HOUSE OF LORDS

SELECT COMMITTEE ON DIGITAL SKILLS

Summary and summary of conclusions and recommendations

SUMMARY

This report is a call to action for the incoming Government in May 2015.

The world is being transformed by a series of profound technological changes dominated by digital—a 'second machine age'. This is already having a significant impact on the UK; over the next two decades some economists have estimated that 35% of current jobs in the UK could become automated. Digital technology is changing all our lives, work, society and politics. It brings with it huge opportunities for the UK, but also significant risks.

This demands an ambitious approach which will secure the UK's position as a digital leader. We recommend that the new Government establishes a single and cohesive Digital Agenda.

The potential value in doing so is significant; the Government estimated that the digital sector alone was worth an estimated £105 billion in gross value added to the UK in 2011. A report by the National Institute of Economic and Social Research in 2013, meanwhile, found that the size of the digital economy was almost double official estimates. Whatever the difficulties in quantifying the value, it is clear that digital is already a substantial driver for growth and will become much more so. Digital technology is transforming much more than just one sector of the economy—the whole economy has become digitised. It would therefore be a mistake to take the 'digital sector' as our sole focus of interest. Digital technology is pervasive across all aspects of life, so much so that the 'digital economy' is becoming synonymous with the national economy. The UK cannot afford to miss the opportunity or shirk the challenges this presents.

The impact of new digital technology is all encompassing—from public transport to agriculture and from household goods to financial services. Analysis of 'Big Data' is transforming healthcare and medicine, as well as consumer and public services. The 3D printing of organs assists surgeons, whilst robotic arms can be controlled by the mind. We are becoming more reliant on technologies for personal use—from social media and entertainment, to older people and those with long-term conditions now able to monitor their health from home.

Everyday activities—such as shopping, using a telephone and banking—increasingly require interaction with technology. Digital skills (the skills needed to interact with digital technologies) are now necessary life skills. Individuals and businesses alike will need skills to protect themselves online. It is not acceptable for any group to be excluded from access to digital technologies. We must aspire for the vast majority of the

population to achieve the level of digital literacy needed to fully participate in society.

All of this will require universal access to the internet to engage with vital public and personal services. That is why we conclude that the Government should define the internet as a utility service, available for all to access and use.

Clusters of rapidly growing technology firms in London, Manchester, Edinburgh and other cities need producers of digital technology in sectors such as artificial intelligence, robotics, gaming and cybersecurity. There are, however, skill requirements that spread much further than these high-tech sectors. The entire workforce will need to embrace technological change and acquire new and differing levels of digital skills.

Digital technology will also challenge traditional methods of delivering education, meaning schools and teachers will have to adapt. New models of learning—such as increased online learning and employer-designed short courses—need to keep pace with evolving technology and digital change. Changing demands from firms, consumers, students and communities mean that apprenticeships, vocational qualifications and degrees need to deliver more general—and also specific—digital capabilities. Adults need more opportunities to learn throughout their lives to adjust to a world changing in ways as yet unknown. Education needs a greater emphasis on providing every citizen with adaptable digital skills. The incoming Government, devolved administrations and grant-giving bodies should agree an agenda of change for further and higher education that addresses the magnitude of the challenge; and re-examine investment in science and research.

There is widespread support for the expansion of apprenticeship programmes, but the UK's interests and ambitions need increased scale. There are not enough apprenticeships in digital subjects or apprenticeship schemes with digital featuring as an important element of content. Apprenticeships need to be seen as a viable alternative to higher education and the more traditional education routes.

The UK enjoys similar advantages in this emerging digital age to those which it had in past paradigm shifts. We are known for our inventors and innovators, engineers and entrepreneurs, outstanding creative talents, educators and scientists. Current and previous Governments have already facilitated some important decisions. From investment in science and research facilities such as the Hartree Centre and the Rutherford Appleton laboratory, to Tech City UK in London and MediaCityUK in Salford, there has been a range of essential policy initiatives—but we can and should do more. The countries ranked higher than the UK (including Switzerland, Singapore, the USA, Finland, Germany, Japan, Hong Kong and the Netherlands) have invested heavily in digital 'foundations', including up-skilling the population in technical expertise and digital capability, and driving universal access and usage.

Policymakers are redefining the role of cities in rebalancing our economy and the widespread devolution of policies and resources are taking shape. Recent efforts have also focused on identifying and encouraging local specialisms and clusters. There is scope to foster world-leading technology clusters in a number of UK regions with the right encouragement and coordination from Government, working with leading regional

bodies, businesses and universities. This could give the UK a real competitive advantage in the global economy.

There is, however, still a real concern that the UK will be left behind in this new digital era; we are at a tipping point. Digital businesses can locate anywhere in the world, and if we fail to provide the right conditions for them to flourish in the UK, we will become a branch economy, much less prosperous and influential than we could be. In the short time that we have conducted this inquiry there have been frequent reminders of the pace, scale and breadth of technological change in our daily lives. There have been numerous job losses in traditional industries and cyber-attacks on organisations ranging from US Central Command to Sony Pictures. Permission has been granted in the UK to test driverless cars, Amazon are experimenting with delivering packages via drones and Asda have installed 3D scanners and printers in high street supermarkets. These examples serve as reminders that change is accelerating and the entire population is affected by the digital revolution.

Since May 2014 in the UK, thousands of digital businesses have been started and many jobs created. At the same time there have been increasing numbers of initiatives from both within and outside the Government, with more reports, strategies and announcements. The engagement of the third sector has been particularly important. But as we heard repeatedly and consistently, all this activity needs joining up; with clear leadership from the centre.

The current Government and its predecessor were not idle, but their efforts have lacked sufficient coordination. Governments can make much happen: improve general and technical skill levels across the UK; apply our research and science to commercial applications; increase awareness of cybersecurity and online safety; and support clusters of technology emerging across the country. These must all be spelt out in the Digital Agenda. Sometimes the Government will need to convene, sometimes to champion or advocate, sometimes to explain, sometimes to reassure and sometimes to stand back. At times there will be a need for investment, although we recognise the constraints on public finances; at other times it will require the pooling and reallocation of resources. We are not calling for extra funding in all areas, but rather, the smarter use of existing money.

We need a proactive Government, able to coordinate and join-up initiatives across sectors, places and organisations, with enough ambition to address head-on the national culture change required to meet the new digital age. We need a Government that will put the change required at the top of its priority list, be restless about progress, and above all make sure that the narrow concerns of individual departments do not undermine the focus of the Government as a whole (as has happened frequently in the past). The Government will not be able to deliver on its own; it must facilitate partnerships across all sectors.

The UK is at a critical juncture. No one is certain where this transformation leads or ends, but it is fast moving and all-encompassing. The incoming Westminster Government with the devolved administrations must therefore give priority to

promoting a cohesive Digital Agenda which ensures that the UK survives and thrives in these radical and increasingly competitive times. The new digital age offers huge opportunities as well as significant risks; it can make the UK, or break it.

Summary of conclusions and recommendations

The core pre-conditions

Hard infrastructure

1. We are concerned about the pace of universal internet coverage and the delivery of superfast broadband. In particular, we find it unacceptable that, despite Government efforts, there are still urban areas experiencing internet 'not-spots', which is hampering universal coverage and the UK's international competitiveness. (Paragraph 34)

2. We agree with our witnesses who urged that the Government should define the internet as a utility service that is available for all to access and use. This is the bedrock of digital competitiveness. (Paragraph 43)

Soft infrastructure

3. We consider that the Government has a responsibility to accelerate the attainment of digital literacy across the population. Future governments must have the ambition to achieve this to realise the UK's economic potential. It must not stop there; changing technologies demand constant updating of expertise. The Government is responsible for ensuring the UK's population keeps pace with the best in the world. (Paragraph 52)

4. The paucity of women in digital and STEM (science, technology, engineering and mathematics) is holding back UK competitiveness. We agree with our witnesses that increasing the numbers of women could reap significant benefits. Girls have to be engaged earlier and across all education levels. The perception of digital and STEM jobs and subjects as male-orientated must be addressed. (Paragraph 60)

Cyber risk management

5. The rise of the digital economy brings new risks to individuals, businesses and national security. These risks include loss of assets and lack of confidence in digital technologies, resulting in unwillingness to use them. (Paragraph 71)

6. We agree with our evidence that the best way to defend against cyber risks and deter attacks is to ensure we train and deploy enough people with the relevant skills and expertise. Everyone will need a minimum level of ability in managing the risks associated with the digital economy. Resilience in the face of cyber-attacks must be built in across the economy. (Paragraph 72)

7. If the internet is to be viewed as a utility that is accessible to all, cybersecurity must, by extension, be considered an intrinsic part of our critical national infrastructure. We are concerned that there is an inadequate level of awareness amongst the population regarding online safety and personal risk management. Whilst we acknowledge that attempts have been made to increase awareness, such as through the Government's Cyber Streetwise campaign, these have not broken through. Given its importance, we believe that there needs to be a culture shift driven by the Government to ensure that the nature of the threat is better understood by the public. (Paragraph 78)

8. Individuals and small and medium-sized enterprises (SMEs) are at particular risk from cybersecurity issues due to a lack of awareness. (Paragraph 83)

Fostering and developing talent

Digital ability levels

9. When analysing the different levels of digital skills required, we find the UK Digital Skills Taskforce's three-band definition ('digital citizens', 'digital workers' and 'digital makers') to be useful, along with the UK Forum for Computing Education's application of the definitions to the workforce. (Paragraph 87)

Medium- and high-level skills

10. There is a shortage of medium- and high-level digital skills in the UK. This needs immediate attention if the UK is to remain competitive globally. To keep ahead of the international competition, the UK must ensure it has the necessary pool of digitally-skilled graduates and others at the higher level (the 'digital makers'), to support and drive research and innovation throughout the whole economy. The long-term solution to the shortage of medium- and high-level skills requires action at all levels of the 'talent pipeline'—primary, secondary, further and higher level education. (Paragraph 92)

Future-proofing our young people

11. Creativity is a strength of the UK's economy. Digital education that fosters creativity and innovation, providing students with the opportunity to test and experiment with technology, will help support this. (Paragraph 97)

12. Those who are not numerate and literate have limited access to and use of digital technologies. The UK has a long-standing systemic weakness in numeracy and literacy. It is imperative we continue to increase national levels of these core subjects to enable the UK to seize the opportunities that digital offers. (Paragraph 100)

13. We agree with our evidence that digital and technology skills should be considered complementary to numeracy and literacy. Digital literacy is an essential tool that underpins other subjects and almost all jobs. (Paragraph 105)

14. We welcome the introduction of the new computing curriculum in England as a major step towards giving the UK a competitive edge, but there are serious challenges delivering its content. Many teachers are not confident or equipped to deliver the new curriculum. (Paragraph 108)

15. New and existing teaching staff need significant contact with industry to see the latest technologies in action and subsequently pass such knowledge on to young people. (Paragraph 115)

16. The UK is taking significant steps to prepare school pupils for the future digital workforce, but we risk being let down by inconsistent training for teachers. Leadership and coordination from the Government in teacher training is essential. (Paragraph 116)

17. There is an urgent requirement for comprehensive industry input into the further education system. The Government should encourage strong partnerships between industry and colleges. Training delivery must be revamped. Further education colleges need to move up a gear and provide industry-designed and endorsed short courses that are going to lead to a job. (Paragraph 125)

18. General digital skills could be improved by including a digital element in all further education courses, as well as more specific courses for digital and technology occupations. We welcome the introduction of the National College for Digital Skills in London. More provision like this would be positive—perhaps one linked to each major cluster in the UK. (Paragraph 126)

19. The qualification and accreditation framework requires greater consistency and longevity. Employer trust in the system will be strengthened by industry-designed and endorsed certificates, delivering the necessary high standards. (Paragraph 130)

20. Skills funding is not presently targeted sufficiently to improve the capacity of the UK's workforce and grow its economy. Provision is cumbersome and slow to adapt. There is a clear opportunity for the Government here; to join-up industry, further education and funding. The Government's proposals to improve further education will not have the desired effects without an overhaul of the funding system. (Paragraph 135)

21. Apprenticeships can help plug the short- and medium-term skills gap. We believe 16–19 year-olds must be targeted by employers, teachers, and careers guidance professionals to enable them to choose and take up good apprenticeships. There is also a need to tackle negative perceptions of vocational education among schools, teachers, head teachers and parents. (Paragraph 142)

22. Including a digital element in all apprenticeship schemes, as well as offering more digital apprenticeships for specific technology occupations and sectors (taking into account the predicted changes to the labour market), could improve general digital skills. (Paragraph 143)

23. Industry needs to be encouraged to offer more apprenticeships. Industry and the Government need to work together to set ambitions for apprenticeship numbers over the next five years, working to match apprenticeships with predicted workforce shortages. (Paragraph 149)

24. Spending on overall research and development has fallen, meaning that the UK's position as a global leader in this field is threatened. This has a negative knock-on effect on the high-level talent pipeline. (Paragraph 153)

25. Universities need to be encouraged to work in partnership with industry, to make sure relevant courses are aligned with employer needs. (Paragraph 158)

26. We believe that greater transparency and availability of destination data would enable prospective students to make a more informed choice about future study at higher education level. (Paragraph 159)

27. The current careers guidance structure is outdated and does not support the needs of the future digitally-skilled workforce. It would be more appropriate to talk about 'employment' guidance. Industry has a vested interest in this; if employers want to close the skills gap and recruit the best individuals, they must have greater involvement. (Paragraph 173)

28. We believe that a radical rethink is required to inject imagination into employment guidance. An employment guidance service needs strong central leadership which coordinates local schemes. (Paragraph 174)

29. Parents and teachers play a critical role in influencing future employment options and choices; both, however, suffer from a lack of awareness that must be addressed. For teachers, part of tackling this awareness could be achieved through increased industry exposure. (Paragraph 180)

Filling the immediate skills gap

30. Continuing Professional Development and a move to short, sharp, relevant interventions later in life are imperative for the UK's workforce to remain competitive. The development of skilling throughout life needs a fundamental rethink. The Government must be at the forefront of this change. (Paragraph 189)

31. The role of business, industry and the Government needs to be examined to deliver a cultural shift towards preparing learners to learn for themselves. (Paragraph 192)

32. The third sector should be supported to use its existing networks and increase the provision of relevant digital courses. (Paragraph 197)

33. Universities could better serve prospective students by adding the option of shorter, more flexible provision to its existing course. This could be done via targeted skills funding. Universities should ensure that all graduates are digitally competent. (Paragraph 200)

34. Immediate industry involvement to enhance the education and training agenda is vital to make sure the UK's workforce can adapt to the requirements of the new world. We recognise the Government's efforts to engage business and industry in education, but these efforts do not go far enough and are geographically inconsistent. Over the next five years the new Government has a responsibility to ensure industry-education partnerships flourish. (Paragraph 204)

35. Current immigration and visa rules do not support the urgent short-term need for talent. We agree with the House of Lords Science and Technology Committee who, in their report 'International Science, Technology, Engineering and Mathematics (STEM) students', recommended that the Government "immediately reinstate the previous post-study work route". (Paragraph 217)

36. Even if the previous post-study visa work route was reintroduced, an incoming Government could not rely solely on high-skilled immigration as the main mechanism to reduce the skills shortage in the short term. Greater emphasis is needed on cultivating

home-grown talent, with a longer-term immigration policy that would still allow the UK access to the best global talent, especially to graduates. (Paragraph 218)

The business environment

Connecting and supporting business

37. Barriers holding back SMEs from reaching their full potential include their low awareness of the opportunities presented by digital technology, limited access to the necessary talent pool and skills, and challenges in accessing adequate finance. The Government has a responsibility to coordinate and facilitate the right conditions for business; but the development of knowledge and support needs to be driven by local and other networks, for example through Chambers of Commerce, UK online centres and Local Enterprise Partnerships. (Paragraph 239)

Regional ecosystems and clustering

38. The role for the Government and local leaders lies in early identification of emerging clusters and in providing targeted support. (Paragraph 252)

39. The strength of the UK is an aggregation of the power of its regional economies. To be competitive we must nurture regional specialisms. We do not know where our next big industry will come from. In this digital age the UK must be agile enough to give timely support to business opportunities. (Paragraph 255)

40. In our view there is a gap in the structural support for university-regional partnerships. Innovate UK is well-placed to identify, fund and coordinate regional opportunities for academia-industry partnerships and could do more. (Paragraph 268)

41. Research Councils are also well-placed to identify strengths in local universities and connect them with the regional area. Individual Research Councils should be given more power to do so. (Paragraph 269)

42. Growth within different areas of the UK cannot be Government-directed, nor should it be. Much expertise lies with local authorities and Local Enterprise Partnerships (LEPs). Light-touch coordination from the central Government would help facilitate reciprocal learning. It is the Government's role to intervene if local structures, including LEPs, are not working. (Paragraph 277)

Making it happen

A leading Government

43. The Government should act as the 'conductor of the orchestra' and play an enabling role, focused on business and education. Although the Government is tackling many issues through a range of initiatives, their efforts would be more effective if they were better coordinated. The Government needs to take responsibility for leading the UK through the seismic changes brought about by changing technologies. (Paragraph 297)

44. **Recommendation 1:** The Government should develop an ambitious 'Digital Agenda' for the UK: at its heart should be the Government's vision for the UK to keep up with the best leading digital economies across the board in five years' time. (Paragraph 299)

45. **Recommendation 2:** This Digital Agenda should be the responsibility of a Cabinet Minister in the Cabinet Office, who would assume ultimate responsibility for driving the Digital Agenda across all Government departments. (Paragraph 300)

46. **Recommendation 3:** The responsible Cabinet Minister should evaluate the UK's Digital Agenda on a regular basis, seeking to drive the UK's digital competitiveness. The Minister should report to Parliament annually against the measures within the Digital Agenda. We recommend an initial progress report to Parliament by summer 2016. We note that a similar practice is already undertaken by the Scottish Government. (Paragraph 301)

47. **Recommendation 4:** Our Committee has completed its work with the production of this report, but it has highlighted an issue of critical importance that will need continuing oversight; we urge the Liaison Committee to consider how best to integrate such a commitment into the future work of select committees in the House of Lords. (Paragraph 302)

A Digital Agenda for the UK

48. **Recommendation 5:** In its response to this report we invite the incoming Government to comment on the focus of our illustrative Digital Agenda and to commit to designing its own, with specific detail on how it intends to meet its objectives. (Paragraph 304)

The UK's Digital Agenda (paragraphs 305–322)

Access to digital technologies

49. Objective 1: The population as a whole has unimpeded access to digital technology.

50. This includes:

a) facilitation of universal internet access: the internet is viewed as a utility; and

b) removing 'not-spots' in urban areas

Skill levels

51. Objective 2: The population as a whole has the right skill levels to use relevant digital technologies.

52. This includes:

a) a culture of learning for life, with responsibility shared between the Government, industry and the individual;

b) a commitment to meet the target set in the Government's Digital Inclusion Strategy, that by 2020 everyone who can be digitally capable, will be;

c) a commitment to increase significantly the number of girls studying STEM subjects at further and higher education, including vocational education;

d) a target for 10% of the workforce to have high-level digital skills by 2020; and

e) facilitation of a bigger role in skills development for industry.

Risk management and cybersecurity

53. Objective 3: Recognition of the risk and benefits of cybersecurity; the UK has a sufficient talent pool with the knowledge and abilities to keep its hard and soft infrastructure secure.

54. As part of this:

a) cybersecurity is placed higher on the public agenda;

b) cyber-education starts at the school level (and is extended to broader society and those not in formal education); and

c) both individuals and businesses—especially SMEs—are targeted.

Schools and teachers

55. Objective 4: No child leaves the education system without basic numeracy, literacy and digital literacy.

56. As part of this:

a) digital literacy is taught as a core subject alongside numeracy and literacy, embedded across all subjects and throughout the curriculum;

b) more focus is placed on building links with employers (including somebody from industry on the governing body of every school); and

c) delivery of the new computing curriculum is seen as a priority. In particular more investment in training new teachers and speed and urgency to train existing teachers, involving the third sector and industry.

Further education and apprenticeships

57. Objective 5: A world-leading further education system for digital skills, brought about by a comprehensive employer-led review of the further education offer.

58. This review could be commissioned at the start of the new Parliament, to be completed within six months, and conducted by the Tech Partnership. The review could examine what is needed for the future of further education, including:

a) a consistent and agile offer across providers;

b) facilitation of strong partnerships between industry and further education;

c) more apprenticeships across the board—and more digital apprenticeships. All apprenticeships should include a digital skills element;

d) an accreditation and qualification system that is fit for purpose; and

e) a revamped skills funding system to promote short, flexible courses and apprenticeships.

Higher education and research and development

59. Objective 6: A responsive higher education system and world-leading research and development.

60. This includes:

a) a higher education system that works with industry to align courses to employer requirements; and

b) a review of spending on research and development aimed to ensure the UK is comparable with other leading economies.

Employment guidance

61. Objective 7: A central, online employment guidance resource. Parents and teachers are more fully aware of the opportunities offered by digital technology.

62. As part of this:

a) access to the employment guidance resource is through social media and other channels; and

b) change is brought about by a wholesale review.

Business involvement and support

63. Objective 8: The right conditions for industry set by the Government.

64. This includes:

a) facilitation of industry involvement across the board;

b) an awareness campaign about the need to improve digital skills among SMEs; and

c) information, advice and guidance for businesses readily available through local networks.

Regional ecosystems and clustering

65. Objective 9: Regional and sub-regional strengths are recognised and encouraged. Regions build on their local specialisms, facilitated by the Government.

66. This includes:

a) a higher education system that is closely linked with industry and regional economies; and

b) Government intervention when a Local Enterprise Partnership or locality is weak.