ROYAL ACADEMY OF ENGINEERING

Response to the Digital Communications Infrastructure Strategy consultation

Department for Culture, Media and Sport

October 2014

This evidence is submitted by the Royal Academy of Engineering. As the UK's national academy for engineering, we bring together the most successful and talented engineers from across the engineering sectors for a shared purpose: to advance and promote excellence in engineering.

The views described in this response were assembled through consultation with our Digital Systems Community of Practice. This group comprises of Academy Fellows with expertise in computer engineering, conventional software engineers, as well as Fellows with expertise in all engineered systems that rely on ICT to function effectively.

The response attached provides answers to the questions posed from a UK strategy perspective.

Executive Summary

1. The role of digital infrastructure is vital for the UK digital economy insofar as it touches every sector in society and every customer segment. It is also critical to ensure the long-term stability and resilience that private investments need.

2. The Academy is concerned that current development of digital communications infrastructure does not consider in enough depth international matters; for example, the need for standards and compatible spectrum policies. The Academy would like to emphasise the key role digital communications infrastructure will have in supporting innovation and growth in all areas of the digital economy – not just in the DCMS defined 'creative industries'.

3. The consultation does little to address how we blend the best of public and private networks through UK wide government support – whether through regulation or procurement. For example, the City of London Financial services are highly dependent on both types of network. The same applies in the higher education system. The growing role of the internet for UK and international eCommerce could also be better acknowledged.

4. The key question addressed in this consultation is the role(s) for government in the evolution of the UK's broadband fixed and wireless infrastructures over the next 10-15 years. The Academy agrees that the government has a role in this vital, fast-growing and pervasive part of the UK economy. We would argue that this role is primarily that of 'facilitator' – encouraging and bringing forward changes that are hard to predict but will be in the interests of citizens and the wider economy. But the government role as investor is only a small subset of total UK communications investment. This still leaves room for deregulation and simplifying UK wide regulation where it remains in favour of pro-investment and pro-innovation policies that are compatible with Europe and allow us to benchmark well against leading G8 nations.

5. A balance will need to be struck between communications performance, security and privacy, and economic benefit. It will be the role of engineers to inform and government to manage this balance. The Academy questions whether it is time to review the architecture of UK regulation to assure UK digital investment is not held back by too many bodies or confusing cross departmental intervention. A UK wide regulatory approach for cost effective networks remains necessary even if local needs have to be considered by the market.

6. In general, predictions about the future have proved highly unreliable, especially about technology. Innovation today is far more global, as we have seen with mobile communications and the internet. The potential for fast and dramatic shifts has been amply demonstrated; for example, in the rise of streaming music, video and the smartphone. On the whole we favour higher projections for future demand but we recognise that experience has led us to question the reliability of our future visions. The most vital characteristic we should build into future plans is adaptability; we need the flexibility to cope with the unexpected, which we will certainly encounter. Government plans should be similarly designed for adaptability.

7. The Academy acknowledges the IET contribution to this debate through the 'Demand Attentive Network' (DAN) initiative. This is already under discussion with DCMS[1]. In addition, the Academy is in collaboration with the IET on a series of connected systems discussions covering digital communications adoption within transport, healthcare, energy and the environment, and defence. We will share results of these workshops in due course. For more information about the series, please contact alan.walker@raeng.org.uk.

Q1 Views are sought on:
a) Is this an appropriate role for Government?

8. Broadly, yes. Government needs to stand back from undue intervention. In particular, regulation must not inhibit innovation and investment progress. It is not easy to know what 'market failure' would look like when long-term infrastructure planning decisions and frameworks are needed.

9. Communications is a vital capability for the digital economy and UK competitiveness. Telecommunications in particular is a vital resource for many businesses and residents. Government has a role in creating an environment conducive to continuing innovation.

10. Investor confidence will require a simplification of foreign direct investment (FDI) rules. The Academy suggests that it is timely to review the UK regulatory architecture to assure continuing investment in the digital economy. Some deregulation and consistency with simpler European regulation should form part of this review.

11. The shift of media services to the internet also needs to be kept under review, particularly for its impact on digital inclusion, content plurality, advertising, and relative broadcasting investment. These, in turn, affect the scenarios offered in the DCMS consultation.

b) What other high level principles the Government might adopt?

12. The Academy suggests the following principles government might consider adopting.

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[1] http://www.theiet.org/factfiles/comms/dan-page.cfm?origin=/dan

13. Design and procurement for adaptability including along demand attentive network (DAN) lines, as mentioned above.

14. Wider access to communications through widening services competition (not multiplying physical networks). This is not a new area for regulation but one for encouragement.

15. Teaching of digital skills in schools. This is being addressed through the computing in schools initiative, but it is still in the early phase. These skills are required as preparation for both citizenship (of a digital society) and for specialised skills for a digital economy. Teachers will require up-skilling to deliver. Funding for teaching of digital skills needs to be firmly established in annual budgets.

16. Free trade in general goods is widely-accepted. Free trade in information (based around informed consent) should also be accepted. Data privacy and data sharing policies need to be kept in step with DCMS measures arising here, or the scenarios described may turn out to be inaccurate.

17. A longer-term vision for a more fibre and wireless future with universal mobility could be a useful framework for debate. This may be better informed by a clearer delineation of consumer, business, public sector and wholesale markets.

18. It falls to the government to up-skill its policy staff. Staff must be able to work effectively in a partnership with industry, and others, to evolve a common strategy ensuring UK infrastructure is continuously being up-graded ahead of rising demand.

19. With the need for an independent regulator, the current impression is that Ofcom focus more on consumer markets rather than UK strategy such as the digital economy. In addition, Ofcom focus more on price than investment and innovation. We suggest an independent regulator is needed more now for the digital economy rather than simply for communications.

c) **What resources do you consider the Government should aim to deploy to effectively manage its role?**

20. Bringing the digital regulatory architecture together is a first major step. However, deregulation and the EU role should ultimately mean less government resources deployed in this area. It also assumes a more joined up government approach to the promotion of the digital economy internationally.

21. With the new EC and commissioners being put in place there seems to be a stronger opportunity to support a move towards a digital Europe activity with less national regulation and a more pro-services choice ethos. The emphasis of the EU framework should also be moved away from micromanagement of telecommunications markets for licensed networks.

Q2 What potential opportunities are there for Government to leverage its combined buying power to support policy objectives?

22. Government should aim to be less interventionist, and focus on strategic issues to assure investment and innovation in the digital economy. Procurement rules can be used but these need to be framed carefully, recognising that infrastructure

benefits from scale even if in services do not. More services choice may be expected.

Q3 If migration to IPV6 is required, are there any barriers to that migration and if so how might these be addressed?

23. IPV6 is already being rolled out and no government action is needed except for pragmatic implementation on its own behalf. The Department for Business, Innovation and Skills should retain a role in monitoring and supporting British industry in key standards and policy making bodies related to communications.

Q4 Is an ongoing disparity of provision of broadband services inevitable? If so should this be addressed and how might this be done most effectively?

24. The notion of increased choice in communications services cannot be mandated by government alone. There needs to be a clearer distinction between networks and services – where the latter will offer even more choice. However, beyond a 'safety net', government should not be predicting the market. Government should largely be encouraging innovation and investment. Ofcom have a key role in the facilitation of broadband services that could be made more visible.

Q5 How symmetrical will digital communications networks have to be in the future? Will this differ across user types? What implications does this have for fixed and wireless broadband provision?

25. We believe this is difficult to predict; however, greater symmetry is likely. This is for the market to decide rather than government.

26. In regard to fixed broadband infrastructure, the consultation document does not address the disparity between the needs of businesses and domestic users. Businesses have a much greater bandwidth need which is partially addressed by their 300Mbps Enterprise Zone. However, business bandwidth can still fall short of the rates required (certainly Gbps and beyond) and can also have much more symmetric needs than their domestic equivalent such as in the case of data centres and web-service providers.

27. The consultation document also fails to mention wireless technologies to deliver fixed broadband infrastructure and the cross-over to mobile infrastructure meeting the needs of domestic data services. Small cells 60GHz deployments are possible areas for investment.

28. In regard to wireless broadband infrastructure, the delay in issuing 4G telecommunication licenses has caused the UK to fall behind in the race to deploy long-term evolution (LTE). Only EE, with their band 3 deployment, has really any kind of UK LTE footprint. The Academy believes that government has a pivotal role in ensuring coverage by population as well as area. It also appears that government's target for 98% population coverage is not very ambitious, compared with other leading nations. The 2017 deadline may well fail to be met. The UK is not a Europe leader on wireless broadband infrastructure and is placed 15th in Europe on fixed broadband infrastructure[2].

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[2] Akamai Technologies (2014). *Akamai's state of the internet Q1 2014 report Volume 7 Number 1*

29. The Academy feels it may be inappropriate for DCMS to predict how indirect and complementary technologies should work together. The regulation should be simplified to allow market convergence and for the market to decide.

Q6 Which countries should be our benchmarks on communications infrastructure to ensure that businesses remain in the UK and continue to invest?

30. Benchmarks should be international. With wireless systems becoming ever-shorter range (terrestrial broadcasting is a growing outlier here), common global standards is more of an issue than cross-border effects. This is vital for the considerable UK industry related to and using communications.

31. Ofcom key countries analysis could be better utilised[3]. Perhaps coupled with an occasional in-depth look at UK-USA or UK-EUROPE and UK-CHINA for service benchmarks.

32. The Academy notes the commitment by Ministers in the Irish Republic to the delivery of ultrafast broadband (at least 30Mbits/sec) to 100% of domestic and business premises in that State well ahead of the European Commission's Digital Agenda for Europe (DAE) target date of 2020. This has significant economic competitiveness implications for the UK, not least in Northern Ireland.

Q7 What metrics do you think should or will become relevant in comparing network performance in different countries? What metrics should most appropriately be used as the basis to set objectives for government policy?

33. Market metrics as contained in the above mentioned Ofcom report[2].

34. Network performance should be left to specialists. Speeds without known coverage and capacity, or end-to-end service quality constraints make little sense. The emphasis should be on market differentiation and not mandating minimum speeds without context.

Q8-10

35. No comments.

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[3] Ofcom (Dec 2013). *International Communications Market Report 2012* http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr12/icmr/ICMR-2012.pdf Summary: http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr12/icmr/ICMR_Section_1.pdf

Q11 Are there wider environmental issues not reflected in the scenario e.g. the price or availability of energy that will affect any of the scenarios and in what way?

36. The Academy notes that the increased efficiency in mobile, battery-powered devices is a key driver for reduced energy consumption. The UK is very strong in this space through leading international players such as ARM.

Q12 How likely is any unforeseen disruption to this scenario and what area might it occur?

37. Unforeseen disruptions are very likely and hard to predict. The growing role of the internet on digital economy needs to be supported by longer term investment plans from industry. The best incentives are to assure appropriate, and not too onerous, regulation compared to leading internet nations such as the USA.

38. The growing role of North East Asia needs to be better acknowledged. International science bridges between UK-USA (OR EU-USA) and UK-CHINA will be needed in areas as diverse as wireless and broadcasting. Global economies of scale and services delivered internationally will affect this development.

Q13-26

39. No comments.

Q27 How might efficient investment in communications infrastructure be supported, for example by changes in the regulatory framework?

40. Resilience and security of networks needs great deal more attention, particularly with growing interdependencies across infrastructure, a very tightly coupled economy, globalisation and the rise of the Internet of Things. It is important that regulation does not inhibit progress but encourages investment and innovation.

Q28 Are there any further measures necessary to incentivise the rollout of future mobile infrastructure in currently underserved areas?

41. Demand is, and should be, the key driver. Demand as the key driver will support international competitiveness of the digital economy.

42. Regulatory certainty (or lack of it) affects investment.

43. Skills to support the digital economy are vital. This affects education and immigration policies.

44. We raise the question whether it is timely for a taxation review – to assess whether incentives to invest and innovate are sufficient against an international backdrop.

Q29 Is there a role for a revised USO or USC to ensure that minimum consumer demand requirements are met and to reduce the potential for a new digital divide? What might this look like?

45. The emphasis should not be on a new USO or USC but on a choice in services. The media already quickly picks up on major gaps in network coverage but less so on services.

Q30 In terms of supporting future innovation and long-term investment in infrastructure, what areas of broadcasting regulation may have served its purpose by 2025-2030 (or indeed earlier). What future technical developments may also have longer term implications for regulation and wider public policy?

46. No comment.

Q31 Are there changes to the EU Framework that the UK might seek to encourage more competition in UK markets?

47. There is a need to simplify the EU role and favour of a broader digital economy and the investment that will ensue.

48. In addition, there is a need to rebalance EU thinking to embrace internet players and acknowledge that indirect competition that may come from these unlicensed entities. This can be positive to voice over IP or OTT services, but communications market should carry responsibilities too, irrespective of the mode of delivery.

Q32 Should Government seek changes to the European Framework which put more reliance on competition law and how might this be done?

49. Yes, the Academy feels this is movement in the right direction. There is need for pragmatic partnerships with key EU countries to bring this about.

Q33 In what ways can you see competition driving technological change in the UK in the future?

50. We expect that there will be a greater range of players including those not traditionally seen as 'communications' such as content generators. There is a role for government in bringing these new groupings together.

Q34 How can the regulatory framework keep up to date with new business models and changes in technology?

51. The principle to deregulate first should be followed. The information economy council, backed by BIS, could offer a Technical Advisory board to help DCMS stay up to date, yet still avoid vested industrial interests.

Q35 Are there any changes to legislation other than the Communications Act that would incentivise the provision of communications infrastructure?

52. A suggested taxation review as mentioned in Q28.

53. In addition, a better benchmarking of key G8 nations for their approaches to digital economy could provide incentive. Consistent approach to digital pricing and payment is needed. The current payment services directive from EU needs to be kept under review for adverse regulatory impact.

Q36 Would there be benefits to investment from a focus on broadband only services? Are there any barriers to the emergence and adoption of broadband only services, whilst still providing necessary access to emergency services?

54. Yes. The best lessons from broadcasting digital switchover (DSO) could be taken into a broadband DSO, provided key wireline and wireless technologies could co-exist.

Q37 How might copper access networks evolve over time alongside other access technologies? Is there a role for policymakers in helping manage any transition from copper to other access networks?

55. The consultation document appears confused about the role of copper. Copper, even with 'fibre' roll-outs from BT, is still needed to provide the connection from the cabinet to the domestic premise. It will be a significant period of time and investment before this is replaced with an all-optical system.

Q38 Views are sought on whether there are any additional actions the Government should consider to ensure:
a) That the provision of all areas of the UK's digital communications infrastructure remains competitive in order to ensure that the UK can take full advantage of growth opportunities in the Digital Age

56. Content choice is a key demand driver for infrastructure. Removing barriers to distribution (Copyright uncertainty), repurposing for wider markets (digital archives initiates), and accessibility rules (sub titling) could all be subject to review to remove costs and maximise digital economy reach.

b) Aside from legislation and adapting the regulatory framework in the broad sense which other actions should the Government take to encourage investment in communications infrastructure?

57. The digital economy could deliver more with the following:
    • big data and data analytics (data protection and privacy uncertainties)
    • transport telematics and connected cars
    • connected education (including online learning and Massive Open Online Courses)
    • connected healthcare
    • smart grid
    • smart cities.

c) That potential investment in the provision of digital communications infrastructure offers a suitable risk and reward profile to ensure that they can be financed by the private sector

58. Generation of demand for services and a regulatory regime that encourages investment are key.

Q39 Views are sought on:
a) The case for the UK to invest to gain 'early mover advantage'

59. The UK must take an international perspective as most communications infrastructure is a global market. For example, the 5G centre of excellence will only work at Surrey University if the international market and supply chain are included, with international standards and spectrum within this.

b) What areas in particular the UK should aim to see investment

60. See answer to Q38.

c) Are there any actions not covered elsewhere in this report that the government should consider to ensure digital communications infrastructure is in place before it is needed and such that it helps generate need.

61. We would like to highlight the 2014 techUK manifesto report[4]. It sets out recommendations for how government, working in collaboration with industry, can secure the UK's digital potential.

62. More multimode concepts could be considered; for example, considering wifi and mobile as the same market. Should mobile and TV be explored together as well – dual mode devices are also within reach, subject as always to supply chain, standards and spectrum policy.

63. As mentioned in the executive summary, the consultation document does not make sufficient effort to emphasise the need for international collaboration on spectrum management. With 2G and 3G systems, the number of common spectrum allocations was manageable - typically 4 and 9 frequency bands respectively. With the advent of long-term evolution (LTE), typical handsets now support many more frequency bands to enable roaming. The subsequent joining of different frequency bands ('carrier aggregation') creates many permutations[5] due to the lack of global collaboration. Greater international co-operation is needed to better manage the spectrum for LTE telecommunication in the UK and to contain cost and availability of high performance terminals.

64. Future impacts to GCHQ should also be considered. Attempts to increase monitoring may lead to increased encryption strength and the default use of encryption for storage as well as for internet transfer. This may, in turn, lead to it being more difficult for the agency to monitor.

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[4] techUK (2014). *Securing our digital future: techUK manifesto for growth and jobs 2015-2020*
[5] 'Carrier aggregation' is a feature in LTE-Advanced to increase bandwidth. The feature attempts to join together different frequency bands. For example, a 10MHz allocation at a carrier frequency of 900MHz can be joined to another 10MHz allocation at 2.1GHz which would give an aggregated bandwidth of 20MHz.

Q40 How can we maximise the current R&D and innovation UK landscape to help take advantage of the opportunities provided by future technologies? What needs to be done by Government and its agencies, and industry to tackle any gaps?

65. The scale needs to be international as does the standards. Science bridges are needed between UK-USA (OR EU-USA) and UK-CHINA for key technologies in communications – particularly mobile, broadcasting and internet.

Q41 In which future communications technologies do you consider the UK has, or could achieve, an international leadership position?

66. There are several possible technologies with 'Demand Attentive Network' (DAN). A DAN is a network that is cognisant of and responsive to the demands that users and applications are placing on it. It then seeks to optimise the use of network resources, including smart terminal devices, in order to provide the outcomes that are required to satisfy the users and applications needs. A DAN is not a single technology, protocol or network design concept. It is an architectural, regulatory and policy approach to leveraging emerging technologies in an effective way to deliver outcomes that meet the demand of users[6].

67. In addition, internet evolution, apps and systems design should also be considered.

Q42 What more might government and industry do to exploit future technologies, associated new applications and emerging business models?

68. See answers to Q38 and Q39.

Q43 What role might local bodies have in facilitating the future delivery of digital communications infrastructure?

69. Communications infrastructure needs scale and long term planning. Services can be local and global. We predict local roles would be limited beyond education and training.

Q44 How can council's maximise the digital communications infrastructure in their local area to support their work on economic regeneration?

70. Councils could remove planning barriers to build the necessary infrastructure for digital communications. Advocate LEP leadership could support investment and innovation. Councils can take lessons from leading smart cities therefore not duplicating expensive and time consuming research and development and implementation studies.

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[6] http://www.theiet.org/factfiles/comms/dan-page.cfm?origin=/dan