
What was considered only recently a matter of science fiction, is quickly becoming the reality of today.
TECH
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Digital maturity, as a mainstream consecrated term, refers to a company's ability to create value through the digitalisation of both its services and operations.

In 2020, right at the peak of the Covid19 pandemic, Deloitte ran a survey, seeking to understand the connection between a company's digital maturity and its financial performance. Their research found that the impact on financial performance that digital maturity can have comes from enabling improvements in efficiency, revenue growth, product/service quality, customer satisfaction, and employee engagement—as well as from prompting a greater focus on growth and innovation.

BCG's Digital Acceleration Index released in June this year (2021) found that, despite major turnover and profit declines at the start of the pandemic, companies deemed the most digitally mature saw valuations 23% above precrisis levels, on average, within six months of the pandemic's start. These results contrasted with the growth of the least digitally mature companies, which saw an increase of only 7% on average.

2020 was a pivotal year in understanding the value and the real return on investment of digital marketplaces, supply chains, services, and products – those companies which swiftly embraced and built on digitalisation thrived; those who did not, collapsed.

Paul John Bakker, the Vice President for Global Enterprise Solutions at ASICS Corporation argues that the companies that were able to recover so fast during the pandemic did so because they were truly digitally focused.

According to Calder's (2019) "Duty of Care: An Executive's Guide for Corporate Boards in the Digital Era", digitally mature organisations outperform their peers by 9% and are more profitable by 26%, and also deliver a greater market value. In her view, what defines any corporation's digital maturity is its ability to transform.

In 2020, McKinsey published the results of a survey related to how COVID-19 has pushed companies over the technology tipping point, and thus transformed businesses forever. The executives who responded to this survey indicated that "their companies have accelerated the digitization of their customer and supply-chain interactions and of their internal operations by three to four years. And the share of digital or digitally enabled products in their portfolios has accelerated by a shocking seven years."

Digitalisation and business transformation go hand in hand in a lucrative, profitable post-pandemic 2022 world. While traditional business models still have a role to play in the wider global economic mix, digitalisation and digital technologies play a key role in creating market value and shareholder returns.

The innovation economy, as it has been coined by some, requires innovation – and such innovation does not come from one's ability to use hammers and nails, but from one's ability to understand the advantages of native integration, plug-ins, artificial intelligence, application programming interfaces and online ecosystems.

Today, not enough corporations understand the incredible value digital and innovative start-ups can create or add to their business models. Peter Fisk, one of the world's most prolific marketers and academics, argued in 2019 that "the global start-up economy is worth nearly $3 trillion, a rise of 20% in two years" and that "technology-driven start-ups aren't just contributing to economic growth, in many ways, they are economic growth."

Nike, Microsoft, American Express, and PepsiCo have already created accelerators, investment funds, and other programmes aimed at start-ups – these corporate mammoths want to be the first to take full advantage of the creativity and innovation bootstrapping start-ups can bring to their businesses.

Large corporations see such funding programmes as an opportunity to find new ideas early and perhaps partner with, invest in, or learn from today's most innovative entrepreneurs. According to an article in Inc., in 2019, Johnson & Johnson and GlaxoSmithKline each put $50 million into a $200 million venture fund to support early-stage biotech firms. In addition, Johnson & Johnson is creating four innovation centers in Boston, London, Shanghai, and San Francisco- to fund early-stage life-science research and help push products forward faster.

John Hill, Chief Information Officer (CIO) and Senior Vice President (SVP) of one of the oldest and most prolific American companies – Carhartt – argues that start-ups play a key role in fuelling corporate innovation because they bring point solutions, they are ready to deploy and can be used to demonstrate the potential behind the solution, filling a void that many multinationals are not necessarily willing or ready to take a gamble on.

In 2018, Prith Banerjee, the Chief Technology Officer of Schneider Electric, was interviewed by EY for an article entitled "What corporates and start-ups need from each other". Telling is the complex simplicity of Banerjee's argument related to the partnering imperative between large corporations and start-ups: start-ups "bring solutions to customers much faster and much more efficiently and cost effectively than trying to do it all yourself".

Dismissing the impact of innovation and positive change that tech savvy start-ups can create for multinationals across the world would be completely counterproductive for the post-pandemic times. In the words of Brent Hoberman, the co–founder of lastminute.com and made.com, and the CEO of the Founders Forum:

"The importance of innovation is not lost on most corporates. Much has been written about the drastically shortening lifespan of big companies - the average tenure of a firm in the S&P 500 has shrunk from 61 years in 1958 to 18 years. But most forward-thinking corporates know that the best ideas don't always come from within their own business. Instead, they are setting powerful examples of how working with and investing in start-ups can help define and grow market position."

The future is now

There is a new world emerging from the shadows of what was considered, only 30 years ago, science fiction – a world where cloud computing, artificial intelligence, machine learning and the Internet of Things are coming into their own.

Manufacturing and customer industries, by and large, are starting to generate and use an increased amount of big data; life sciences, especially biotechnology, relies heavily on cloud computing and its extremely low-cost storage capacity and accessibility. There cannot be any discussion surrounding smart cities and autonomous vehicles, let alone what is anecdotally called 'the future of work', without a heavy reliance and dependence upon the possibilities created by cloud computing.

As with any virtual storage, online interaction and communication, the biggest threat posed by cloud computing is that related to its security and to, what one would call, 'hackability'. No online data is cybercrime full proof, though there have been significant strides made to ensure that protection is as high as it can be.

Common software frameworks are here to stay – they enhance collaboration between software developers and, in tune with a circular business model, that collaborative ecosystem creates both opportunity and growth.

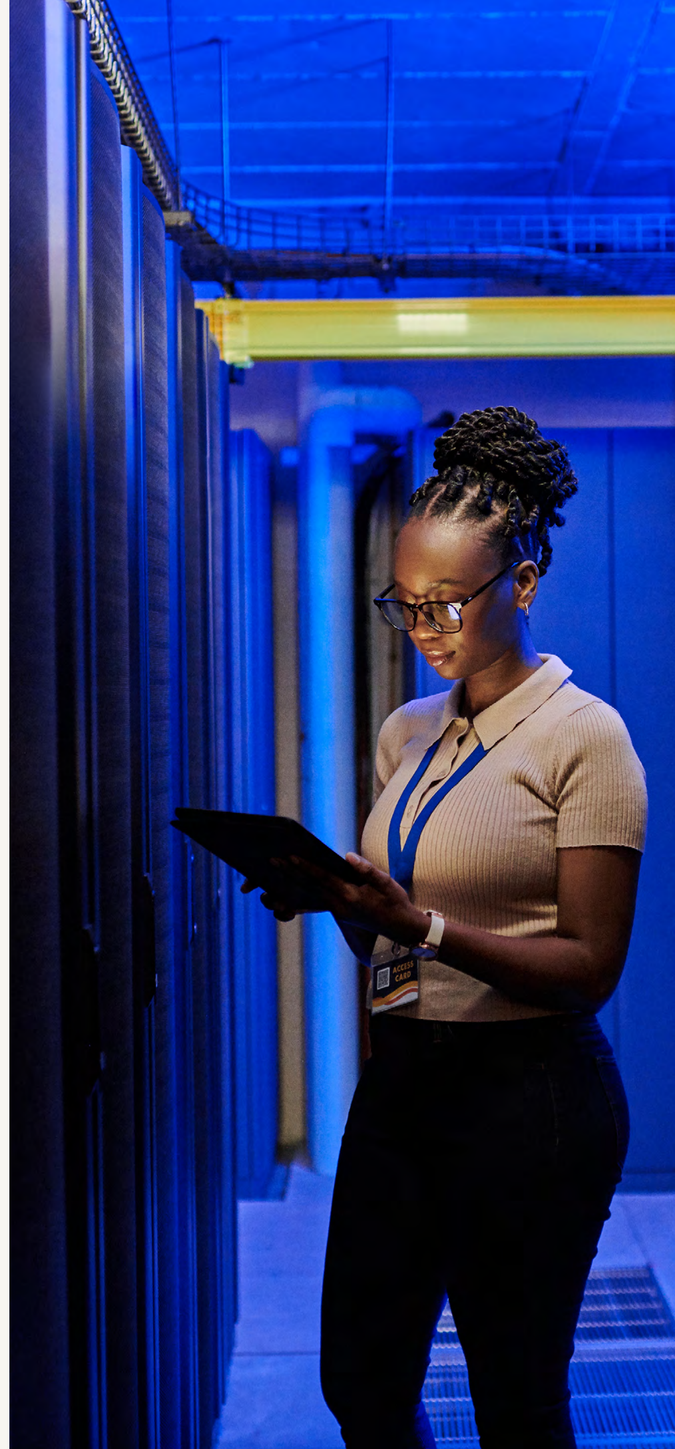
The number of newcomers entering the software market globally is steadily increasing: they are fully aware of the capitalisation power that only open-source architectures can offer. The opportunity to add to already existing machine learning and artificial intelligence frameworks is growing, and the solutions that can be identified, co-created or developed by digitally native start-ups are highly likely to see a massive boost.

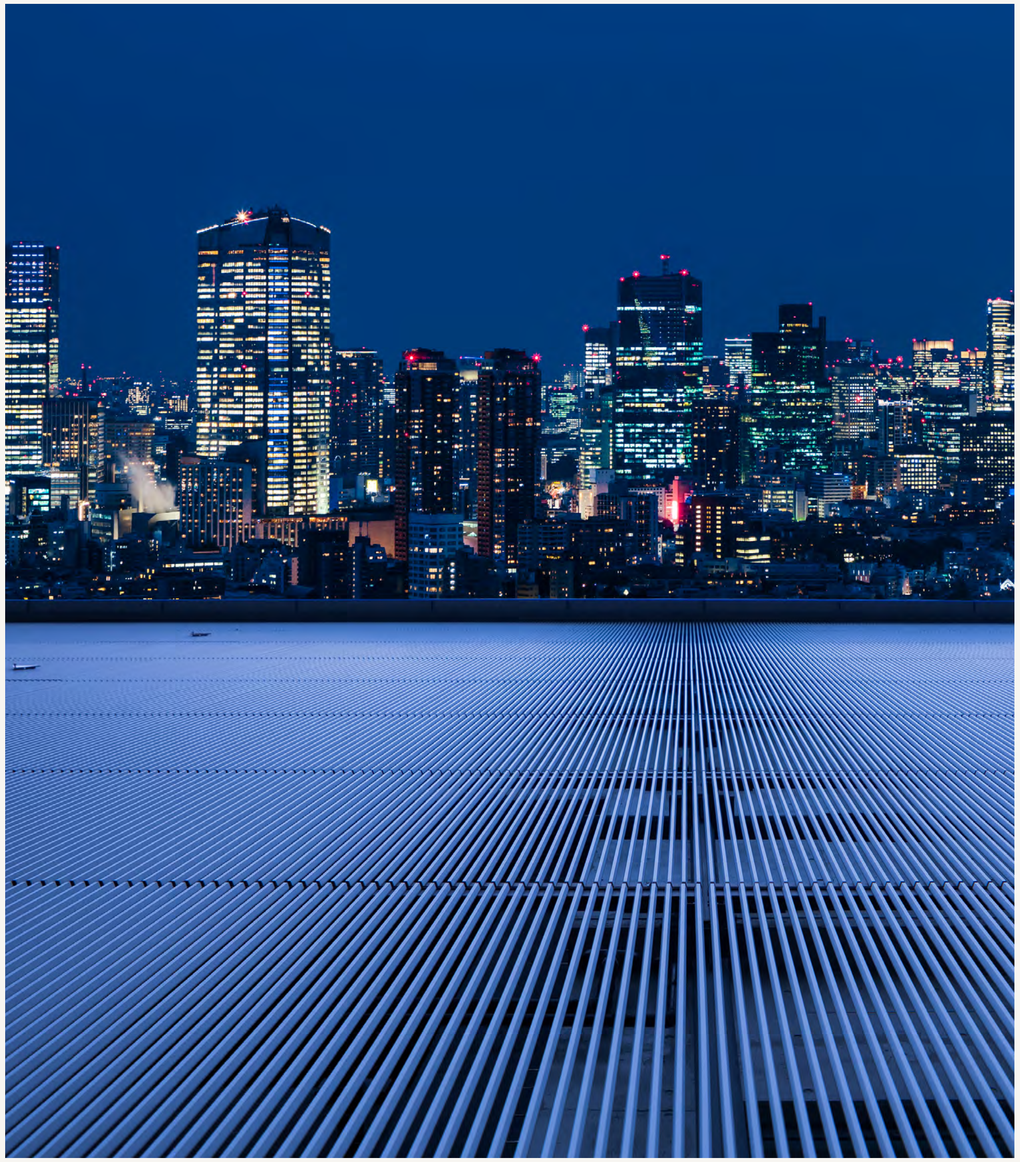
Concepts that still, to many, mean nothing or are considered a thing of the future, are already gaining ground: machine learning, artificial intelligence, application programming interfaces and natural language processing cannot have their capitalisation opportunities stifled, on the contrary.

Deep learning algorithms are an area to watch, both in terms of the software being able to autonomously learn and fine tune itself but, also, in terms of who their main users may be: due to rather market-restrictive computational, resource and power requirements, they are likely to be extensively used by large multi-national corporations or by international governments.

The use of any personal and proprietary data raises a significant number of ethical concerns not just for the common consumers, unsuspecting members of the public but, also, for various national and international organisations concerned with the intrusiveness of computer-generated software, algorithms, intrusiveness, machine learning and artificial intelligence.

Automation, energy efficiency, connectivity, smart transportation, smart buildings, and big data will all shape – and are already doing it – the net zero cities of the future.





Smart cities

Nilssen (2019) developed a typology of smart city initiatives based on the extent and types of innovations they involve, comprising four dimensions of innovation: technological, organizational, collaborative, experimental. Her article - 'To the smart city and beyond? Developing a typology of smart urban innovation' – provides significant insights into the type of innovations that become key in smart city initiatives.

"While smart cities have the potential to change cities for the better, they also come with potential hidden costs. Defining scalable, efficient and realistically achievable smart city policies requires a clear understanding of the strengths, weaknesses, opportunities and threats facing smart cities".

OECD, 2020

According to Ellen MacArthur Foundation, cities account for 85% of global GDP generation and for 75% of natural resource consumption. They also produce 50% of global waste and 60-80% of greenhouse gas emissions.

While currently cities are massive polluters and heavily applying the principles of a linear economy largely based on mass consumption and waste, it is also the cities which are likely to drive the world economy towards circular business models and circularity-based economic growth.

Today, the world's top ten smart cities are in Singapore, Norway, The Netherlands, Spain, USA, UAE, UK, and Hong Kong. It may not come as a surprise that half of these smart cities are in Europe – strict building and energy efficiency regulations enforced by the European Union have allowed several European capitals to make the most of the technological advancements of recent years and find creative ways to minimise urban pollution and waste.

Real-time crime mapping, for instance, helps in policing; telemedicine brings health practitioners into patients' homes; digital tracking of waste receptacles tells a garbage hauler when a bin is full; open databases allow business owners to adapt based on traffic or pedestrian flow; online connection platforms provide internet access or battery charging for personal devices (*The American Society of Mechanical Engineers, 2020*).

In practice, and depending on the current level of infrastructure available, both in terms of buildings and IT, any city in the world can become a smart city providing it approaches urban development and GDP growth from a resource use minimisation and optimisation perspective:

- Data collection to provide an accurate picture of traffic volume, and rush hour patterns/bottlenecks.
- Population-wide broadband availability and open-source access to various public interest information.
- Home energy and water management systems (smart metering).
- 24/7 monitoring systems for the elderly and those with special needs.
- Pattern analysis of wind speed and direction, and solar penetration, to improve access to and reliability of renewable energy sources.
- Digitalisation of public services.
- Artificial intelligence-based public transport monitoring system to avoid traffic accidents and optimise public transport resources (i.e., adding more peak/rush hour buses)
- Electric vehicles and EV-charging technology
- Waste containers fitted with sensors to monitor their filling up levels, to optimise their collection time.
- Crime and violence pattern analysis

Any opportunity for technological advancement and development has its own risks; affordability of services, personal data protection and availability of jobs are some of those immediately obvious risks that one may associate with automation and smart cities.

Irrespective of the current level of urban sustainability demonstrated by the world's top ten smart cities, there is a gamechanger in the works: Saudi Arabia's NEOM city. In the words of the Saudi Crown Prince, Mohammed bin Salman, "95% of nature within NEOM will be preserved, with zero cars, zero streets and zero carbon emissions."

THE LINE will power NEOM as it becomes a hub for innovation where global business and emerging players can research, incubate and commercialise ground-breaking technologies to accelerate human progress.

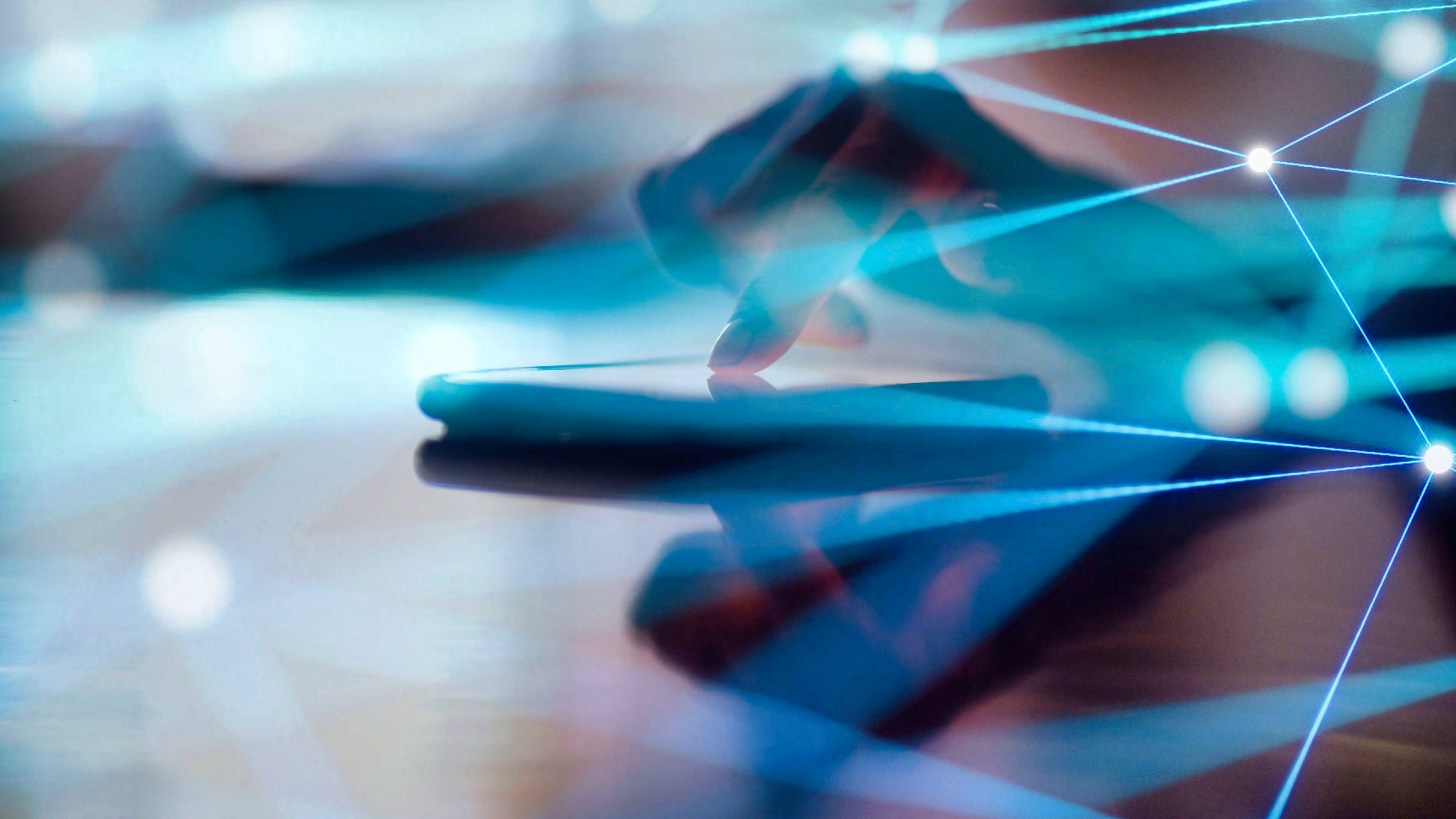
By integrating commerce and industry into the heart of future communities, THE LINE will help reimagine supply chains and facilitate new and better ways of working. It will also foster innovation and empower entrepreneurs.

THE LINE is a 170km-long linear urban development of multiple, hyper-connected communities, with walkable neighbourhoods, connected to public green spaces and natural landscapes, linking the coast of the Red Sea with the mountains and upper valleys of the north-west of Saudi Arabia.

After decades of intensive fossil fuels exploration and production, with a GDP considerably boosted by the Saudi Kingdom's profits from the oil and gas trade (it has the world's second largest proven oil reserves, and these account for about 16.2% of the world's total oil reserves), under the leadership of the new Crown Prince, Saudi Arabia has shifted its national focus on sustainable technologies and cutting-edge renewable energy sources.

THE LINE utilizes human-centric design, advanced infrastructure and manufacturing and cutting-edge technology to solve the world's greatest challenges. It will reshape industries such as mobility, clean energy, AI and robotics, with a focus on the environment and sustainability.

When and if commissioned, NEOM will likely revolutionise the current norms and approaches to urban living.



AI strategy

The UK Government has recently published its "National AI Strategy", a lengthy document, peppered with lofty aspirations and rallying statements such as supporting "the transition to an AI-enabled economy" and ensuring that "the UK gets the national and international governance of AI technologies right to encourage innovation, investment, and protect the public and our fundamental values". And paramount to achieving all these objectives is the public's "trust and support," and the "involvement of the diverse talents and views of society."

A natural question to ask would be related to the public's trust in what and support of whom, since trust is related to reliability and competence, and support is dependent on any one's government ability to deliver on its various commitments made to its voters.

To date, and according to OECD's latest data, there are over 600 AI policy initiatives from 60 countries, territories, and the European Union.

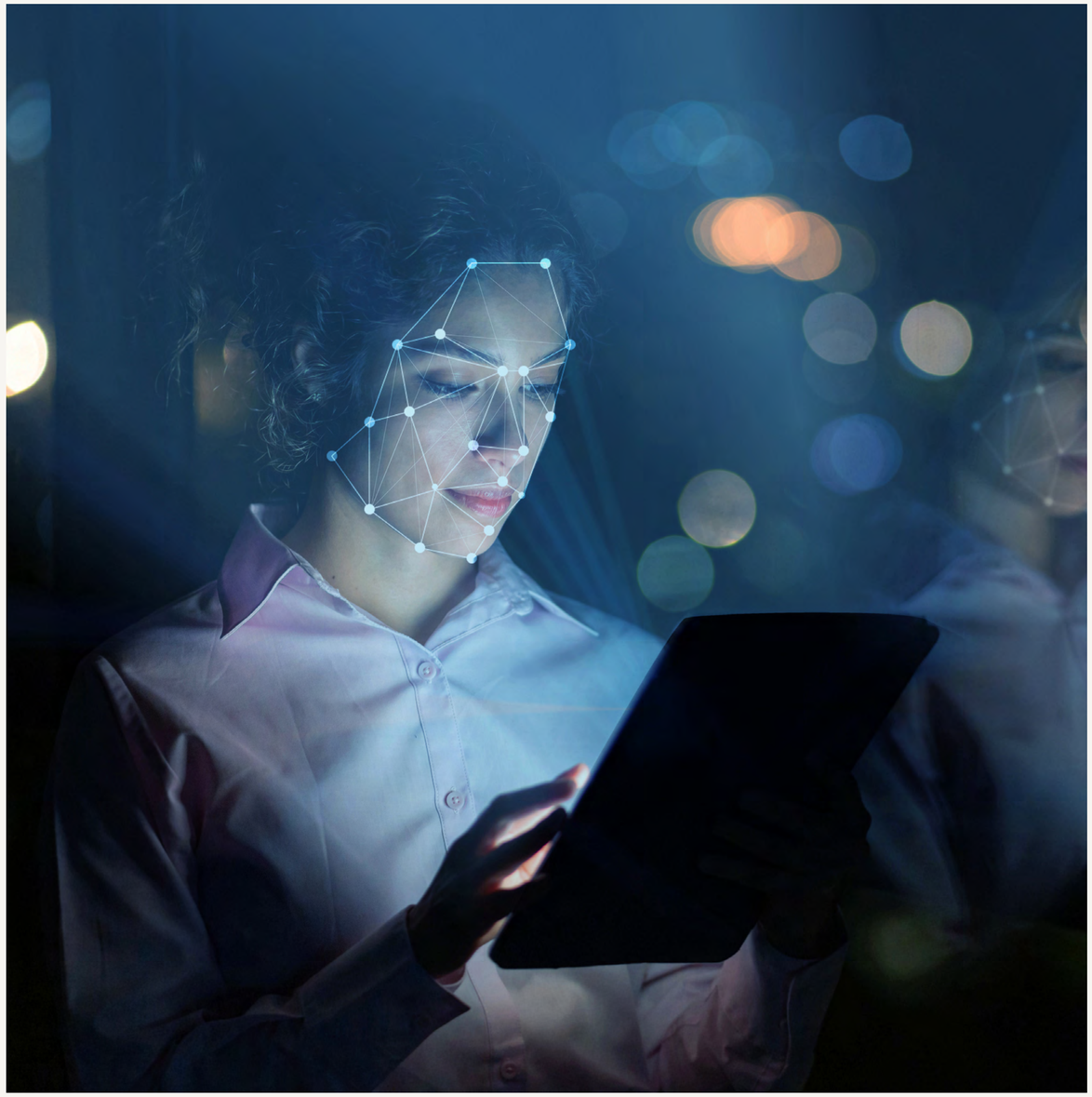
There is a remarkable two-part document entitled Comparison of National Strategies to Promote Artificial Intelligence published by the Konrad Adenauer Foundation which asks two very fundamental questions:

1. What regulatory framework conditions have they [Governments] defined?
2. How do they [Governments] implement policy strategies and programs to create new industrial policy facts?

Artificial intelligence should not be used as a component of political rhetoric and electoral promises – it needs facts, significant amount of support and investment from the private sector, and an apolitical Ombudsman/Regulator to ensure the lack of vested interests of any party – be it government or private sector – in the development and deployment of any AI:

"If you run a business – whether it is a startup, SME or a large corporate – the government wants you to have access to the people, knowledge and infrastructure you need to get your business ahead of the transformational change AI will bring, making the UK a globally competitive, AI-first economy which benefits every region and sector."

Excerpt from UK's National AI Strategy



To enable AI driven technologies, to foster a truly inclusive ecosystem – one solely driven by innovation and collaboration – the digital divide currently existent in the UK, let alone the digital poverty that faces many of the country's youths and adults, needs to be rapidly narrowed.

As of 2020, "2,500 new Masters conversion courses in AI and data science are now being delivered across universities in England". According to Statista, "in the 2019/20 academic year, there were over 412,000 enrolments for courses involving business and management studies, making it the most popular subject group in that year. Subjects allied to medicine had over 295,000 enrolments making it the second-most popular course in that year".

According to UCAS data cited by fenews.com, acceptances to computer science courses have risen by almost 50% (from 20,420 in 2011 to 30,090 in 2020); and acceptances to engineering courses were up 21% from 25,995 in 2011 to 31,545 in 2020 – driven by an increase in demand from UK's 18 year olds; whilst acceptances to the newer artificial intelligence (AI) courses have seen a 400% rise in the past decade (from just 65 in 2011 to 355 in 2020) – there is a stark difference between AI courses uptake and business studies and medicine uptake (over 700,000).

Any national artificial intelligence strategy should include clear economic goals and benchmarks – visa benefits for high skilled migrants and government-led investments are a form a state-aid given to either employers of such non-native talent or to various businesses to catapult their innovation potential. To date, and according to Konrad Adenauer Foundation, "the Chinese strategy is the only one of these that contains measurable economic goals and benchmarks."

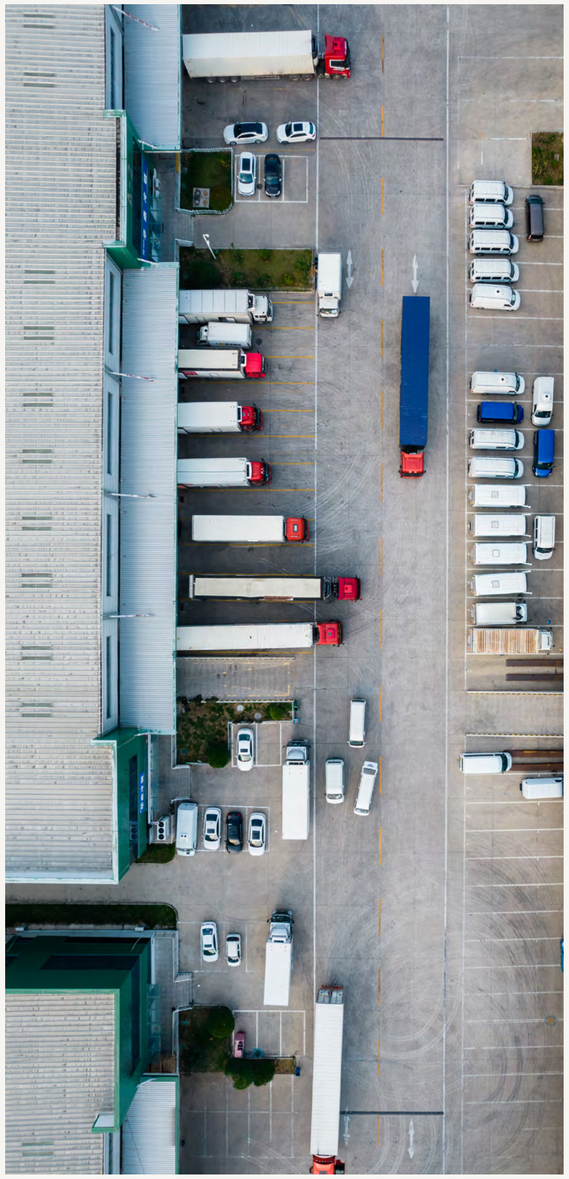
A look at the most valuable Top 20 technology companies as of 2021 clearly demonstrates that the fight for innovation supremacy is largely fought between US-based and European tech giants.

There is much more at stake in the race to AI/computing supremacy that is currently being fought between the world's superpowers: the AI's ecosystem ability to serve and protect humanity, to improve the sustainability and circularity of our interrelated and co-dependent economic systems, and to offer clear incentives for human innovation in all fields.

To achieve these, and to monetise all traditional competitive advantages available to nation states, competition becomes moot; collaboration and ecosystems become paramount.

Pos.	Company	Country	Value $B
1	Apple	USA	612
2	Google	USA	458
3	Microsoft	USA	410.27
4	Tencent	China	240.93
5	Facebook	USA	226.74
6	Nvidia	USA	104.76
7	IBM	USA	91.34
8	Instagram	USA	82.9
9	Adobe	USA	78.52
10	Intel	USA	71.94
11	SAP	Germany	69.24
12	Accenture	Ireland	64.73
13	Oracle	USA	60.84
14	Texas Instruments	USA	49.24
15	Salesforce	USA	48.36
16	Qualcomm	USA	48.36
17	YouTube	USA	47.1
18	Cisco	USA	46.82
19	Samsung	South Korea	46.77
20	TikTok	China	43.52

The most valuable Top 20 technology companies in 2021.
Statista



AI in action

Globally, food waste is estimated to amount to a whopping £2.9 trillion per year. There's clearly enough food being produced but much of it is wasted due to operational inefficiency and severely bloated supply chains. With such a vast problem, it's clear that a multi-pronged attack must be employed to deal with the gargantuan issue of global food waste.

The circular economy aims to disrupt the status quo by designing out waste, keeping products in use and creating closed-loop systems where waste projects are regenerative. There are some ways in which circular principles can be applied to managing food waste.

Creating closed loop systems is one way to eliminate waste, but another strategy is to reduce the size of the loop by becoming more efficient and less wasteful. Big data fuelled by advances in AI technology may hold the key to reducing global food waste; arming companies with actionable insights enables them to make efficiency gains and, therefore, cut down on waste.

AI technology is already being utilised commercially, leading to tremendous cost savings and efficiency gains. A UK technology start-up, Winnow has produced an AI-powered bin that uses a camera together with an intelligent platform to enable restaurants and retail kitchens to track what type of food is being thrown away.

Ikea is one of the companies making use of this technology to cut down on waste in their in-store kitchens. Using computer vision, Winnow's technology can track and weigh discarded food, which means that management teams have greater granularity on the type of food being thrown away. Whereas previously kitchen staff may have had to resort to manually entering data about food waste, thanks to AI and machine learning, this process can now be fully automated, leaving staff free to focus on running the kitchen.

As food is thrown away, intelligent cameras scan and identify the type of food and calculate its weight. This data is uploaded into Winnow's intelligent platform, with daily reports produced. Having greater visibility on what is being thrown away and how much is wasted helps to detect potential issues related to overstocking. This data empowers kitchen staff to plug any gaps and understand where they could be more efficient. The results are impressive: Winnow's technology has allowed Ikea to cut down in-store food waste by 50%.

On the retail side, expiry dates are a major bottleneck in terms of reducing food waste. Research indicates that, on the retail side, 260,000 tonnes of food that could have been eaten are thrown away. Rather than using expiry dates, new technology such as AI-powered packaging enables consumers to gain an accurate picture of whether food can still be consumed.

Another solution is for the supermarkets to drill down into buyer behaviour in order to sell more and waste less. Tech start-up, Wasteless aims to reduce food waste through its AI-powered dynamic pricing solution. The company's proprietary software solution uses real-time tracking, dynamically setting the product's price based on expiry date.

This dynamic pricing model enables supermarkets to sell more of their products and thus throw less away. As well as being less wasteful, the supermarket benefit from less lost stock and a boost to their business through greater sales.

UK supermarket, Ocado has already started to use AI-based technologies with the aim of reducing food wastage. Ocado's smart logistics platform uses machine-learning and forecasting to intelligently predict the food that their customers need. These insights are then utilised in the supply chain to ensure that excess produce is not ordered from suppliers.

According to McKinsey, the use of AI in the food industry is the key to unlocking a $127 billion dollar opportunity. A solution to large-scale food wastage is a marathon, rather than a sprint, but certainly AI is unlocking the doors to innovative solutions for how food is manufactured, produced and sold.

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