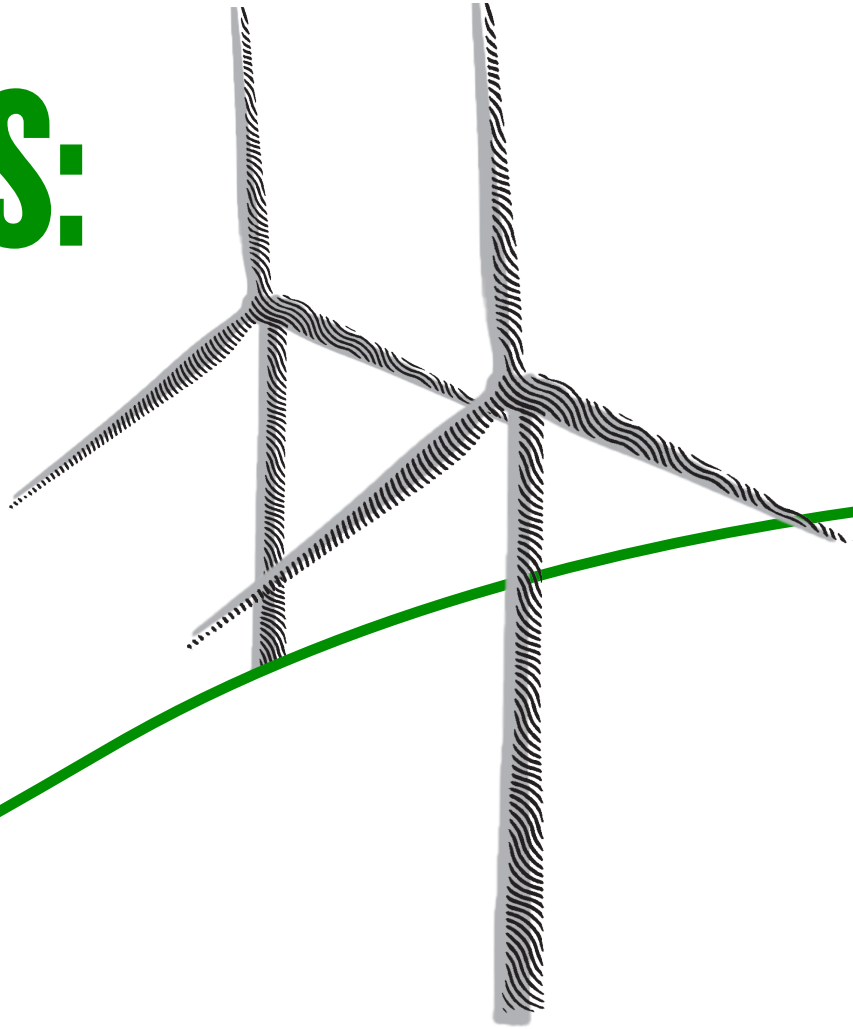
AGEING SOCIETIES: EMERGING TECHNOLOGIES

Technology Roadmap 2022



Royal College of Art
Postgraduate Art & Design

Royal College of Art
DESIGN AGE® INSTITUTE

The Design Age Institute is the UK's national strategic unit for design and the healthy ageing economy. It brings together designers, businesses, researchers and communities to help address the challenges and opportunities of an ageing society. Through the transformative power of design, it aims to help everyone age happier and healthier.

A key component is exploring technology futures to humanise emerging technologies through inclusive and speculative design for older people.

We would like to thank the Design Age Institute partners, the National Innovation Centre for Ageing and the International Longevity Centre UK, and others for their feedback.

Royal College of Art
THE HELEN HAMLYN CENTRE FOR DESIGN

The Helen Hamlyn Centre for Design is a global leader in Inclusive Design, Design Thinking and Creative Leadership, working with government, business, academia and the third sector.

It focuses on Inclusive Design process and projects, linking this to developments in Design Thinking and Creative Leadership. With a three-decade history, it is the longest-running centre for design research at the RCA.

We would like to thank Sidse Carroll PhD, Dr Melanie Flory, Rama Gheerawo and Dr Chris McGinley, of the Helen Hamlyn Centre for Design, for their support.

CONTENT

FOREWORD

My connection with the Helen Hamlyn Centre of Design began in the summer of 2019 when its Director, Rama Gheerawo, and I met in line waiting to get onto a bus in Tel Aviv. It was at this Access Israel conference where I learned about the HHCD and the Centre's work. Rama and I have worked together ever since and I've been deeply impressed with the thoughtful work that the Centre does - learning about the needs of all people, regardless of the location, ability, gender, age, and so forth.

My 25+ years building technology in some of the world's most influential companies has given me a first hand perspective on the intersectional nature of technology - it's fascinating how often one failure opens the door to another solution in the future. My work at Google as Europe, Middle East and Africa (EMEA) Lead for Accessibility and Disability Inclusion brings me face to face with the inequalities that an unintentional, non-inclusive society creates.

I can say from a first hand perspective that the Hype Cycle, as is described in this report, is real and it's unfortunate. In the same way inventions are rarely the result of a "Eureka!" moment, impactful technology will take time to mature into something truly useful. This is tremendously important because people with disabilities, caused by birth, accident, or ageing are rarely considered in the early phases in the development of new tech. This has the unfortunate consequence of making it easy not to believe in, or believe too much, the promise of new technologies. As inflated expectations are dashed by reality, trust is lost - often by those who can benefit the most.

This report shares an interesting view of upcoming technologies and where they are in this cycle with a long time horizon. Understanding this allows us to choose where they want to invest their money or their expectations. With realistic expectations we can prioritise the needs of people who are outside of the norm. Only by intentionally involving and designing with people with different needs can we start to fulfil those early expectations for all.

Christopher Patnoe
EMEA Lead for Accessibility and Disability Inclusion
Google

1. INCLUSIVE AGEING SOCIETIES

Ageing societies represent one of the most complex societal challenges of our time.

The United Nations (UN) has identified population ageing as the 21st century's global demographic phenomenon. Almost every country in the world will see an increase in the proportion and number of older persons in their populations.

- Worldwide, the 65+ age group is set to increase from 9% in 2019 to 16% by 2050, more than doubling from 727 million to 1.5 billion [UN 2020].

- In the UK it is expected that more people will live longer and have fewer children, with 25% of the population being aged 65+ by 2050, an increase from 18% in 2018 [ONS 2019].

We are also living more diverse lives, which requires appropriate equity in designing for our future selves [WHO 2015].

Longevity Economy

Older people are driving a large proportion of the world's economic activity. In 2020 the Longevity Economy was estimated to generate nearly £11 trillion worth of economic activity [Coughlin 2017]. In the United States the age 55+ population accounted for 50% of domestic consumer spending growth since the global financial crisis. This number stands at 67% in Japan and 86% in Germany [Kuenen 2011].

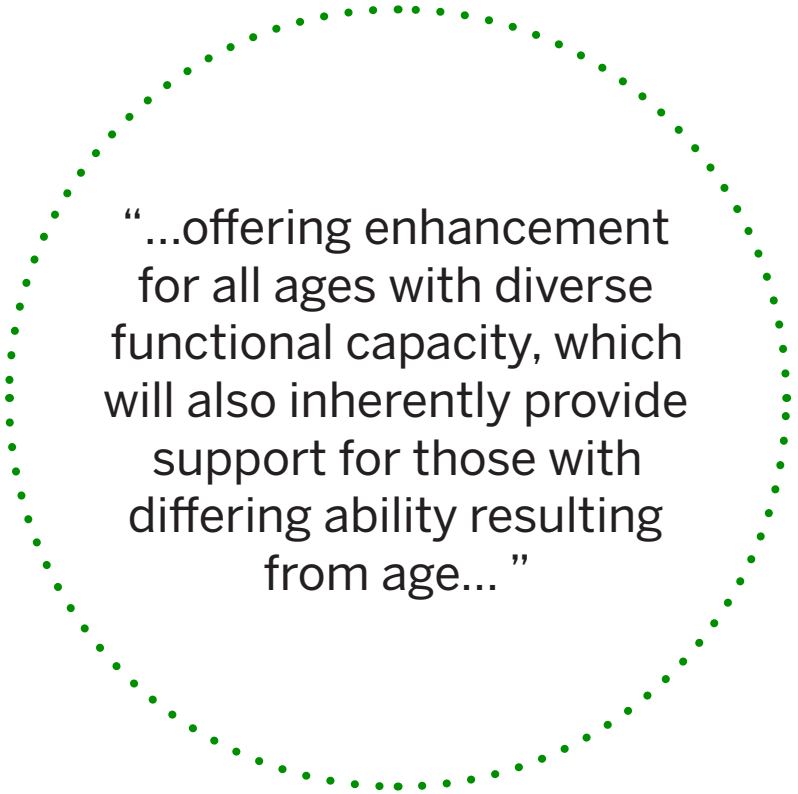
The Longevity Economy has an inherent duality. The majority of older people have diverse functional capacity, and only a minority are classified as disabled. In the UK, 58% of people at or above the state pension age have diverse functional capacity [ONS 2013, 2014]. In Canada this figure stands at 62%. So, this can be expected for the majority of older people in the future.

Digital technology companies, policymakers and academia are understandably interested in the potential of the Longevity Economy, especially emerging digital technologies that would bring living 'longer' closer to living 'well'. While the promise of such technology is inspiring, research reveals that older people are rarely included and consulted in development, which is limiting and unethical. Instead, we need to acknowledge the inherent duality of the Longevity Economy, requiring inclusive age-friendly design in the development of mainstream digital technologies [Rothwell 2017]. So, moving beyond medical products at points of crisis to aspirational age inclusive design. However, this requires a better understanding of the relationship between emerging digital technologies and the needs of older people in the Longevity Economy.

> "We recommend ... bringing together academia and industry to embed inclusive, age-friendly design in the development of mainstream technology... "
>
> Professor Dame Nancy Rothwell, Council for Science and Technology, writing to PM (2017)

Technology Futures

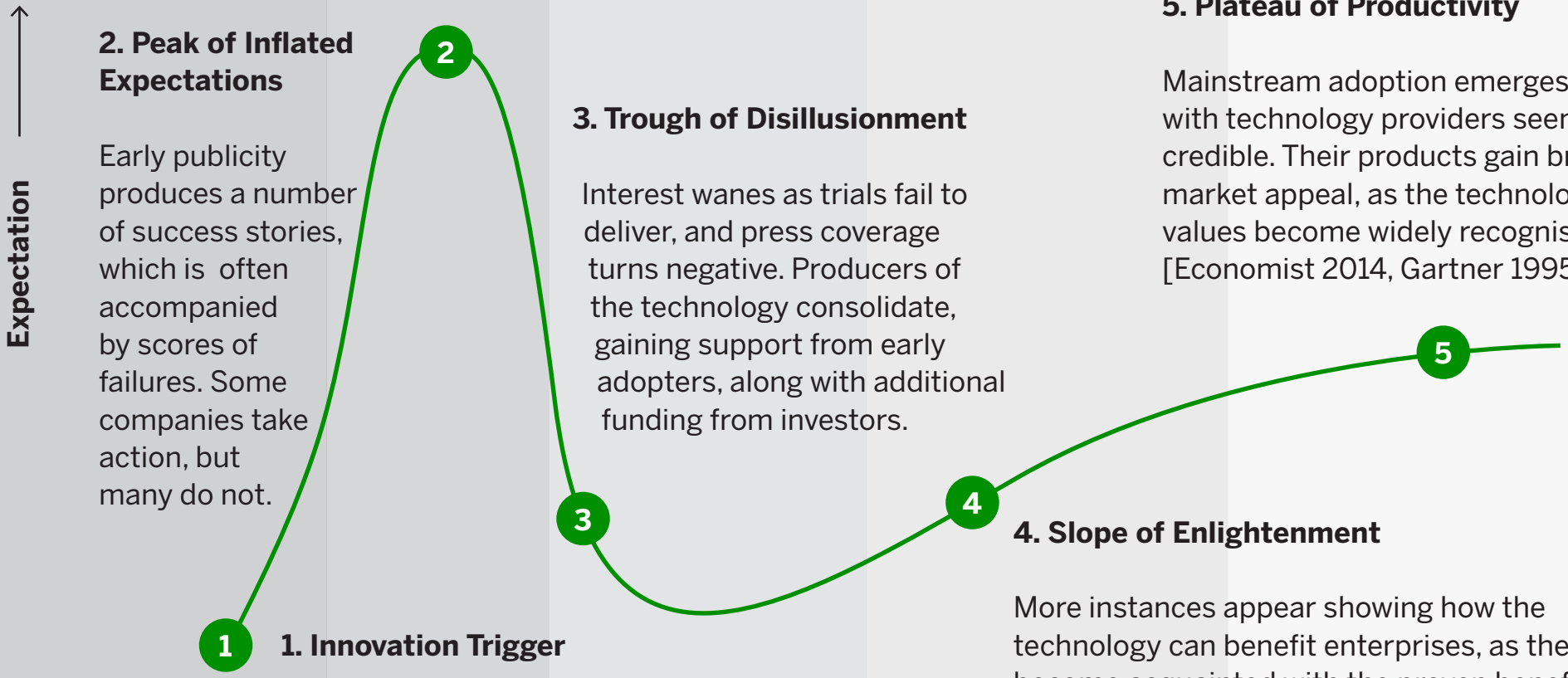
We adopted a Technology Futures approach to better understand the potential of emerging digital technologies for the Longevity Economy. Specifically, age inclusivity through an enhancement model for the development of mainstream digital technologies [Parra 2014]. Offering technology-based enhancement for able-bodied people of all ages, can also inherently provide support for those with differing abilities. Being part of mainstream (and therefore popular) technology would also ensure economies of scale, as well as wider social acceptance of enabling-technologies. Importantly, this will minimise stigmatisation. We then identified emerging digital technologies significant to the inherent duality of the Longevity Economy.



Technology Roadmap

To share our understanding and insights of the emerging technology landscape, we concluded the best choice would be Gartner’s [1995] Hype Cycle model. This is because it is well established within the technology sector, often utilised to influence technology companies in their strategy and investment decisions [Steinert 2010]. It also supports policymakers in efficiently allocating funding and resources to best support research and development of emerging digital technologies [Park 2015, Chen 2019]. The Hype Cycle summarises the life-cycle status of emerging technologies in a chosen domain [Bresciani 2010], in this case the Longevity Economy. So, we hope the following will help those interested in developing emerging digital technologies for the Longevity Economy, identifying the most significant on the horizon.

2. HYPE CYCLE EXPLAINER



2. Peak of Inflated Expectations

Early publicity produces a number of success stories, which is often accompanied by scores of failures. Some companies take action, but many do not.

3. Trough of Disillusionment

Interest wanes as trials fail to deliver, and press coverage turns negative. Producers of the technology consolidate, gaining support from early adopters, along with additional funding from investors.

5. Plateau of Productivity

Mainstream adoption emerges, with technology providers seen as credible. Their products gain broad market appeal, as the technology's values become widely recognised. [Economist 2014, Gartner 1995]

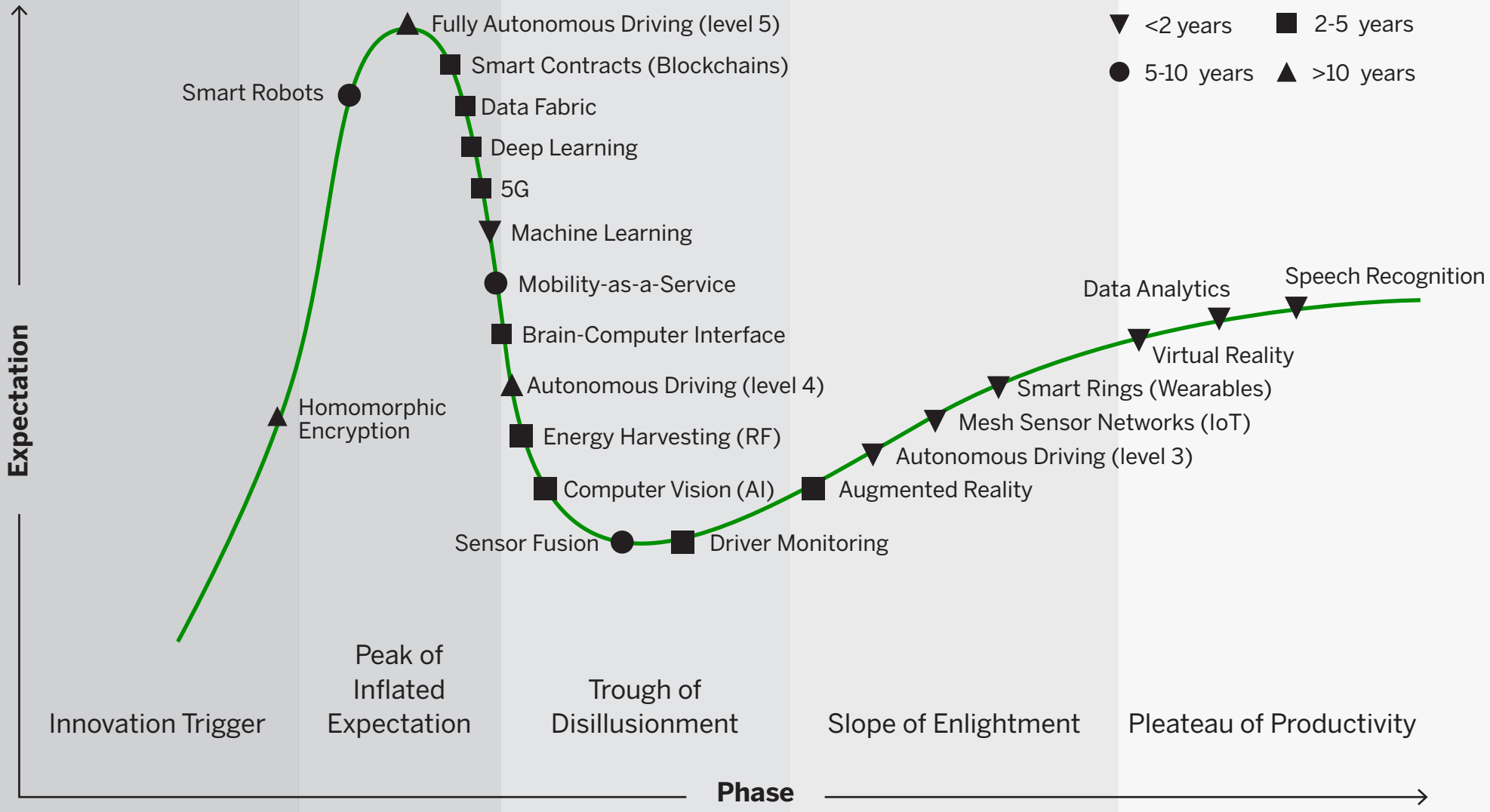
1. Innovation Trigger

News media begins to notice a promising new technology, with early proof-of-concept stories and media interest triggering significant publicity. Often no usable products exist and commercial viability is unproven.

4. Slope of Enlightenment

More instances appear showing how the technology can benefit enterprises, as they become acquainted with the proven benefits and best practices. Second and third generation products emerge, providing the confidence for mainstream adopters to consider committing themselves.

3. TECHNOLOGY ROADMAP FOR LONGEVITY ECONOMY [Briscoe 2022]



4. NEXT TWO YEARS

In the next two year, the most significant emerging digital technologies for the Longevity Economy, will be largely determined by the 'new abnormal' as the effects of the covid pandemic likely lessen [Whitty 2021].

For example, hybrid working models are expected to become commonplace in suitable industries [Rudnicka 2020]. As this occurs, trends prior to the pandemic will begin to reassert, including how we can better support healthy ageing and care for older people in the future.

Automated Driving (Level 3)

Level 3 Automated Driving, also known as conditional driving automation, is able to drive from one point to another if certain conditions are met. However, in the case of emergencies, drivers are expected to take control of the car [Watzenig 2017]. The vehicle has environmental awareness, and is able to make informed decisions, e.g. accelerating past a slow-moving vehicle. Honda recently became the first automaker in the world to sell a car with 'traffic jam assist'. Essentially, automation is possible within structured environments, such as motorways, and this has considerable potential for a range of applications.

Data Analytics

Data Analytics is the examination of data to find trends and draw conclusions about information, by applying an algorithmic process to derive insights and meaningful correlations [Runkler

2020]. Services will include the potential to keep individuals engaged in their own well-being, as well as allowing vestiges of society to detect likely emerging issues. Also, there are emerging applications in transportation, education and health.

Machine Learning

A branch of artificial intelligence (AI) focused on building applications that learn from data and improve their accuracy over time. It differs from Data Analytics by creating and training algorithms through data so they can function independently, rather than using data to generate insights. Machine Learning will have a broad range of applications, including smart cities and automated industry [Farhadi 2018].

Mesh Sensor Networks (IoT)

A network of tiny autonomous devices embedded in everyday objects or distributed around, which are able to communicate using wireless links. Mesh Sensor Networks pass sensor data to each other, acting as repeaters for other nodes when necessary. This differs from network arrangements with a central node that controls communications. There are emerging applications in industry and consumer spaces, including environmental monitoring, home automation and traffic control [Gupta 2015].

Smart Rings (Wearables)

A ring that can provide feedback to users allows them to engage with their environment in more natural and discrete ways, including gesture control, than other wearables [Gheran 2018]. While battery technology remains one of the biggest obstacles in such devices, kinetic energy sources will power sensors for data collection without continuous battery drain. Together with emerging advances in battery and wireless charging technology, such devices should be able to power themselves or retain sufficient charge for much longer periods (e.g. weeks).

Speech Recognition

Speech recognition, or speech-to-text, is the ability of a machine or programme to identify spoken words. Speech recognition traditionally required training, where speakers read predefined text [Yu 2016]. However, the increasingly widespread availability of speaker-independent systems support most commercially available voice control interfaces (e.g. Amazon Alexa, Apple Siri, etc).

Virtual Reality (VR)

A computer-generated simulation in which a person can interact within an artificial three-dimensional environment, similar to or completely different from the real world. It typically requires special electronic equipment, such as a headset with a screen inside and tracked hand controllers [Anthes 2016]. Applications include recreation and therapy, individually and in groups.

5. TWO TO FIVE YEARS

The most significant emerging digital technologies for the Longevity Economy, in the next two to five years, will again, largely be determined by the likely post-pandemic environment [Whitty 2021].

The majority of effects from the pandemic will have abated, although some structural changes will remain. A narrative is emerging of a second ‘Roaring Twenties’ [Terzi 2021], in which we can expect an acceleration in digital innovation to all areas of life partly from our necessary responses to the pandemic.

5G

5G is the fifth generation technology standard for mobile broadband, which began deployment in 2019. In addition to greater bandwidth, reduced latency and Quality of Service (QoS) guarantees will support emerging real-time applications in the internet-of-things (IoT) and other spaces [Agiwal 2021]. It is also expected to be increasingly used as an Internet Service Provider (ISP), competing with existing ISPs.

Augmented Reality (AR)

Augmented Reality (AR) aims to add to the real physical world through the use of digital visual elements, sound, or other sensory stimuli delivered via technology [Billinghurst 2015]. Unlike Virtual Reality, which creates its own cyber environment, AR enriches our existing environment with additional information. It can facilitate virtual participation in a wide range of activities, such as social events, the pursuit of hobbies or virtual tourism.

Brain Computer Interface

Brain Computer Interfaces (BCIs) have emerged as a novel technology that bridges the brain with external devices. It acquires brain signals, analyses them, and translates them into commands that are relayed to external devices to carry out a desired action [He 2020]. The greatest emerging potential is for non-invasive BCIs, offering 'mind control' over a range of activities, beyond disability solutions.

Computer Vision (AI)

Computer Vision is a field of Artificial Intelligence (AI) that enables computer systems to derive meaningful information from digital images, videos and other visual inputs. Computer Vision enables computers to see, observe and understand. So, they can label images, take actions or make recommendations. Computer Vision trains machines to see with cameras, data and algorithms rather than retinas, optic nerves and a visual cortex. It can surpass human

capabilities, once trained it can analyse thousands of products or processes a minute, noticing imperceptible defects or issues [Szeliski 2022].

Data Fabric

Data Fabric is an emerging data architecture pattern that links together different data sources in a consolidated cloud environment. It powers seamless, secure access to disparate data storage systems, located on-premises, in the cloud, in a multi-cloud or hybrid environments [Hoberman 2018]. It will be a first step in achieving a degree of meaningful interoperability (at least at the data layer, over the 'walled gardens' of Big Tech), necessary for integrated solutions such as Mobility-as-a-Service.

Deep Learning

Deep Learning models introduce an extremely sophisticated approach to Machine Learning, specifically modelled after the human brain. Complex, multi-layered 'deep neural networks' are built to allow data to be passed between nodes (like neurones) in highly connected ways. The result is a non-linear transformation of the data that is increasingly abstract. So, similar to how we learn from experience, a Deep Learning algorithm performs a task repeatedly, each time tweaking the algorithm to improve the outcome [Janiesch 2021].

Driver Monitoring

Driver Monitoring, also known as driver attention monitoring, is a vehicle safety system to assess driver alertness and provide warnings if needed, before eventually applying the brakes autonomously. There are two types, eye trackers and steering wheel sensors. If a driver is detected not paying attention, warnings are sounded through lights and/or sounds. If the driver still does not re-engage, the car will pull itself to the side of the road and stop [Hecht 2018]. As the focus of automakers shifts from driving to riding experience, Driver Monitoring will move beyond keeping drivers alert to analysing their moods and expressions to personalise experiences.

Energy Harvesting (Radio Frequency)

Energy Harvesting, also known as ambient power, is the process by which energy is derived from external sources, captured, and stored for small, wireless autonomous devices, like those used in wearable electronics and wireless sensor networks. Given the ubiquity of electronics and mobile devices, Radio Frequency (RF) waves are constantly broadcasted into the environment by these devices [Aparicio 2016]. So, our surroundings are rife with potentially usable energy that could power our electronics if harnessed and stored. Wireless Energy Harvesting (WEH) has emerged as the most trusted RF harvesting technology, because of its simplicity and ease of implementation. At close range to a transmitter, RF energy can be used in low-power devices such as GPS tags, wearable battery-free sensors and to wirelessly charge low-power consumer electronics. At a longer range, there could be a number of other applications such as building automation.

Smart Contracts (Blockchains)

Smart Contracts are programmes stored on a blockchain that run when predetermined conditions are met. They are typically used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss. They can also automate a workflow, triggering the next action when conditions are met. The code and the agreements contained therein exist across the blockchain network, being as distributed as the network. As the code controls the execution, transactions are trackable, and therefore irreversible [Zheng 2021]. Applications are emerging in supply chain management, energy, finance, and healthcare.

6. FIVE TO TEN YEARS

The most significant emerging technologies for the Longevity Economy, in the next five to ten years, will mostly be determined by the future needs of today's 50-55 year olds, in an environment in which the economy has seen significant automation [Xu 2018].

The impacts of even this partial automation economically and to society will be as significant as the effects of industrialisation historically. Meaningful regulation of Big Tech will necessarily emerge to enable the cultural acceptance of automation across the entire economy.

Mobility-as-a-Service

Mobility-as-a-Service (MaaS) is an emerging type of service that integrates various forms of transport into a single point-of-access accessible on demand. The concept encapsulates a shift away from personal modes of transportation, towards mobility provided as a service. For travellers, MaaS can offer added value by providing a single application to access a range of integrated mobility solutions, solving the challenges of combining the different parts of individual journeys. Therefore, creating an ecosystem of interoperable mobility services [Jittrapirom 2017].

Sensor Fusion

Sensor Fusion is the process of combining sensory data derived from disparate sources, such that the resulting information has less uncertainty than the sources individually. For example, some mobile phone location systems enhance GPS with WiFi localisation [Elmenreich 2002]. There are a wide range of emerging applications, including the Internet-of-Things, autonomous vehicles, and healthcare. For example, to make safe and dependable autonomous vehicles, of any level, Sensor Fusion incorporating multiple types of sensors (e.g. LiDAR, radar, cameras, etc) is typically considered necessary.

Smart Robots

Advancements in robotics have led to the emergence of Smart Robots, which are defined as autonomous artificial intelligence (AI) systems that can collaborate with humans. They are capable of learning from their operating environment, experiences, and feedback from human–machine interaction (HMI), to improve their performance and capabilities [Westerlund 2020]. Applications are expected to include autonomous drones, domestic helpers, exoskeletons, smart warehouses, as well as co-working in demanding and dangerous environments.

7. BEYOND TEN YEARS

The most significant emerging technologies for the Longevity Economy, beyond ten years, will largely be defined by automation in every aspect of human existence [Barnhizer 2016].

However, this will be coupled with emerging climate crises, which will increasingly force significant population relocation [Parenti 2017]. This will also lead to increasing re-wilding of urban and suburban spaces looking to compensate for rising carbon emissions.

Considering the likely trends there will be a focus on rapid mainstreaming of emerging technologies to aid environmental efforts. For example, calculating total life carbon expenditure of consumer goods, and automated sorting to significantly increase recycling and support circular economies at scale.

Autonomous Driving (Level 4)

Level 4 Automated Driving, also known as high driving automation, is able to drive within predefined areas under most circumstances, including when things go wrong. The availability of self-driving mode is managed by geo-fencing, but drivers still have the option to manually override [Watzenig 2017]. Pre-defined areas are usually urban environments where the default speed limit is 30 mph, at least until legislation and infrastructure evolves. So, most Level 4 vehicles in existence are geared toward ride-sharing.

Autonomous Driving (Level 5)

Level 5 Automated Driving, also known as full driving automation, will not require human attention to drive under any circumstances. Furthermore, the choice for manual control may be unavailable, as some vehicles are expected to dispense with steering wheels and pedals. They will be able to go anywhere, with no geographical restrictions [Watzenig 2017]. In theory they will be as capable as an experienced human driver, and reasonably expected to become more competent as they significantly exceed the typical experience of any human driver. Level 5 vehicles will create new mobile spaces, where the capacity of the vehicle will be mostly available for activities other than driving.

Homomorphic Encryption

Homomorphic Encryption allows for computation on encrypted data without first decrypting it, with the resulting computations also remaining encrypted. Furthermore, these computations when decrypted are identical to those produced had they been performed on the data unencrypted. Therefore, it can be used for privacy-preserving outsourced storage and computation (i.e. Cloud Computing), and has the potential to address the ever-increasing privacy challenges [Lauter 2011]. For example, analytics in healthcare can be problematic due to medical data privacy concerns, but if an analytics service provider can operate on encrypted data instead, these privacy concerns are considerably diminished. Furthermore, even if the systems of service providers were to be compromised, the data would remain secure.

REFERENCES

[Agiwal 2021] M Agiwal et al. A survey on 4G-5G dual connectivity: Road to 5G implementation. *IEEE Access*, 9:16193–16210, 2021.

[Anthes 2016] C Anthes et al. State of the art of virtual reality technology. In *IEEE Aerospace Conference*, pages 1–19, 2016.

[Aparicio 2016] M Aparicio et al. Radio frequency energy harvesting sources and techniques. In W Cao and Y Hu, editors, *Renewable Energy*, chapter 7. IntechOpen, Rijeka, 2016.

[Barnhizer 2016] D Barnhizer. The future of work: Apps, artificial intelligence, automation and androids. *Cleveland-Marshall Legal Studies* Paper No. 289, 2016.

[Billinghurst 2015] M Billinghurst et al. A survey of augmented reality. *Foundations & Trends in HCI*, 8(2-3):73–272, 2015.

[Bresciani 2010] S Bresciani et al. Gartner's magic quadrant and hype cycle. *Universita della Svizzera italiana*, 2010.

[Briscoe 2022] G Briscoe. Technology Futures Roadmap For Ageing Societies. *World Ageing and Rejuvenation Conference*, 2022.

[Chen 2019] X Chen et al. Disruptive technology forecasting based on gartner hype cycle. In *IEEE technology & engineering management conference*, pages 1–6. IEEE, 2019.

[Coughlin 2017] J Coughlin. *The longevity economy: Unlocking the world's fastest-growing, most misunderstood market*. Hachette, 2017.

[Economist 2014] Divining reality from the hype. *The Economist*, 2014.

[Elmenreich 2002] W Elmenreich. An introduction to sensor fusion. *Vienna University of Technology*, 2002.

[Farhadi 2018] H Farhadi. *Machine Learning: Advanced Techniques and Emerging Applications*. IntechOpen, 2018.

[Gartner 1995] Understanding Gartner's Hype Cycles. *Gartner.com*, 2018.

[Gheran 2018] B Gheran et al. Gestures for smart rings: Empirical results, insights, and design implications. In *Designing Interactive Systems Conference*, pages 623–635, 2018.

[Jittrapirom 2017] P Jittrapirom et al. Mobility as a service: A critical review of definitions, assessments of schemes, and key challenges. *Urban Planning*, 2(2), 13-25.

[Gupta 2015] D Gupta. Wireless sensor networks 'future trends and latest research challenges'. *IOSR Journal of Electronics and Communication Engineering*, 10(2):41–46, 2015.

[He 2020] B He et al. Brain–computer interfaces. In B He, editor, *Neural Engineering*, pages 131–183. Springer, 2020.

[Hecht 2018] T Hecht et al. A review of driver state monitoring systems in the context of automated driving. In *Congress of the International Ergonomics Association*, pages 398–408. Springer, 2018.

[Hoberman 2018] E Hoberman et al. The forrester wave: Big data fabric, Q2 2018. *Tools and Technology: The Data Management Playbook*, 2018.

[Janiesch 2021] C Janiesch et al. Machine learning and deep learning. *Electronic Markets*, 31(3):685–695, 2021.

[Kuenen 2011] J Kuenen et al. Global aging: How companies can adapt to

the new reality. *Boston Consulting Group*, 2011.

[Naehrig 2011] M Naehrig et al. Can homomorphic encryption be practical? In *ACM workshop on cloud computing security workshop*, pages 113–124, 2011.

[ONS 2013] 2011 census: Detailed characteristics for England and Wales.

[ONS 2014] Disability prevalence estimates 2002/03 to 2011/12.

[ONS 2019] Living longer: is age 70 the new age 65.

[Parenti 2017] C Parenti. If we fail. *Catalyst*, 1(2), 2017.

[Park 2015] D Park et al. A study on the dynamic nature of co-evolution between technology and society: Hype cycle management issues. *Indian Journal of Science and Technology*, 8(25), 2015.

[Parra 2014] C Parra et al. Information technology for active ageing: A review of theory and practice. *Foundations and Trends in Human-Computer Interaction*, 7(4):351–444, 2014.

[Rothwell 2017] N Rothwell. Harnessing technology to meet increasing care needs. *Council For Science And Technology*, 2017.

[Rudnicka 2020] A Rudnicka et al. Eworklife: Developing effective strategies for remote working during the covid-19 pandemic. In *The new future of work online symposium*, 2020.

[Runkler 2020] T Runkler. *Data analytics*. Springer, 2020.

[SC 2018] A demographic, employment and income profile of Canadians with disabilities aged 15 years and over, 2017. *Statistics Canada*, 2018.

[Steinert 2010] M Steinert et al. Scrutinizing gartner's hype cycle approach. In *Picmet technology management for global economic growth*, pages 1–13. IEEE, 2010.

[Szeliski 2022] R Szeliski. *Computer vision: algorithms and applications*. Springer, 2022.

[Terzi 2021] A Terzi. The roaring twenties after covid-19: revisiting the evidence for europe. *Journal of New Finance*, 2(1):3, 2021.

[United Nations 2020] World population ageing 2020 highlights: Living arrangements of older persons. *Dep. of Economic & Social Affairs*, 2020.

[Watzenig 2017] D Watzenig et al. Introduction to automated driving. In *Automated Driving*, pages 3–16. Springer, 2017.

[Westerlund 2020] M Westerlund. An ethical framework for smart robots. Technology Innovation Management Review, 10(1), 2020.

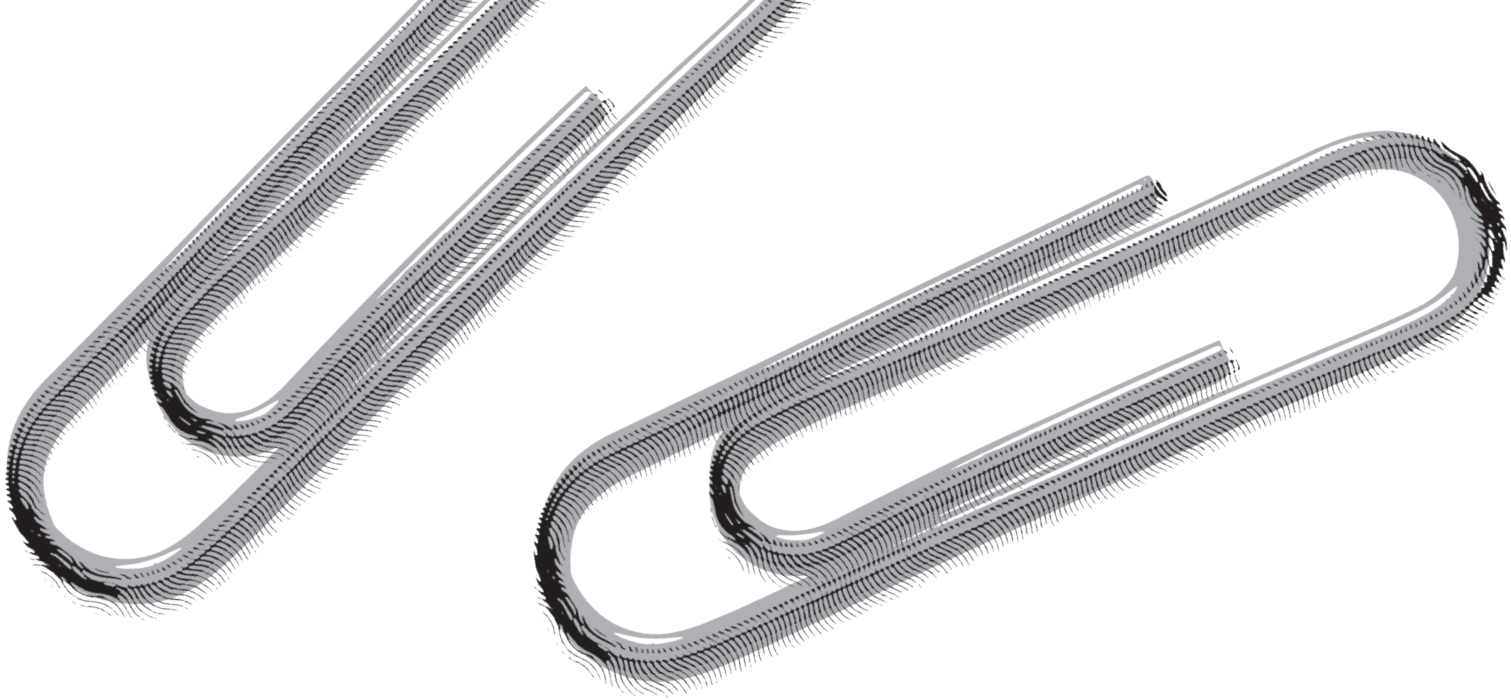
[WHO 2015] World report on ageing and health. *WHO*, 2015.

[Witty 2021] C Witty. Oral evidence: Omicron variant update, *HC 990*.

[Xu 2018] M Xu et al. The fourth industrial revolution: Opportunities and challenges. *International journal of financial research*, 9(2):90–95, 2018.

[Yu 2016] D Yu et al. *Automatic speech recognition*. Springer, 2016.

[Zheng 2020] Z Zheng et al. An overview on smart contracts: Challenges, advances and platforms. *Future Generation Computer Systems*, 105:475–491, 2020.



For further details:
Dr Gerard Briscoe

Helen Hamlyn Centre for Design
Rausing Research & Innovation Building
Royal College of Art
15 Parkgate Road
London SW11 4NL

+44 (0)20 7223 7705

dai-hhcd@rca.ac.uk

www.rca.ac.uk/research-innovation/research-centres/helen-hamlyn-centre/design-age-institute/

@HHCDesign

Ageing Societies:
Emerging Technologies
Technology Roadmap 2022

Research
Dr Gerard Briscoe
gerard.briscoe@rca.ac.uk

Design
Juliette Poggi
juliette.poggi@rca.ac.uk