Your response

Your response should include details of:

- a description of the relevant technology;
- a view of the potential impact of the technology on the sectors we regulate, preferably
- identifying the impact against the criteria listed in section 3.16 of the call for inputs;
- the current state of development of the technology, including any demonstrations of
- feasibility;
- any unresolved issues which need to be addressed for the technology to achieve full
- potential;
- references to key publications and the leading groups working on the technology; and
- whether you would be open to discussing the technology in more detail with Ofcom.

Your response

Confidential? – N

Understanding future technologies and services is critical for regulators. In the context of wireless telecommunications, spectrum allocations and assignments must occur well in advance of the introduction of new services. Given that public consultation, band clearing, and award of spectrum can take many years, regulators need to look ten years ahead at likely demand and usage.

Future predictions are, of course, unreliable and prone to bias by proponents of particular solutions. However, there have been some accurate independent forecasts. For example, in a book published in 2001,[1] Professor Webb predicted the services and solutions that would be used in 2020 with commendable accuracy. Professor Webb published a similar book more recently in 2018.[2] We base our conclusions and recommendations here broadly on his forecasts.

Professor Webb's analysis suggests that:

- Individuals will see an ever-better virtual assistant functionality from their devices as AI solutions, such as Siri, steadily improve using emerging techniques.
- In the home, some new connected devices, such as smart speakers and home IoT products, will be installed, but we do not anticipate that home automation will improve much.
- Leisure interests will expand, with each genre (e.g. cycling) gaining apps, online communities, additional functionality and, where appropriate, monitoring from IoT devices.
- In business, offices will see widespread deployment of IoT, biometrics and robotics, primarily as a way to save administrative and maintenance costs. Some sectors, such

as agriculture and manufacturing, will make extensive use of IoT to improve productivity. Others, such as retail, will decline further due to changing habits. Some sectors, such as construction and hospitality, will be broadly unaffected by digital trends (although perhaps not by societal and Covid 19-related trends).

- Transportation will not change materially other than we will be better connected while travelling, have more journey information and see a gradual growth in driverless vehicles (cars, trains, buses, etc).

Major technologies likely to shape our digital world over the coming 10-20 years include IoT, AI, cloud storage and computing, and robotics. These will grow alongside current key technologies such as the Internet and fibre optic communications, which will continue to form the basis of our communications in the future. These technologies will have the greatest impact in offices, homes, farms, factories, and campus environments, where they will be used to automate and to provide increased security.

Delivering the wide range of IoT, robotics, cloud computing, and AI across these environments will require excellent connectivity solutions with a wide range of services from ultra-low data rate IoT to ultra-low latency robotic control. We anticipate that many of these solutions will be self-deployed by building owners in the same manner that Wi-Fi is self-deployed in such environments today. Self-deployment is typically a preferred solution since it allows for tailored coverage, complete control over critical infrastructure, enhanced security, and can often come at a lower cost than procuring a service from an external operator. These solutions may also be offered as part of a managed service by a variety of entities.

To date, local wireless deployments have been predominantly restricted to Wi-Fi and to simple IoT systems, such as LoRa, in licence-exempt spectrum. These solutions are acceptable for some use cases. However, given the unpredictability of licence-exempt spectrum and limitations related to duty-cycle and a device eco-system, such deployments have not seen as much growth as expected. It is also likely that the lack of suitable spectrum is one of the key causes for the slower-than-expected growth of IoT systems, which in turn impacts the data available for AI solutions to deliver insights. Put simply, without access to spectrum for local deployments of the widest range of wireless technologies, it is highly likely that future technological solutions and services will fail to emerge or will be substantially curtailed.

Enabling local access to spectrum will typically require innovative shared spectrum solutions. A good example of this is CBRS, being made available in the United States, which allows self-deployment of 4G and 5G technologies in local settings with more deterministic access and with a very strong device eco-system. Similar approaches have been suggested in the United Kingdom, for example by an ad-hoc group working through the Spectrum Policy Forum. The technology to deliver innovative dynamic spectrum access (DSA), including cloud computing and sensing, is now well-established and may be one of the most important enablers of our digital future.

Notes:

1. W. Webb, “The future of wireless communications”, Artech House, 2001.
2. W. Webb, “Our Digital Future”, Amazon, 2018.