

What will affect
the world around us?

Future Forces

2019

Introduction

In the space of a year, the world does not appear to change radically, but contexts shift fast. The disruptors of yesterday become embedded, more sophisticated, mature and normalised. At the same time, legacy organisations and processes shift quickly. Many incumbents are transforming from within, showing new promise.

Linear ways of thinking are rapidly becoming obsolete - replaced by systematic approaches where data is linked and disparate sources speak to one another. This clash of old and new generates new business models and the time it takes to develop new propositions keeps shrinking.

Technology has enabled infinite options - a world where consumers are presented not with one right answer, but several. But how do we make sense of it all? It becomes more important than ever to shape the world around our shared humanity. Brands win consumer loyalty by cutting through the noise, without becoming noise themselves. When people thrive, we now have more tools and mindsets to ensure that our communities and habitats thrive too.

Artificial Intelligence has replaced digital transformation at the top of most people's agendas. Nonetheless, lots of hype remains. But like any technology, AI is an enabler that can have both negative and positive effects depending on how it is applied. New occupations will of course arise to make sense of it all.

In the background, larger forces are at work. We see six core themes.

The purpose of this report is to surface and describe the forces around us, forces that impact, inspire and influence. In this year's Future Forces we showcase some key highlights that, even if they don't all represent seismic breakthroughs, raise important points and provoke a discussion. Within each sector (Mobility, Energy, Transactions, Retail, Manufacturing, Construction and Wellbeing) we describe three main signals, which we call "Driving Forces," providing a collection of inspiring new developments from a range of progressive organisations, social initiatives and cultural movements across the world. It's followed by "Future-Proofing" – a set of questions that help you understand how these trends might be translated into unconventional new opportunities for you and your business in each sector to break out and change established ways of living and working.

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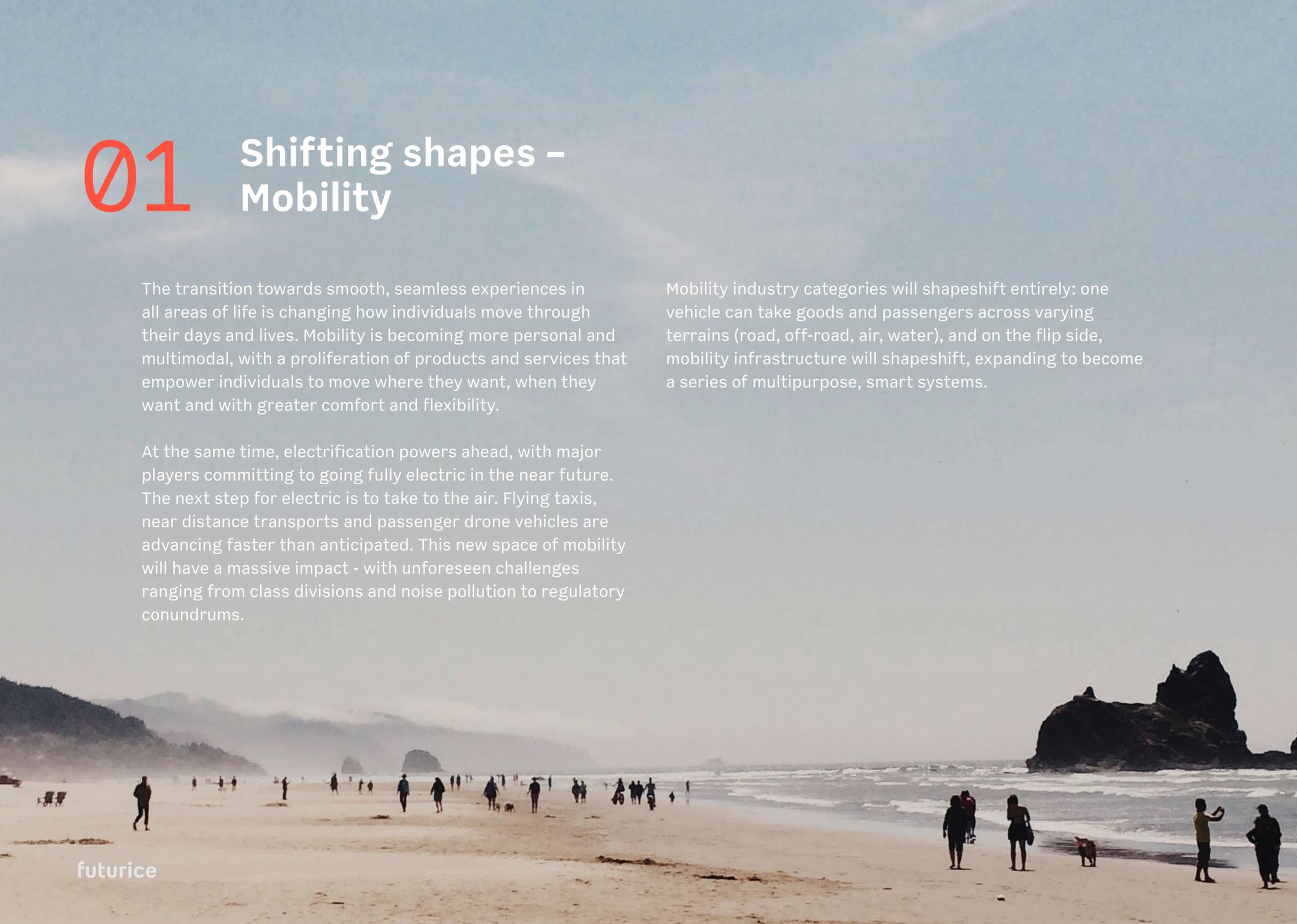


01 Shifting shapes – Mobility

The transition towards smooth, seamless experiences in all areas of life is changing how individuals move through their days and lives. Mobility is becoming more personal and multimodal, with a proliferation of products and services that empower individuals to move where they want, when they want and with greater comfort and flexibility.

At the same time, electrification powers ahead, with major players committing to going fully electric in the near future. The next step for electric is to take to the air. Flying taxis, near distance transports and passenger drone vehicles are advancing faster than anticipated. This new space of mobility will have a massive impact - with unforeseen challenges ranging from class divisions and noise pollution to regulatory conundrums.

Mobility industry categories will shapeshift entirely: one vehicle can take goods and passengers across varying terrains (road, off-road, air, water), and on the flip side, mobility infrastructure will shapeshift, expanding to become a series of multipurpose, smart systems.



Driving Forces

A Tailored Motion

B Electrification of Everything

C Transformers



A Tailored Motion

With cities under growing strain from traffic, consumers are starting to demand more compact types of vehicles to help them navigate busy urban areas. Uber predicts ride hailing will make up less than 50% of its business in a decade, with the company offering more rides on electric bicycles and scooters than cars. Uber's main rival, Lyft is also planning for this transition.

The rise of autonomous and electric vehicles is allowing carmakers to transform the design and functionality of their vehicles. Volvo's new 360c concept has reimagined the car as a short-haul flight replacement, offering a mobile bedroom, living room or office space for a more productive or relaxing travel experience.



A Tailored Motion

Technology is helping people to optimise their surroundings where ever they go. An office space concept by Carlo Ratti Associati in Torino, Italy, uses smart sensors to allow the creation of 'temperature bubbles' within a building. Workers can set heating levels in fan units above their heads and have their preferred temperature follow them from room to room. By the same token, a new product has been developed that can filter the air around a pushchair or car seat to protect babies and young children from harmful exhaust fumes whilst on the move.

On a very individual level, Reebok has launched a true last-mile solution with a bra that can change depending on the activity level of its wearer. Using radical technology, PureMove is able to tighten when an individual is moving fast and loosen itself when they are moving slowly or standing still. The technology has the potential to revolutionise the entire activewear sector.



B Electrification of Everything

Zunum Aero, a company backed by Boeing, has been developing a family of 10 to 50-seat hybrid electric regional aircraft. One of the company's models is a 12 seater aircraft, which includes a series of hybrid ducted fans which can be powered by batteries alone for short trips and a range-extending generator for longer journeys. The aircraft is set to be delivered in around 2020.

In September, aerospace and transportation company, Bombardier, launched a new battery-powered train in Berlin, the first to be launched in Europe for over 60 years. Called Talent 3, the train is said to generate no exhaust fumes and is able to travel for 40 kilometers between charges. Next year, the range will be increased to 100 kilometers.



B Electrification of Everything

The drive towards battery-powered vehicles is also finding its way into the shipping industry. Ampere, the first all-electric ferry was launched in Norway in 2015 following an extensive partnership between Norled AS, a ferry operator, Fjellstrand Shipyard, Siemens AS and Corvus Energy. In just three years, the electric ferry cut emissions by 95% and costs by 80%.

Earlier this year, Volkswagen announced it will launch a car-sharing service called WE which operates only electric vehicles. Initially, the service will focus on car-sharing, but eventually will expand to include access to other vehicles, such as a light e-scooter it calls the Streetmate and Cityskater, which Volkswagen describes as a “last-mile electric street surfer”.



C Transformers

Goodyear has launched an eco-friendly tire with moss growing in its sidewall which feeds on moisture absorbed through the tread. The moss sucks in carbon dioxide and releases oxygen. The energy that's created by photosynthesis in the moss is captured to power a light in the tire which alerts pedestrians when the driver is turning or stopping.

In partnership with the Carnegie Mellon University's National Robotics Engineering Centre, defense agency, DARPA, has developed an innovative tire that can be configured for different types of terrain whilst the vehicle is in motion. Round wheels can be set for harder ground and adapted into track-style treads for softer terrain, all in just a couple of seconds and without cutting speed.

The city of Southampton in the UK has just celebrated the launch of a bus which is able to remove pollution from the air as it travels. The prototype bus comes fitted with an air filtration system on its roof from Pall Aerospace that was originally designed for planes and marine vessels.

C Transformers

Last year, Airbus unveiled a revolutionary new transport concept at the Geneva Motor Show called Pop.UP, which is part car, part drone and part train. Dubbed the ‘passenger capsule,’ the two-seater monocoque is able to travel on a base of wheels as a regular car or be adapted for vertical flight. The modular design of the capsule means they can also be connected to form a train-like vehicle.

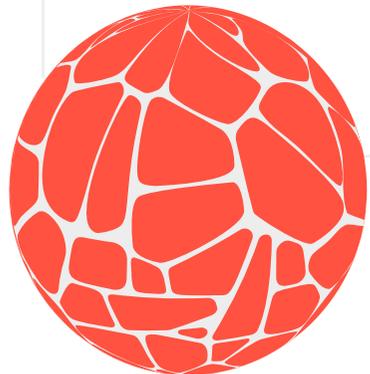
In anticipation of regulatory barriers around urban drone flights being removed, a company called Skyports has been buying up a network of London rooftops to act as landing and re-charging pads for drones as they become increasingly ubiquitous in urban areas.

On the horizon

Horizon 1

6-12 months

- Public transportation continues to shift towards fully electric and hybrid electric solutions
- With carbon neutrality goals set by cities, more emphasis is placed on walking, biking and other light and flexible modes of movement
- Electric bikes and other light mobility devices keep gaining ground and shaping attitudes



Horizon 2

12-24 months

- With all major carmakers getting their electric models in scaled production, wider adoption starts to ramp up reciprocally
- Improved batteries enable increased electrification in marine and rail applications
- Contextual and individualised modes of mobility gain a foothold as technology evolves and integrates into our everyday surroundings



Horizon 3

2-5 years

- Aviation is electrified, with the first passenger drones and hybrid electric small aeroplanes in limited commercial use
- Unconventional materials piloted in commercial mobility concepts for, e.g. pollution mitigation in urban mobility and built environments
- Hyperloops and skyports force a rethink of the urban mobility infrastructure



Future proofing

- 01 Could increasingly flexible light personal vehicles challenge the traditional division between private and public transport in short distance urban trips?
- 02 How do we ensure that social mobility and combating poverty is not derailed through the obvious segmentation of haves and have nots as new mobility concepts take hold ?
- 03 Are we finally tackling pollution as we should or just displacing it, especially as the IPCC report generates increased pressure for more, and faster, change
- 04 More and more, we are able to quantify the impacts of our behaviour on the environment. Will this awareness bring responsibility and behavioural change on a communal and individual level?
- 05 Will urban ridesharing providers solve the increasing problem of traffic congestion by switching towards lightweight electric means of transportation, especially for last mile travel?
- 06 How should major automotive brands respond as other niche and indeed extremely powerful mobility service providers cement themselves into people's lives?
- 07 There's growing concern among AI experts that it may be years, if not decades, before self-driving systems can reliably avoid accidents and navigate complex urban environments flawlessly. Should we nonetheless put them on the streets?
- 08 Major players have committed to going fully electric. What does this mean for the natural resources required for powering batteries? Will closed-loop resource efficiency increase naturally as battery production scales up exponentially in the coming years?
- 09 How much can we personalise mobility concepts and still maintain public service in our built environments?
- 10 Who is expected to adapt - the cars, cities or its inhabitants?

02

Power Play – Energy

Battery development and production is one of the most vibrant areas within the energy sector. Entire markets and industries are investing billions of dollars for a future that is not here yet, but rapidly on its way. While a shift away from fossil fuels to batteries spells hope of a more sustainable future, it comes with its own set of challenges. Where will all the additional electricity powering millions of EVs come from and how can charge time for electric batteries be dramatically reduced? And will it help or hinder us reaching the IPCC's new targets for climate change action?

As power infrastructure shifts to energy storage, a new platform for human and technological innovation is emerging. The opportunity to transform the traditional petrol station, for example, and offer a new type of customer experience is huge. And the data generated by electricity usage could radically alter how we monitor transport networks and improve the experience of passengers.

Then there is the exploration into unfamiliar territory - fringe energy. The natural world has become increasingly erratic, heightening the need to look beyond wind, solar and fossil for alternative sources of power. Conversations around hydrogen are being revitalised and significant leaps are being made in harnessing biogas for energy, particularly in the developing world.

Driving Forces

- A Power-up
- B Experience of Energy
- C Fringe Energy



A Power-up

Worldwide lithium battery production is surging, with multiple new gigafactories being set up around the globe. Earlier this year, Chinese Electric Vehicle (EV) manufacturer BYD started development on what it claims will be the world's largest battery factory. German carmaker Volkswagen is also rumoured to be developing its own gigafactories to support its goal to build 2 to 3 million EVs a year by 2025.

With the rapid development of more advanced solid-state batteries, considered by many to be the next step in energy storage, the range of EVs could soon increase rapidly. Volkswagen recently announced a \$100 million investment in solid-state battery start-up, QuantumScape, with plans to “enable an industrial level of production of solid-state batteries”. The German carmaker said the technology has the potential to increase the range of its E-Golf from the present 300 kilometers to 750 kilometers.



A Power-up

The S Pen stylus in Samsung's latest Galaxy Note 9 has been integrated with Bluetooth technology for the first time and can be charged instantly using a supercapacitor. Just sticking the S Pen into the phone for 40 seconds is enough time to charge it for 30 minutes of use.

Battery life of older electric cars is being extended with a smarter approach to recycling. While they are no longer appropriate for cars, they're still ideal for a range of static uses such as storing electricity from solar panels and wind turbines. In Japan, old electric car batteries are even being used to chill beer at convenience stores.



B Experience of Energy

The development of EVs is creating the opportunity to completely rethink the traditional petrol station. A Danish company called COBE has developed a green charging station which not only reduces charging time, but also turns the experience into a more relaxing and meaningful break for the driver.

During the recent heatwave in Europe, a supermarket chain in Finland allowed 100 customers to spend the night at its air-conditioned store in Helsinki to escape the heat. Houses and apartments in the Nordic countries are well equipped to deal with freezing conditions, but lack the necessary air conditioning for higher temperatures. Meanwhile in Paris, the mayor Anne Hidalgo announced a city-wide plan to use public buildings as emergency shelters for homeless people this winter on nights when temperatures dip particularly low. Climate change will increase the need for alternative solutions which enable people to cope with shifting weather patterns in urban environment.



B Experience of Energy

Electricity usage is helping to more accurately monitor and track movement around our cities. Researchers from CMU showed that morning peak congestion times are related to particular types of electricity-use patterns. Using this approach to make predictions of morning traffic patterns proved more accurate than when using actual traffic data.

New York-based energy technology company, LO3 Energy, is pioneering the development of community microgrids in the Gowanus neighbourhood of Brooklyn. The company believes decentralised power systems like this could have a huge impact on vehicles in the future, allowing public buses, for example, to become vessels for energy, taking electricity from areas of excess and redistributing it to grids that are more power deficient.



C Fringe Energy

Developing countries in Africa are pioneering the use of biogas to generate power and fuel at a local level. For example, methane from anaerobic digestion of fertilizer is being harnessed as a clean alternative cooking gas in Zimbabwe, helping to reduce deforestation.

British scientists have developed a new system that's been dubbed the 'urine battery', which transforms urine into electricity using a microbial fuel cell. Just over half a litre of urine is enough to charge a smartphone for six hours.

The vast majority of energy-storage capacity currently comes from pumped hydroelectric power. When the amount of energy available in the grid exceeds demand, excess electricity is used to pump more water into dams. If demand exceeds electricity output, the water level is allowed to drop through gravity, which in turn drives turbines and generates more electricity. A start-up called Energy Vault has developed a more efficient alternative. Rather than pumping water into dams, excess energy is used to lift and stack concrete blocks. When more energy is needed, the blocks can then be lowered through gravity, generating electricity. As concrete is a lot denser than water, it stores and generates significantly more energy than an equal-sized tank of water.



C Fringe Energy

An Australian company has found an innovative way to use the power of the sun to produce fresh water and allow food to be grown in arid environments. Sundrop Farms has developed a solar plant made up of 23,000 mirrors, which reflect the sun's heat onto a central solar tower where 1,000,000 litres of seawater is converted into fresh water every day. The process also drives a turbine, allowing the generation of electricity.

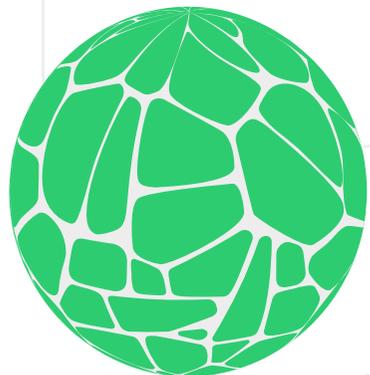


On the horizon

Horizon 1

6–12 months

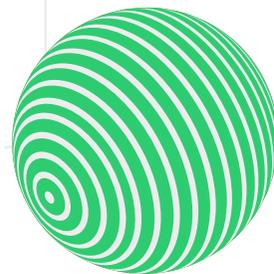
- Ultra-fast charging stations become more prevalent and increase availability outside of early adopter cities and regions
- Climate becomes a service experience differentiator for various companies - their value-add becomes the manipulation of temperature to provide a targeted experience, both outside of and during extreme weather events
- Utilities use access fees to maintain their power generation monopoly against microgrid consumers and competitors



Horizon 2

12–24 months

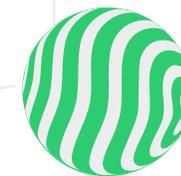
- Solar power is deployed into more vehicles, and designed into most future models, as a way to offset the need for more charging stations
- Home chargers intelligently adjust charging times based on other life event data (e.g. calendar info), like upcoming events or home life patterns, as well as factors such as overall consumption and pricing



Horizon 3

2–5 years

- Microgrid deployments provide economic incentives for utility vehicle fleets to use their own green or inexpensive power at one location and then use power or sell it on to consumers in a different area



Future proofing

- 01 How will companies overcome local barriers of resistant grid owners blocking innovation?
- 02 How can energy be distributed smartly without immense capital costs and lock-ins?
- 03 How might businesses provide ways for the bottom of the pyramid to be an equal part of the solution?
- 04 How can energy be distributed more evenly? Could the answer lie in smart energy systems or portability?
- 05 How can energy scarcity and inequality be tackled in both urban and rural areas?
- 06 Will low-tech energy innovations flourish in the developing world?
- 07 With the line between producers and consumers blurring - how might these prosumers engage in the energy economy more inclusively?
- 08 How should the world be preparing for the immense amounts of energy AI will consume, the darker side of cloud computing and data centres?
- 09 As stored energy becomes a commodity like oil or gas, how can companies ensure they are positioned further up the value chain?

03 Value Exchange – Transactions

The growth of near field communication technology is allowing payments to be woven into new and often unexpected objects - from wristbands to smart watches to connected rings. This growing ecosystem of 'pop-up payments' is making banking much more convenient, seamless and integrated into everyday life. For brands, this offers the opportunity to develop new types of payment experiences that help to build loyalty like never before.

As payments become diversified, authentication is going through its own renewal, with behavioural biometric technology increasingly being used to identify users in new and more versatile ways. People can now be identified by everything from how they hold their device or swipe across the screen, to how the mouse is moved or how their password is typed. Going forward, this technology will be critical in making pop-up payments safe and reliable.

At the same time, traditional money-based notions of value are being redefined, as the sharing economy and the huge value of big data continue to grow. Long gone are the days of the gold standard as a monetary system. Data is being traded like a commodity and intellectual property is becoming the money maker of the world's biggest and fastest-growing companies.

Driving Forces

- A Pop-up Payments**
- B Invisible Way**
- C Value of Everything**

A Pop-up Payments

Jewelry is another area of fashion where payment technology is being integrated. With its built-in NFC chip, the K Ring allows its wearer to make payments anywhere in the world where the mastercard symbol is displayed. The ring is made of scratch-resistant zirconia ceramic and comes in 14 different colour combinations.

Later this year, Diesel will launch a new smartwatch called the Diesel Full Guard 2.5 that supports payments with a built-in near-field communications (NFC) chip that works with Google Pay. Similarly, Garmin offers a digital wallet system called Garmin Pay as part of its Vívactive 3 smartwatch.

Earlier this year, Russia's Pochta Bank announced a partnership with the Russian Esports Federation that will allow it to offer a bank card for gamers, giving them exclusive access to a new esports website called Cyberlab. And at this year's US Open tennis tournament, American Express launched a payment-enabled wristband for its cardholders attending the event, which allowed them to pay for concession stand purchases.

B Invisible Way

With the surge in mobile and wearable payments behavioural biometrics technology is emerging as the perfect solution for authenticating users. The technology measures unique patterns in human activities such as voice ID or facial expression analysis. The mobile behavioural biometrics market is expected to grow to over \$9 billion by 2022. Google has already taken a lead. The company is planning to offer a face unlock system to future devices that run on Chrome OS.

Biometric technology is also being integrated into everyday products. With embedded electrodes and a new electrical sensor installed in the back crystal, the Apple Watch Series 4 is able to take an ECG reading from the user's wrist. This data has the potential to be used for biometric authentication. Also in the consumer electronics sector, IDEX Biometrics has partnered with Ohsung Electronics to integrate its fingerprint sensor technology into one of the South Korean firm's TV remote controls.

The potential of biometric technology is being recognised across a range of industries, from telecommunications to banking. Deutsche Telekom is now using AI-based conversational analysis technology to authenticate customers contacting its call centers. And Royal Bank of Scotland uses a range of behavioural biometric data to identify its 18.7 million retail and business account holders, including measuring the angle at which people hold their devices and the fingers they use to swipe and tap.



C Value of Everything

Japanese cafe chain Shiru has launched a concept cafe on a university campus in Providence, Rhode Island in which if you're a student or a professor, your coffee is free in exchange for data about yourself, from name, studies, graduation year and interests among other items. “By doing so, the students also open themselves up to receiving information from corporate sponsors who pay the cafe to reach its clientele through logos, apps, digital advertisements on screens in stores and on mobile devices, signs, surveys and even baristas.

John Hancock, one of the largest life insurance providers in North America, now only sells “interactive” policies that require customers to share their personal health data through wearable devices. Customers are rewarded with discounts and gift cards for hitting exercise targets. However, privacy advocates have raised concerns that this could open the possibility of insurers punishing customers who fail to maintain a healthy lifestyle.

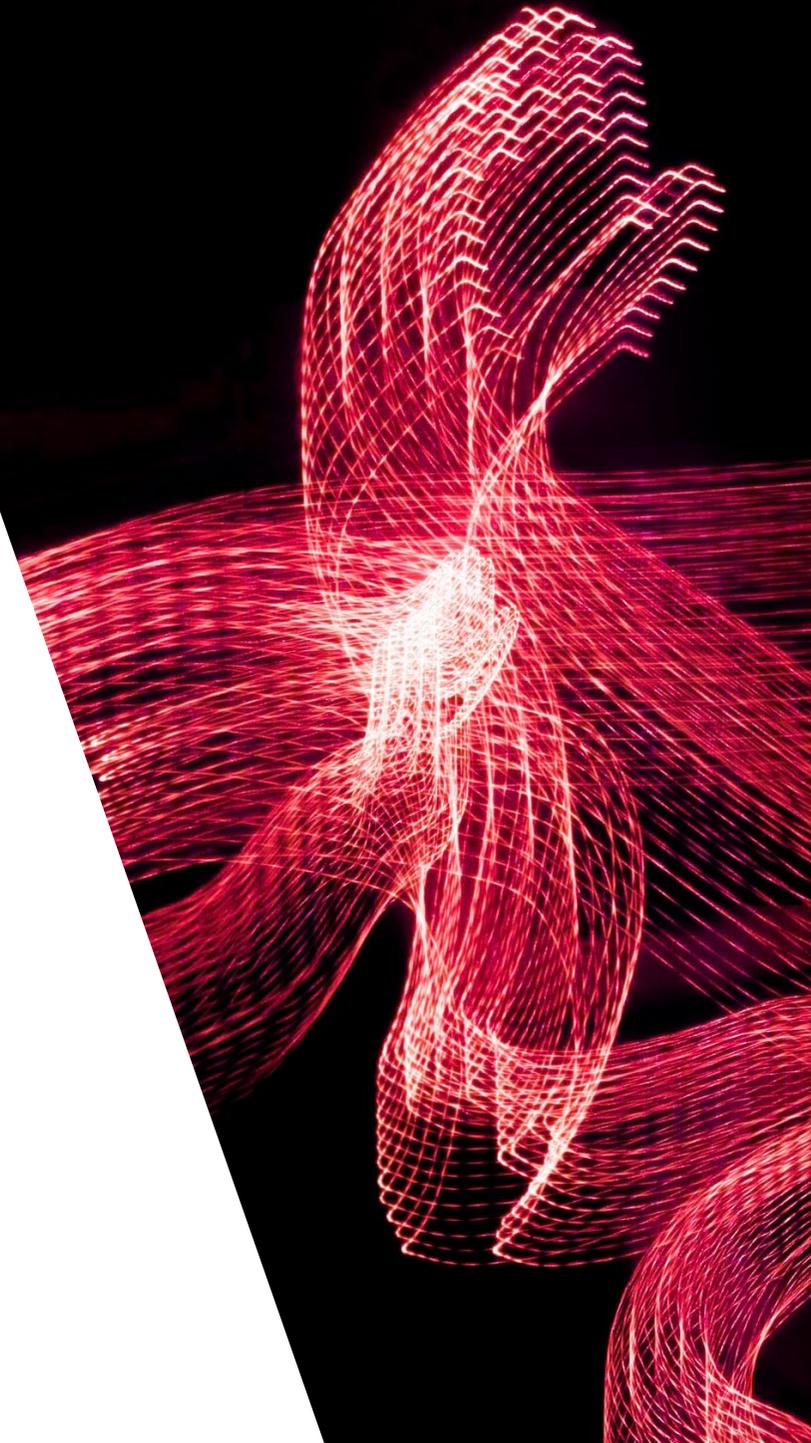
The sharing economy is now going far beyond cars and hotel rooms to include almost any item - a sign that the value and importance of ownership continues to decrease. Dubbed the “Airbnb of stuff”, Fat Lama was launched last year to give everyone access to shared items—from drills to hoovers to Go-Pro cameras. The start-up recently announced \$10 million in fresh funding.



C Value of Everything

DOVU is a blockchain-based platform which offers a unified token, wallet and marketplace for earning and spending mobility related rewards. For example, when drivers share their connected car data or avoid driving at peak times, they are rewarded with tokens that can be used for mobility services like parking or public transport.

An app called DataWallet allows people to curate their personal data and decide which information can be made available to third parties, as well as receive a cut when the data is sold on. Members are able to give access to their Facebook, Twitter and Instagram accounts, fine-tuning the settings for each if they don't want their home town or work history to be included. User payouts range from \$1 to \$50 depending on the number of reports sold on.



On the horizon

Horizon 1

6-12 months

- Real life transactions start to increasingly resemble online, approval based payments.
- A combination of AI and behavioral biometrics sees widespread use in fraud detection in financial services.
- Brand and even event-based transaction services will increase.



Horizon 2

12-24 months

- First services that allow consumers to monetise their data start to gain traction. Biometric identification becomes commonplace and methods of payment are embedded into a diverse selection of wearables and other things we carry with us.
- After payments, other banking services and transactions migrate into the integrated ecosystem consisting of our phones, pads and digital assistants.
- A rapid increase of AI-based banking services offered to customers in financial services and even retail banking takes place.



Horizon 3

2-5 years

- Other values systems rise to challenge money



Future proofing

01

There is an increasing divide between the haves and have nots. How does our defined 'value' determine what doors are open or closed to us?

04

What is the balance between privacy and human rights vs. getting the most productivity and insights from big data?

02

How can people who don't have access to the latest smartphones be authenticated through biometric data?

05

As monetary value becomes increasingly abstracted - is it time for a new kind of gold standard? How will value be measured and trusted in the near future?

03

What kind of new services can be created around behavioural biometrics?

06

How can new banks lock in loyalty and become profitable when there are so many 'no strings attached' services available to consumers?

04 Our Favourite Shop – Retail

Technology continues to merge with bricks and mortar to create new ways of managing retail operations. Artificial intelligence is being leveraged for security as well as for creating a more personalised experience for customers. And digital technology is transforming how products are tracked at every stage, opening up new ways to reduce waste and boost revenues.

Social media has democratised the playing field for reaching consumers - with agile and nimble startup brands competing on the same channels as the bigger retailers and reimagining how these mediums are used. These overnight brands are capturing consumers with tactics that cut through the noise - from drip releases of spotlight items to live auctions.

In response, the corporate giants are forging new strategies. They are going incognito and renewing their offering with sub brands, continuously trying to remain fresh in the eyes of consumers. Innovative brand partnerships are being formed that offer customers more contextualised and seamless experiences.

With endless choice both online and offline, brands are also seeing an opportunity to help consumers cut through the noise by offering more cohesive curated experiences. Unique worlds are being shaped around the consumer - with machine learning algorithms getting to know them better every day.

Driving Forces

- A Keeping an AI on Customers**
- B Start-up Retail**
- C Curate for Me**

A Keeping an AI on Customers

AI-based technology has huge potential in improving store security. Japanese telecommunications company, NTT East, and start up, Earth Eyes Corp, have developed an AI security camera which uses a special pose detection system to identify suspicious behaviour in a store and alert the owner with a message sent to their smartphone. The “A.I. Guardman” can reportedly reduce shoplifting by up to 40%.

Sportswear giant, New Balance, is also exploring the potential of AI. In a unique marketing exercise launched during New York Fashion Week, the brand placed a booth in Soho with multiple cameras facing out that took pictures of pedestrians as they walked past. The images were then scanned in real time using AI technology to spot people with a unique and different style, who were awarded with a pair of New Balance trainers. Called “Be The Exception”, the campaign was developed to “celebrate people who go left when everybody else is going right.”

Israeli start-up, Wasteless, is using technology to reimagine the traditional price tag. The company allows retailers to tag items and continuously monitor what’s being sold, helping to cut down on waste. The system also offers “dynamic pricing” to customers, where products automatically fall in value as it reaches its sell-by date.



A Keeping an AI on Customers

Fashion brand, Reformation, recently opened a new minimalist store in NoHo, New York, which features an array of tech-enhanced experiences. For example, customers walk into a lounge-styled showroom where they can look at clothes on a screen and have them delivered in their size to the changing room.

UK retailer Sainsbury's is currently trialling its first till-free store in London, where customers can scan products immediately with their smartphones and put them straight into a bag. The payment is then processed through their mobile when they've finished shopping.

Appear Here is an online platform where people can find space for their shop, stall or pop-up store anywhere in the world and book it as easily as booking a hotel room. Landlords are able to list their space for free.



B Start-up Retail

Large companies are going incognito by launching sub brands that help them to break into new industries. Amazon now sells 76 of its own private label brands, including women's underwear from Mae and organic baby food and diapers from Mama Bear. Automotive companies are also embracing the trend. In order to appeal to younger audiences, Toyota has launched a new concept store that is part cafe, part car-sharing service. Forming innovative brand partnerships is another method large companies are using to break into new environments. For some time, IKEA has been inviting non-competing brands to become co-creators. Some of IKEA's recent brand collaborators include Lego, Renault, Sonos and Adidas.



B Start-up Retail

The growth of social media, and in particular Instagram, has helped to create a platform for a new generation of direct-to-consumer retail brands that don't require a physical space to build a successful business. Fashion magazine Vogue recently published a list of the digitally native retail brands that everyone should be watching, which included online shoe retailer M.Gemi, clothing brand Everlane and secondhand clothing store, The RealReal. These high-quality brands are winning over the hearts of consumers with clearly focused, no-nonsense offerings, not to mention, radical transparency. The digital native approach has also helped Glossier to launch a global skincare and makeup business. The company recently secured \$52 million in fresh funding. Without the high costs associated with brick and mortar, direct-to-consumer retail brands can go all in to bring themselves to life, delighting customers with immersive (yet temporary) pop-up stores and experiences.



C Curate for Me

With so much choice available both online and offline for consumers, a growing opportunity is emerging for brands to help filter out all the noise and use data to curate a more contextualised offering. In Los Angeles, Nike has launched a concept store that is located and stocked based on the behaviour and preferences of Nike customers in the local community.

Personal styling service, Stitch Fix, uses AI and data analytics to offer a far more convenient and personalised shopping experience. The company serves curated fashion boxes containing a range of different garments, all based on a customer's shopping preferences. The service is made possible by 85 data scientists and sophisticated machine learning algorithms.

The New York City Library has been using Instagram Stories to help cut through the clutter of content and curate more authentic stories for young readers. Through a partnership with ad agency, Mother, the library has been converting classic books into animated “Insta Novels” with a more engaging and eye-catching format.



C Curate for Me

Some brands are even trying to help curate urban living. Carmaker, BMW, has turned an abandoned paint factory into housing in Shanghai as part of its urbanism and architecture project, Mini Living. The building includes communal spaces for working or eating. Residents are also able to get involved in cultural events, rooftop farming and a car-sharing programme.

With endless amounts of free content online and growing concerns over fake news, The New York Times has recently seen a surge in subscriber numbers as people become increasingly willing to pay for reliable and authentic sources of content.



On the horizon

Horizon 1

6-12 months

- First commercial use cases for AI in retail operations
- Increasingly specialised curation in retail content



Horizon 2

12-24 months

- AI gains foothold as a shopping advisor
- Use of big data in curation of retail stock/offering for consumers increases rapidly
- More partnerships with brands to create holistic contextual experiences
- Brands continue to expand beyond their traditional field
- Incumbents use 'pop up' brands as a way to test and renew their offering



Horizon 3

2-5 years

- Automated and augmented retail spaces become mainstream
- Virtual personnel and models proliferate, making the retail experience increasingly customisable



Future proofing

01

What happens when retailers know their customers better than they know themselves? Is there a privacy line that companies should never cross?

02

Will inclusive marketing emerge for different body types?

03

In a world of hyper-consumption, what can companies do to put the global economy on a more sustainable footing?

04

Voice tech is creating a new post-visual experience. How can brands enter into the voice space and provide a valuable, respectful service within the consumer's home?

05

Can local production decrease or increase energy use at the lifecycle level?

06

How can businesses remain viable when their customers have such short attention spans? Does it require a strategy of continuous reinvention?

07

Is the current over-reliance on algorithms creating enforced echo chambers for customers? How can companies provide more 'surprising' moments for consumers?

05

Making of – Manufacturing and Construction

Manufacturing, construction and agriculture are currently undergoing huge tech-led change. Advanced new digital and data-led techniques are enabling performance-driven, location-specific processes that lower the costs of transportation and drastically shorten production times, and out on the farms, increase yield...

At the same time, factory- and field-based robots are becoming more and more sophisticated. The technology behind shapeshifting is getting up to speed, making robots adaptable and versatile. And advances in nanotech mean robots can now work in the smallest of spaces. Self-healing abilities and robot re-education further increase the feasibility of these mechanical co-workers.

Alongside robotics, 3D printing is another technology set to transform multiple sectors. Thanks to material innovation and modular ways of building we are now able to create all kinds of shapes and structures, and do it faster, more efficiently and with far less waste.

Climate change will continue to exert pressure and demand a more proactive response from industry and agriculture. Industrial plants are being developed that suck in huge amounts of air and remove CO2 from the atmosphere. Buildings are playing a part in managing pollution too, with paints that can remove toxins from the air, making our cities more eco-friendly.

Driving Forces

A Agile Works

B Adaptive Robotics

C Buildings against Climate Change

D Built Organics

A Agile Works

Sportswear manufacturer, Adidas, has set itself the ambitious goal of creating 50% of its shoes using digital manufacturing processes. At two state-of-the-art factories, one in Germany and one in Atlanta, Adidas makes trainers using completely digitally automated machinery. These ‘Speedfactories’ are more sustainable than traditional factories and allow for a much quicker production time and agile response to fashion trends.

Advances in machine automation promises to completely disrupt the construction industry as well. Danish robotics company, Odico, is transforming industries that rely heavily on costly and complex manual labour. The company produces robotic arms with a multitude of applications and has developed an automated method for producing complex structural formwork, a process that is usually very labour intensive.

Australia’s Fastbrick Robotics is helping to fully automate the construction of residential buildings. The company has developed a robot, dubbed Hadrian X, which can measure and compensate for movements caused by wind or vibrations, allowing it to lay bricks in outdoor conditions with the highest precision.

A Agile Works

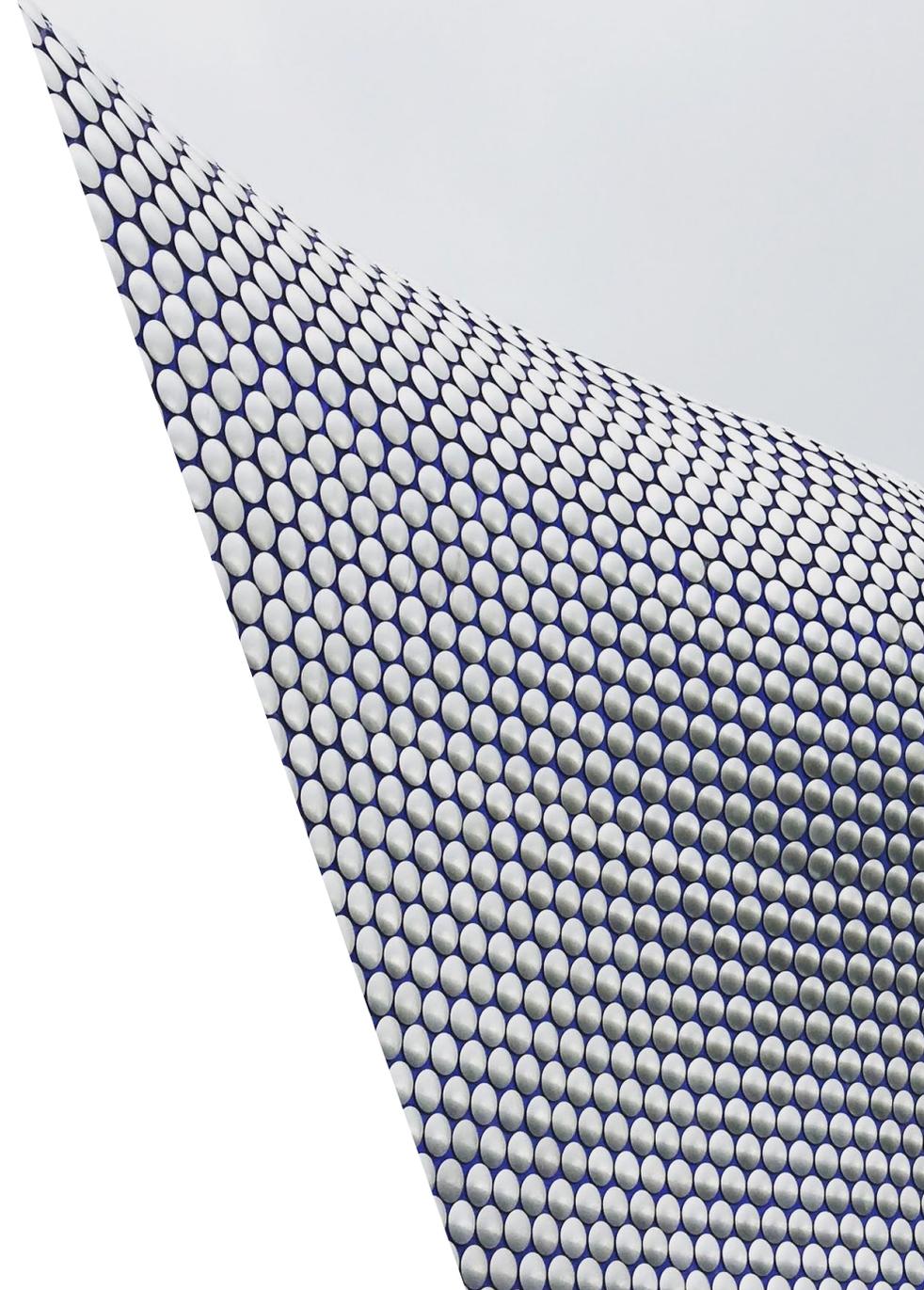
Built Robotics could be about to have a similar impact on the \$130 billion global excavation industry. Started by an ex-Google engineer, the robotics company has developed a fleet of autonomous earth movers that allow operators to pre-program the precise coordinates for the size of the hole that needs to be dug.

In England, an entire hectare of wheat was recently planted, cared for and harvested by a team of unmanned drones - only the second crop ever to be raised by robots. Agri-drones are also being used in Japan, where they spray rice crops with fertiliser and survey them for insects and mould.

B Adaptive Robotics

The University of Tokyo's JSK Lab has developed a dragon robot that is able to fly and change shape in midair. The machine comprises four modules, each with a pair of maneuverable fan thrusters and battery powered joints that allow the dragon to autonomously change shape in order to fit through a given area. The dragon also comes with an Intel Euclid, which serves as both the eyes and the brain of the robot.

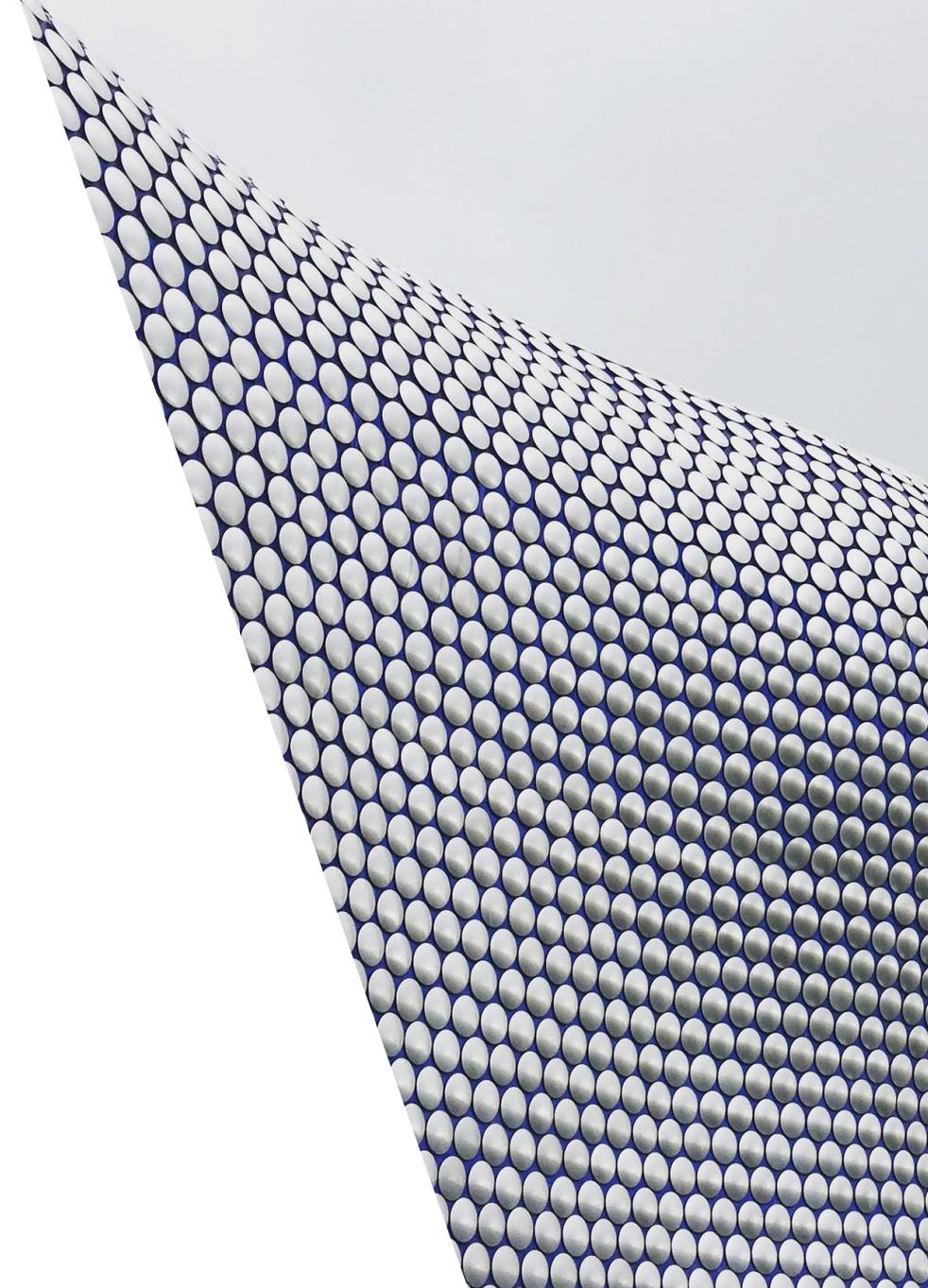
Advances in nanotechnology are opening the possibility of developing micro-robots that are able to operate and do detailed jobs in very small spaces. Aerospace company Rolls Royce is currently developing tiny insect-inspired robots that climb inside jet engines and act as the eyes and hands of engineers to complete repairs. Engineers from the University of California are even developing ultrasound-powered nanorobots capable of swimming through blood to clear bacteria and toxins.



B Adaptive Robotics

Technology is allowing robots to perform even more delicate tasks. Robots usually require detailed coding instructions in order to recognise objects and perform tasks with them. Introduce a completely new object or alter its positioning and most robots struggle to perform their functions. This is beginning to change. Engineers at MIT have developed a robotic arm that is able to visually study different types of shoes and pick them up, including ones they have never seen before. A similar breakthrough has been made by San Francisco-based company, Osaro. The firm has built a robotic arm that's able to spot randomly placed and irregularly shaped pieces of chicken and gently place them into a bento box. The robot is set to be operating at a Japanese factory within a year.

In a nod to Terminator 2, scientists have developed robot 'skin' that automatically heals itself. The material is made of droplets of liquid metal contained within a rubber like covering that is able to stretch, fold and bend. If the rubber material is cut, the droplets burst open and create new circuits so electricity can continue flowing even when the skin is damaged.



C Buildings against Climate Change

A new 25-storey building in New York - 570 Broome - has been coated with a spray-on solution called Pureti that breaks down contaminants in the city's air through a photocatalytic process, converting the toxins into harmless minerals. The building has the purifying power of 500 trees. Windows have the potential to help in the fight against climate change as well. While they have not entered mainstream construction yet, scientists at MIT, UCLA and Michigan State University have been making significant progress in the development of transparent solar window technology.

Scientists and engineers are putting significant thought and energy into developing buildings that can suck in air and remove carbon dioxide from the atmosphere. Previously this approach to carbon capture was dismissed as being far too expensive, but a recent study found that existing technologies could bring the cost down to between \$94 and \$232 per ton. Calgary-based start-up Carbon Engineering has spent almost a decade developing and perfecting a plant in British Columbia that can suck in large amounts of air and remove CO₂. The plant has been partly funded by the US Department of Energy.



C Buildings against Climate Change

Urban ‘greeneries’ are becoming increasingly prevalent in cities around the world. To help clean up the air and provide an environment for pollinators, a 27-storey building is being constructed in Toronto with 450 trees and plants growing from its balconies and roofs. Mexico City has even more ambitious plans. The city is planning to turn 1000 motorway pillars into vertical gardens with a hydroponic system to keep it watered and sensors for remote monitoring.



D Built Organics

3D printing is now having a major impact in the construction industry, where it is allowing homes to be built with significantly less waste and more resilience. Construction technology start-up, ICON, has developed technology that allows a home to be created in only 12 to 24 hours and at a cost of just \$4,000. The company recently partnered with San Francisco non-profit, New Story, to provide affordable housing to poor communities around the world.

Dubai has given itself the ambitious target of having 25% of all its new buildings constructed using 3D printed technology by 2025. The move is designed to reduce human construction labour by 70% and building costs by 90%.

Swiss University, ETH Zurich, is currently building an experimental house using robots and 3D-printed materials. The DFAB House uses only the minimal amount of material necessary to make it load-bearing. One of its many innovative and beautiful features is a concrete ceiling with formwork 3D printed from sand.

Even complex structures like bridges are now being made autonomously and using 3D printed materials. In Holland, technology start-up, MX3D, recently finished 3D printing a steel pedestrian bridge using robots. The bridge is set to span a canal in Amsterdam.



On the horizon

Horizon 1

6–12 months

- 3D printing used for one-off public buildings/ construction
- The automation of agriculture continues
- Vertical forests and urban greeneries improve quality of air in cities



Horizon 2

12–24 months

- More climate conscious construction planned and delivered
- Localised urban pop-up factories in the plans



Horizon 3

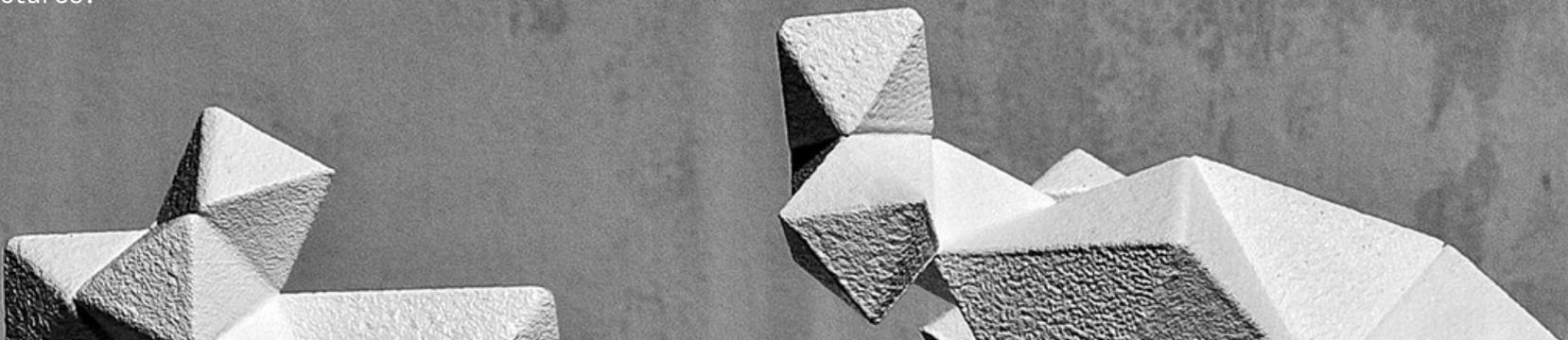
2–5 years

- Advanced grippers manoeuvre delicate tasks
- Construction becomes highly climate conscious
- Carbon capture becomes widespread
- At construction sites, robots work side by side with people
- Self-repairing machinery



Future proofing

- 01 When investing in robots - should companies consider their lifecycle? How often should they be re-taught?
- 02 Will manufactured products change as companies get access to more skilled robots?
- 03 Access vs. ownership. Will buildings as a service change the dynamics of the industry? Who is the owner?
- 04 Are structures and buildings in built environments meant to last for decades or centuries? Or should they be designed for constant flux?
- 05 Could solid wood building elements replace energy intensive concrete and steel structures while acting as a natural carbon sink?
- 06 Traditionally, there have been 'industrial areas' within urban environments. What will happen to them as pop-up factories become more prevalent?
- 07 The construction industry has notoriously low margins - making it hard to invest in R&D and innovation, not to mention sustainability. What are the efficiencies that prevent waste and, in doing so, increase profits sustainably?
- 08 With rising levels of urbanisation, more housing is required and fast. Should resources be focused on building temporary housing or permanent?
- 09 Raw materials for construction and manufacturing are becoming increasingly scarce. Could circular economy combined with new low carbon concrete and steel initiatives increase sustainability in construction?
- 10 What is the role of wellbeing in structures?



06

Body and Soul Augmented – Wellbeing

The number of gadgets and devices helping people to monitor and measure their health and fitness has exploded over the last few years. The huge volume of health data this has generated is transforming how diagnoses are made, with increasing numbers turning to crowdsourcing platforms that mix the wisdom of the past with new technologies to connect the dots in ways we have been incapable of doing at scale.

At the same time, new spaces of wellness are emerging and intersecting with technology - from fem tech to sleep tech to brain tech. What can be learned from the rising popularity of these categories? What does it teach society about female empowerment, overworking, the mental health crisis or

preparation for old age? The trend is also reframing how people view their bodies, as they become increasingly augmented by technology. Neurotechnology for example is demonstrating how brains are in fact organs that can be trained like a muscle.

In the background, the baby boomer population, the largest generation on earth, is ageing. In a globalised, world where families are increasingly disconnected, how can people care for relatives from faraway and how can the elderly be looked after in a dignified manner? Our understanding of death has broadened: we now understand it as a process rather than an event. An industry is growing around the process of preparing for the end of life, to consider this transition is marked, and what is left behind.

Driving Forces

- A Health-as-a-Service**
- B Modular Medicine**
- C Deathcare**



A Health-as-a-Service

New types of data-driven practices are emerging that transform the relationship between GPs and their patients. Parsley Health is a membership-based wellness practice in the US which takes a tech-driven approach to monitoring the whole body and understanding the root cause of health problems, rather than just treating the symptoms. Another US-based healthcare provider reimagining how people manage their health is Forward, a subscription based service that brings together the knowledge of real physicians with the best aspects of technology.

In order to diagnose health problems, people are also increasingly turning to crowdsourcing services and initiatives. Led by the global medical community, The Human Diagnosis Project was formed to help build a global system for recording and mapping the best steps to help patients. The platform combines collective intelligence with machine learning. Similarly, CrowdMed is an online portal that offers a collaborative approach to solving complex medical cases, bringing together extensive knowledge from across the global medical community to help people find the best cure.



B Modular Medicine

The digital health trend is also having a major impact in the mental and neurological health space. Brain optimisation start-up Field uses neuroenhancement technology to help its customers to reduce their stress levels and boost their productivity. The company even aims to help increase its members sex drive.

FOMO (fear of missing out) is gradually being replaced by JOMO (joy of missing out) as people look for ways to take a break from their busy digital-dominated lives. At Google's annual developer conference, Google CEO, Sundar Pichai, made JOMO a key theme of his presentation and announced a digital wellbeing initiative that aims to encourage healthier tech habits. As part of the initiative, Google has launched several tools to help people regularly switch off, including a dashboard on its newest Android which shows how much time a person is spending on each app.

The fertility market is another area of health that's ripe for digital innovation. Women's health app Natural cycles combines an algorithm with body temperature to predict when a woman is ready to conceive. Similarly, bluetooth-enabled tracking device, Kegg, monitors a woman's mucus levels to determine her fertility.



C Deathcare

End Well was founded to bring about a cultural shift in attitudes across society towards death and how it is managed. One of the key areas explored by the group is how technology can be combined with empathetic design to improve the end of life experience.

There is even a course available for people keen to learn more about the cultural and practical aspects of death. A Course in Dying (ACID) covers everything from death education, funerary evolution, near death experiences and the history of death rituals, to interviews, artist features and cemetery reviews. The course aims to raise death awareness and break age-old taboos.

The process of writing a will is also becoming easier thanks to digital technology. London-based startup, Farewill, takes people through the entire process, including choosing guardians for any dependents or selecting executors for their will. Online platform, Cake, goes even further, offering guidance on everything from writing the will to organising the funeral to covering off legal issues.



C Deathcare

The rapid development of artificial intelligence means it is now able to play a role in palliative care, as demonstrated by a Stanford University pilot programme. The technology is able to compare a patient's medical history with the records of millions of other patients to predict if they may die in the coming year and whether they would benefit from palliative care or end-of-life conversations.

As one of the most crowded cities on the planet, the cost of storing the ashes of loved ones in Hong Kong can be as much as \$130,000. Local entrepreneur, Anthony Yuen, has come up with a cheaper alternative by developing virtual reality software that allows people to place virtual headstones anywhere they want in an augmented reality landscape of Hong Kong.

The drive towards sustainability is also finding its way into the funeral process. When a body is buried, not only does it take up valuable space, but it can also leave a toxic cocktail of bacteria, chemicals and drugs in the ground. Cremation is arguably even worse, releasing the same energy as a 4,800 mile drive. However, more eco-conscious alternatives are emerging. In the US and Canada, Alkaline hydrolysis is becoming increasingly popular as a cleaner and greener way to dissolve a body. In Ireland, a company called ecoLegacy is able to turn bodies into plant food through a thermal process that uses cold, heat and pressure. Even mushrooms are now being used as a method for faster and greener decomposition of dead bodies.



On the horizon

Horizon 1

6-12 months

- Happiness ambassadors become more common in organisations and services
- Subscription-based health services grow in popularity
- Niches like fem and brain tech continue to evolve
- Sleep continues to be one of the key factors in wellbeing and the fight against stress and weight gain



Horizon 2

12-24 months

- Female empowerment through tech in developing countries
- Death as an experience fascinates people, giving rise to services that recreate it for the masses
- Crowdsourced health advice becomes more common



Horizon 3

2-5 years

- Planning your health & life journey using DNA testing and stem cell banking
- More later-in-life services widely in use, more digital possibilities to organise near and after death moments
- Robots in care work
- Focus on sustainability of death/burial - a more conscious approach



Future proofing

- 01 What impact are influencers having on the health decisions of their followers?
- 02 Will tech companies take over the health industry?
- 03 Can we trust the tech giants to be the gatekeepers of our digital health?
- 04 How can wellbeing be made accessible to all?
- 05 Who owns, controls and uses a person's most intimate health-related data?
- 06 How can health businesses guard against hacking?
- 07 Is the wellness trend just a fad. How sustainable is it? How can claims be substantiated?
- 08 Where is the line between private and public health care?

Parting thoughts

The future. You definitely can't predict it, but you can at least invent your way towards it. We hope you've enjoyed this collection of our perspectives and challenges as we look ahead.

This is an ongoing process for us, and the more people we involve, the better. To that end, please feel free to contact us to arrange a presentation. Our clients also get a lot from running future vision workshops with us, so please get in touch if you'd like us to organise a workshop with your teams.

Here are the people closest to you across our different studios:

UK: [John Oswald](#)

Finland: [Virpi Vaittinen](#)

Sweden: [Lindsay Tingström](#)

Germany: [Helmut Scherer](#)

Norway: [Juho Kinnunen](#)