Appendix C: Digital Economy Theme Priorities

The five Digital Economy (DE) Theme priority areas have been developed through engagement with the research active community, and reflect the Theme's long-term strategic goals. These priorities are at the heart of Digital Economy Theme research. The example research questions provided are not exhaustive. We welcome research proposals which can address these priorities within a range of contexts, including major societal issues such as the COVID-19 pandemic and the net-zero agenda.

Content Creation and Consumption

Creating and consuming digital media, games, and interactive software can be diversified and made more accessible. In content creation, there is significant potential to support wider application of digital creativity techniques and technologies across many domains.

Creative content methodologies have already been deployed with impact in education and community campaigning, and there is likely to be significant scope for further impact not only in the creative industries, but in sectors such as manufacturing and healthcare. For content consumption, the diversification of the set of devices and platforms through which content is accessed offers exciting research challenges. As people increasingly use heterogenous combinations of devices, including within smart environments, there is scope for research in richer, more responsive user experiences.

Tackling this research priority will require fundamental changes to how we view creativity and digital expression. Key to this is the investigation of intelligent tools, processes and platforms, which make it easier for expert and non-expert users to generate, disseminate, understand, customise and retrieve digital content. At the same time, we must ensure content authenticity, provenance, and intellectual property rights, while investigating new approaches to human-algorithmic interaction and the rationale behind data-driven or automated decision-making.

Examples of high-level research questions include: What are the application domains and novel tools and methods that will support contextually broadened content creation and consumption? What prototypes and other interventions will enable, motivate and illuminate the overcoming of specific challenges in new domains? How can we realise the full impact potential of existing digital creativity techniques across video and games? What are the content creation and consumption opportunities for using mixed reality, generative AI and responsive media, for research in the creative economy and more widely? And how can the unengaged community be engaged and how can resistance to accepting research ideas be overcome by using creative techniques, for example, through the provision of demonstrators, evidence frameworks and technology enablers?

The creative industries' landscape can be revolutionised by amplifying the knowledge that is exchanged and shared between researchers with different

levels of expertise and background, particularly across sectors which are not traditionally associated with one another, and where experience-centred approaches and design thinking could potentially enhance value. This could mean the integration and convergence of technologies and taking account of the varying perspectives of different types of user behaviours, backgrounds and cultures to create tools for new immersive experiences and digital personalisation of products.

Advances are needed in AI, human-computer interaction, software engineering and sociotechnical understanding to underpin this, and research should be undertaken in collaboration with artists, designers, social scientists, entrepreneurs and psychologists, and others.

Beyond a Data-Driven Economy

The dramatic explosion of data over the last decade has changed the way society operates. The emergence of the data-driven economy has created new opportunities for businesses and stimulated research and innovation to harness the power of the ever-expanding volume of data.

Digital platforms underpinned by this data are driving de-centralisation of the digital economy, enabling a dynamic gig economy, in which everyone has the potential to become a producer and consumer. Data can be considered as an enabler to create new businesses models to help address key challenges across the economy and society through the democratisation of information; for example, in healthcare, the supply chain (e.g., food, manufacturing), sustainability, transport, crime and the creative economy. But the fast pace of these transformations means many of these changes are poorly understood, with siloing of data creating concentrations of socio-economic power with limited stakeholder governance.

The 'Beyond a Data-Driven Economy' priority focuses on addressing these issues by considering both the impacts and opportunities that the data-driven economy will have on individuals, businesses and governments. The key focus of this thematic area is the range of challenges and opportunities for business; however, it will also need to address the commensurate challenges of governance and government.

Examples of high-level research questions include: How do/will the emerging technologies underpinned by data enable new products or services and change the way they are delivered? How does the proliferation of data impact the individual, the world of work, and the breadth of the private sector? How can data analytics be implemented to aid business strategies? What's the potential of using decentralised platforms underpinned by trusted data for transport, supply chains or the creative industries? How can the security implications of the sharing economy be addressed? Will decentralisation lead to citizens being empowered to better manage personal data through selling or leasing their data, education, digital literacy or policy? What are the ethical considerations of data commodification and data sharing for AI? In addition, advances are needed around distributed ledgers, data analytics, AI, ethics and policy, decentralisation of data control/access, security in the sharing economy and cryptocurrencies.

A significant outcome would be for this priority to address how markets can harness and learn from data, including how new technology can enable businesses to create and adopt new business models, and how these changing models of value may affect the way we work, and change the way we interact with individuals, businesses and government. This should include good governance of data-driven platforms, and issues of fairness and equality around new models of value emerging in the data-driven economy.

A holistic, people-centred systems approach should be taken; the needs, attitudes and behaviours of individuals who interact with the digital systems for businesses being considered at the heart of any research proposal. Research is needed to understand how society and businesses want to operate in the human-driven data economy and how to harness the opportunities that will arise. The collection, buying, selling and leasing of data are emerging issues in this area, so it is important that researchers consider Responsible Research and Innovation and ethics, good governance and societal impact when developing new business models or platforms. Hence, proposals should focus on the 'how' rather than the 'what' in terms of products and services and aim to facilitate adoption through the integration of the consideration of societal attitudes, technical challenges, law and regulatory matters.

Equitable Digital Society (EDS)

Digital technologies are having a profound effect on the organisation of societies and the practices of everyday life. However, the benefits of the digital economy are not equally distributed, for example between different age groups and socioeconomic backgrounds. In some cases, digital technologies are creating new challenges of social division and inequality.

The Equitable Digital Society priority focuses on addressing these issues by challenging the assumption that technology alone is sufficient, and instead promotes the co-creation and design of appropriate digital technologies and services that will support a fairer, more inclusive society. Crucially, this will require academia, industry, the third sector, government and other relevant organisations to work together to identify and prioritise citizens' needs to define a shared vision for an Equitable Digital Society and how it can be achieved. The aim is to reach greater social, political and economic inclusion, and to support social cohesion, whilst minimising the emergence of new spheres of exclusion. This may enable greater creativity, productivity and enhanced wellbeing of all citizens.

Examples of high-level research questions include: How can the potential for technology and whole system/service design be realised to make socioeconomic life fairer? Can decentralisation play a part in empowering citizens through control and access of their data? In a future world where artificial intelligence may become pervasive, how will automated decision-making by algorithmic classification be governed? How can we ensure that data-driven decision-making does not result in prejudice and discrimination, and that citizens are equipped to challenge algorithmic decisions? How can negative consequences due to online harms be predicted and prevented? How can digital technologies address the challenges of adoption and use of technology across societies, for example in addressing the issues faced by those who are unwillingly not in the Banking

system? What are the changes required to achieve an Equitable Digital Society that can be addressed by sociotechnical, applied research?

An ambitious outcome would be the judicious use of digital technologies and services across all societies which supports inclusion, equality, participation and social justice.

To align with this priority, research should commit to a co-creation approach with a wide range of citizens, including both socioeconomically advantaged and disadvantaged communities, and ensuring a range of cultural perspectives. Processes for these citizens' engagement, consultation and representation in the design and use of digital technologies, platforms and services should be incorporated into the research. An Equitable Digital Society should aim to realise digital benefits for all, empower the disempowered, and create technologies that will reduce inequalities and shape inclusive societies to help reach the best version of our increasingly digitalised world.

Sustainable Digital Society

Climate change and other anthropogenic impacts on the environment are a persistent and growing threat worldwide. Whilst digital technologies have potential to bring about social, economic and cultural benefits, increasingly, they are associated with growing ecological burdens and social divisions. This sociotechnical priority focuses on the use of digital technologies to address anthropogenic environmental impacts and improve environmental sustainability, whilst considering the ongoing impacts associated with the creation and use of the digital technologies themselves, to ultimately create a Sustainable Digital Society.

This priority encompasses not only the development of new technologies, but new digitally inspired business models, processes and policies (within the public, private and third sectors), focusing on environmental and social impacts, as well as economic benefits. New forms of governance and new types of supply chain will be needed to enable organisations and societies globally to implement new and more sustainable processes, whilst ensuring all members of society have agency with regards to sustainability.

Examples of high-level research questions include: How can novel digital technologies be used to shift patterns of consumption and foster more sustainable ways of living and economic arrangements? How can we explore the tensions between the push for increasing digitalisation and the associated energy costs and environmental impacts? What sociocultural and policy challenges must be addressed in order to enable the widespread adoption of sustainable technologies? How can policymakers and businesses understand the needs and preferences of large numbers of individuals via digital technology? How can digital technologies be made sustainable end-to-end – from conception through to design and development, to maintenance, upgrade or evolution, and decommissioning?

An ambitious outcome would be for digital technologies to enable a re-imagining of the current organisation of global societies into alternative, more sustainable arrangements in all aspects of everyday life, and to empower the public as a

force for positive change across the public, private and third sectors. To ensure that research undertaken creates a more sustainable future, it must be situated in deep understanding of the how social and digital actors come together. Research in this area will, therefore, require an interdisciplinary and global approach, combining technical research with research across the social sciences, environmental sciences, business, humanities and the arts.

The coming together of academia, industry, the public, charities and policymakers, as well as international collaboration, is key to creating a Sustainable Digital Society. This priority is linked to Responsible Research and Innovation (RRI). Applicants must should demonstrate evidence of their consideration of the environmental impacts of their research activities, and how these impacts will be mitigated.

Trust, Identity, Privacy and Security (TIPS)

Complex, pervasive, highly connected digital systems are integral to daily life – from ordinary citizens to industrial and government infrastructures. Societal trust is now in danger of being disrupted by digitally mediated means, such as the increasing proliferation of fake news and 'deepfakes', widespread application of facial recognition technologies, interference in electoral processes and recurring security breaches. This priority focuses on interdisciplinary, sociotechnical research that fully integrates the needs of the people and organisations who use, operate and run digital systems; ensuring they are safe, secure, reliable, trustworthy, legally compliant, and ethically sound.

Research should consider trust, identity, privacy and security at scale and via automatic means, and the tension between what works for an individual, what works for a group and what works for the public at large. Moreover, further research is needed to understand the 'security gap': the apparent dissonance between the availability of solutions to security issues, and shortfalls in their adoption. Adventurous, disruptive research is required to develop new models for security that navigate this complex ecosystem and ensure a successful and resilient digital economy for all.

Examples of high-level research questions include: How can we build digital technologies which mitigate for increasing lack of societal trust whilst still embracing the opportunities that the digital economy can bring? How do we trade off transparency and accountability with privacy and security to create an inclusive digital economy for social good that works at scale and across different cultures, perspectives and social constructs? How do we protect the interests of the individual and build confidence that digital economy services will use personal information responsibly, while enabling new commercial and societal opportunities for innovation? How can new technologies be built to fight crime in a digital context?

The outcome of impactful research in this area is that security, privacy and trust will be inherent in digital systems that work easily, efficiently and effectively, and society will be better prepared and better able to deal with critical challenges. Citizens will have control over their privacy and an intuitive understanding of the security trade-offs they make day to day, and can trust

that their identity and individual values will be respected with regards to how they engage with the digital economy.

Achieving this research challenge will require fundamental advances in security and privacy within computer science, mathematical sciences and engineering. However, even if one can demonstrate strong trust in a technical sense, human or societal aspects of trust do not always align, so research must consider social and cultural aspects in an integrated fashion.