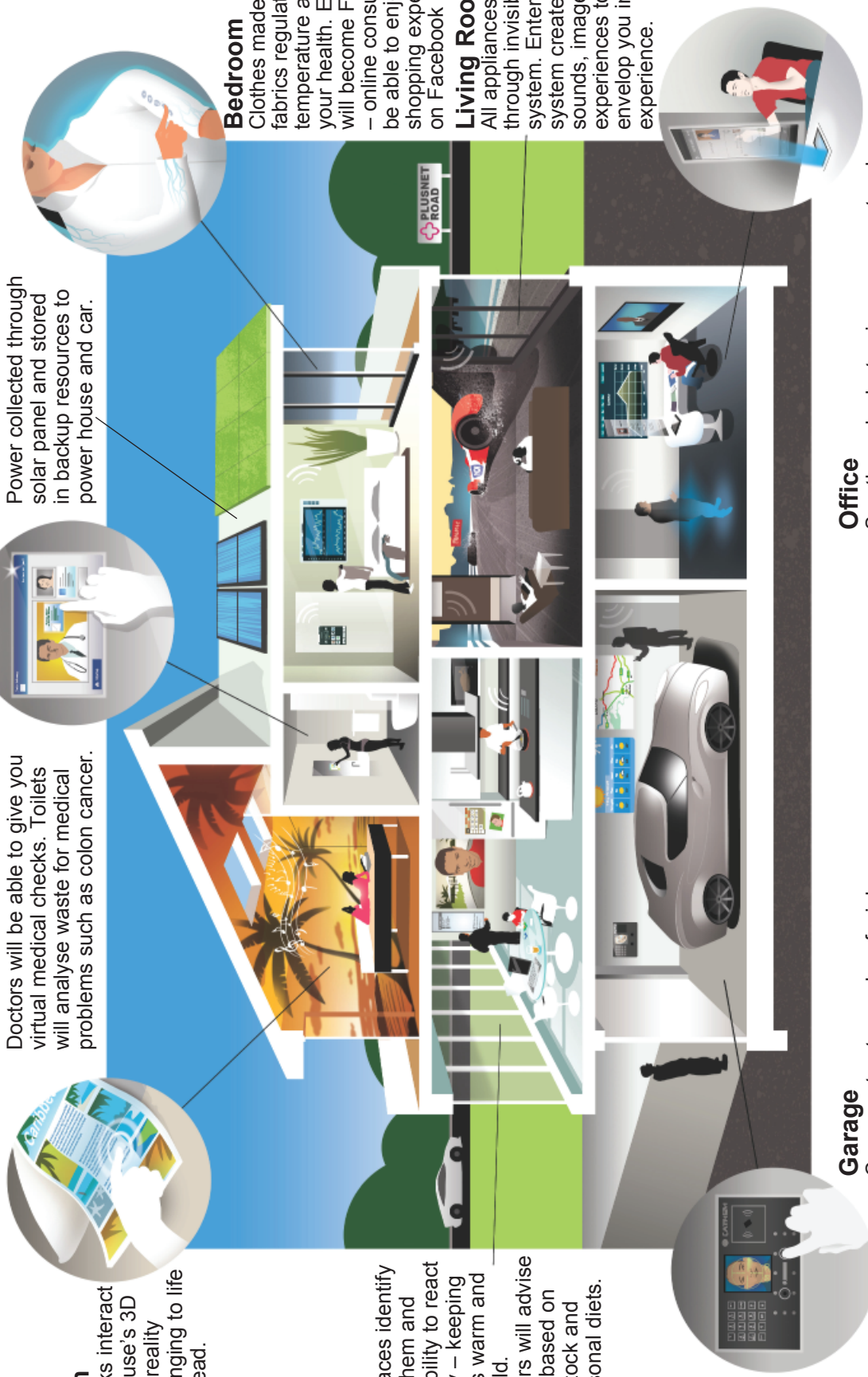
- Retailers are having to invest millions of pounds in creating logistics networks and IT systems to cope with delivery of online orders, while sales in stores fall back. Retailers without a strong online presence had a poor Christmas.

Source: text adapted from article by Sarah Butler, The Guardian, 15 January 2014

Images from Google Think Insights
http://www.thinkwithgoogle.com/research-studies/the-new-multi-media-screen-world-study.html

Source A continues on the next page

Figure 4: What is a smart home?



A smart home, or smart house, is a home that incorporates advanced automation systems to provide the inhabitants with sophisticated monitoring and control over the building's functions. For example, a smart home may control lighting, temperature, multi-media, security, window and door operations, as well as many other functions.

Smart homes use 'home automation' technologies to provide homeowners with 'intelligent' feedback and information by monitoring many aspects of a home. For example, a smart home's refrigerator may be able to catalogue its contents, suggest menus, recommend healthy alternatives, and order replacements as food is used up. A smart home might even take care of feeding the cat and watering the plants.

Smart homes present opportunities to change the way we live and work, and to reduce energy consumption at the same time. Imagine being able to check messages, open windows, operate lights and curtains and monitor how much money your house has made you from your renewable energy system, through your smartphone, from anywhere in the world!

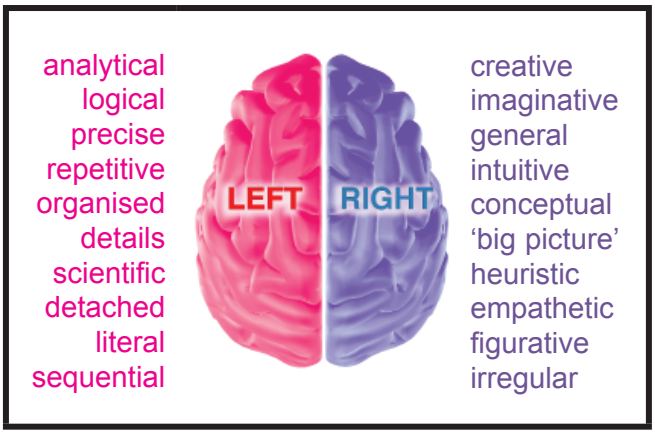
Source: text adapted from Smart Home Energy
Image from www.plus.net,

Source A continues on the next page

Figure 5: Smartphones and technology causing a rise in 'digital dementia'

High tech gadgets such as smartphones are changing the way our brains work – threatening our memory and concentration.

If you find it difficult to concentrate and remember simple things you may now be able to blame modern life for ruining your brain and giving you 'digital dementia'.



New research from tech-savvy South Korea has warned that the way our brains are developing is changing thanks to the amount we now rely on technologies such as the internet and smartphones – and not for the better.

Our brains, and particularly those of young people and children, are changing in a rather concerning way as the amount we use the right and the left side becomes unbalanced. Children's brains are developing differently thanks to tablets, phones and internet. Damage to the right brain hemisphere has been associated with deficits in ability to concentrate, short attention span, and emotional disturbances, such as depression.

Young people are increasingly struggling to remember basic things such as their phone numbers.

It's so much easier to ask Google Maps where you are than to look at street signs, or split the bill using an app rather than calculate the cost of your meal in your head. And when was the last time you bothered trying to remember what other movie that obscure bit part actor in Breaking Bad was in when there's 'IMDb' for that?

When questions to friends are now more often than not answered by 'why don't you search it?', it's starting to feel lazier not to consult our smartphone. But this reluctance to think may be worse for us than we'd previously thought.

Doctors advise young people and parents to exercise moderation in the use of digital devices, noting that researchers still have a lot to learn about the long-term side effects of heavy use of smartphones and similar devices.

Source: article from Kim Hookem-Smith, Yahoo Lifestyle, June 2013
computer illustration, © exdes/Vetta/Getty Images
brain illustration, © ScottCamazine / Alamy
cartoon, © 2007-2014 toonpool.com GmbH

Source B: UK and US must do more to protect internet users' privacy

The UK and US must do more to protect internet users' privacy, the inventor of the World Wide Web, Sir Tim Berners-Lee, has warned as a survey of online freedoms is released.

Berners-Lee warned that "a growing tide of surveillance and censorship" posed a threat to the future of democracy, even as more and more people were using the internet to expose wrongdoing.

His remarks came before the second annual release of a global league table that classifies countries according to a set of freedoms. Since last year, the US has dropped from second place to fourth, while the UK has remained in third place. Sweden still tops the list, with Norway in second place. All of the Scandinavian countries – Sweden, Denmark and Norway – feature in the top 10. The UK was poorly placed on privacy rights but was lifted by its high scores for availability of relevant content and the internet's political impact.

The table is compiled by comparing 81 countries, combining measures such as the extent of access to the internet, how much censorship is employed, and how 'empowered' people are by its availability. The list has been expanded from the 61 countries surveyed last year.

Democratisation of information and communication flows was further constrained by a global trend towards greater online censorship and surveillance, the report warned.

Along with many other countries including the UK and US, Sweden's leading record in web innovation could be at risk from excessive state surveillance. Russia, meanwhile, ranked 41st, behind countries including the tiny island of Mauritius, for failing to have relevant content or offer empowerment to citizens.

Last year, Berners-Lee introduced the inaugural index by pointing out that there was no off-switch for the internet – a fact that was proving uncomfortable for a number of governments that had tried to shut down radical dissent in the previous 12 months through the Arab Spring. But this year his remarks focused more on the threat of surveillance, which has been highlighted by the Guardian's revelations about the extent of online spying and subversion of internet protocols by the US's National Security Agency and the UK's GCHQ.

The survey found that 76 of the 81 countries examined did not meet 'best practice' standards for checks and balances on government interception of electronic communications.

Speaking before an event to launch the updated version of the index, the 58-year-old British computer scientist said: "One of the most encouraging findings of this year's Web Index is how the web and social media are increasingly spurring people to organise, take action and try to expose wrongdoing in every region of the world. But some governments are threatened by this, and a growing tide of surveillance and censorship now threatens the future of democracy. Bold steps are needed now to protect our fundamental rights to privacy and freedom of opinion and association online."

The survey also found that almost a third of countries surveyed block politically sensitive content. The US was the best performer this year on use of the web for social, political, environmental and economic empowerment, but received mediocre scores on the breadth of internet access, communications infrastructure, and for its lack of adequate safeguards to protect users' privacy from extensive electronic surveillance.

"Countries should accelerate action to make the web affordable, accessible and relevant to all groups in society, as they promised at the World Summit on the Information Society in 2003," said Anne Jellama, chief executive of the World Wide Web Foundation.

Source: adapted from Charles Arthur and agencies, The Guardian, November 2013

Turn over ▸

Source C: Data vultures join the dots

Recently, a backbench Conservative MP could not believe his luck. While browsing Labour's website in March, the MP stumbled upon a press release accompanied by an advert to "date Arab girls". It looked like a prime opportunity to smear the opposition for an apparently money-grubbing deal.

The MP pounced. In a tweet to the Labour press team, he said: "I know you are short of cash but having an invitation to 'date Arab girls' at the top of your press release?"

Labour's response was succinct and ironic. "Oh dear," tweeted one of its press officers, followed by a link to the help page of Google Adsense, which spells out how adverts are placed on websites. "In addition to seeing ads based on your interests, they may also be based on the types of sites you visit," Google states.

Normally a prolific tweeter, the Conservative MP has offered no explanation for his embarrassing blunder. It remains unclear what trail he had left on his computer to elicit an ad for the dating site. But his gaffe is a stark reminder of the chilling ambitions of the technology industry, which is amassing huge caches of information on more than two billion internet users worldwide.

Google is the big player in the multi-billion dollar cyber-snooping sector. The internet giant generates more than $50 billion (£31 billion) in annual revenues, largely through targeting ads at internet users based on browsing history. With each click on its search engine, its financial empire grows stronger. However, there is plenty of cash floating around to ensure that the bottom fishers thrive too. Scores of companies are collecting data from web traffic, which they sell to large corporations and advertising agencies.

Increasingly, these data brokers are attempting to stitch it all together to get data from the real world – from shopping habits to political preferences – as well as the virtual. This will be gold dust for the advertising industry.

Personal information is the oil that greases the internet economy. For Google, Facebook and their counterparts, the goal is to build ever more detailed pictures of consumers. "Monetising people's personal data is at the heart of Google's business model," said Auke Haagsma, a director of iComp, a lobby group backed by Microsoft, the Premier League and others. "Everything they do is about getting more information about people and exploiting it without any limitation," Haagsma said.

This Orwellian vision gives an extra edge to the debate over how to protect privacy on the internet.

Online adverts pay for myriad free internet services, from email and news to maps and music. Privacy campaigners, however, fear the frightening consequences of allowing companies to build up such unprecedented hoards of data and the intrusive consumer profiling they could spawn. "The holy grail for these companies is to be able to monitor us in as much detail offline as they can do online," said Nick Pickles of Big Brother Watch. "Privacy is being steamrollered in the race for profit before consumers even realise what is happening."

Watchdogs on both sides of the Atlantic are fighting back. In Europe, Google was reprimanded last year for breaching privacy laws and has been given notice to clean up its act.

Google said its "privacy policy respects European law and allows us to create simpler, more effective services. We have engaged fully with the authorities involved throughout this process, and we'll continue to do so going forward."

Google has long been pushing the boundaries on privacy and was censured in America and Europe for surreptitiously mining data from wi-fi networks while it collected photos for its Street View system.

A decision is awaited on the European Commission's near-three-year probe into allegations that Google favours its own services by demoting competitors in search rankings. Joaquin Almunia, the competition commissioner, may give an update to European law makers this week. It is thought he will reach an agreement with the Californian company rather than begin formal charges, a process that could take several more years. An armistice would see Google list more of its competitors' services in search results.

But, while the legislators fiddle, those vast pools of data just keep on getting deeper.

Source: adapted from Simon Duke, The Sunday Times, 29 September 2013

Source D: Smart Cities and Smart Buildings make smart workers

Our cities and the way we work are changing. A future of Smart Cities and buildings will not only affect our working practices, but it will probably change the way we think.

The notion of **psychogeography** (the impact of geography and the built environment on our thinking, emotions and behaviours) is an obvious, but important, one. The way people feel when they're in or close to a building is crucial to what they do when they're around that space. In the past we talked about "sick building syndrome" – now buildings are smart and can meet all our needs both physically and psychologically.

Wikipedia describes psychogeography as a "whole toy box full of playful, inventive strategies for exploring cities... just about anything that takes pedestrians off their predictable paths and jolts them into a new awareness of the urban landscape".

The cities of the future are likely to have a psychogeographical feel to them, as are the buildings that are in them. Transportation systems that take people around the city will be just as important as where they decide to walk; it is certain these cities will be very different to the ones we live in today.

This also applies to the way we will work in Smart Cities, that is if we work in them at all. Working smart has always been a more productive way than working hard and while this is true now for those who have used the internet to their advantage, the lines between work and leisure will become even more blurred than they are today.

Presently people commute at the busiest times of the day, at the most expensive times of the day and in conditions that really are cattle class. This is something that cannot be sustained.

Turn over ▸

Moreover, the pressure of a crowded city bus or an overburdened metro or underground system will be alleviated by integrated transport systems.

“An essential attribute of Smart Cities is ‘multi-modal mobility’ – this means parking, buses, trams, the underground, trains, car sharing and vehicle hire all being integrated into the same system. That means moving from one means of transport to another in a seamless way, and the city itself proposing customised mobility options to citizens. To make this a technical reality you need to gather and combine data from separate systems,” said Monica Beltrametti, Vice President, Xerox Research Centre, Europe.

These ‘separations’ are well known. Timetables that don’t synchronise, cycle paths that are dangerous and ridiculously high parking charges are factors that turn people away from urban areas. A truly Smart City would attract people to the area instead.

Then there is the ‘office’, the workplace that will be revolutionised by the Internet of Things, and machine-to-machine communication. For those who are not working from home, the new office may even prove to be a more efficient and leisured experience than that enjoyed domestically.

Self-aware technology and networks will become increasingly prevalent as the cost of sensor technology continues to fall. BYOD (Bring Your Own Device) will become ‘standard practice’. The cloud will do more powerful and weird things; unimaginable things within the next decade. Michael Bayer, President of Avaya, (a leading technology and communications business) says: “The impact of smart buildings on our daily places of work could be profound. Imagine a workspace that’s aware of you as an individual – whether you’re an employee, partner, customer or supplier. Imagine an office that recognises who is entering the building, what physical access they require, what devices they have with them, and what information they might need. What’s more, this office knows your preferences for light, temperature and room type. It will alert you when someone who might be useful to a project you’re working on enters the building; and even automatically set up a meeting with that person. This is the world of smart buildings.”

A future of Smart Cities and Buildings that make life easier and more pleasant seems inevitable; hopefully, its psychogeographic power will allow citizens to move, think, co-operate and work in ways that will be smart; very smart indeed.

Source: adapted from Monty Monford, The Telegraph, October 2013

Source E: Sensible or sinister? The growth of 'smart' thinking

Smart technology can provide social, financial and environmental benefits and could help speed us towards a sustainable, low carbon economy… but gaining public trust is crucial.

In a room in Brussels a diverse group from across Europe was brought together by Hitachi to explore how partnerships between business and civil organisations could create smart city communities. Numerous other companies, such as IBM, are heavily promoting the opportunities that smart technology presents.

'Smart' benefits

These companies argue that if we could create smart grids and smart metering, they would enable massive carbon savings. Balancing the energy demand from households and industry would reduce the need for highly inefficient power stations that are only there to cope with peak demand requirements. If we could create better storage facilities on the grid, we wouldn't have the current ridiculous situation where wind companies are sometimes paid to not generate electricity.

More interestingly, local energy storage devices and smart metering could enable local energy markets to be created, with people selling the energy they generate at a cheaper price to their neighbours.

Smart technology could also transform our transport systems. Tracking systems on vehicles could help optimise speeds and routing, encourage fuel-efficient driving and cut congestion. A report commissioned by Vodafone calculated that if introduced across Europe these simple transport changes alone could save €13.2 billion in energy bills.

Smart technology could also bring social benefits. The NHS is facing the daunting challenge of making £20 billion of efficiency savings over the next four years. One area where this could be achieved is by changing the way health services are provided to people facing long-term conditions. The 5% of patients who have one or more long-term conditions currently account for 49% of all inpatient bed days.

Smart technology, or tele-health, can enable patients with long-term conditions to monitor a range of daily vital signs such as blood pressure, oxygen saturation, pulse rate, temperature and weight, while at home. This also provides trend data for clinical teams.

Turn over ▸

Recent research has shown that getting people to take their own readings not only reduces pressure on NHS time, it also provides patients with a greater understanding of their own condition, thereby promoting improved self-management. As a result of these dual benefits, research shows a 20% reduction in emergency admissions, increased levels of patient satisfaction and a 45% reduction in mortality.

The problem of complexity

Why then are these technologies not being introduced faster? The debate in Brussels quickly settled on the problem of complexity. It was argued that the current way we procure things is simply not capable of coping with solutions that require collaboration between many different sectors and technologies.

The changes required across all sectors are profound. It is difficult to find an organisation that has the authority, the knowledge, the desire or the financial capacity to take a leadership role in bringing together the partners in order to create smarter solutions. It is difficult but not impossible. Even within the small group in Brussels we heard of a number of small-scale projects in cities such as Nice, where smart technology is making a significant difference.

Additional problems, which will need to be addressed, include the cost of purchasing this new technology and the 'training' element – many people still lack confidence when using technology and smart technologies will need to meet this challenge through the development of intuitive software which helps the user through problems. New technologies in the workplace will inevitably have an impact on employment levels with manual jobs replaced by technological alternatives. How we address this challenge remains a problem dating back to the Industrial Revolution and the Luddites.

The challenge

It is clear that smart technology could help speed us towards a more sustainable low carbon economy – providing significant social and financial benefits en route.

Introducing the technologies effectively requires complicated new forms of collaboration. This is a challenge but one that is surmountable as the benefits of smart solutions become ever more apparent. However, there is probably a bigger obstacle to overcome – lack of public trust. New thinking is needed about who holds the data captured, and more transparency is needed about why it is being collected and how it will be used.

Source: adapted from Trewin Restorick, chief executive of Global Action Plan, The Guardian, March 2012

Photograph: Per-Andre Hoffmann/Getty Images/LOOK

END OF SOURCES