amazon PUBLICFIRST

Amazon UK

Innovation Report


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Public First is an independent consultancy that works to help companies and organizations develop new policy proposals, better understand public opinion, and model their economic and social impact. Public First is a member of the Market Research Society.

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Executive Summary

Innovation is how the world gets better. Economists estimate that innovation accounts for about 80% of long-term growth[1], helping increase our quality of life, making us richer and solving societal challenges. Neither governments, academics or companies can deliver all the innovation we need on their own - but instead they must all work together.

Amazon is one of the most innovative companies in the world. Building on its Day One principles of customer obsession and long-term investment, the company has continually re-invented itself and created at least six industry changing innovations - Amazon.com, Marketplace, Prime, Amazon Web Services (AWS), Echo and Kindle.

In our research, over **four-fifths** of the public described Amazon as innovative, while online shopping was seen as the third most helpful innovation of the last thirty years.

In this report, we use new research, modelling, consumer and business polling to explore the impact of Amazon's innovations in the UK, as well as what we can learn from it to unlock future advances in four core areas: retail, home, cloud computing and AI.

1 https://web.stanford.edu/~chadj/facts.pdf

Retail

Over the last 25 years, Amazon's continued investment in logistics, infrastructure and development centres has transformed the retail experience for consumers, employees and businesses around the world.

Innovations in retail can be some of the most democratising. Everybody needs to shop for essentials, and it is often the lowest income households which are most stretched for time. In our polling, over three-quarters of people on low incomes said that cost and affordability were important factors in why they shopped at Amazon.

Even more important than lower prices is the increased choice and convenience that online retail has enabled. In our estimates, the equivalent value in consumer welfare this creates is nearly five times higher than that delivered by price savings alone.

In the next few decades, innovations in drone delivery, electric and autonomous vehicles, and robotics could continue to transform the sector. Greater use of robotics could help make the logistics sector as productive as manufacturing, delivering safer and higher wage jobs. At the same time, drone delivery could unleash the next transformation in retail, delivering essentials to customers in under 30 minutes, and help reduce traffic congestion in busy city centres.

To take full advantage, however, it will require collaboration from both companies and governments: we will need innovation test beds, a clear roadmap for commercial charging infrastructure and greater collaboration between companies, regulators and governments to adapt regulations for new technologies.

Key Findings:

In total, we estimate that Amazon creates around £30 billion a year in additional value for consumers from increased variety, saved time and reduced costs. 71% of Amazon consumers say that Amazon has helped them discover new products and brands they would not have found otherwise.

£30bn

3/4

Three-quarters of Amazon customers told us they have used Next Day Delivery. In total, we estimate the convenience offered by Amazon's online retail has saved Amazon's customers in the UK the equivalent of four extra bank holidays per household.

Over 100,000 UK–based small and medium sized businesses use Amazon to sell. On average, using Fulfilment By Amazon is around 70% less expensive for sellers compared to fulfilling orders themselves.

70%

€700m

Over the next 25 years, greater use of robotics could increase wages in logistics to match those in the manufacturing sector. Amazon is the world's largest manufacturer of industrial robots announcing a €700 million investment in robotics and AI-powered technology in Europe in 2024.

Drone delivery could help take 25,000 delivery vans off the UK roads

By the time it is fully scaled up, we estimate drone delivery could create an additional £5.5 billion in demand for local shops and retailers.

Home

Most of us wish we read more - but finding the perfect moment with a paper book can sometimes be tricky. By pioneering innovations such as the Kindle, digital audio books and audio entertainment Amazon has helped make it easier to fit in enjoying more books around our busy lives.

Amazon's Alexa was the first real AI assistant many people in the UK used, and is still the most familiar today. Combined with devices like Echo or Ring cameras, Alexa is helping millions of people in their everyday life at the centre of a smart home: saving time, keeping them entertained and giving greater peace of mind.

In our research we found two groups for whom Amazon's devices and services can be particularly powerful:

- For parents, Kindle and Alexa are helping answer their children's questions, entertain them and give them greater confidence with their reading

- For those with a physical or mental disability, smart home innovations make it easier to control their home and stay in contact with friends, relatives or visitors

In the next few decades, a second generation of AI assistants, smart home devices and household robots could be even more powerful. Just as the washing machine or hoover did in the post war era, this new generation of tools could significantly increase leisure time. At the same time, AI assistants could further increase the accessibility of information, entertainment and access to key public services.

Key Findings

£3.6bn

Every day in the UK, we estimate Alexa helps two million people cook, five million people keep up with the news, and 10 million people listen to music. On average, Amazon smart speaker owners ask Alexa a question once per day - and based on responses from customers we estimate that it creates £3.6bn in consumer welfare.

60%

Over 60% of parents who have purchased a Kindle for their child believe it has increased their confidence with reading. Three quarters of parents with an Alexa-enabled speaker say they have used it to help entertain their children or answer their questions.

£250

By extending the life of older TVs, Fire TV sticks have saved about six million households in the UK an average of £250

Based on current smart TV prices, compared with buying a new television - or £1.6bn in aggregate.

A new generation of the smart home could free up leisure time and increase energy efficiency. Simply increasing adoption of today's technologies could save over 300 million hours for families a year, and prevent 5 million tonnes of CO_2 emissions.

5m

Continued innovation in digital personal assistants will enable more personalised and smarter support, helping more power take advantage of the power of digital technology. A majority of adults under 25 told us they would be interested in using an AI assistant as a personal tutor, assistant or workout coach.

Cloud Computing & AI

In the early 2000s, Amazon launched Amazon Web Services, to rethink IT infrastructure completely.

Today, cloud computing is a major driver of economic growth in the UK: helping organisations of all sizes to drive innovation faster, reduce costs, and compete on a global stage. Cloud computing allows small businesses and startups to have access to the same advanced technologies as the largest enterprises.

Cloud computing is also an important enabler for emerging technologies like AI. Together, cloud computing and AI could create hundreds of billions in value for the UK economy. In order to meet companies' increased demand for cloud computing and AI, the UK is likely to need additional data centre capacity. At the same time, the UK will need to do more to ensure that everyone can take advantage of the digital opportunity from these new technologies.

Key Findings

Using the cloud reduces the time it takes to deploy new software by over a quarter

84% of AWS users agree that cloud platforms make it easier to bring new products to market.

63% of businesses agree that AI could transform their company

84%

84% of AWS users thought that their business had saved money as a result of investing in cloud infrastructure, with an average cost saving of 28% compared to using on-prem IT. In total, taking into account cost savings and revenue gains, AWS customers reported receiving an average return of over £2 for every £1 they spent on AWS.

Introduction

Imagine: it is a Saturday afternoon. You are about to print out your kid's homework when you realise you are out of ink. No time to go to the shops that evening, and tomorrow you're out all day.

No problem. You order some more on Amazon, it will arrive through your letterbox on Sunday and the homework will be on the teacher's desk on Monday morning.

Thirty years ago, life was different. If your local shop didn't stock something, you were often out of luck. If someone told you about a great book to read, you might have to wait weeks for it to be ordered in - and then, of course, you would have to remember to keep the physical copy with you to read it. Local businesses had no good way to distribute their products across their company, and anyone who wanted to start a new digital company would have to invest in their own expensive services.

In the long run, it is innovation that matters most for driving improved living standards and higher wages – more than physical capital, working longer or even education. **Economists estimate that innovation accounts for about 80% of long-term growth.**[1] That innovation has, in turn, helped the average person over the last 50 years enjoy **50% more income** in real terms,[2] **work 200 hours less** a year[3] and enjoy air with over **60% less pollutants** in it.[4]

That innovation comes from many places. Innovation isn't just about basic advances in science - but figuring out how to bring those advances together into new solutions that improve our lives. While some of it comes from universities and academic labs, an equal proportion comes from companies. From the personal computer to the Covid-19 vaccine, many of the most important developments in recent years relied on by the private sector.

Amazon is one of the most innovative companies in the world. Very few companies are lucky to create one industry changing innovation. Amazon has created at least six – Retail, Marketplace, Prime, AWS, Echo and Kindle – as well as dozens of other highly valued services.

In our research we found that customers appreciate Amazon: **four-fifths of the public described Amazon as innovative**, while online shopping was seen as the third most helpful innovation of the last thirty years – and chosen by more than twice as many as social media.

From the beginning, the company has stressed the importance of a Day One culture: continuing to reinvent its products and services, and focus on the consumer rather than narrow competition.

1 https://web.stanford.edu/~chadj/facts.pdf
2 https://www.measuringworth.com/
3 https://ourworldindata.org/working-more-than-ever
4 https://ourworldindata.org/outdoor-air-pollution

Day One

"This is Day 1 for the Internet, and, if we execute well, for Amazon.com."

"There are many ways to centre a business. You can be competitor focused, you can be product focused, you can be technology focused, you can be business model focused, and there are more. But in my view, obsessive customer focus is by far the most protective of Day 1 vitality."

"It remains Day 1."

Jeff Bezos in 1997, 2016 and 2020

First explained in Amazon's annual letter to his shareholders in 1997, and then expanded on in the years since, Amazon's has continually followed core innovation principles including:

- **Customer obsession.** In Amazon's phrase, "customers are always beautifully, wonderfully dissatisfied, even when they report being happy and business is great. Even when they don't yet know it, customers want something better, and your desire to delight customers will drive you to invent on their behalf. "

- **Embracing failure.** Not every Amazon innovation has been a success: the Fire Phone was only on sale for just over a year before being discontinued. But without taking risks on projects that could fail you don't get big upside either. Five months after the Fire Phone, Amazon would announce another new line that many people were unsure about: the Echo.

- **Investing for the long term.** You can't build a global logistics network or develop and scale innovations such as drone delivery overnight. Often, the timing of when an innovation will find its niche or how long it will take is hard to predict.

- **Building up internal infrastructure** that allows for small teams and nimble organisation… Amazon has innovated just as much in its organisational design as it has in its products. By building its internal systems and infrastructure in a modular way, it makes it much easier to make rapid decisions without suffering the communication overhead that comes from having to explicitly align too many people for every decision.

- **…and then opening up that infrastructure to everyone.** Amazon didn't just build the world's most comprehensive online retail storefront, data centre infrastructure or fulfilment network: it opened these innovations up to other businesses too, meaning that companies of any size can take advantage of the same economies of scale as Amazon.

In this report, commissioned by Amazon, we wanted to explore three key questions:

- What has the impact been so far from Amazon's key innovations in retail, home and cloud computing?
- What innovations might be coming up in the next ten to twenty years?
- What policy steps can help ensure that the UK is ready to take full advantage of these innovations?

A Manifesto for Innovation

Amazon's Recommendations for Innovation and Research

The UK is one of the world's most innovative economies, ranked fourth behind Switzerland, Sweden and the US on the most recent Global Innovation Index.[5] Some of our most important advantages include our world leading universities, a flexible economy, and the strength of our wider tech sector.

However, we also have significant weaknesses that are holding the UK back from fully catalysing on these strengths and turning them into broadly shared economic growth:

- Low levels of R&D investment. Since the late 1990s, investment has fallen as a share of GDP, seeing much sharper falls than in other G7 economies such as the US, France and Germany.[6]
- A regulation system that doesn't fully take into account the potential benefits from innovation. New innovations can create new risks, and so need to be regulated carefully - but they also create new opportunities to improve safety, sustainability, and the standard of living in a way that can be hard to predict.
- Weak knowledge transfer and innovation diffusion. While the UK's frontier firms are growing as fast as ever, we don't always see these gains diffusing fully across the economy - a significant cause of the UK's recent growth slowdown.

The Government should:

- Commit to a 3% target for R&D spending as a share of GDP in the UK economy.
- Foster stronger commercial links between universities and local businesses, to facilitate knowledge transfer and better translate research into commercial outcomes.
- Create a new Innovation Impact Assessment to ensure that the CMA and other regulators take into account the impact of their decisions on wider innovation.

5 https://www.wipo.int/global_innovation_index/en/2023/

6 https://www.productivity.ac.uk/news/boosting-productivity-why-doesnt-the-uk-invest-enough/#:~:text=The%20overall%20investment%20rate%20in,%25%2C%20as%20Figure%201%20shows

Timeline

1998
Amazon Launches in the UK

2002
Amazon Marketplace launches

2014
The Amazon Echo smart speaker (1st generation) released alongside Amazon Alexa

2014
Prime Video launched in the UK

2014
Amazon Fire TV launched in the UK

2016
Amazon Web Services launches its first infrastructure Region in the UK

2020
Amazon introduces Just Walk Out technology

2020
EVs are first introduced to the Amazon delivery fleet

2022
Amazon introduces electric HGVs, e-cargo bikes and walkers

2022
Prime Video passes £1 billion investment in UK TV, movies and live sport

2004
The first UK Development Centre is built in Edinburgh

2007
Amazon Prime launches in the UK

2008
Amazon acquires Audible

2010
Kindle arrives in the UK

2016
Ring launches in the UK

2016
Robotics introduced to an Amazon fulfilment centre in the UK for the first time

2017
Amazon Fresh online debuts

2019
Amazon co-founds The Climate Pledge

2023
Amazon marks 25th anniversary operating in the UK

Retail

Amazon's Innovations

Choice

Increased choice was Amazon's first innovation. Amazon was founded on the theory that the web would allow for a new type of store, able to offer many more products than could fit in a catalogue - let alone a physical store. Given the relative ease of shipping them, books were the first product to be offered.

By 1997, Amazon's founder Jeff Bezos could point to offering "more selection than was possible in a physical store (our store would now occupy 6 football fields)." Over the last few decades, this choice has only grown, as Amazon entered new product areas and enabled small businesses to sell through its store too. Today, according to third party estimates, there are hundreds of millions of items sold through Amazon.

That choice matters:

71%

of Amazon consumers say that Amazon has helped them **discover new products and brands they would not have found otherwise.**

82%

of Amazon consumers agree that **when they don't know where to find something, Amazon is the place they look.**

Having the range available on Amazon means that you always know where to look when you're trying to find something - no matter how odd your request.

What is the strangest thing that you have ordered through Amazon?

“Multi coloured knee-high socks”

“A pirate costume for my cat“

“Chinese puzzle box”

“I have recently ordered £50 worth of tinned fruit that you can’t often find in the shops these days!”

“Obscure American vinyl”

“I have bought Blu-rays from Amazon Japan because the titles are not available in the west.”

“A hat for my dog”

“A banana costume”

“Some gadget for my back I didn’t know existed!”

Innovations in retail can be some of the most egalitarian: almost everyone spends a significant proportion of their time and money on shopping.

One important benefit, of course, is lower costs. **In our polling, over three-quarters of respondents on lower incomes said that cost and affordability were an important factor in why they shopped at Amazon.** A recent independent study from Profitero estimated that Amazon's prices are 14% lower than its online competitors,[7] and in total we estimate that Amazon has delivered £5 billion in cost savings to UK consumers.

Increased choice, however, can create even bigger benefits for the consumer. On one recent estimate, the gains to consumer welfare from increased product variety in books can be around 40 times larger than just gains from reducing prices.[8] **As part of our modelling, we estimate that the increased product variety from Amazon creates around £17 billion in additional consumer welfare for people in the UK.**

Convenience

A generation ago it was not uncommon for mail order companies to "allow 28 days for delivery". 15 years ago, Amazon created the two-day service for Prime members. Fewer than a million Brits signed up. Today, more than 12 million households subscribe, and packages overwhelmingly arrive the next day.[9]

Fast delivery is not just important because nobody likes to wait - in many cases, getting something fast and reliably is really important.

7 https://www.profitero.com/press-releases/british-retailers-fight-the-growing-price-gap-with-online-retail-giant-amazon
8 https://www.nber.org/system/files/working_papers/w30802/w30802.pdf
9 https://www.aboutamazon.co.uk/amazon-fastest-ever-prime-delivery-speed

Amazon's range and rapid delivery allow people to solve urgent problems: a forgotten birthday, a broken item, or a medication you forgot to buy. Three-quarters of Amazon customers told us that they have used Next Day Delivery, and of those:

87%

agreed that Next Day has helped them **order something that they needed urgently**

61%

have used it to **fix a broken item in the home**

60%

have used it to **get a gift for a forgotten birthday, anniversary, or celebration**

56%

agreed that Next Day has helped **save them from an embarrassing situation**

In our polling, convenience was particularly important to working age people, who are more likely to care about quick deliveries, and are also much more likely to use lockers and gift-wrapping services.

By focusing on convenience and making the process of online retail as seamless as possible, Amazon saves significant time for people. **In total, we estimate that the convenience offered by Amazon's online retail has saved people in the UK over a billion hours a year – or the equivalent of an extra 4 bank holidays per household.**

"In the UK, the most recent data shows small businesses selling over 750 million products a year - and exporting more than £3 billion of goods abroad every year."

Small businesses

If you are a small business, you can't just walk into Lidl or Ikea and lay out your products on their shelves. Amazon is different. Through services like Marketplace or Fulfilment by Amazon (FBA), the company allows SMBs to take advantage of exactly the same retail storefront, warehousing and fulfilment networks - picking and choosing what works best for their business.

These have enabled 100,000 UK independent small businesses to sell direct to customers, benefitting from the store, warehousing and fulfilment networks, and reducing friction to offer choice and selection to customers. The majority of these independent sellers are SMBs. In the UK, the most recent data shows small businesses selling over 750 million products a year - and exporting more than £3 billion of goods abroad every year.[10]

This has opened up significant benefits for UK businesses and their customers on Amazon.co.uk:

70%

On average, using FBA is around **70% less expensive** for sellers fulfilling orders themselves[11]

60%

More than **60% of sales** on the Amazon store come from other businesses[12]

For consumers, Amazon gives shoppers the confidence to try out products from small businesses they wouldn't otherwise encounter:

50%

On average, Amazon shoppers say **over half their orders from Amazon are with small businesses they were previously unaware of**

59%

of Amazon shoppers agree that **finding small brands on Amazon makes them more likely to order from them**

65%

of Amazon shoppers agree that **if it is on Amazon, I am more likely to trust a small business**

10 https://assets.aboutamazon.com/ad/75/ebc6e512428583ef86af56c432aa/2021-uk-sme-community-report.pdf
11 https://www.aboutamazon.co.uk/news/company-news/ceo-andy-jassys-2023-letter-to-shareholders
12 https://sell.amazon.com/blog/amazon-stats

Sustainability

Amazon has a net zero carbon target of 2040 - ten years ahead of the UK government and the Paris Climate Agreement. As part of this, the company matched the operations of its offices, fulfilment centres and data centres utilising 100% renewable energy in 2023.

To achieve its goals, Amazon is innovating in multiple areas including:

- **Last mile micromobility.** Amazon now has seven micro mobility hubs in Glasgow, London, Belfast and Manchester, from which 2.5 million parcels are delivered each year on foot or by e-bike. As well as helping to reduce carbon emissions from deliveries, these can be the fastest way to deliver parcels in dense urban areas as they can access cycling infrastructure and can park closer to customers.

- **Using more electric vans.** Amazon has more than 1,000 electric delivery vans in the UK, and it expects to have 100,000 worldwide by 2030.

- **Using Electric Heavy Goods Vehicles.** While electric vans are mainstream, electric trucks are not. Amazon now has nine fully electric HGVs, using first-of-their-kind fast 360 kW electric charging points, at their fulfilment centres in Tilbury and Milton Keynes.[13]

- **Using AI to reduce waste.** Amazon's AI Packaging Decision Engine helps fulfilment centre workers choose the most efficient packaging option for each item, while ensuring it still arrives safely. At the same time, other AI tools help ensure that damaged items don't get sent out in the first place, or reduce returns of clothing by increasing the likelihood that they fit better to start with.[14]

Since 2015, Amazon estimates that it has avoided over two million tonnes of packaging material and reduced the average packaging weight per shipment by 40%.[15] Over the last few years, the company completely replaced the use of single-use plastic for delivery bags with 100% recyclable paper and cardboard packaging. Amazon is currently testing in Bristol a new first-of-its kind automated packing machine that can scan the shape of items and cut a precise made-to-fit paper bag for them. On average, this machine helps avoid more than 26 grams of packaging per shipment.[16]

13 Amazon's electric delivery vehicles from Rivian roll out across the U.S. (aboutamazon.com); Bringing electric cargo bike deliveries to Croydon, England (aboutamazon.eu)
14 https://www.aboutamazon.com/news/sustainability/how-amazon-uses-ai-sustainability-goals
15 https://www.aboutamazon.com/news/sustainability/how-amazon-uses-ai-sustainability-goals
16 https://www.aboutamazon.co.uk/news/sustainability/new-automated-packaging-technology

In our polling, we saw how important sustainable packaging was to consumers:

7 in 10

More than 7 in 10 UK customers said that it was important to them that their package was delivered in recyclable packaging.

2/3

This was not just important to the young, but people of all ages and social backgrounds **- with at least two-thirds of all age groups rating this as important.**

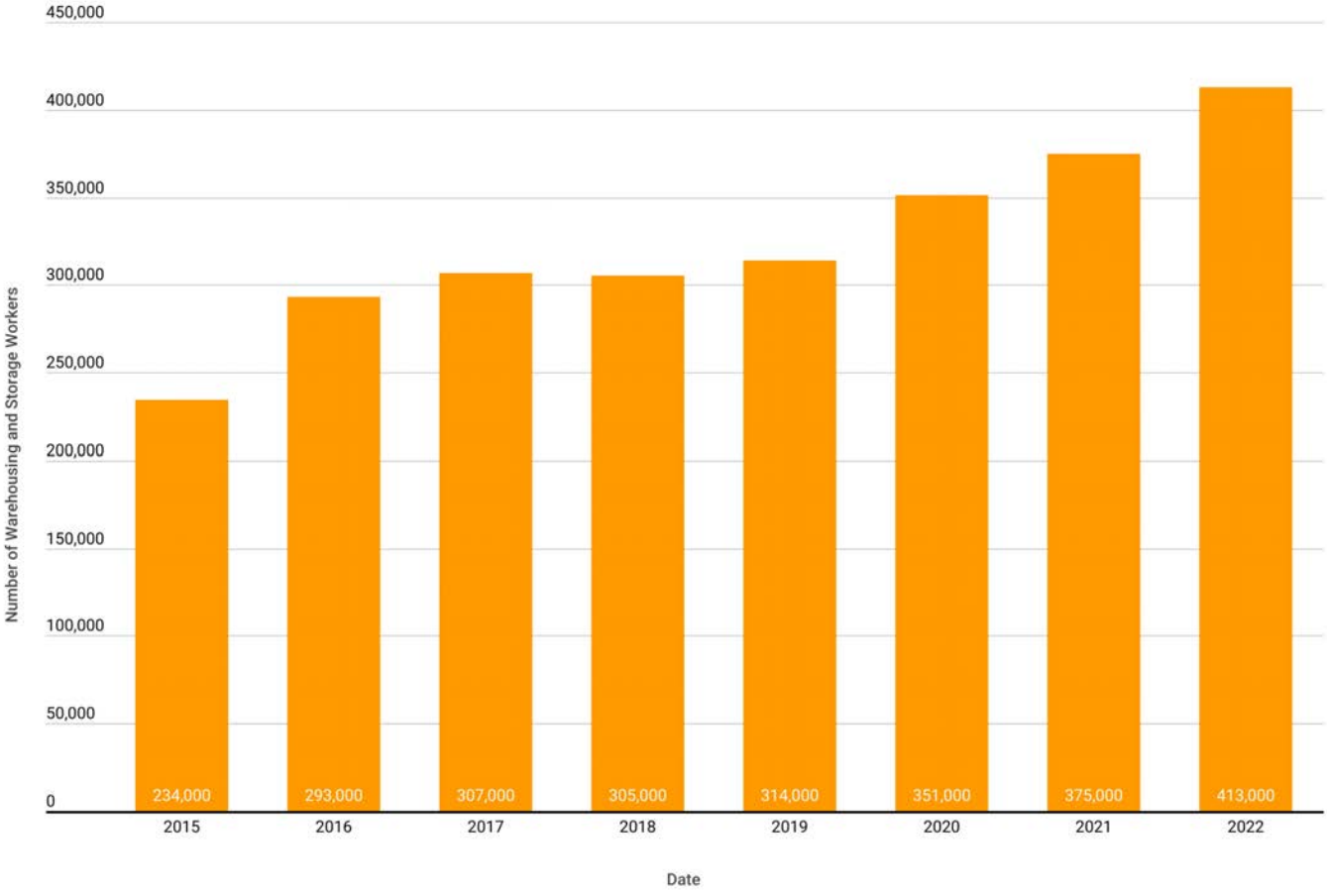
8 in 10

Nearly 8 in 10 wanted multiple items to be delivered together, largely for sustainability reasons.

What could come next?

Robotics

Since 2015, the number of workers in the warehousing sector in the UK has increased by over 75%, with a significant factor in this growth the continued rise of e-commerce. At the same time, the number of postal and courier businesses have increased by nearly a half.[17] With e-commerce expected to rise faster than growth in the economy as a whole for at least the next five years, the total workforce is likely to continue to grow.



This growth in employment has come at the same time as online retailers have also invested significantly in automation and robotics. Amazon started using robotics after its 2012 acquisition of Kiva Systems, now renamed Amazon Robotics.

Today the company has over 750,000 robots working globally,[18] and is the world's largest manufacturer of industrial robots.[19] In 2024, Amazon announced a €700 million investment

17 https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/articles/theriseoftheukwarehouseandthegoldenlogisticstriangle/2022-04-11
18 https://www.aboutamazon.com/news/operations/amazon-introduces-new-robotics-solutions
19 https://www.aboutamazon.com/news/operations/how-amazon-deploys-robots-in-its-operations-facilities

in robotics and AI-powered technology in Europe. This year, the company expects to introduce 120 new pieces of automation technology across Europe.

Amazon's current robots include:

The **Amazon Robotics Floor** is designated area within fulfilment centres where thousands of mobile robots such as the Hercules model (see Box) bring goods back and forth between employees and the inventory storage area.

Amazon's **Proteus** model is a next generation fully autonomous mobile robot, able to operate freely and safely in and around Amazon employees. The robot was designed to be able to help move heavy objects, and to communicate clearly its intent as it moves around Amazon's faculties.

Robin is a robotic arm that combines AI algorithms with advanced cameras and sensors to allow it to identify and grab a wider variety of different types of packages. Globally, Robin has already handled more than a billion packages.

The **Robotic Tote Palletizer** (RTP) uses two robotic arms working together to stack and condense totes (or containers) into pallets, avoiding the need for heavy lifting from employees.

In the US, Amazon is now starting to test Digit, a fully bipedal robot developed by Agility Robotics, and able to move, grasp and handle items of up to 35lbs of weight. It will be initially used to pick up and move empty 'totes', the boxes used to move customer orders through the fulfilment centre.

In practice, the use of robotics in the logistics sector has not reduced the need for human workers, but has instead helped remove many physically arduous or repetitive tasks. This means workers do not have to walk as far, and allows them to stay at more ergonomic workstations.

Using robotics doesn't just make the work more pleasant, but safer too. Amazon's own data shows declining injury rates over time, and that sites with Amazon Robotics installed see fewer recorded incidents than those without.[20] At the same time, Amazon's robots are designed to work safely around humans: slowing down or stopping completely if humans get too close.

This pattern of increased robotic investment improving the quality of logistics jobs is likely to continue. Robotics appears to be following the same rapid falling cost curve we have seen in other fast moving hardware sectors, such as batteries or solar panels. While the total cost of a humanoid robot like Digit is around $200,000 today, that could drop by over 400% in the next few years[21]. In some types of repetitive tasks, robots can already pick significantly faster than the average human.

Combined with underlying advances in AI technology and continued investment in new systems, this is expected to increase productivity of the overall sector: raising wages, increasing the quality of jobs and reducing prices for consumers.

At the moment, average labour productivity in the sector is less than half that of manufacturing - in the next 25 years, we estimate that gap could be reversed, with potential to reduce the cost to pick and place an item by at least a factor of five.

20 https://www.aboutamazon.com/news/operations/amazon-robotics-safety
21 https://www.bloomberg.com/news/articles/2023-12-06/will-robots-take-warehouse-jobs-gxo-logistics-tests-cheaper-work-alternative?srnd=premium

How do fulfilment centres in the UK make deliveries so fast and reliably?

Fulfilling an order quickly has three fundamental elements: having the product in stock, finding the product quickly, and having a quick and reliable delivery system.

To start, Amazon's AI-driven model uses transaction data and market conditions to assess the stock that needs to be held in each location to maximise order fulfilment while keeping costs low by minimising inventory.[22] Put simply, you cannot deliver a product you don't have.

Next, any fulfilment centre places products in a specific location as and when they arrive, and records the location. The product is then found as and when a customer orders it. Finally, that product is added to others in the same order, packaged, and made available for delivery. Amazon has radically improved all three elements using unprecedented amounts of both AI and robotics.

In a conventional warehouse products arrive and are taken by employees to a pre-set location, which is usually the same all year round and has a product-led order. For example, a book wholesaler might store books alphabetically by author, rather like a library. When an order comes in, another employee will find the relevant shelf with the relevant product, and pick the item. They then find the next item on the list. When they have all the items, they return to a packing zone and place them in a box or other packaging.

Amazon does not use fixed shelves, but rather tall yellow mobile pods, each of which can contain up to 500kg of goods.[23] In an Amazon Robotics facility, they are moved around the fulfilment centre by low level "Hercules" robots that slide underneath a pod, lift it a fraction and move it to a new location. The robot scans the floor to ascertain where to go, and where to stop. It also has cameras and other devices to ensure that it slows down if, for example, a maintenance worker is in the area.

As products arrive from suppliers, a pod arrives at the unpacking ("stow") zone. An Amazon employee places the items in the right place in the pod, which then returns to its location. Amazon's AI allocates the right pod for each product, aiming to ensure that pods remain full, and wherever possible that each pod contains products that are ordered at the same time.

When a product is ordered, a Hercules robot places itself under the relevant pod which then leaves its storage location and travels to a packer. The packer lifts the product out of the pod, checks it, and places it - with any other item ordered - in a crate on a conveyor belt, ready to be packed.

The Bristol fulfilment centre has 3,000 Hercules robots. It is imperative that robots do not crash to minimise congestion. Amazon constructs 3D simulations to prototype new designs of fulfilment centres.[24] Although they are controlled by cloud based AI determined algorithms, individual robots are also programmed to make their own 'good decisions' - for example, robots will take short cuts if they detect a clear route. The system is dynamic, constantly noting every performance aspect, and improving the algorithm. This has dramatically improved the rate of Hercules utilisation - more items moved per robot - and increased the speed at which items arrive with the packers. This sort of constantly updating AI-led cloud computing robotics is what allows Amazon to offer rapid deliveries, reliably, and at low cost.

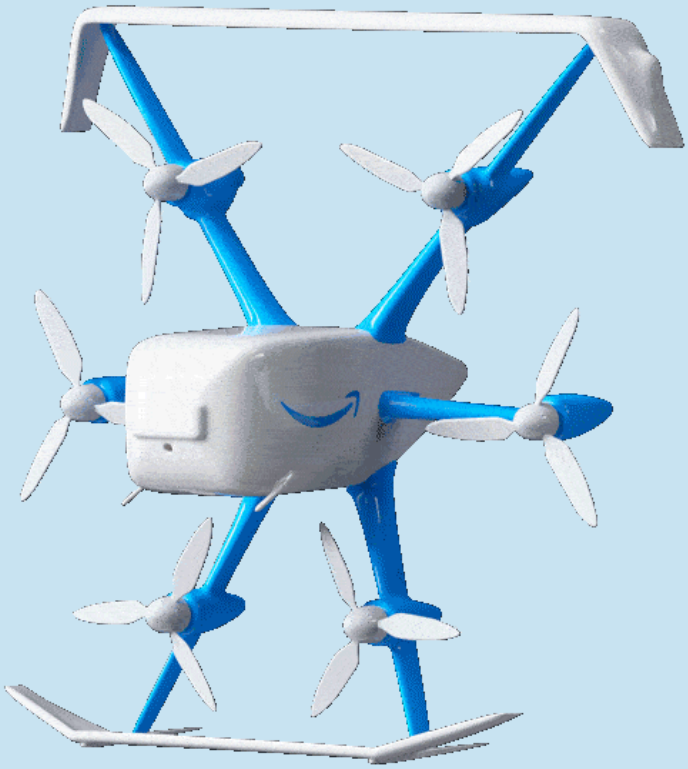
22 https://www.aboutamazon.co.uk/amazon-fastest-ever-prime-delivery-speed#:~:text=Delivering%20our%20first%20package%20via%20Prime%20Air%20drone&text=We%20are%20delivering%20faster%20speeds,our%20structure%20and%20product%20placement.

23 https://www.aboutamazon.co.uk/news/operations/bristol-amazon-warehouse-tour

24 https://www.aboutamazon.com/news/innovation-at-amazon/amazon-fulfillment-center-simulations

Drones

In the near future, Amazon plans to launch delivery by drone in the UK, offering parcel delivery with Amazon's new MK30 drone design. The MK30 is almost half as quiet as previous models, able to fly twice as far at speeds up to 50 mph, able to deliver goods up to 5lb in weight and continue to operate even during light rain.[25] This initial UK test is expected to help both Amazon and regulators work out how to roll out and scale up drone delivery, contributing to the Government's target for commercial goals to be commonplace by 2030.

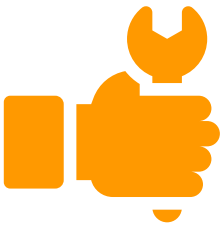


By the end of the decade, Amazon has set a goal to deliver more than 500,000 packages annually by drone, a result of which could enable some delivery times to fall under 30 minutes. **The UK could see over 900,000 drones operating annually by 2030, contributing up to £45 billion to the economy.[26]**

For many use cases, drone delivery can offer significant benefits over other means of delivery. To start with, drone delivery can be significantly faster. From the mail order catalogue to Amazon's One Day Delivery, the history of retail shows that getting faster can significantly transform the retail experience for customers.

25 https://www.aboutamazon.co.uk/news/operations/photos-of-amazons-new-prime-air-drone
26 https://assets.publishing.service.gov.uk/media/62d52e158fa8f50c08c53382/drone-ambition-statement.pdf

As part of our polling, we asked the British public where they thought that having the option to receive delivery under 30 minutes could be helpful:



73%

of British adults thought it could be helpful if they **need to fix or replace something urgently**

68%

of British adults thought it could be helpful if they **forget to buy a present or card**

64%

of British adults thought it could be helpful if they needed **ingredients to cook**

By making it more convenient to order from local shops and retailers, drone delivery is likely to increase demand too. In total, we estimate that drone delivery could **create another £5.5 billion in demand for retailers in the UK.**

Speed is not the only benefit from drone delivery:

- **By taking vehicles off the roads, drone delivery can help offset congestion.** This can be particularly important in busy urban areas, as the increased popularity of e-commerce drives greater demand for last-mile delivery. In 2020, the World Economic Forum estimated that the top 100 cities in the world could see the number of delivery vehicles increase 36% by 2030, increasing congestion by over 20%.[27] **In total, we estimate that drone delivery could help take 25,000 delivery vans off the UK roads.**

- **Drone delivery can be cheaper than other forms of delivery.** For busy urban delivery routes, where a single driver can deliver 50-100 packages in a single shift,[28] drones are likely to be less cost efficient for deliveries where ultrafast delivery is less crucial. In other scenarios, however, where a single human supervisor is able to monitor more drones and a human driver is able to deliver less packages in a single run, the economics begin to shift - and drones could easily end up 40% cheaper.[29]

- **In many cases, drone delivery is more energy efficient than using a car or van.** Similarly, when you are comparing only sending a few urgent packages at a time, using a vehicle to deliver a five pound package is significantly less energy efficient than using a dedicated drone. In 2022 PWC estimated that the sector could reduce the UK's carbon emissions by 2.4 million tons.[30]

27 https://www3.weforum.org/docs/WEF_Future_of_the_last_mile_ecosystem.pdf
28 https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/drones-take-to-the-sky-potentially-disrupting-last-mile-delivery
29 https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/drones-take-to-the-sky-potentially-disrupting-last-mile-delivery
30 https://assets.publishing.service.gov.uk/media/62d52e158fa8f50c08c53382/drone-ambition-statement.pdf

- **Drone delivery can help plug the middle or last mile gaps in other supply chains.** Drone deliveries can help transit medical supplies, tests and urgent post in remote areas of the UK, such as the Scottish Highlands.

- **Drone delivery can go in both directions.** Drone delivery could make it easier to return or try out items from online shopping - or to post a parcel or a letter on a day that the traditional mail isn't running.

A Manifesto for Innovation

Amazon's recommendations for retail and logistics

The UK has one of the world's most advanced retail markets, with e-commerce making up a higher proportion of retail sales than in any other major advanced economy.[31] In the next decade, the UK innovations in areas like drones, electric vehicles and autonomous vehicles could unlock a more convenient, sustainable and cheaper retail system for consumers - and for workers more productive, pleasant and highly paid jobs.

Like any transformative innovations, it is hard to predict the exact course of how and when these technologies should develop, and how our current regulatory and transport systems will have to evolve. Governments, regulators and companies will have to work together to horizon scan, and continue to iterate as the technology develops. What is clear is that is to decarbonise the UK's logistics sector investment we will need significantly more investment in electric vehicle charging infrastructure.

The Government should:

- Work with the UK Regulators Network and the Digital Regulation Cooperation Forum to horizon-scan for emerging technologies (e.g. UAVs, autonomous vehicles), and pre-emptively address development and deployment bottlenecks.

- Work with cities to design innovation test beds: areas where key future technologies such as drone delivery or self-driving vehicles can be trialled in the real world.

- Develop a clear roadmap and targets to deploy commercial charging infrastructure across the country.

- Ensure that distribution network operators provide accurate, timely data about the electricity grid for electric vehicle charging infrastructure.

- Prioritise the planning reform needed to unlock urban spaces to facilitate hubs for e-cargo bike deliveries and storage for electric vans.

31 https://www.retailresearch.org/online-retail.html

Home

Amazon's Innovations

Most of us wish we read more - but finding the perfect moment with a paper book can sometimes be tricky. In our polling, nearly two thirds of adults (62%) said that they wished they read more, and nearly half (46%) admitted that they find it hard to find time to read.

Amazon's innovations in Kindle and Audible have helped make it easier for people to enjoy books in new ways, fitting them around busy lives.

In our polling:

59%

of Kindle users that we polled[32] say they bought it because it **can be easily transported**

60%

of Kindle users that we polled **say the ability to switch devices and continue reading is important to them.**

47%

of Kindle users that we polled say **they can access books more quickly with Kindle**

For many people, audio is often a helpful or even the primary way they enjoy books:

75%

of Audible users say that they **use it at least once a week**

59%

of Audible users **prefer listening to books than reading books**

10%

UK listening hours on Audible are up 5% year-over-year and to kids' content up by over 10%

32 Kindle users were polled in the same way as the other populations in this report

Amazon's innovations haven't just made it easier to discover and enjoy more books - they've also made it easier for anyone to publish their own book. For authors around the world, sharing their story with readers is a lifelong dream. In 2007, Amazon launched Kindle Direct Publishing (KDP) in the UK to make it easier for authors to fulfil that dream. Self-publishing through KDP gives authors more choices than they've ever had in deciding how to bring their books to readers, enabling them to retain their copyright and earn royalties of up to 70%. Authors retain creative control. By leveraging ACX authors can bring their books to audio with ease. Authors can connect with producers, narrators to bring their books to audio.

For example:

Barry Hutchison is a full-time author with experience in both traditional and independent publishing, frequently writing under the pen name 'J.D. Kirk'. He has written over 140 books for both children and adults spanning genres like science fiction and crime thrillers.[33]

> *"Kindle Direct Publishing has allowed me to write the stories I want to write and get them into the hands of readers - in a fraction of the time it would take with a traditional publisher."*

LJ Ross is an international bestselling author, best known for creating atmospheric mystery and thriller novels, including the DCI Ryan series of Northumbrian murder mysteries which have sold over 10 million copies worldwide.

> *"At first all my sales were from family and friends,"*

she laughs. But she held her nerve, and her first novel, Holy Island, written whilst on parental leave, published in January 2015 and gathered word-of-mouth momentum. By May of that year, she was number one on the Kindle bestseller chart on Amazon.co.uk. Since then, Louise has continued to write at a prolific rate. She also launched a new series of standalone romantic suspense novels, with new book The Haven coming in July 2024.

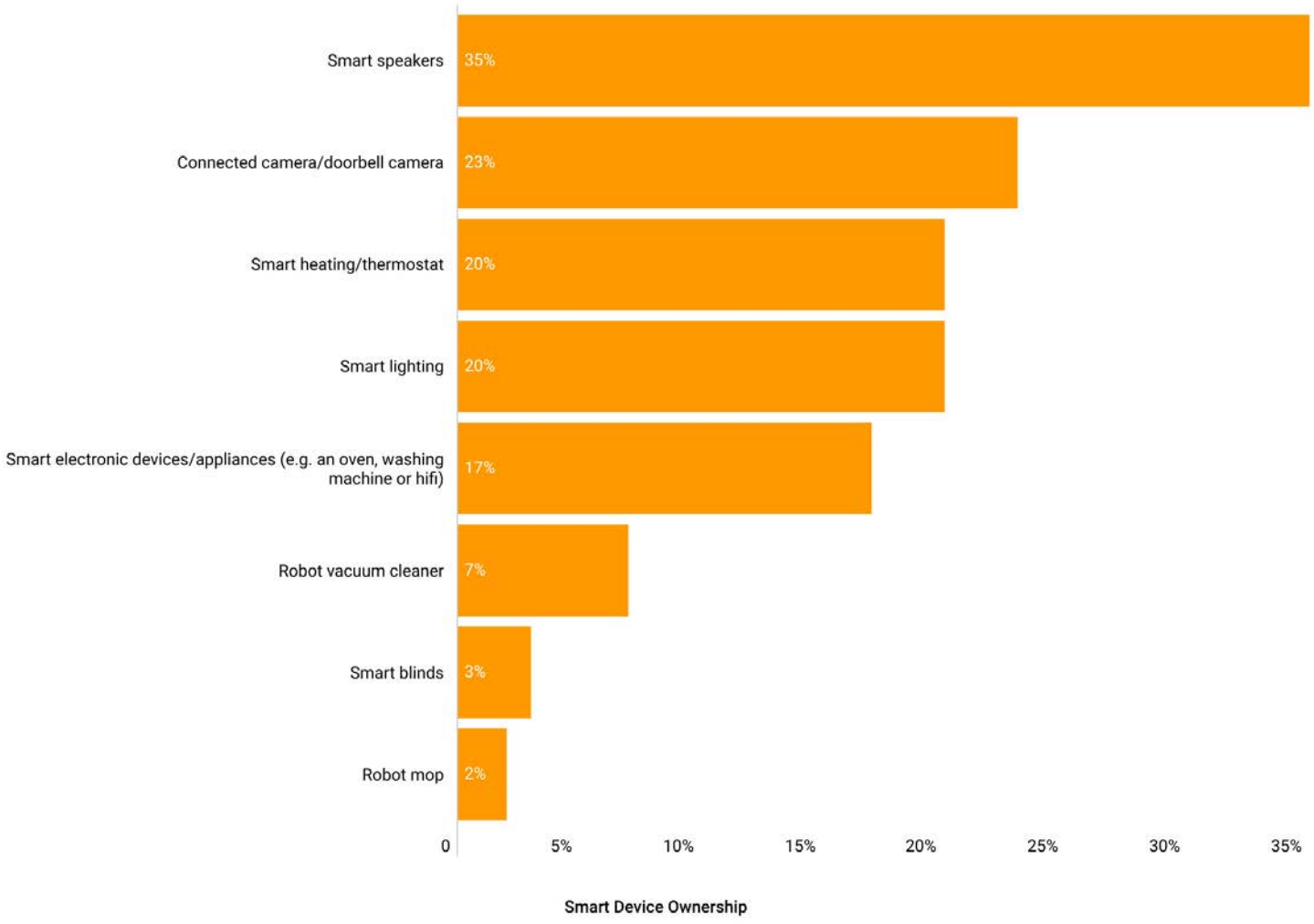
> *"For me, it's just been life changing," she said. "I want to share this experience with everyone and say to anybody else who thinks they've got this passion in them - just go for it!"*[34]

33 https://www.amazon.co.uk/stores/Barry-Hutchison/author/B003C6RNSG?ref=dbs_a_mng_rwt_scns_share&isDramIntegrated=true&shoppingPortalEnabled=true

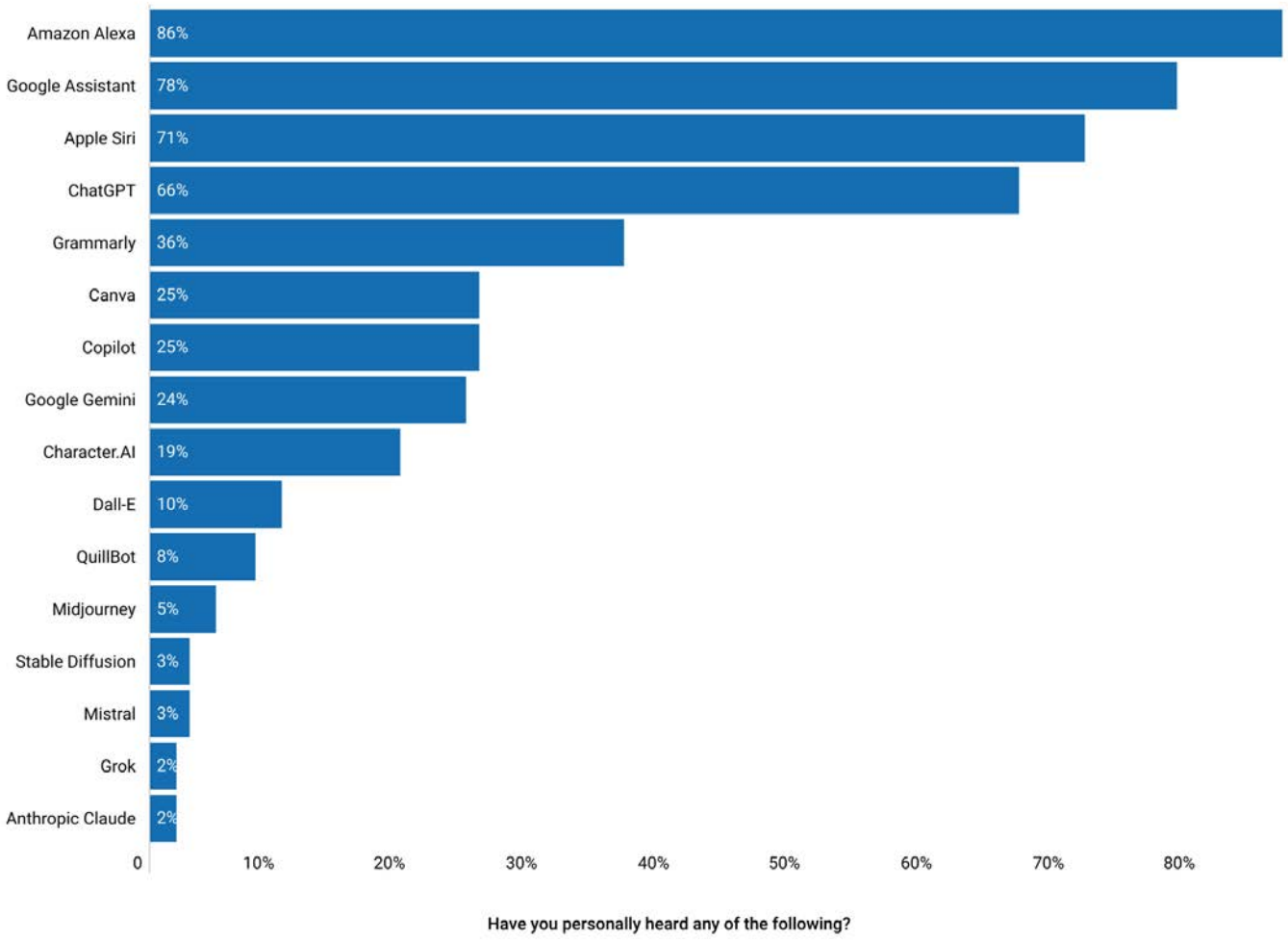
34 https://www.aboutamazon.co.uk/news/small-businesses/writing-advice-from-the-top-of-the-chart

Helping around the Home

In the last twenty years, a new wave of smart appliances has emerged in the home, taking advantage of the connectivity of the internet and the greater smarts of machine learning to create more powerful, energy efficient, secure and flexible tools. Over half of the UK population now has at least one smart device in their home.



For most of us, speech is the most natural way to communicate. On average, we speak around 16,000 words a day, or more than twice the amount we write. Amazon's Alexa was the first real AI assistant many people in the UK used, and even today is the assistant most people are familiar with.



For many people, Alexa and the Echo are their first step into creating their own smart home. Over half of Echo owners use their device to connect to devices around the home, and over 50% tell us that buying the speaker first meant that they then invested in other smart home features and devices. By integrating with these kinds of smart home features, we estimate that using Alexa **saves UK households over 80 million hours a year.**

Beyond helping with the smart home, Alexa also helps people out with their day to day tasks. Every day in the UK, we estimate **Alexa helps two million people cook, five million people keep up with the news, or 10 million people listen to music.**

In our polling, a majority of Amazon smart speaker owners tell us that they regularly use Alexa to find out a fact, keep up to date with the news, ask about the weather, set a reminder or time.

While each of these individual use cases may only take a few seconds, the total value they create in people's lives adds up. In total, we estimate that the consumer surplus created by Alexa is equivalent to over £3.6bn in value.

In our polling:

71%

of Amazon smart speaker owners agreed that **Alexa helped keep them entertained**

57%

of Amazon smart speaker owners agreed that **Alexa helps keep them updated with the latest news**

61%

of Amazon smart speaker owners agreed that **Alexa is the most enjoyable way to listen to radio**

Alexa is one of the leading ways its users discover and enjoy new music. Over half of Echo users say they have used it to discover new music in the last month.

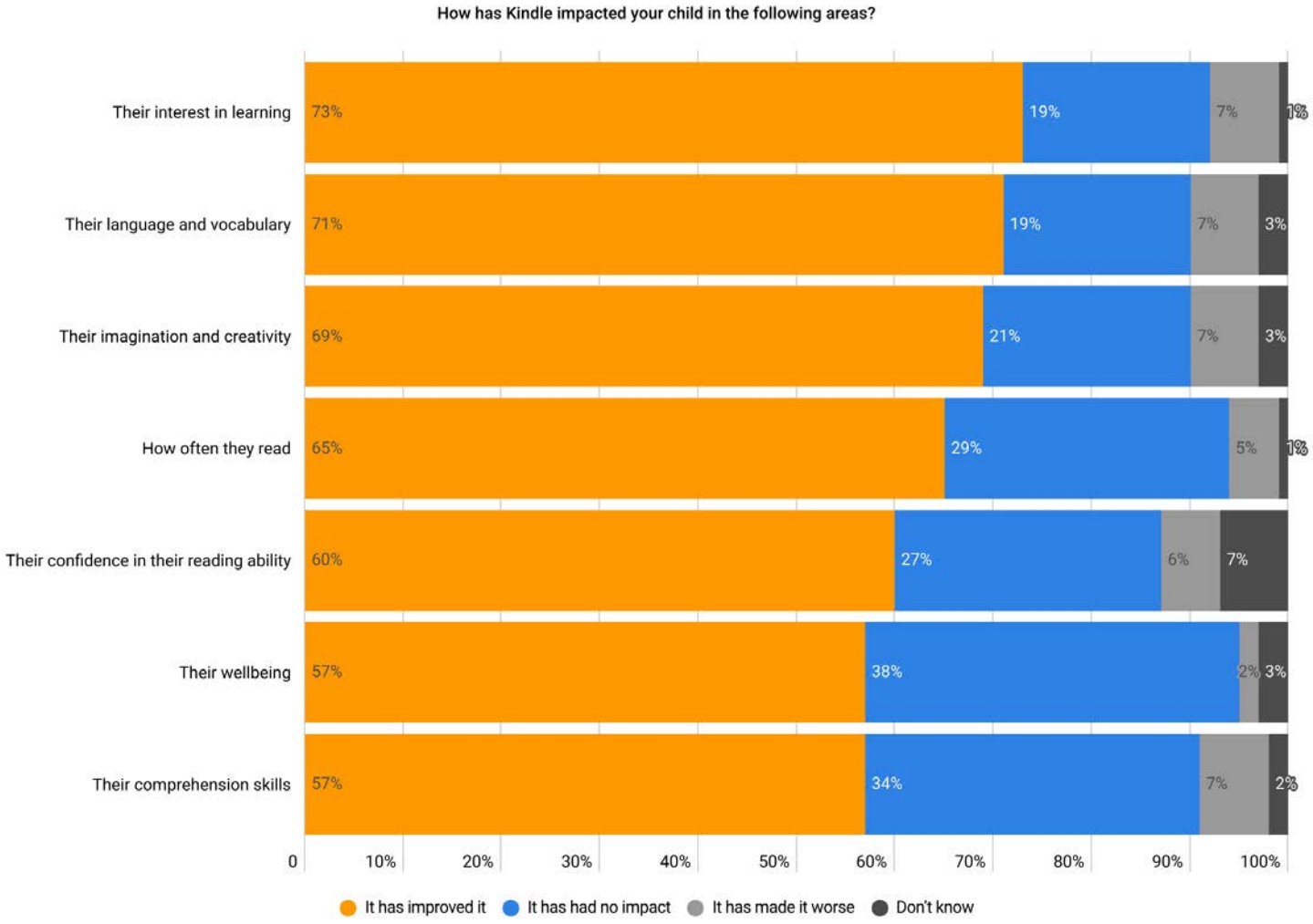
For young adults in particular, Alexa is often one of the primary ways today that they listen to traditional radio stations. A majority of Amazon smart speaker owners under-45 agreed that they were unlikely to listen to the radio if they did not own a smart speaker.

Parents and Children

One group which Amazon's innovations in the home have been particularly impactful for is parents with young children.

Three quarters of parents with an Alexa-enabled speaker say they have used it to help entertain their children or to answer a question for them, and **over half to play background melodies to help their child sleep.**

Similarly, Kindle is having an equally significant impact on the reading habits of children as of adults. Parents consistently report that their children read more, with more skills and more confidence, because of Kindles.



Alexa development in Cambridge and beyond

Amazon's Cambridge Development Centre continues to play a key role in Alexa, Amazon's cloud-based voice service used in Echo and on Fire TV. Amazon's acquisition of Cambridge-based voice recognition firm Evi in 2012, enabled not only the development of Alexa, but Cambridge as a key development hub in the UK for Amazon.

In 2017, Amazon opened a new development centre there.

Cambridge now holds a number of teams including:

- Alexa machine learning to develop speech recognition and understanding of human language
- Alexa knowledge to improve responses to customer questions
- Amazon devices to develop software for devices like Kindle, Fire tablets, Fire TV, Dash, Echo and others.[35]

35 https://amazon.jobs/en/landing_pages/Cambridge#:~:text=The%20problems%20we%20solve%20in,way%20possible%20in%20multiple%20languages.

Increasing Accessibility

For those with mobility issues, Alexa makes life easier by helping with daily tasks - like turning on the lights, controlling the blinds, interacting with the air purifier, or finding out who is at the front door, without having to move.[36] **Over half of Amazon Echo owners who have long-term physical or mental health conditions already use their Amazon Echo to control smart devices in the home.**

Similarly, Amazon's Ring and Blink cameras and doorbells allow users to speak to visitors and Ring's Intercom allows entry to a building. Linked up to the Ring or Blink app, users are able to control their devices from anywhere without having to move to the door. **In our poll, 72% of those with long-term disabilities who owned a Ring or Blink product said it allowed them to monitor outside, and 71% said it gave them peace of mind.**

Both Kindle and Audible make it easier for those without perfect vision. The RNIB estimates that there are over 2 million people in the UK with some of visual impairment,[37] while up to one in ten people in the UK has some form of dyslexia.[38] **In our polling, over two-thirds of Audible users with a long-term disability agreed that Audible had helped them enjoy books again.**

Entertainment

In 2022, Amazon announced that in the UK Prime Video had invested more than £1 billion in TV, movies and live sport since 2018 including UK Originals such as Clarkson's Farm, The Devil's Hour, 007: Road to a Million and many more. Amazon MGM Studios have also taken up long-term residence in some of the 31 purpose-built stages at the newly expanded Shepperton Studios in Surrey.

In our polling:

74%

As a result, three quarters (74%) say that Prime Video has helped them **discover films and TV that they would not have discovered otherwise.**

50%

Over half of users agree that Prime Video has **helped them watch more British TV and films and more regularly.**

79%

of Prime Video users find the service **easy and intuitive to use**

36 Meet the customers who use Alexa to live more connected and independent lives (aboutamazon.co.uk)

37 https://www.rnib.org.uk/professionals/health-social-care-education-professionals/knowledge-and-research-hub/key-information-and-statistics-on-sight-loss-in-the-uk/

38 https://www.nhs.uk/conditions/dyslexia/#:~:text=It's%20estimated%20up%20to%201,successful%20at%20school%20and%20work

Features like X-Ray make it much easier to find out more information about the cast, crew, soundtrack, or other details of the content you are watching. In our polling, over half of young Prime Video users said that they had used X-Ray,[39] **and overall 89% of people who had used X-Ray said they found it helpful.**

At the same time, Amazon's Fire TV devices have given families an affordable way to enjoy the benefits of a smart TV and all the latest streaming services without having to buy a completely new set. **Around four in five Fire TV owners reported that they had bought it to improve the performance and capabilities of an older TV.**

By extending the life of older TVs, Fire TV sticks have saved an estimated six million households in the UK an average of £250 compared with buying a new television - or £1.6bn in aggregate. That is enough money to buy a bicycle or go on a weekend getaway.

39 Users under 35

How Amazon and Oxford University discoveries are improving Prime Video

In London, a large number of Amazon teams work to support Amazon's global Prime Video business. They create the software that lets you search and select films from your smart TV, or use X-Ray, the system that lets you access instant information on the actors you're watching. Special rooms within Amazon's London offices are used to help test new features, which have to work on over 5,500 different kinds of devices. In mass-scale tests, new features are run thousands of times on hundreds of devices concurrently.

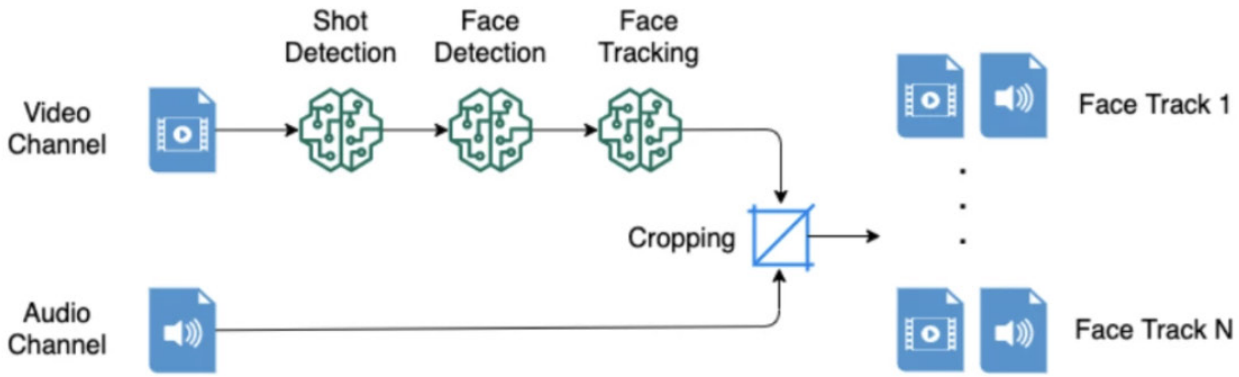
As with many other Amazon innovations, machine learning plays a substantial part in improving accuracy and quality for Amazon Prime video. For example, subscription video services - including Prime - have to constantly review the quality of the content they stream. Defects can crop up at any point from recording through to transmission.

Doing this manually is virtually impossible at Amazon Prime's scale. Instead, for a long time the industry detected anomalies in the video signal that tended to (but didn't always) mean defects were occurring.

One of the Amazon teams, the Video Quality Analysis (VQA) group, trained computer vision models to watch video and spot issues - like unexpected black screens and audio noise. This model can process hundreds of thousands of videos and catalogue them at high speed. From this they developed detectors for 18 types of defect in videos.

For example, a special detector called LipSync was based on the SyncNet architecture of the University of Oxford.

Lipsync[40] takes in 4-second fragments of video and audio. Three consecutive models detect the duration of the shot, identifies the faces, and tracks those faces. The output is then combined with the audio so that the SyncNet model can decide if it is in sync or not.



Preprocessing pipeline to extract face tracks — four-second clips centered on a single face.

40 https://www.amazon.science/blog/how-prime-video-uses-machine-learning-to-ensure-video-quality

What could come next?

Home

Over the course of the twentieth century, one of the most powerful improvements to productivity came not in the office or the factory, but the home: new consumer appliances like the dishwasher, hoover and washing machine radically reduced the time it could take to keep the house in order. In our consumer poll, the average person said they still spent 10 hours a week doing household chores - and that more than a TV or even central heating, the technology they would least like to give up is the washing machine.

Over the next decade, adoption of these tools is likely to continue to grow, while manufacturers experiment with new form factors and features. In 2022, Amazon launched Astro, its first robot able to follow you around the home, and designed for home security, portable entertainment and feeding your pets.

By 2030, we estimate that smart devices could **save over 300 million hours for British families a year, and through increasing energy efficiency prevent over 5 million tonnes of CO_2 emissions a year.**

Today's smart devices are largely based around either using existing devices to work more efficiently - or manoeuvring around other objects and obstacles in the home. To really make a difference to housework, we will need to create new devices with a human level of dexterity: making it possible for them to unload the dishwasher, fold laundry or help with food preparation.

While we haven't yet developed technology capable of doing this, a new generation of startups and innovators believes this is not far off. By combining the AI advances from the last few years with traditional robotics, we could see much more flexible and affordable assistants come to market in the next few years:

- London based Prosper Robotics, for example, is developing a household robot designed to ship in 2025, and able to "cook your breakfast, make your bed, and wash your clothes."[41]

- Dyson is aiming to introduce a specialised domestic robot by 2030.

On one estimate from Oxford University, within the next twenty years, 39% of time spent on domestic tasks could be automatable.[42] The global size of the household robotics market is estimated to more than quadruple this decade,[43] while Goldman Sachs predicts that mass consumer adoption could start to scale between 2030 and 2035. **By 2050, we estimate that similar devices could create an extra 200 hours of leisure for their owners each year.**

41 https://prosper.org/
42 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0281282
43 https://straitsresearch.com/report/household-robots-market


“By 2030, we estimate that smart devices could save over 300 million hours for British families a year, and through increasing energy efficiency prevent over 5 million tonnes of CO2 emissions a year.”

Assistants

In the next few years, new assistants based on multimodal generative AI will allow tools like AI to become much smarter: able to have a real conversation with you, understand basic context, act as a tutor and perform simple tasks for you.

Over the next decade, the integration of generative AI technology into voice assistants such as Alexa is likely to make them significantly more useful, flexible and approachable. In our polling 80% of adults were already interested in one trying out a range of potential generative AI powered voice assistants, with 44% having an option they thought they would use regularly.

We saw particular interest among younger adults under 25.

61%

of adults under 25 would be interested in an AI assistant that could act as a **personal teacher or tutor**

63%

of adults under 25 would be interested in an AI assistant that could act as a **personal assistant, making reservations or bookings for you**

58%

of adults under 25 would be interested in an AI assistant that could act as a **virtual workout coach**

As an early example of how this technology can make interacting with our devices and services more intuitive, this year Amazon is launching AI-enhanced search on Fire TV. Instead of having to know the exact name of the film or TV show you want, this makes it possible to ask for much more complex recommendations such as "Alexa, show me movies about dog and human friendships" or "Show me psychological thrillers with surprise endings"[44].

One area where generative AI powered assistants and tools could be particularly useful is in helping to make technology more accessible. According to DWP data, 47% of people in the UK have a mobility issue, 9% a hearing impairment[45] and 9% a vision impairment. Ensuring websites and other technologies are accessible to everyone often simply doesn't happen: over 95% of web pages don't meet the WCAG2 standard for accessibility.[46]

Generative AI technologies can make it much easier to make current digital tools more accessible in many ways - and because they don't depend on the company itself implementing them, can be much more widely used. These use cases can vary from making it easier to access entertainment to better interacting with the public sector. For example they could make it possible to:

44 https://www.aboutamazon.com/news/devices/amazon-fire-tv-generative-ai-search?utm_source=pocket_shared

45 https://researchbriefings.files.parliament.uk/documents/CBP-9602/CBP-9602.pdf?utm_source=pocket_saves

46 https://webaim.org/projects/million/?utm_source=pocket_shared

Translate a complex web page into simpler language, or answer any questions about it

Help people navigate to where they can access their benefits or other services from the public sector, and explain what is available to them

Have an AI describe what it can see to those with a visual impairment or create alt text for pictures on the web

Help guide and suggest responses to those who struggle with social interaction

Take notes and help those who struggle to write to communicate in text form

A Manifesto for Innovation

Amazon's recommendations for Home

The Government should:

- Give the Government Digital Service a mandate to work to ensure public information and digital services are accessible through new types of accessible interface, such as voice or AI assistants
- Work with local authorities to deploy technologies like Alexa in settings like social care, where they can help support elderly and disabled customers
- Create a level playing field for books and audiobooks, and eliminate the current 20% VAT that still exists for audiobooks

Cloud Computing & AI

Amazon's Innovations

Speeding up Innovation

"In the early days of operating Amazon.com we experienced first-hand how hard and expensive it was to provision and manage IT infrastructure, and how this distracted talented teams from actually innovating. That's why we launched Amazon Web Services in the spring of 2006, to rethink IT infrastructure completely, so that anyone—even a kid in a college dorm room— could access the same powerful technology as the world's largest and most sophisticated companies. Since those early days, we've never stopped inventing on behalf of our customers—from storage to networking, to serverless, to machine learning, to custom silicon and hardware, and generative AI."

Our Origins, AWS[47]

In new polling of UK cloud users this year, we saw that cloud services like AWS are continuing to help other companies deliver innovation faster:

27%

On average, AWS customers reported that using the cloud **reduces the time it takes to deploy new software by over a quarter (27%).**

75%

of AWS users **believe that developing and deploying new software would take more time** without cloud infrastructure.

84%

of AWS users agree that **cloud services have made it easier to conduct new research** or develop new products.

84%

of AWS users agree that the **cloud makes it easier to bring new products to market.**

47 https://aws.amazon.com/about-aws/our-origins/

Beyond innovation, cloud computing has also proved to be a powerful accelerator of wider economic growth through means such as:

1. *Hosting tools that help businesses work more flexibly and operate more efficiently.*
2. *Enabling businesses that switch from on-premises IT to reduce costs, scale more easily and earn more revenue.*
3. *Reducing the barriers to entry, helping enable a wider ecosystem of tech startups, scale ups and unicorns.*

In our polling we saw that:

84%

of AWS users think that their business had **saved money as a result of investing in cloud infrastructure,** with an average cost saving of 28% compared to using on-premises infrastructure.

90%

of AWS users say that **the cloud has made it easier to be flexible** and to scale their computing needs up or down as required.

85%

of AWS users agree that the **use of cloud computing has made it easier to compete with larger companies.**

82%

of AWS users agree that **cloud computing has made it possible for them to take their business global.**

In total, taking into account cost savings and revenue gains, AWS customers reported receiving an average return of over £2 for every £1 they spent on AWS.

What could come next?

AI

For decades, cloud computing has played a key role in helping businesses to digitise their processes, increase productivity and create new ways of working. It makes it possible for organisations of any size and in any industry across both the public and private sectors to access IT services such as computing power and data storage, as well as more advanced technologies like AI, generative AI and machine learning (ML), flexibly, securely and easily.

Over the last five years, customer spending on cloud infrastructure has grown by over 25% a year in the UK,[48] and IDC predicts that, worldwide, it will continue to grow by around 13% a year for the next five years.[49]

Many economists also believe that AI and generative AI is likely to create hundreds of billions of pounds in economic value, and raise the UK's growth rate above the 1.4% it has averaged in the last twenty years.[50] **In fact, the economic impact from AI in the next five years could be over 10 times greater than its impact in the last five.[51]**

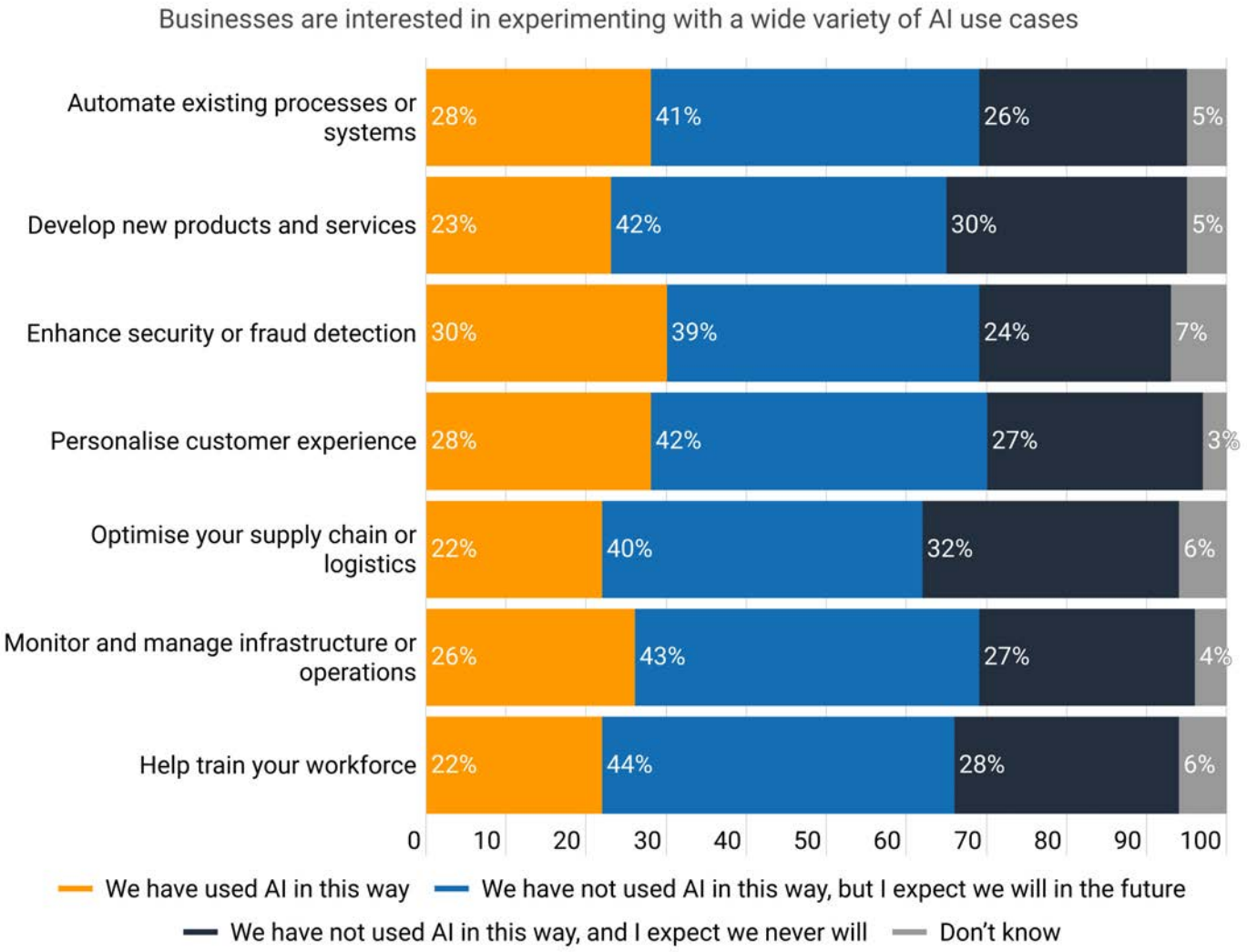
In our polling, we saw that businesses do not just view AI as hype, but a real opportunity for their business. **63% of businesses agree that AI could transform their business** and only 29% believe that AI will have no impact.

That said, technological changes do not take place overnight. Most significant technologies that shift the economy take years, if not decades, to realise their full impact. It takes time for businesses to invent new workflows, train their staff, and iterate and adapt their products and services. For example, the steam engine took at least a century to fully impact the UK economy.[52]

Globally, around 85% of total IT spend still remains on premises.[53] While a majority of businesses in the UK now make some use of online tools, such as video conferencing and group messaging, there is still a substantial opportunity for businesses to use the cloud and other tools for more complex workflows.

Similarly, while AI is expected to have a significant impact on the UK economy, at the moment only around a fifth of businesses (22%) say that they are already using dedicated AI tools extensively. Around another third of companies said they had experimented with them, while 40% had not used them at all.

48 https://www.statista.com/outlook/tmo/public-cloud/united-kingdom
49 https://www.idc.com/getdoc.jsp?containerId=prUS52001524
50 See, for example, Strand Partners (2024), Public First (2023) or IMF (2024)
51 Internal Public First modelling of economic impact of AI
52 https://www.lse.ac.uk/Economic-History/Assets/Documents/Research/LSTC/wp7503.pdf
53 https://www.aboutamazon.com/news/company-news/amazon-ceo-andy-jassy-2023-letter-to-shareholders



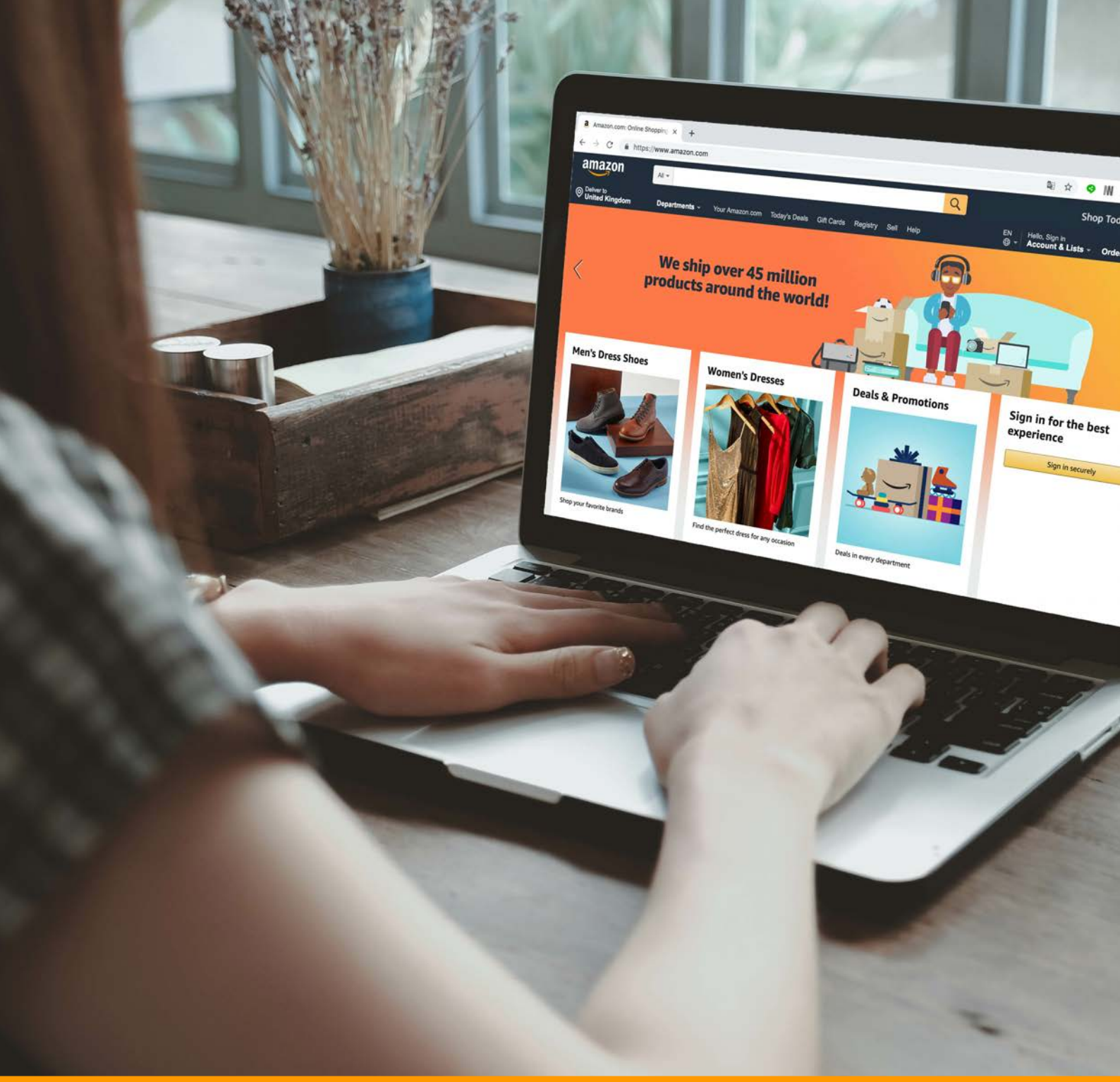
A Manifesto for Innovation

Amazon's recommendations for Cloud & AI

The Government should:

- Continue to monitor demand and supply for the UK's increasing data centre needs over the next decade, engaging with industry to make sure that steps taken to increase investment are effective.
- Formalise effective, multi-stakeholder engagement processes to ensure the UK's approach to AI regulation has a strong, shared foundation of international standards and definitions.
- Maintain a 'risk-based' framework to AI regulation, that considers a balance of both the risks and opportunities.
- Develop an ambitious roadmap for closing the digital adoption gap for key technologies across the UK's regions, with a particular focus on small businesses and how they can adopt and make best use of AI and cloud in their sectors


alexa



Appendix A

Methodology

Estimating the value Amazon creates for UK consumers from increased variety, saved time and reduced costs

To work this out, we combined estimates of:

- The value of **increased product variety,** we drew on academic research by Bryjolfsson, Hu and Smith (2003) which estimated the value of increased product variety at online booksellers. This provided us with a framework we then extended to value the consumer welfare gains from increased product variety, in combination with estimates of Amazon's sales in the UK and Public First survey estimates of the ease with which purchases could be made in the absence of online shopping.

- The value of **time saved**, drawing on data from both our polling and Statista to estimate the average time a person spends in a shopping visit, both online and offline. We then multiplied this by the number of households, the proportion of Amazon users and a value for leisure time saved, drawing from WebTAG estimates.

- The value of **cost savings,** drawing on work from Goolsbee and Klenow (2018), which looked at the impact of inflation in online versus in person retail

Impact of Drone Delivery

To calculate additional spending, we make use of our polling data which asks responders for different consumption categories, whether they would likely order more of that category if drone delivery were available. We apply this to an estimation of the population for whom drone delivery would be possible. Finally, we assumed a 10% increase in demand from these consumers and aggregated up to estimate the total additional demand.

To calculate the number of vans that can be taken off the road, we first estimates the total number of vans in the UK using total number of deliveries a day and average number of deliveries per van per day. We then applied estimates of the share of deliveries that could be made by drone and an estimate of the share of households for which a drone delivery would be possible, to obtain an upper bound estimate of the number of delivery vans that could be mitigated. From here we estimated the number of vans that would remain and scaled up to account for the additional vans that would be needed for more less dense delivery schedules. We then recalculated the potential vans that could be mitigated from this new figure.

Consumer Surplus of Alexa

In our polling we asked a series of questions to Amazon smart speaker owners on how much they would need to be paid to give up access to Alexa. We used these questions to establish the "consumer surplus" associated with Alexa - the difference between what Alexa is worth to individuals in monetary terms versus what they are paying for it (nothing beyond the initial cost of an Alexa-enabled device). It is thus a measure of the value that consumers derive from the service.

We estimate that the consumer surplus of Alexa stands at about £130 per user per year, amounting to £3.6bn of aggregate consumer benefits.

Cost Savings from Fire TV

To estimate the savings from households using Fire TV sticks to extend the life of an older television, we drew on Public First opinion research on the motivations for purchasing a Fire TV stick. This allowed us to establish the number of households using Fire TV sticks to enhance the functionality of older televisions.

We then combined this with estimates of entry-level television prices to estimate savings to households.

Potential Time and Energy Savings from Smart Home Devices

To estimate the potential time savings from smart home devices:

- We drew on our polling to estimate the number of UK households currently using a variety of smart devices.
- We then used a combination of desk research and polling to conservatively estimate the potential annual time saving each device could provide a UK household.
- We used desk research to derive a compound annual growth rate (or adoption rate) for each class of device and extended this to 2030.

When then considered two potential types of energy savings:

- For **smart thermostats** we drew on Fraunhofer Institute for Building Physics IBP's conservative estimate on energy savings to estimate the average energy saving per household. The total energy saving across UK households was then calculated, taking into account the percentage of households with a smart thermostat according to Public First's consumer poll. This was converted into Co2e using the UK government's GHG Conversion Factors.

- For **smart bulbs** we first estimated the potential energy use of a lightbulb being left on. This was then combined with third party data on how often households leave their lights on while at work.

amazon

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