Disruptive Technology Trends

NatWest

10x

Twenty linear steps may take you to the door, yet **twenty exponential steps will take you to the moon.**

That principle applies when disruptive technologies converge and drive advances that **alter our perceptions of what technology can do.**

We have all felt the changes brought about by the convergence of **social technologies**, **mobile & IoT** and **cloud**. Soon we will witness a new wave of disruption at the intersection of **AI**, **quantum**, **distributed ledgers** and **immersive technologies**.

Five strategic themes of technology convergence are emerging. They will disrupt entire sectors and industries – **fundamentally reshaping how we create, consume and distribute financial services and beyond.**

Strategic Themes

Personalisation & Hyper-Aggregation

Privacy, Trust, Permission & Protection

Platformisation & Decentralisation

Human-Digital Interface

Culture & Work 2.0

Personalisation & Hyper-Aggregation

Deriving value from huge, diverse data sets

The data universe is expanding exponentially and shows no signs of slowing. It records hundreds of billions of transactions, interactions and behaviours every day. This data will be aggregated into huge data sets to create new value for businesses and consumers. Value will be manifested in hyper-personalised products, services and advertisements that meet exact preferences and needs.

Sensor of 'you'

Due to the plummeting cost of increasingly sophisticated microprocessors, there will be few things which aren't 'smart'. As smart cities, autonomous vehicles, drones and micro-bots become increasingly commonplace, every aspect of your existence and context will be quantified into data.

Is personalisation always a good thing?

There is a growing concern that instead of achieving personalisation, basing recommendations on automating parts of our lives using historic data actually homogenises our tastes and preferences and reinforces existing biases.

Created just for you

Segmentation will end as businesses are able to leverage big data to personalise their products and services at the level of the individual consumer. In time, this will become a basic expectation.

Ethics and explainability

Robust human and technology controls will need to be developed to ensure AI algorithms do not discriminate against the samples of the population they analyse.

As the sophistication of the AI algorithms delivering personalised experiences increases, the ability to justify decisions will become essential. If a consumer is declined health insurance based on analysis of their health data, they will want to know why.

Privacy, Trust, Permission & Protection

Creating digital environments that individuals can trust

Data is becoming more personal. Solutions which protect users' privacy, empower choices around data sharing and ultimately protect the integrity of data are critical to building and maintaining trust in the digital world.

Locked out of the digital world

Personal data is a requirement to access many 'free' digital products and services. Digital platforms now represent the infrastructure of our existence, so it is becoming increasingly difficult to avoid personal data sharing. A compromise is needed – one which prevents users being 'locked out' of the digital world but empowers them to manage and control how their data is collected, analysed and shared.

AI guardians

Data regulations fall short of truly empowering users to take ownership of their data. Disruptive technology such as AI could monitor how and why personal data is being used. Effectively acting as a guardian for users, AI could intelligently and proactively protect their privacy in the new data-driven world.

Trust as a service

Trust will emerge as a new commercial opportunity and will become a differentiating factor when choosing products and services. As a consequence, traditional cloud architectures may be challenged as technology companies contain analysis on end-user devices, rather than processing, storing and aggregating in a centralised cloud.

Cyber arms race

New protective technologies such as biometrics could be used against us if they were to be subverted. Advances in quantum computing could theoretically render existing encryption methods useless.

Platformisation & Decentralisation

Creating new business models

Platform businesses are shifting their core vision from 'what products or services are we offering?' to 'what connections are we enabling?' The platform model means value can be created, exchanged and consumed in a variety of places rather than flowing in a straight line from producer to consumer. However, concerns are mounting that centralised platforms may abuse their positions as dominant players to further their own interests rather than the broader ecosystem. Developments in decentralised technology are driving the emergence of new models and approaches.

Decentralised platforms

Distributed ledger technologies remove central parties and claim to enable individuals and ecosystem players to exert greater control over their own data and digital assets.

For example, rather than share their personal files to gain free cloud storage, a decentralised cloud storage model would set up an encrypted storage exchange between users. Those with excess storage sell, those with not enough buy. The storage network is decentralised across all participants and trust is achieved through technologically enabled consensus.

The convenience conundrum

The centralised, multi-faceted nature of existing platforms offers users a seamless experience across different contexts. While alternative models may promise a more mutually beneficial relationship, it remains to be seen whether this is a sufficient draw for consumers to vote with their feet and cut ties with the incumbent platforms.

Deconstructing the market structure

If centralised platforms are dismantled, the power held by corporate technology leaders will begin to diminish. As ownership of digital infrastructure and data transfers to individuals, the small and mid-sized business marketplace will greatly expand.

Human-Digital Interface

Redefining our relationship with technology

As we enter into a world where objects, people and environments are all connected by a mesh of invisible electronic tethers, our decision making, the services we want, and the results we expect from our interactions become much more complicated. Human-digital interfaces will have to predict what we want to do next and our interactions will be with whole systems rather than individual devices.

Personal clouds

Smartphones are evolving into multiple connected devices that enable us to interact with systems in a manner appropriate to context. Constantly synced and biometrically secured, we will exist within a ubiquitous personal cloud, tailored to our individual needs and preferences.

Identity as a service

Access and connectivity to a ubiquitous constellation of devices and the wider ecosystem will be facilitated by biometrically secure interactions. These interactions will be seamless, dynamic and automatic, streamlining a cloud-based human-digital experience.

Life beyond the screen

Zero user interface (UI) is not the entire removal of an interface; rather it is where many of today's visual interfaces recede into the background, leaving us open to engage with data and services that are important and useful to us at that point in time. This shift away from the constrained environment of screen and pointer means the actions we are trying to complete are becoming more complex. They now have to take into account more input around human behaviours, motivations and emotions.

Dramatically shifting how we work and play

The lines between work and leisure are blurring. A new relationship is emerging between professionals and technology as the scope and complexity of tasks that AI, and particularly machine learning, is capable of automating continues to grow. Job-matching and talent platforms are changing and expanding the way individuals look for work and how companies identify and recruit talent. Independent workers are increasingly choosing to offer their services on digital platforms and, in the process, are challenging traditional ideas about how and where work is undertaken.

The AI co-worker

Immersive technologies and AI are enabling new categories of knowledge-enabled jobs. Machine-embedded intelligence and knowledge facilitates access to lower-skilled workers with little to no training.

As the accessibility and scope of these tools grow, 'citizen developers' will be able to develop bespoke solutions to fulfil specific business needs.

Specialist and dangerous roles can be opened up to a broader range of individuals by utilising immersive technologies for training and orientation.

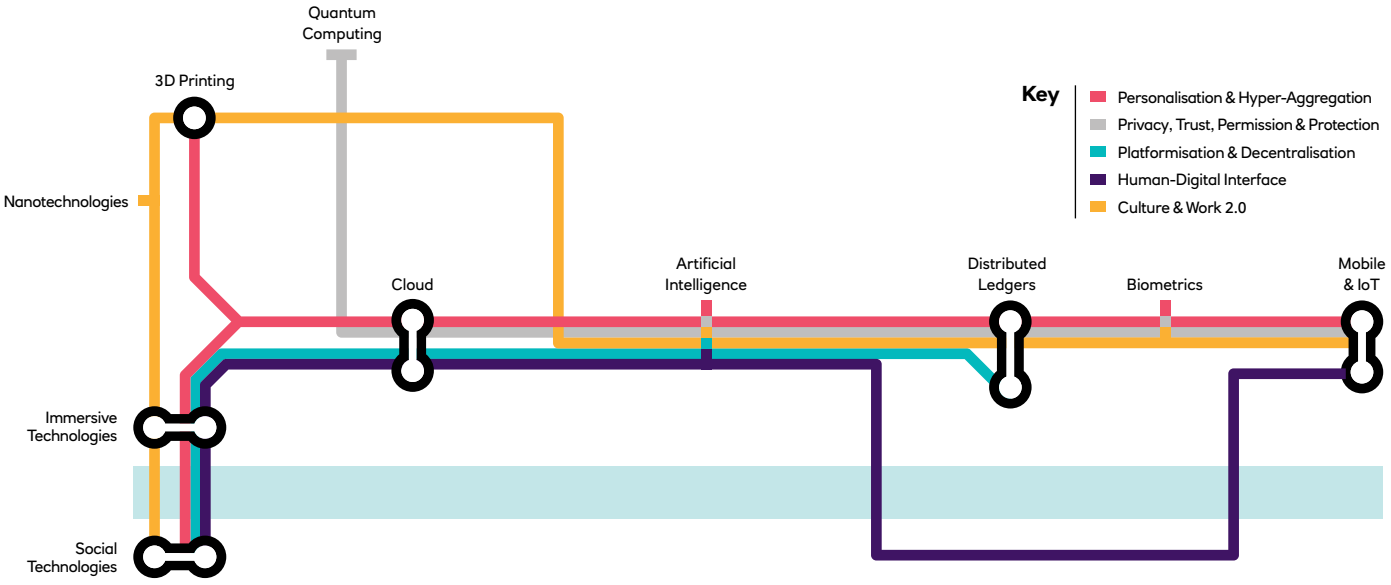
An unknown future

There will likely be growth in roles that focus on the creation and refinement of disruptive technology and the data that fuels it. For example, as AI becomes more common and mission-critical, the challenge of ensuring AI models act in accordance with organisational values will emerge. This will require professionals with knowledge and skillsets which are just on the brink of existence.

New relationships

As the technology interfaces we interact with become more 'human', they will become a consistent presence in our daily lives. Technology will become more ubiquitous but also more invisible.

Technology Stops on our Key Strategic Themes



Cloud
Cheaper and easier technology

Social Technologies
Enabling dynamic interactions

3D Printing
On-demand production & delivery

Artificial Intelligence
Intelligent decision making

Biometrics
I am, therefore I can

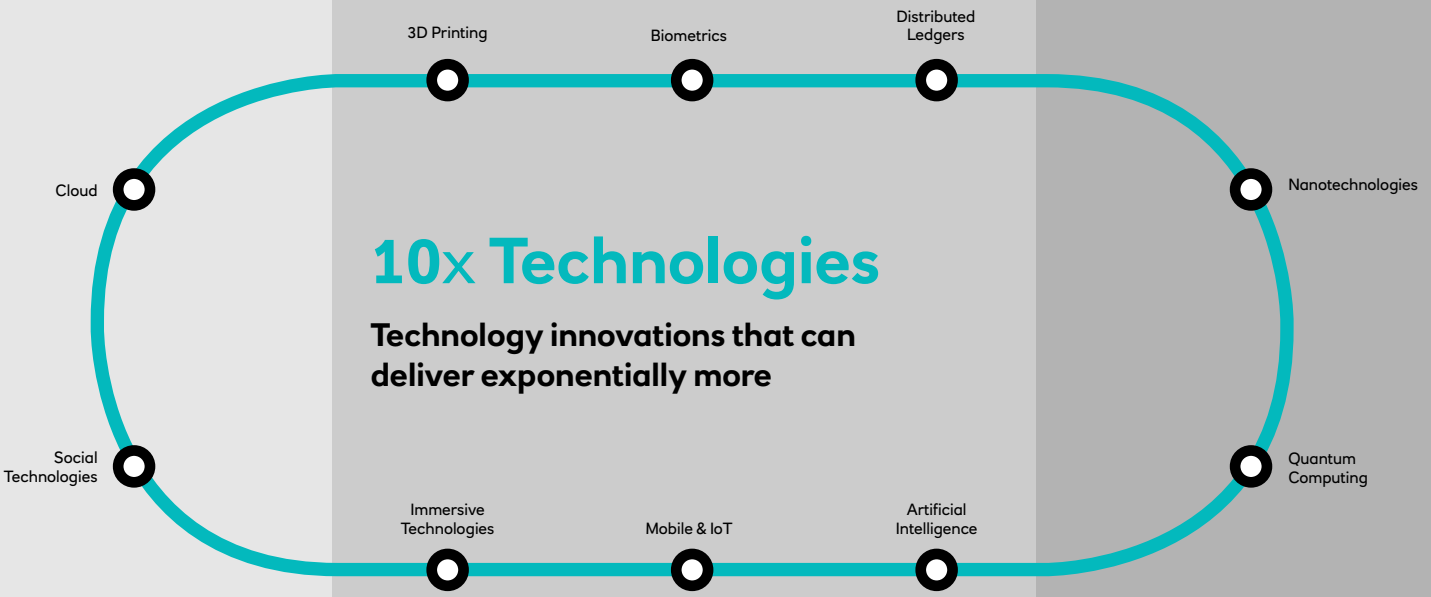
Mobile & Internet of Things (IoT)
Gateways to the digital world

Distributed Ledgers
Distributed, decentralised networks

Immersive Technologies
Combining the digital and physical

Nanotechnology
Smaller and smarter

Quantum Computing
Redefining computing limits



Adopted technologies

have achieved widespread, stable deployment across multiple industries.

Emerging technologies

are operating at a smaller scale. They may be mature in some conventional use-cases, with more disruptive and innovative applications being explored and developed.

Experimental technologies

could be extremely disruptive across the entire technology and consumer landscape. They are still at the very edge of our technology horizon.

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Cloud

Cloud is the delivery of services, from storage to software, over the internet. It offers users resources through an on-demand model; peak capacity is only supplied when needed. As the amount of data generated from connected devices continues to grow, cloud providers are using devices at the edge of the network to carry out computational tasks where speed of processing and zero latency are essential.

Social Technologies

Social technologies are digital enablers for connections between people and groups of people. They may become the primary channel organisations use to interact with their customers. Customers not using social technologies may find themselves 'locked out' of the most competitive product and service offerings.

Now

The reliance of social media platforms on advertising has hindered the organic spread of content. Video is taking centre stage as content becomes increasingly temporary. There is growing concern among users about the way social media platforms analyse and share their increasingly personal data.

Next

Incumbent social players will be credibly challenged by 'grassroots' and decentralised platforms. Distributed ledger technology (DLT) and blockchain will enable decentralised business models to emerge which may start to disrupt existing social platforms.

10x Future

Social technologies will continue to reach into increasingly private parts of our lives – health and personal finance for example. AI 'curators' will be used to automate, manage and protect our online existence and transact on our behalf in the digital world.

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3D Printing

Also known as additive manufacturing, 3D printing refers to the process of manufacturing three-dimensional objects from digital design code. Materials such as plastics or metals are successively layered to build the desired object. The range of materials used to 3D print are expanding to include food and even biomaterials, which could lead to the 'printing' of human body parts.

Now

As 3D printing advances, there is a need for the development of robust patent and IP management solutions to protect the unauthorised printing of digital designs. Emerging solutions can stream digital designs from a secure cloud to printers when a print job is initiated.

Next

Hybridisation of 3D printing with other technologies, such as robotics and advanced materials, will overcome the technology's existing limitations: size, complexity and difficulty meeting high degrees of tolerance.

10x Future

Self-healing smart materials will be capable of sensing and reacting to external stimuli. 3D printed smart car tyres will be able to read road conditions and feedback data to the vehicle, driver and traffic-management organisations.

Artificial Intelligence

AI is a combination of technologies that can answer intricate questions and solve problems by mimicking human intelligence. AI systems can learn and improve through experience, removing the need for prescriptive programming. They can handle uncertainty and make decisions based on a level of confidence rather than following specifically programmed rules.

Now

Organisations are deploying AI solutions for well-defined problem spaces. AI avatars are acting as a first point of contact for customers. Behind the scenes, AI systems are being applied to fraud detection and regulatory compliance.

Next

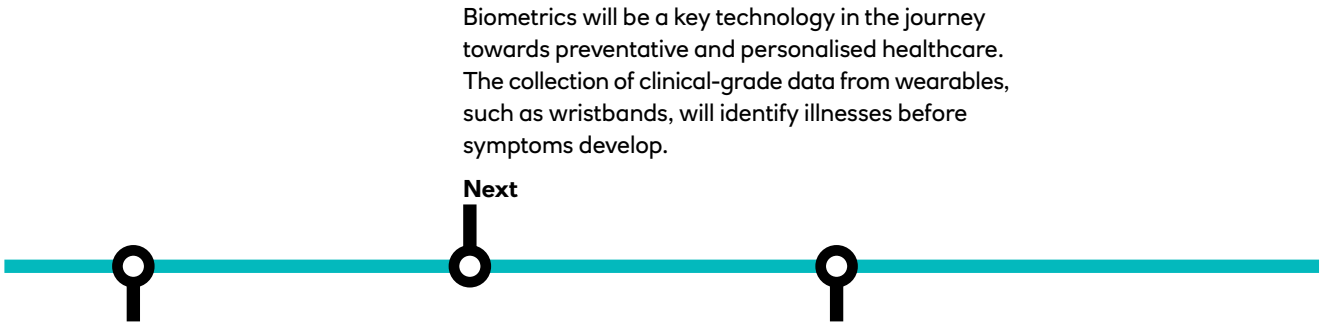
Customer-facing AI will move beyond voice and chat interfaces. It will have the capability to understand context and transact proactively on customers' behalf, drawing on real-time data sources.

10x Future

Individuals and enterprises will deploy AI to transact on their behalf across a wide range of activities and services. This will lead to AI-to-AI channels, radically changing how, in a digital world, consumers discover, select, pay and consume.

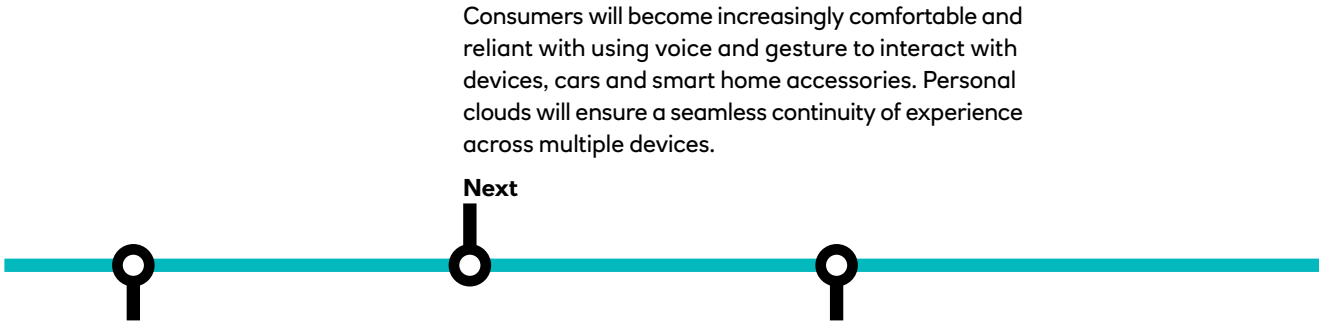
Biometrics

Biometrics refers to technology that measures and analyses unique physical or behavioural characteristics. As the technology develops, it is able to capture an increasingly wide range of biometrics: cardiac rhythms, vein patterns and brain electrical activity. This widens its potential use-cases beyond authentication and security to health monitoring, marketing and insurance.



Mobile & IoT

The channels through which we access the digital world are changing. As the cost of sophisticated processor chips continues to fall, Internet of Things (IoT) devices increase in both number and intelligence. For users, the connected world will be experienced through a personal cloud which will seamlessly transition across different channels, devices and experiences.



Now

The smartphone has become the primary gateway to the digital world and is increasingly being used to manage the growing number of connected devices around us. The prevalence of mobile banking across the UK and Europe has risen as voice channels and mobile payments have gone mainstream.

Next

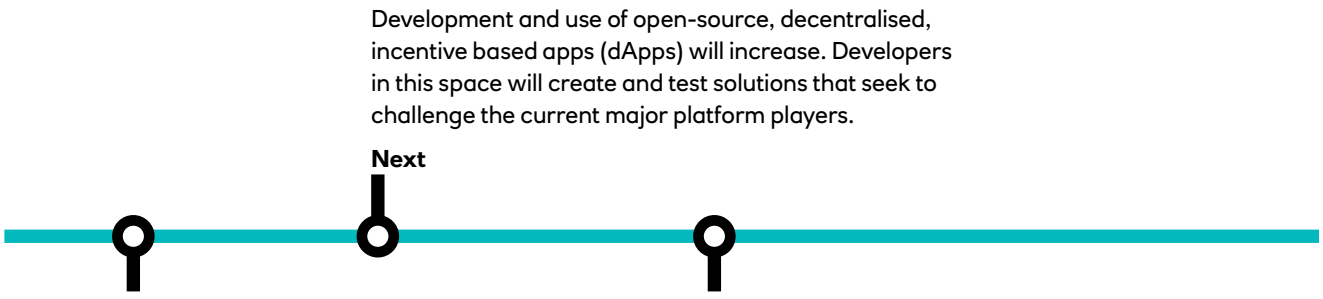
Consumers will become increasingly comfortable and reliant with using voice and gesture to interact with devices, cars and smart home accessories. Personal clouds will ensure a seamless continuity of experience across multiple devices.

10x Future

The amount of sensors in the environment will increase exponentially. People will become ‘sensed entities’. Organisations will leverage ‘sensors of you’ to detect changes that may impact on customers’ behaviour and financial habits.

Distributed Ledger Technology

Distributed Ledger Technology (DLT) is software designed to generate trust through programmatic techniques. It describes a set of instructions and rules that allow computers within a network to maintain an immutable ledger of transactions without the need for a central arbiter. Distributed ledgers are the enabling technology for a range of use-cases, including cryptocurrencies, smart-contracts and decentralised apps (dApps).



Now

Excitement around cryptocurrencies has led to soaring (and plummeting) valuations. Testing of other DLT use-cases has begun at scale, with distributed ledgers being applied to mortgage reporting, equities trading and asset tracking.

Next

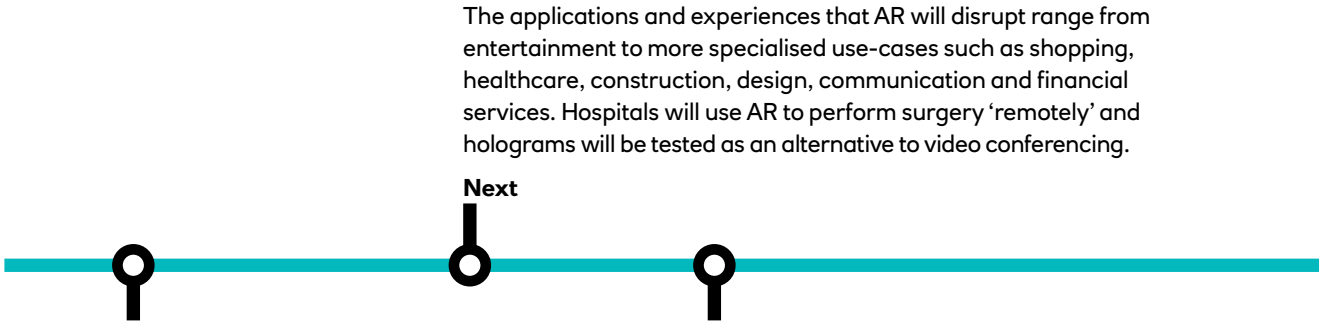
Development and use of open-source, decentralised, incentive based apps (dApps) will increase. Developers in this space will create and test solutions that seek to challenge the current major platform players.

10x Future

DLT could enable decentralised business models to emerge that completely disrupt the status quo in sectors as diverse as finance, media, transport, real estate, and government. DLT could be leveraged to store individuals' entire digital identity (passport, health data, genome, government ID, biometrics and so on).

Immersive Technologies

Immersive technology is an umbrella term referring to technologies which combine digital and real-world environments. Immersive technologies can be segmented into virtual reality (VR) and augmented reality (AR). VR creates digital environments to fully immerse users in a virtual world. AR is the live direct or indirect view of a real-world environment augmented with digital sensory input such as sound and video.



Now

AR has become the key component of immersive technology, whereas interest in VR is beginning to lag. Sound and haptics have moved immersive technologies beyond visual stimulation.

Next

The applications and experiences that AR will disrupt range from entertainment to more specialised use-cases such as shopping, healthcare, construction, design, communication and financial services. Hospitals will use AR to perform surgery 'remotely' and holograms will be tested as an alternative to video conferencing.

10x Future

Reliance on screens and displays as the primary way of interacting with technology will lessen in favour of more natural channels such as AR, gesture, touch and voice. The 'zero UI' future becomes closer.

Experimental technologies

could be extremely disruptive across the entire technology and consumer landscape. But they are still at the very edge of our technology horizon.

Nanotechnology

Nanotechnology is the development of materials and devices made on the molecular and atomic scale. Generally, it deals with structures 100 nanometres or smaller; a sheet of paper is about 100,000 nanometres thick. Nanotechnology can include and be a part of a variety of other diverse disciplines such as chemistry, physics, biology, engineering, computer science, electronics and medicine.

Now

Low-tech nanotechnology is present in mainstream consumer products such as clothing, tennis balls and sunscreen. More specialised nanomaterials such as graphene are starting to be commercialised.

Next

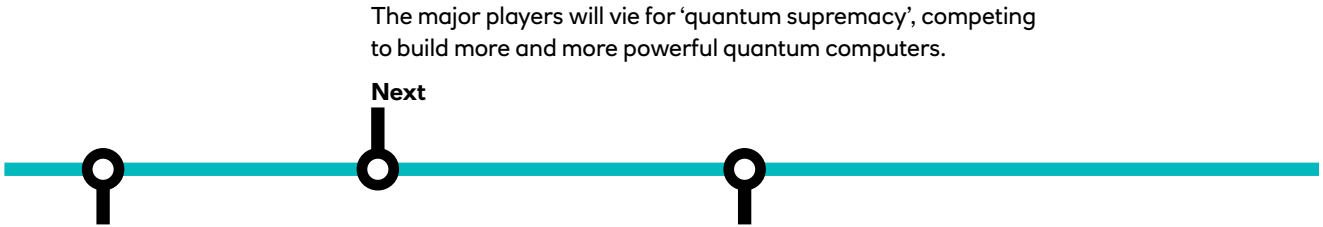
As more high-tech nanotechnology applications move from the laboratory into consumer products, regulatory attention will increase to address emerging safety and environmental concerns.

10x Future

Bleeding edge nanotechnology will move closer to the point of acceptable risk for mainstream consumer trials. As consumer devices are increasingly miniaturised, nanotechnology may lead to implantable technology which is capable of replacing existing smartphones. Meanwhile, synthetic DNA encoding and sequencing becomes a feasible way to store vast amounts of digital data.

Quantum Computing

Quantum computers take a new approach to processing information by leveraging the laws of quantum mechanics. Quantum systems could disrupt encryption, help make sense of the increasingly large amount of data generated and collected, and solve complex problems that even the most powerful conventional computer cannot.



Now

Quantum computing has moved from a theoretical to experimental technology. There is increased availability of corporate funding for the research and development of the technology required to build a quantum computer, which is a commercially viable alternative to classic super-computers.

Next

The major players will vie for ‘quantum supremacy’, competing to build more and more powerful quantum computers.

10x Future

Quantum computing could herald an exponential shift in computing power. Million-qubit systems, whose general computing applications are still difficult to fathom, are conceivable within 10 years.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