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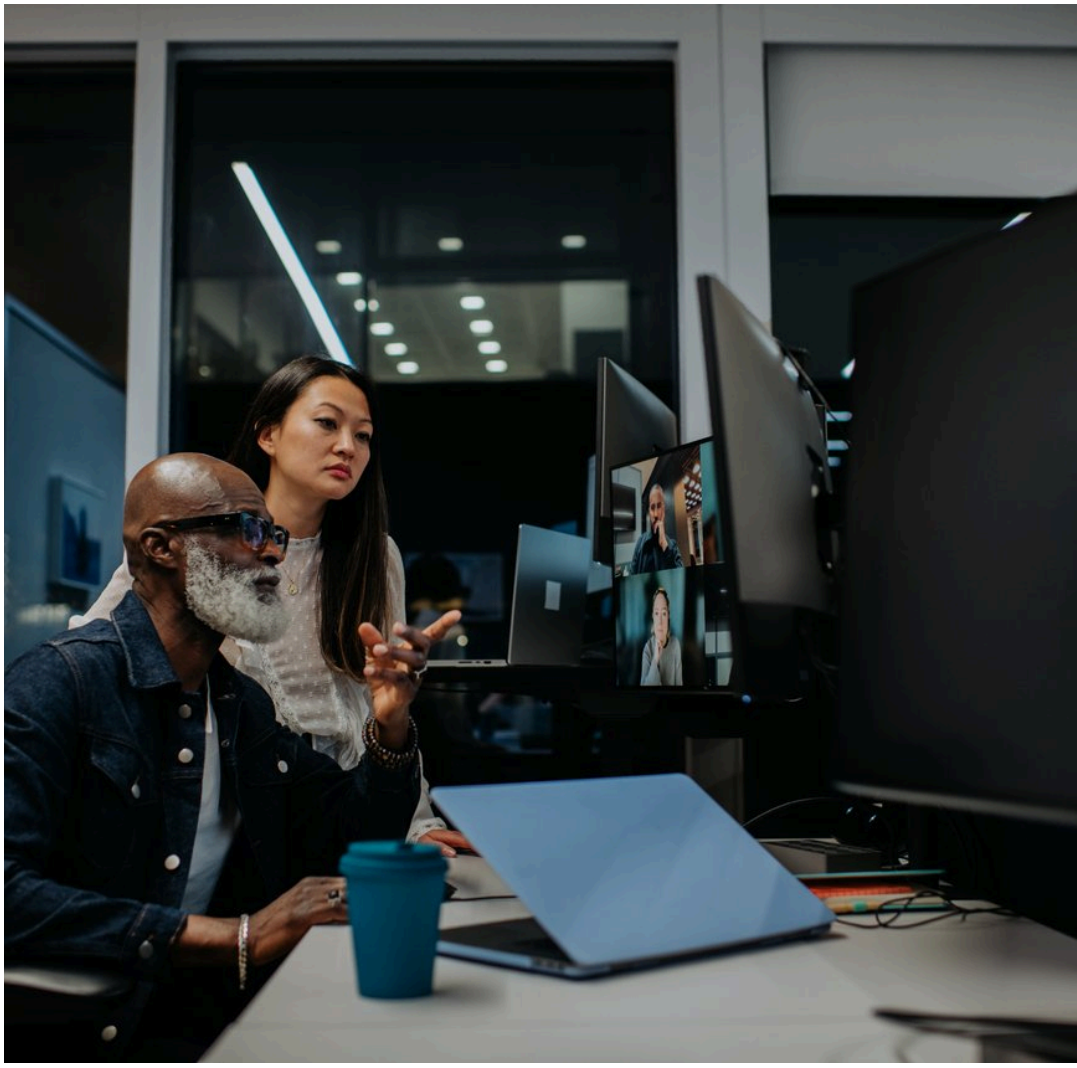

Rebooting the UK's Tech-Diffusion Ecosystem to Drive Growth

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Executive Summary

Technology promises to be a critical driver of growth for the UK in the years to come. But in a global economic environment in which competition is fierce, and where the prospect of being world-leading in a broad range of technologies is beyond the reach of all but the largest economies, the path to broad-based prosperity is through the diffusion and adoption of cutting-edge innovation as much as in innovation itself.

Invention remains important and should be pursued. Indeed, the United Kingdom can and does invent new technologies, techniques and processes. The country has enviable assets – from world-class universities to deep capital markets – and a proud history of invention. Over the past decade, successive governments have set out ambitions for the UK to lead the world across the technology spectrum – in artificial intelligence, quantum technologies, semiconductors, genomics, sustainable batteries, offshore wind, hydrogen, nuclear power, defence drones, self-driving vehicles, cyber-security and more.

But invention alone will not deliver broad-based economic growth. Even with the UK's vibrant tech ecosystem, there are too few frontier firms to improve the lives of workers and firms across the everyday economy, and in many industries – especially those dominated by the United States and China – genuine technological leadership is often out of reach.

The greater prize lies in diffusion – the adoption and spread of available technologies across the wider economy. Even where a country does not lead in the development of new tech, it can be a fast follower and reap significant gains in more competitive firms, higher wages and more jobs.

But the UK is currently on the wrong track. Sluggish adoption of new technologies has been a key reason for the country's weak productivity growth over the past 15 years – compared not just to the US, but to peers such as France and Germany. As technological change gathers pace, the UK must make diffusion and adoption a core part of its national growth mission. The upside is huge: the government's own analysis suggests effective adoption of emerging technologies could raise GDP by 8 per cent by 2035, with widespread AI uptake alone potentially adding £173 billion to the economy.

The road to unlock this is complex and reforms take time to bear fruit: increasing openness to trade, people, money and ideas; investment in supporting infrastructure and skills; and cultivation of a competitive and business-friendly regulatory environment.

The government can have a more immediate impact in upgrading the UK's tech-diffusion ecosystem. Currently, the UK's fragmented and underpowered ecosystem pales in comparison with best-in-class examples set by Singapore, Germany and the US. UK firms struggle not just with what to adopt, but how to make new technologies work and stick. A transformed system would start to close the diffusion gap with other countries, with the biggest gains felt among small and medium-sized firms. For these businesses, adopting new technology is often hard – but supporting them in doing so can help ensure that gains from innovation are shared broadly.

The UK needs a new approach: firms should have end-to-end support in identifying, acquiring and integrating suitable technologies as a route to growth. And this should be delivered by a modernised infrastructure that capitalises on the potential of technology itself and harnesses the UK's universities – one of the country's greatest institutional assets – to deliver support that is more targeted, more effective and available across the country. In essence, this redesigned ecosystem provides all firms with a digitally enabled chief technology officer (CTO).

This strategy would reduce adoption barriers for 100,000 firms, or 7 per cent of the UK's employing small and medium-sized enterprises (SMEs). It could deliver in excess of £6 billion in GDP by the end of this parliament, a 0.2 per cent uplift, as firms benefit from faster knowledge transfer and a more dynamic, innovation-oriented business environment.

These gains are on par with those expected from the government's flagship planning reforms over the course of this parliament, also projected to add 0.2 per cent to GDP by 2029–30,[1] and on par with the long-term combined impact of the UK's post-Brexit trade deals with India, Australia and New Zealand.[2] Boosting the UK's tech-diffusion ecosystem would largely pay for itself, with the expected additional tax revenues from higher growth covering almost all of the set-up and running costs of the proposed programme.

The government should retool its services to address the main barriers firms face along their adoption journeys and rewire its infrastructure to connect and amplify every service.

- **Identification:** Develop an interactive online "technology compass" to help firms identify gaps in their operations that technology could fill and offer personalised advice on how to plug them in. In tandem, maintain a catalogue of secure, affordable technologies that have been proven in other business settings to efficiently select which technologies are most suitable for their needs.
- **Acquisition:** Establish a technology-adoption voucher scheme that covers up to half of the upfront costs of tech adoption for SMEs and extend the British Business Bank's Growth Guarantee Service to help de-risk the costs of private finance for tech adoption.
- **Integration:** Establish a network of university technology-adoption centres that utilise the UK's higher-education institutions as the new backbone of an upgraded national tech-diffusion system, the UK equivalent to Germany's Mittelstand-Digital Innovation Hubs. Universities would be funded to provide training (such as Help to Grow: Management courses), build networks by connecting businesses with volunteer mentors and be a source of graduate CTO advisors through new industrial placements.

- **Infrastructure:** Join up different strands of support through a dedicated CTO digital platform – a single entry point for assistance in technology adoption that consolidates all UK business support in one place, integrated into the government's existing Business Growth Service. Personalise outreach and support to each firm's needs and context by creating a business digital ID – a unique identifier issued at registration with Companies House and delivered to all UK businesses. Scale and supplement in-person support with an AI-driven CTO assistant – an "always on" bot that powers the system connecting and triaging services and expanding reach across the economy.

No country can lead on every frontier, and not every business must be a pioneer. Diffusion, as much as innovation, drives prosperity – and the fruits of technological progress can only be shared broadly when firms are empowered to follow in the slipstream of those at the cutting edge.

01

Why Diffusion Matters

Without diffusion – the dissemination and adoption of innovations – even the most extraordinary advances will not matter.[3] For all the glamour of breakthroughs at the technological frontier, it is a country's ability to embrace technology at scale that determines whether new inventions translate into greater productivity, higher living standards and economic leadership.

That is reflected in the historical record. For the UK, its technological heyday in the first industrial revolution was driven in large part by its ability to combine new technologies such as the spinning jenny and steam engine with a superior system for disseminating knowledge through the economy that catapulted it to the forefront of global manufacturing. That has been repeated in each subsequent technological revolution: economic leadership has flowed to the countries that have best been able to take advantage of the new "innovation opportunity space"[4] that opens up – the US at the end of the 19th century, Japan in the middle of the 20th, and arguably China in the 21st.

In today's interconnected and rapidly changing global environment, diffusion can happen faster than ever before.[5] Technology has the potential to radically change the economy, as climate change reshapes energy systems and AI disrupts business models and labour markets. In this environment, being a fast follower rather than a frontier buster – competing less on the innovations themselves, but on their usage and diffusion – is the more realistic strategy for most countries. Even for countries at the cutting technological edge in some areas, invention alone will not deliver broad-based growth; instead, a failure to diffuse technology risks creating a two-speed economy – one in which frontier innovations thrive but their benefits remain confined to a small group.

The UK stands at a decisive moment: get diffusion right and the country can preserve its competitiveness on the global stage, even as the US and China compete to lead the current technological revolution. Its knowledge-intensive, services-heavy economy is well placed to take advantage of new

digital technologies. Get it wrong, however, and the country will fall further behind as those same technologies allow more dynamic competitors to make inroads into the UK's sectors of global standing.

What Can the UK Aspire to?

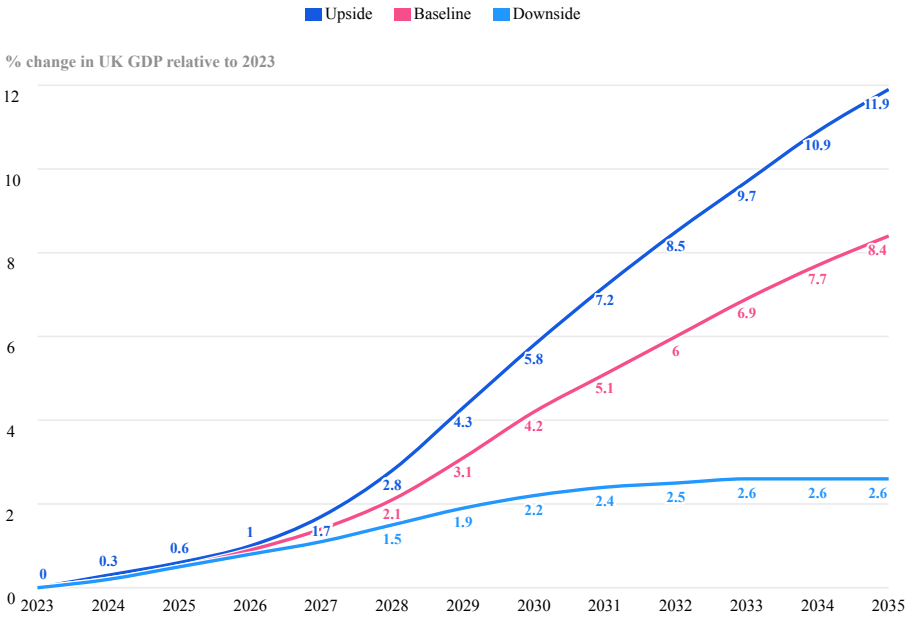
The UK is today a laggard in diffusion and adoption. Its struggle to harness the benefits of new technology has intensified since the global financial crisis, during which investment has dropped off far more sharply than in countries like the US, Germany and France. That has contributed enormously to the UK's growth malaise. If investment had matched the average of those peers' pre-crisis levels, the economy would have been around 4 per cent larger today.[6] The UK's poor record of diffusion and adoption contrasts with its competitive innovation ecosystem. In the latest Global Innovation Index, the UK ranks 37th in terms of "knowledge absorption", despite sitting in sixth for overall innovation.[7]

The slowdown over the last two decades reflects a number of factors. Uncertainty has killed business investment and risk taking. UK-specific shocks such as Brexit and a particularly acute exposure to the global financial crisis has left it less able to weather global shocks such as Covid-19 and the energy-price crisis caused by the war in Ukraine. As a result, the Economic Policy Uncertainty Index for the UK rose at three times the rate of the global average over that time and remains twice as high today.[8] Without clarity about what markets they can sell into, what regulation they will face and what support they will enjoy, business are reluctant to take the risks inherent in the adoption of new technologies.

Uncertainty has been compounded by under-investment in the building blocks of adoption such as skills and infrastructure. Intangible investment,[9] in areas such as workforce training and organisation development, has grown at half the rate of its average before the global financial crisis.[10] And a combination of low growth and austerity have starved UK infrastructure of resources, with an estimated £2.6 trillion capital gap by 2025,[11] relative to the US, Germany, France and the Netherlands.

FIGURE 1

GDP impact of adopting emerging technologies by 2035



Source: "The wider economic impacts of emerging technologies in the UK", Government Office for Science and Department of Science, Innovation & Technology

A revived diffusion engine is essential not only for making up lost ground, but also for meeting the challenge presented by the scale of technological progress underway. The government's own estimates suggest that effective adoption of frontier technologies could add 2 to 4 per cent to GDP by 2029, and 3 to 12 per cent to GDP by 2035, with a mid-point estimate of 8 per cent.[12] And TBI estimates that widespread adoption of AI alone could boost UK GDP by up to 6 per cent over the same period – equivalent to an additional £173 billion at 2025 prices. Moreover, a stronger diffusion engine can also help to spread the growth benefits of technology more widely. In AI, for example, adoption is startlingly lopsided: more than two-thirds of large companies had begun to integrate AI into their operations, compared with

only 15 per cent of smaller firms. In January 2025 the rate of adoption in London was more than twice the rate in the worst-performing region, the North East.[13]

Boosting technological diffusion must be a national priority if this government is serious about growth. Diffusion depends on the decisions individual firms make about adopting new technologies but incentives to invest are heavily influenced by conditions that government ultimately controls. Volatile politics and inconsistent policy have been at the heart of the headwinds holding back business investment in new technology over the past 15 years, not least by adding to uncertainty and undermining confidence.

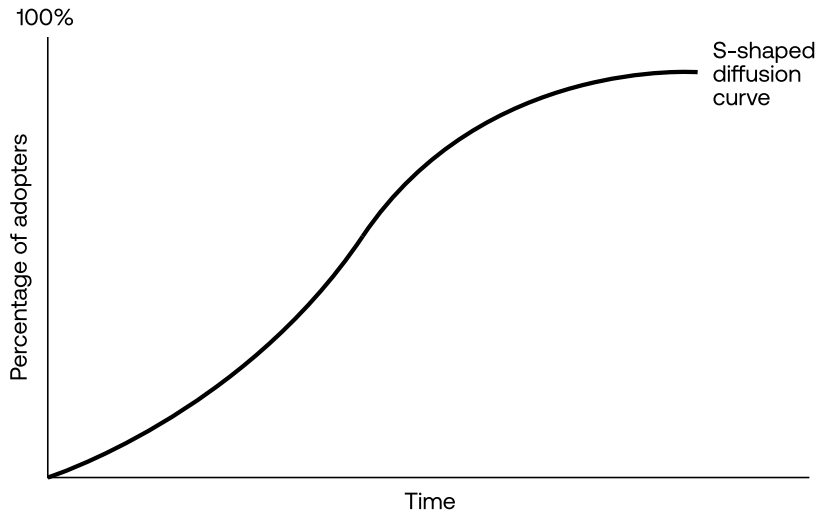
Better policymaking can change that. But in most cases, reform is complicated and will bear fruit only gradually. Competition and trade policy create incentives to adopt new technologies, both to survive and to take advantage of larger markets. Regulatory policy and public procurement can boost confidence by setting guardrails and demonstrating proof of concept. And investment in skills and enabling infrastructure can reduce barriers and costs of adoption. All these areas need attention and are – to varying degrees – part of the government's long-term growth strategy.

The government can play a more direct and immediate role in helping businesses adopt technology through the diffusion ecosystem – the focus of this report. Policy has tended to focus on moving more firms up the familiar S-curve of adoption, where technologies spread gradually, then rapidly, as confidence grows. Yet this overlooks the real challenge: the barriers that make the UK's S-curves flatter and slower than they could be. Adoption at a firm level is rarely frictionless and usually follows a J-curve, where businesses face near-term costs – disruption, reskilling, organisational change – long before productivity benefits appear. A fifth of technology-adoption journeys take more than a year and, for a quarter of firms, the cost of acquiring and integrating new technology is more than 10 per cent of annual turnover.[14] A sophisticated diffusion strategy must help firms navigate that dip, not just spreading technology to as many firms as possible. Only by steepening the S-curve can the UK turn innovation into broad-based growth.

Past governments have not invested sufficiently in the tech-diffusion ecosystem needed to help firms navigate this uncertain new world. Government initiatives have too often failed to prioritise adoption of proven technologies in favour of frontier innovation and R&D, feeding the sense that technology adoption is for the few not the many.[15] This policy gap has been recognised by this government in its Modern Industrial Strategy and its Technology Adoption Review – but so far action has not followed. At a time when business confidence in government is at a low ebb, a revitalised diffusion ecosystem is an opportunity to reset both relations with British people and the economic prospects of the country.

FIGURE 2

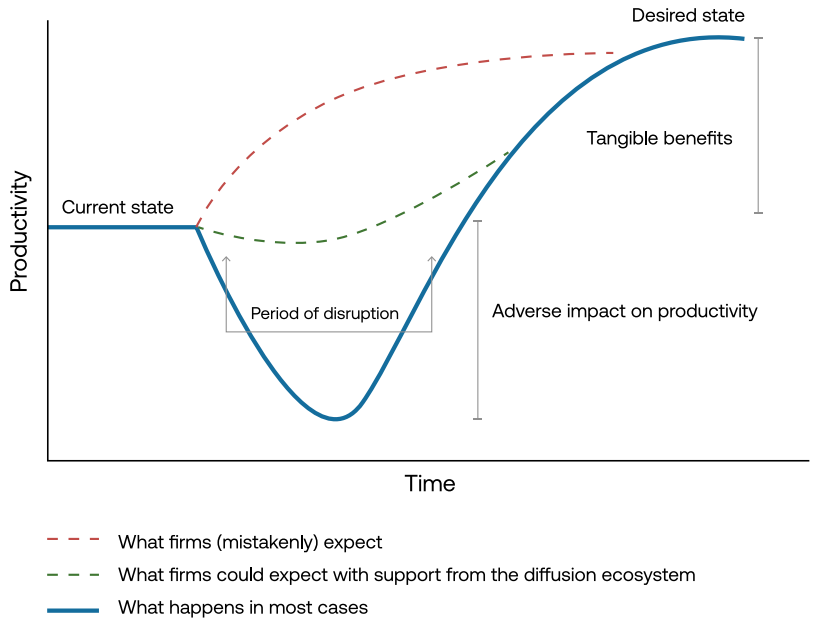
The S-curve of technology adoption



Source: Adapted from David Viney

FIGURE 3

The J-curve of productivity



Source: Adapted from David Viney

A Transformed Diffusion Engine

The UK's existing diffusion ecosystem falls short across the adoption journey, failing to tackle the barriers that firms face at each stage – from identifying the right technology to deploying the finance to acquire it and the know-how to integrate it.[16] Many firms start without impartial advice on what their needs are and what will work, relying on private providers for information. When they move to acquire a technology, front-loaded costs and thin finance slow progress, just where smart public support could de-risk the leap. And when they try to integrate said technology, scarce in-house know-how and weak links to practical help mean tools go under-utilised without expensive external consultants.

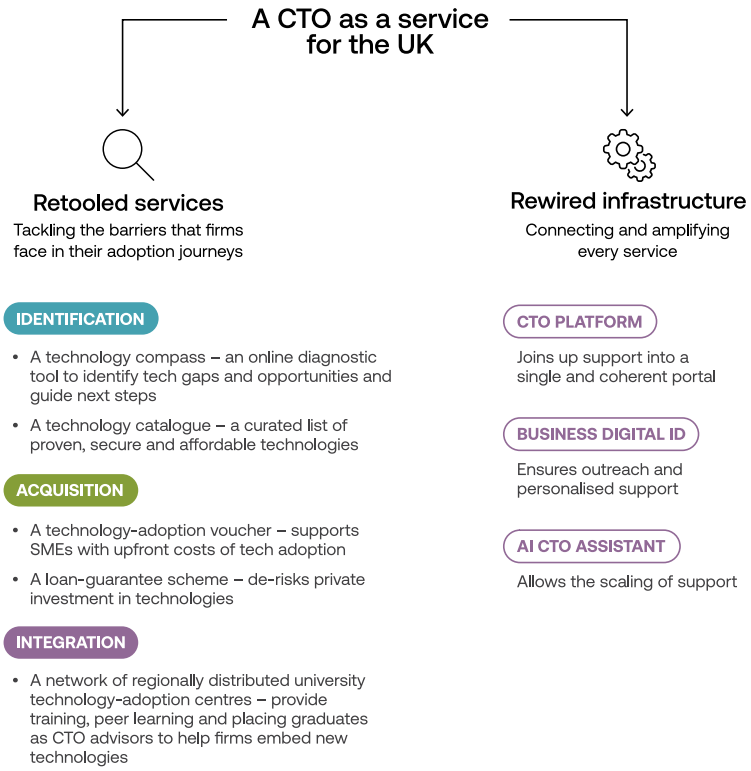
A weak diffusion infrastructure reinforces these challenges. Support is fragmented, poorly targeted and lacks the mechanisms to scale up in a resource-constrained environment, which caps the capacity for it to move the dial on growth. The Made Smarter programme, which has provided tech adoption support for a limited number of SMEs since 2018, is a good example of that constraint. Firms that use the service tend to see higher revenues (by 6.5 per cent), employment (by 3.9 per cent) and productivity (by 2.6 per cent)[17] but, until recently, the service has lacked scale. It reaches on average only 1,100 firms per year and it is limited to just the advanced manufacturing sector in the North West of England (though a nationwide expansion is now planned).

Other countries have long grasped the importance of a more active state in technology diffusion. Singapore's system is best-in-class, showing what an end-to-end architecture that guides firms from diagnosis to deployment might look like. The country's SMEs Go Digital programme helps businesses identify proven technologies, the Productivity Solutions Grant and Enterprise Development Grant de-risk acquisition with co-funding, and dedicated consultants and training support ensure smooth integration – all coordinated through a single national digital infrastructure.

The UK can also learn from a wider field of peers. Germany's Mittelstand-Digital centres offer impartial advice and local testbeds where firms can try technologies before they buy, while Canada, Denmark, Netherlands and France have all experimented with different forms of financial support to de-risk acquisition. The US and Germany set the standard in integrating new technologies into their manufacturing sectors, combining dense regional networks – the US's MEP centres and Manufacturing USA institutes, Germany's Fraunhofer and Mittelstand-Digital hubs – that embed engineers and advisors directly in firms to help integrate new technologies into everyday production.

FIGURE 4

Rewiring and retooling the diffusion ecosystem to accelerate diffusion



Source: TBI

The remainder of this report sets out how the UK can radically redesign its diffusion ecosystem, shifting from a patchwork of partial programmes to a coherent system that acts as a chief technology officer (CTO) for the whole economy – or a CTO as a service – built around the UK's universities. Change is possible within this parliament: the UK does not require costly new institutions, just better use of and stronger links between the ones it already has. The report proposes four strategic interventions:

1. Provide clear, impartial advice to support technology identification through a national technology compass diagnostic tool and curated technology catalogue of proven solutions
2. De-risk investment in acquiring new technologies through adoption vouchers and dedicated loan guarantees from the British Business Bank
3. Build in-house capability by establishing university technology-adoption centres that train leaders, embed expert advisors and connect firms through peer-learning networks
4. Build a system that can deliver these and other services in a way that is both targeted and scalable, including a unified digital CTO platform, a business digital ID, and an AI CTO assistant

The goal is to make technology adoption a realistic prospect for every firm, ensuring the gains of innovation reach beyond the frontier to the everyday economy where change for the average voter is most tangible. Under the system, any firm – irrespective of size, sector or location – could begin their adoption journey through the single national digital CTO platform, which would bring together diagnostics, practical advice and examples of proven technologies to help identify its needs. Each firm's plan would be informed by the data contained in its own digital ID, allowing support to be tailored to its size, sector and level of readiness. Vouchers or loan guarantees tied to proven tools would make investment less risky when a firm takes the decision to acquire new technologies. And the system would be on hand when a firm moves to integrate that technology – university technology-adoption centres should seamlessly pick up the baton, providing local access to networks, training and embedded expertise. And throughout the journey, an AI CTO assistant would provide "always on" support that dovetails with the work of traditional human advisors, radically scaling up how many firms can benefit.

Upgrading the UK's diffusion ecosystem is good value for money. It offers a near-term boost to growth within this parliament while essentially paying for itself through higher tax revenue – critical for a government facing tight fiscal and economic constraints.

An ambitious programme that targets support at 100,000 small and medium firms over the course of this parliament (7 per cent of all employing SMEs) could raise productivity of those firms by 5 per cent on average, delivering in excess of £6 billion (or 0.2 per cent) of GDP by the end of this parliament. To put that gain in perspective, it is on par with the near-term impact of the government's flagship planning reforms – projected to raise GDP by 0.2 per cent by 2029–30,[18] and with the long-term combined impact of the UK's post-Brexit trade deals with India,[19] Australia[20] and New Zealand.[21]

Moreover, the programme would largely pay for itself – raising £2.5 billion in extra tax revenue over this parliament – offsetting almost all of the £1.1 billion setup cost and £1.6 billion in running cost over the same period.[22]

02

Identification

The adoption journey starts with identifying what technologies are relevant, what problems they could solve and whether they align with a company's business model. This is the point where uncertainty is greatest and a lack of trusted information particularly detrimental.

Without clear, impartial information, many businesses struggle to assess their needs, navigate fragmented guidance and distinguish credible solutions from vendor hype. In the UK, 59 per cent of businesses say it is hard to get impartial advice on the appropriate application of new technologies.[23] Rapid technological change, combined with fears of obsolescence, security risks and unclear regulation, deepens this uncertainty.[24] Yet information alone is not enough. Trust – both in government and in technology – is the foundation of any diffusion effort.

The government should go beyond providing information and equip every firm with a clear entry point into adoption: reliable diagnostics to assess firm readiness and trusted guidance to discover technologies that are proven and secure. As part of a wider digital transformation, the cost of which is set out in Chapter 5, the additional cost of developing these tools would be relatively modest. International reference points and UK technical day-rate standards point to a cost of up to £20 million[25] by the end of this parliament, including set-up and running costs.

Recommendation: *Develop a "technology compass" that is available to all businesses as a diagnostic tool for technology adoption. This would identify a firm's technological maturity by helping businesses work out their capabilities, spot barriers and build a roadmap for action.*

An accessible and trusted diagnostic tool is among the most effective ways to kickstart adoption when integrated as a gateway into wider diffusion systems. Documented success stories[26] show that free diagnostics and follow-on guidance can reduce companies' manpower needs by up to 20 per cent and increase efficiency by 40 per cent as firms redesign processes and adopt new digital tools.[27]

Good models exist in the UK, but their scope is limited. The Made Smarter programme's roadmapping workshops are highly valued by participants, but they are confined to the manufacturing sector in specific pilot regions. Elsewhere, provision is inconsistent. Some growth hubs and consultants offer audits, while the now-discontinued Help to Grow: Digital included a software quiz. The Digital Catapult has developed a strong digital-maturity assessment,[28] but it is framed primarily around frontier innovations like AI, making it less relevant for many SMEs.

To fill this gap, the government should develop a technology compass: an online diagnostic tool accessible to every firm, regardless of size, sector or region. The platform would combine data and AI and integrate with the wider diffusion system to deliver specific, actionable advice. Drawing initially on firm-level data from cross-government sources such as Companies House and His Majesty's Revenue and Customs – already used by private analysis to identify high-growth firms[29] and classify sectoral activity[30] – and later through a business digital ID, the technology compass would generate a tailored starting point for each firm. From there, an AI CTO assistant (outlined in Chapter 5) would guide firms through an interactive diagnostic, analyse responses against external benchmarks to pinpoint capability gaps and, where needed, triage them to human advisors within the diffusion ecosystem to build a customised adoption roadmap. As the technology compass is fully integrated with the wider diffusion ecosystem, each firm's roadmap would be immediately actionable – linking directly to funding, training and technology providers – and efficient, enabling advisors to build on diagnostic data rather than restart assessments with each new engagement.

The technology compass would be dual use too. Firms would benefit from a personalised roadmap that identifies potential and prioritises actions, and government would have access to a nationwide map of adoption bottlenecks for the first time, enabling resources to be targeted where they would have greatest impact.

Recommendation: *Create a technology catalogue to guide firms through the process of filling gaps identified by diagnostic tests by providing trusted guidance on which technologies to adopt.*

Businesses want trusted guidance on the tools that will help them achieve their goals – proven evidence of tech effectiveness is considered as a key enabler by 40 per cent of UK firms.[31] Yet today, that guidance is missing. Firms face an information environment that is overloaded and yet thin on useful insight. A recent TechUK report found that 44 per cent of SMEs consider technology information "too confusing" and more than half struggled to identify the right tools for their needs.[32] Private solutions are often vendor-driven, leaving businesses confused between marketing and evidence, or too complex for smaller firms to navigate. Existing directories such as Enterprise Nation's Tech Hub[33] or GOV.UK's generic listings are incomplete and lack the reliability that ongoing curation or transparent user feedback might bring.

The limits of private-sector solutions underline the case for the role of government in platforming proven technologies. But it needs to be designed well to succeed. The closure of Help to Grow: Digital removed one of the only government-backed technology catalogues available to SMEs in the UK. Businesses valued its curated list of tools,[34] confirming the demand for such a service. But its design proved too rigid, with overly narrow eligibility criteria and limited vendor choice.

Singapore provides a model of success. The catalogue under its SMEs Go Digital programme offers both generic digital solutions suitable for all firms and sector-specific options aligned with industry transformation roadmaps. All technologies are pre-approved by a combination of government agencies – the Infocomm Media Development Authority (IMDA), Enterprise Singapore (EnterpriseSG) and relevant sector agencies – for usability, security, interoperability and value for money. Critically, this catalogue is directly linked to funding and advisory services, ensuring that firms are channelled towards the most appropriate solutions. When funding was directed to sector-specific technologies in the catalogue, adopting firms achieved 4 per cent higher value-added per worker and 4 per cent higher revenue, almost double the gains of those that adopted generic tools (2.4 per cent and 1.6 per cent, respectively).[35,36]

The UK should mirror this approach and build a technology catalogue to cut through the noise. It would reduce information overload and the cost of search and compliance while strengthening the link between diagnostics, finance and implementation support. This catalogue should have the following features:

- A core catalogue of fully vetted, pre-approved technologies that are proven, secure, interoperable and cost-effective.[37] This would be developed out of technologies trialled in previous UK initiatives, such as Help to Grow: Digital and Made Smarter as well as international models such as Singapore's SMEs Go Digital, in consultation with businesses and industry bodies.
- An exploratory catalogue of technologies nominated for approval that are pending full verification. This tiered structure would allow the catalogue to evolve amid a fast-changing technology landscape through horizon scanning, nominations by businesses and vendor proposals, while preserving the robust verification standards of the core catalogue.
- A technology-selection process characterised by evidence-based selection criteria, with technologies meeting compliance[38] and effectiveness standards. The Department for Science, Innovation & Technology would oversee governance of the catalogue, working with sector leads, trade associations and standard-setting bodies to ensure relevance and quality. Selection would be supported by user feedback and business ratings captured through the technology catalogue and wider digital CTO platform, using real adoption experiences to build confidence.
- A strong link to the wider diffusion ecosystem, so that firms encounter the catalogue as part of a guided adoption journey rather than a static list. Available through the digital CTO platform (outlined in Chapter 5), it would connect to adoption roadmaps generated through the technology compass and onward to funding and other support options.

A catalogue for UK businesses could be built quickly by assessing technologies trialled in previous national initiatives and benchmarking them against international references, all in close consultation with businesses

and industry bodies. It should start with technologies in manufacturing and the professional- and business-services sectors so it could be trialled within the Made Smarter expansion process. The government could build on the experience of the National Digital Exchange (NDX),[39] recently announced to help public-sector teams access pre-approved tech deals at nationally negotiated prices through an AI-powered matching engine. The technology catalogue would provide an equivalent space for matching SMEs to validated technologies.

03

Acquisition

Once firms identify the right technology, the challenge shifts to how to finance acquisition. The UK faces a dual problem in financing technology diffusion: deep risk aversion among firms and a misalignment between public financial support and the real costs of adoption.

Many businesses – particularly SMEs – remain cautious about borrowing for growth or transformation. Years of austerity, repeated shocks and sustained policy uncertainty have entrenched a conservative investment culture. And the scars of the global financial crisis linger, as most SMEs continue to struggle to access credit.[40] By 2023, 77 per cent of firms preferred slower growth over taking on financial risk, and more than 80 per cent relied on internal funds, with half using them exclusively.[41] For many, this meant partial adoption at best.

This financial reluctance is compounded by upfront costs of technology adoption. This is frequently cited as the main barrier to technology adoption: 69 per cent of UK businesses find that innovative technologies that could benefit their organisation are prohibitively expensive.[42] Yet even where firms are willing to invest, current public incentives are poorly matched to their needs. R&D tax credits or the annual investment allowance are aimed at innovation-intensive firms, not at SMEs struggling with the practical costs of modular software, subscriptions, integration or change management. And private-sector finance remains reluctant to offset that: the total stock of bank loans to smaller businesses fell for the fourth consecutive year in 2024 and remain below pre-Covid levels.[43]

The UK must deploy a broad fiscal package, not single tools, to help companies bridge the gap between high upfront costs and uncertain benefits.[44] A calibrated mix of instruments is needed to reach firms at different maturity and risk levels. Tax incentives work best for established businesses with planning capacity. For example, extending full expensing for investments in intangibles would significantly boost large firms' capacity to integrate new technologies and, in turn, unlock their productivity potential.[45] As set out by TBI in our *Pro-Growth Roadmap for Business-Tax Reform*, this

would contribute to a 0.3 per cent increase in GDP by the end of this parliament – equivalent to £9.6 billion in today's terms – and generate an additional £4 billion in annual tax revenue.

Other tools are more effective for smaller companies. Grants or vouchers are more effective for younger, cash-constrained firms still building capabilities, while de-risked credit helps more ambitious or high-potential firms invest in transformational technology projects that carry higher uncertainty. But in the UK ecosystem, the fiscal offer has significant gaps in both design and coverage. Existing grant schemes are too narrow or short-lived. The Made Smarter Adoption programme, for instance, offers matched grants of up to £20,000 but only reaches a limited number of advanced manufacturers in the North West. Help to Grow: Digital, which offered a 50 per cent discount worth up to £5,000 for eligible software, was discontinued after just one year, hindered by low awareness, limited vendor choice and weak targeting.[46] And de-risked credit instruments are over-concentrated on R&D rather than adoption. The British Business Bank's Growth Guarantee Scheme (GGS), though capable of supporting diffusion, still functions largely as its predecessor Recovery Loan Scheme did, with a focus on operational liquidity and post-pandemic recovery rather than financing technology transformation for growth.

The government must recalibrate these tools: targeted vouchers to help cash-constrained firms and expanded guarantee mechanisms to crowd in private finance for riskier but high-impact adoption projects.

Recommendation: *Nationalise the success of the Made Smarter Adoption scheme by establishing a nationwide technology-adoption voucher scheme to provide SMEs with upfront support to de-risk investment in technologies, integration services, change management and training.*

Made Smarter Adoption currently operates a matching-grants scheme that helps SMEs co-fund technology upgrades, resulting in average turnover and employment increases of 6.5 per cent and 3.9 per cent respectively – a 2.6 per cent increase in productivity. Yet the programme remains very narrow in scope, reaching only around 1,100 applicants per year, and concentrated in advanced manufacturing.

International evidence shows that well-designed voucher schemes can deliver measurable improvements in business performance. Singapore's Productivity Solutions Grant (PSG) has supported more than 100,000 SME projects since 2017, covering up to 80 per cent of adoption costs, and evaluations show it has increased firm productivity by 4 per cent when vouchers are applied to sector-specific technologies.[47] Germany's "Digital Jetzt" programme (the funding component of Mittelstand-Digital) generated roughly €1.2 billion (£1 billion) in additional gross value added across more than 4,000 firms, from a €163 million (£144 million) investment, equal to a 6 per cent GVA boost per firm.[48]

The proposed technology-adoption voucher scheme would achieve scale via integration into an upgraded diffusion ecosystem. Key design elements should include:

- **Coverage:** Vouchers would cover 50 per cent of adoption costs up to a maximum of £10,000 of support,[49] with firms contributing the remainder. Firms unable to co-fund would be referred to commercial lenders for affordable finance and to avoid dependence on grants alone.
- **Engagement:** Past schemes have failed due to lack of awareness or demand. The business digital ID would facilitate engagement with the businesses that would benefit most from financing. The digital CTO platform would play the central role in promoting technology-adoption vouchers, with firms accessing it as part of their initial diagnostic. The technology compass would determine eligibility, targeting those for whom this support is most relevant.
- **Eligibility:** Technology-adoption vouchers would be linked to verified solutions listed in the proposed technology catalogue, ensuring that public funding supports effective and tested technologies while maintaining flexibility of choice for firms. They could also be used to finance training and integration services identified through diagnostics.
- **Support:** Successful adopters could access subsequent vouchers or advisory sessions through university technology-adoption centres (outlined in Chapter 4) to embed change and scale impact.

A nationwide technology-adoption voucher scheme based on an ambition of reaching 100,000 employing SMEs by the end of this parliament – or 7 per cent of all employing SMEs in the UK – would cost up to £700 million.[50] Although a substantial outlay, it would likely pay for itself just through its direct effects: full take-up could increase firms' productivity by up to 4 per cent[51] and yield as much as £2.2 billion in additional output and £900 million in additional tax revenue by the end of this parliament, based on international comparisons. There could be further growth as a result of the wider spillover effects from greater technology diffusion beyond the participating firms as more take-up creates more use cases and less uncertainty. Although this would represent a step change compared to the current reach of available matched grants, it is still smaller than schemes pursued in other countries.[52]

Recommendation: *The government should direct the British Business Bank to create a dedicated stream within its Growth Guarantee Scheme (GGS)*[53] *to finance the adoption of emerging technologies. This would boost the UK's international competitiveness by enabling SMEs to make high upfront investments in higher impact drivers of growth such as advanced automation, AI-enabled platforms and robotics, for which banks are currently reluctant to provide financing.*

The GGS already provides government-backed guarantees to de-risk SME lending, but at present there is no requirement that loans be used for technology adoption. Most firms use it instead for cashflow or working capital, reflecting its origins as a pandemic-recovery scheme. Creating a stream dedicated to adoption would signal its strategic importance – just as Innovate UK has a guarantee stream specifically for innovation – and reorient the scheme from merely supporting recovery to driving growth.

Under this dedicated stream, government would share risk with commercial lenders by guaranteeing a share of potential losses. This would enable banks to extend credit on better terms: longer maturities, lower collateral requirements and more affordable rates. Eligibility would focus on the most ambitious and high-potential firms. Firms would only qualify if they had completed diagnostics through the technology compass, demonstrated

financial viability and committed to technologies in the technology catalogue. This would ensure that loans are directed to serious projects with the highest potential for transformation.

Public risk-sharing has a proven record of unlocking private investment. In Europe, such mechanisms have a long-standing tradition of success: the EU Guarantees on Credit to SMEs have been shown to boost employment by 17.3 per cent, turnover by 19.6 per cent and productivity by 2.3 per cent within five years of issuing a guaranteed loan.[54] Germany's state-owned investment and development bank KfW has used similar instruments for decades to finance SME modernisation. In the UK, the predecessor of the GGS – the Enterprise Finance Guarantee (EFG) – delivered strong results, boosting firm productivity by 0.7 per cent during its evaluation period.[55] The current GGS[56] has delivered more than £2.5 billion in lending to approximately 5,500 SMEs annually.

The new stream for adoption would crowd in more private finance for the most ambitious firms, ensuring risk does not become a brake on transformation. Crucially, this would not require a direct allocation of capital from the government's budget. For a modest risk exposure, government could unlock large-scale private investment in the technologies that will power future growth. A £1 billion loan capacity for SME tech adoption, with a 70 per cent guarantee would imply a maximum liability of £700 million and an actual cost to the Exchequer of less than £70 million by the end of this parliament (equivalent to under £20 million per year).[57] The government should extend the guarantee to 20,000 firms by the end of this parliament (roughly 5,000 firms per year), doubling current GGS annual participation. International comparisons suggest that additional funding could boost productivity by 2.3 per cent[58] for participating firms – boosting GDP by approximately £1 billion and generating an additional £400 million in tax revenues over the same period.

04

Integration

The adoption journey does not end with identifying and acquiring a technology; it must also be integrated across the firm. This is often the hardest stage. New tools disrupt established processes and roles, and reorganisation costs are high. New technologies force realignment of legacy systems and changes must be embedded across whole organisations. For many, the barriers to integration outstrip their in-house expertise and available external support.

The challenge is clear. Sixty per cent of UK businesses report struggling with the short-term impact of adopting new technologies despite recognising the long-term benefits.[59] That challenge spans technologies – mature and emerging. In the UK, even with mature technological concepts like the internet of things and big data, adoption is widespread in principle, but respectively only 7 per cent and 11 per cent of firms use them at high intensity.[60] And the gap is wider for emerging technologies: a global study in 2024 found that only 4 per cent of companies had fully integrated AI across functions and were consistently generating measurable value, while 74 per cent remained in early or intermediate stages.[61]

Diffusion networks often bridge these shortfalls through peer learning and advice. Germany's Mittelstand-Digital programme has built a decentralised national system of 25 regional centres, mostly hosted at universities and Fraunhofer Institutes, offering impartial, vendor-neutral advice focused on implementation. An independent 2025 evaluation found it had raised SME digital maturity and improved competitiveness, and its funding component increased productivity by 6 per cent delivering up to €1.2 billion (£1 billion) in additional GVA.[62] And the US offers a similar service to its manufacturing sector through its network of Manufacturing Extension Partnership centres distributed across 50 states delivering $17 in economic benefit for each $1 invested.[63]

The UK lacks this kind of diffusion backbone. Sector bodies have limited coverage, and Growth Hubs, established in 2011 to play this role, have reached only 8 per cent of SMEs.[64] Attempts to build links between public

and private institutions have typically been short-lived or isolated. Meanwhile, one of the UK's greatest institutional strengths – its universities – remains underused. While world-leading in research and spinouts, universities have little presence in helping non-R&D-intensive SMEs adopt proven technologies. Many business owners still report that they do not know who to talk to when engaging their local university.[65]

The potential is there. The UK already has the institutional assets to make this work; what it has lacked so far is the will. The UK's universities, with their expertise, networks and geographical reach, are the natural partners for government in building the capabilities firms need to integrate new technologies effectively.

Recommendation: *Leverage the strength of the UK's university system by establishing a network of university technology-adoption centres. This would allow the government to build on the role many universities already play in supporting businesses and leverage regionally distributed higher-education institutions as the backbone of an upgraded national diffusion system.*

Universities are one of the UK's greatest untapped assets for technology diffusion. They are regionally distributed and technically capable institutions with world-class facilities and expertise. Yet for most SMEs outside research clusters, universities remain distant.

University technology-adoption centres would change that, acting as regional support points for firms, helping them navigate the services organised under the digital CTO platform (outlined in Chapter 5) and acting as funded delivery partners providing training, peer learning and hands-on advisory services. These centres need not start from scratch but should instead embed the existing network of Growth Hubs, building on existing connections with regional authorities and local businesses. Growth Hubs should sit within universities, acting as the interface between central government, universities and local business ecosystems. That relationship should ensure that support is coherent across regions, aligned with local growth plans and integrated into the wider national diffusion strategy.

The aim should be to establish around 60 university technology-adoption centres – at around a third of the universities in the UK – building out from the 60 universities already offering Help to Grow: Management (HtGM) courses while integrating the existing network of Growth Hubs to ensure even distribution across the UK's regions.

Germany's Mittelstand-Digital, which focuses more narrowly on manufacturing, operates 25 centres, which cost €40 million to run in 2019 (equivalent to £47 million today).[66] Using this reference, as well as current costs of comparable projects in the UK,[67] Britain could operate 60 centres for around £115 million per year. By reallocating the approximate £13 million[68] budget currently committed to Growth Hubs to this new programme, the net cost could be lower. Given the funding challenges facing many universities, this financing must be additional rather than drawing from existing budgets.

University technology-adoption centres would offer three core services:

1. Training – Skills and managerial capability are decisive for the successful integration of new technologies. A 2025 report by PwC for the Government Office for Science identified skills shortages as the second-largest obstacle to adoption across all firm sizes,[69] and data from the 2021 census show UK firms in the top decile for management practice are twice as likely to have adopted advanced technologies.[70] Although systemic reform and large-scale funding are required to overturn the lack of investment in skills,[71] the diffusion ecosystem can begin to fill this deficit with well-targeted interventions.[72] University technology-adoption centres should give SME leaders the skills and confidence to manage transformation by expanding and modernising the HtGM course,[73] placing digital adoption at its core. The curriculum should emphasise the "digital adoption and transformation" module to focus on equipping leaders with the capability to deliver technological change and deeper integration into the diffusion ecosystem. Packaging HtGM as part of the wider university technology-adoption centre offer provides a better prospect for follow-through. These centres would act as a gateway to wider workforce training, connecting managers to opportunities that fit within firms' adoption roadmaps.[74] Driving participation through all the tools of the diffusion system, HtGM should be expanded to 10,000 participants annually, up from 3,300 currently, at a cost of around

£100 million annually.[75] This would have the potential to boost firm productivity by around 4.2 per cent[76] and raise GDP by around £200 million annually, as a wider array of firms get access to the management skills needed to drive technological change.[77]

2. Peer Learning – Effective networks are often the difference between success and failure: firms with access to advisory networks, technical support or peer learning are consistently better equipped to sustain change.[78] But just one in four UK SMEs say they receive technology information from networks or professional associations.[79] University technology-adoption centres should build up a network of mentors, including retired entrepreneurs and other volunteers, to guide firms through real-world challenges of adoption. Support would combine:

- **One-to-one mentoring sessions** to address specific business challenges
- **Group peer-learning sessions** with mentors facilitating discussions among firms facing similar adoption barriers or opportunities
- **AI-supported guidance** to connect firms directly to relevant services on the digital CTO platform

By drawing from existing initiatives, such as HtGM[80] and Digital Boost,[81] and connecting with complementary networks, such as the Royal Voluntary Service[82] and Tech London Advocates,[83] the university technology-adoption centres could build a network of around 10,000[84] mentors capable of reaching up to 50,000 unique businesses by the end of this parliament – roughly five firms for every active mentor. Establishing this network of mentors would require up to £20 million a year, based on the comparable US SCORE[85] programme. These mentorship and peer-learning interactions could increase productivity by up to 1.5 per cent,[86] which in turn could push up GDP by an estimated £400 million over this parliament.

3. Hands-on advisory – Even with better training and networks, many firms still need practical help to embed new tools. One in five UK businesses rely on costly and time-limited external consultants to support adoption and integration.[87] The government could help meet this need by supporting

university technology-adoption centres to adapt the proven Knowledge Transfer Partnership (KTP) into a technology-specific knowledge-adoption partnership, shifting the emphasis from invention to adoption and providing firms with hands-on support for technology integration, aligned with international best practice.[88] Placements would be offered to firms with strong growth potential and the capacity to host graduates, making the scheme both practical for businesses and appealing for students. Associates drawn from graduate programmes in fields relevant to implementing organisational and technological change, such as management, engineering or computing, would help firms redesign processes, train staff and embed the new technologies identified through their adoption plans. Delivering 10,000 six- to nine-month placements over the course of this parliament – three times more than the KTP, but shorter in duration – would cost up to £75 million per year, with each placement costing around £40,000. Participating firms would contribute around 25 per cent of the cost (£10,000 per placement), which could be supported through a technology-adoption voucher. Assuming KTP-level returns and focusing on firms with higher growth potential, this programme could increase productivity by approximately 5.8 per cent[89] as individual firms benefit from in-house adoption support – boosting GDP by £300 million and tax revenue by £100 million annually.

05

Infrastructure

For diffusion to sit at the heart of the UK's growth strategy, its organising infrastructure needs a full-scale modernisation. Upgraded services only matter if the infrastructure behind them offers joined-up, targeted support tailored to firms' real challenges – and can deliver it at scale to move the dial on growth.

The UK's existing diffusion infrastructure is failing to deliver on all counts.

The support that firms receive is fragmented and difficult to navigate.[90] Around 40 per cent of SMEs say the government does not provide clear information or support.[91] While the diffusion ecosystem has areas of institutional strength, it does not add up to a coherent whole. Instead, businesses face an array of more than 100 different programmes, each with their own portals and rules, under the responsibility of more than eight government organisations, costing around £23 billion a year[92] spread across tax reliefs and government-funded schemes. Constant ministerial reshuffles and departmental reorganisations have only added to the confusion, and after Brexit, the loss of EU-derived support schemes further deepened fragmentation, with the National Audit Office warning that improved coordination and prioritisation is "urgent and critical".[93]

Support is also poorly targeted, with outreach too often relying on one-size-fits-all messaging, delivered from the centre, with limited tailoring to different business contexts. Industry bodies and the government itself have called for behavioural insights to improve policy recognising precisely these weaknesses.[94] Businesses have lauded the Made Smarter[95] programme, recognising that the kind of support they most value is an end-to-end support adjusted to each firm's needs combining advice, finance, skills and peer engagement across the adoption journey. The framing of innovation in national discourse further alienates many smaller companies. A focus on cutting-edge technologies feels remote from the day-to-day challenges of most businesses and leaves firms in foundational sectors – like retail, logistics, construction or care – unsure whether technology adoption even applies to them.

Finally, even where interventions are effective, the UK lacks the mechanisms to scale up what works to deliver system-wide change. Dozens of initiatives – from digital road-mapping pilots and regional bootcamps to peer mentoring and sector-demonstration projects – have shown promise but remain isolated, small in scale and short-lived. With funding spread thin, pilot projects typically receive no more than £60 million each, competing with hundreds of others rather than being expanded into system-wide programmes.[96]

The result is a system that is failing to reach as many as it should, and one that provides inadequate advice when it does. Businesses are disengaging. The share of companies seeking external advice has halved over the past decade to 24 per cent.[97] By failing to join up its component parts, the UK is missing a great opportunity: firms that access external advice see, on average, a 10 per cent increase in productivity compared to those that do not.[98]

The UK needs an enabling infrastructure that offers, in effect, a digital CTO as a service that provides end-to-end tailored support for all companies embarking on technological transformation. At its core should be an emphasis on support that is integrated, personalised and scalable. The building blocks are threefold: a digital CTO platform to join up support, a business digital ID to help target advice and outreach, and an AI assistant to scale up the capacity of the wider ecosystem. All three components could be ready by the end of 2027 if work begins urgently and is then scaled nationally by the end of this parliament.

Recommendation: *Develop a digital CTO platform that acts as a single entry point for firms to access technology-adoption support. This would consolidate advice, finance, training and technology offers in one place, transforming today's patchwork of portals into a coherent system while providing a platform from which to scale new offers in future.*

The platform should be delivered as a pillar within the government's Digital Business Growth Service.[99] This service already seeks to consolidate business-support options but would provide users with a clear and visible

"Your CTO" dedicated to technology adoption, placing it on an equal footing with other fundamental aspects of growing a business, such as exporting and attracting investment.

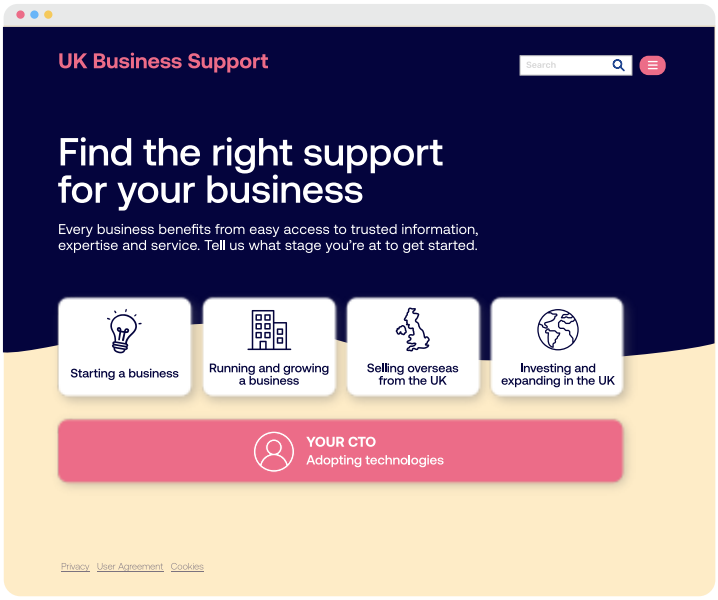
The platform would be the launchpad for the full array of services the government provides around adoption. In radically cutting search costs for firms, it would be fundamental to the success of the wider system. Firms would no longer waste time looking for help, explaining their needs or being mismatched due to incomplete information. Instead, they would be presented with a personalised interface, with support options aligned to their specific needs based on information provided by their business digital ID (outlined later in this chapter) and past interactions with the service.

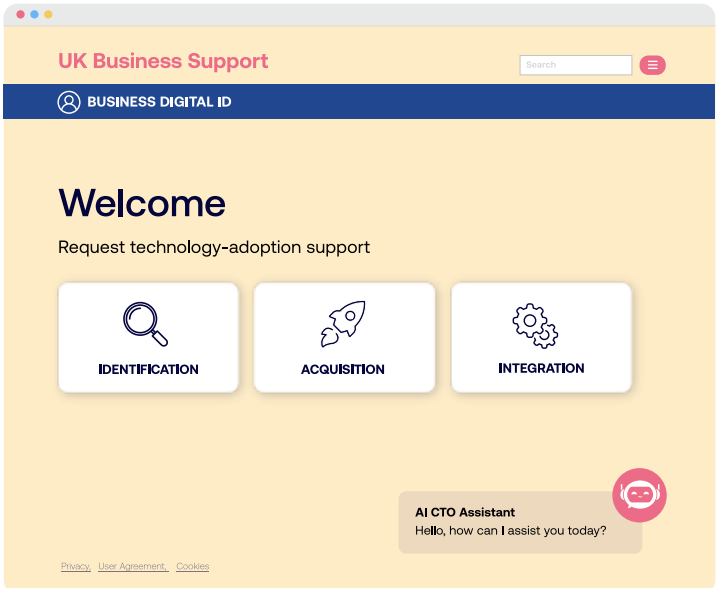
A single platform would also simplify how other nodes in the diffusion ecosystem interact with businesses. For service providers such as universities or industry bodies, having one place to market services would make outreach easier and facilitates coordination across the system. And the platform would help government to capture firm-level data, generating feedback and improving policy design in real time. The development and integration of the digital CTO platform is estimated to cost around £130 million[100] by the end of this parliament, based on the cost of previous UK-wide interoperability initiatives.

International experience demonstrates how this can be implemented. Singapore's SMEs Go Digital[101] and New Zealand's Digital Boost[102] have become trusted national hubs guiding thousands of firms through adoption, combining single-entry access with personalised, practical support. The UK can build on that example, using better data and AI to maximise scale and precision of support.

FIGURE 5

A digital CTO platform consolidating finance, training and technology advice





Source: TBI based on business.gov

Recommendation: *Introduce a digital identity for business that allows government to reach disengaged firms and personalise support.*

A business digital identity makes UK business far more visible to government. The value to policymaking is multifaceted: as set out in the recent TBI report, *A Pro-Growth Roadmap for Business-Tax Reform*, by enabling smarter regulation, simplifying compliance and reducing administrative costs, a digital ID can provide a broader basis for business dynamism. Within the diffusion ecosystem, its role is equally critical: it would allow government to greatly expand the number of firms it engages and deliver support tailored to each company's stage of adoption and sector context.

A consistent failing of the diffusion ecosystem has been its inability to reach the right firms at the right time. Many past offers and campaigns have under-delivered due to lack of awareness. A digital identity for business would include verified contact information and business-activity data, allowing government to identify firms that are disengaged from existing programmes and proactively reach out to them with relevant, personalised offers instead of the generic emails, campaigns or sector announcements that have failed in the past. Government could also prioritise the firms most likely to deliver productivity gains, such as high-growth or scaling firms, so that vouchers, grants and advisory services can have the greatest impact. Live data on engagement and performance would improve resource allocation, evaluation and coordination across departments and outreach could be proactive, with the state pushing support to those firms that are under-engaged and would benefit from support.

A digital identity would allow support to be personalised by linking data about each firm – sector, size, region, digital maturity, adoption journey – to enable delivery in ways that match the firm's context and potential. Combined with the technology-compass diagnostic, a digital identity would generate a real-time profile of each firm's needs and opportunities, surfacing relevant finance, training and advisory options, while tracking progress and managing applications securely.

Other countries' experiences[103] have proven the effectiveness of a business digital identity and the fact that the core infrastructure can be developed quickly. And businesses themselves recognise the gap: a 2025 UK SME Survey found that eight in ten SMEs would be willing to pay for a Digital Company ID service to save time, increase efficiency and improve data security.[104] In the UK, a business digital identity could be developed by 2027. New firms would get their ID upon registration with Companies House and existing firms would be gradually onboarded, but within two years the digital ID should become mandatory, with access to major programmes and support offers available only through this mechanism.

The UK would not be starting from scratch. A business digital ID would build on the existing GOV.UK Verify and the One Login architecture.[105] Building out the necessary functionality from here could cost up to £500 million[106] based on those previous projects as well as additional costs around integrating the infrastructure with the wider diffusion ecosystem. Beyond the benefits of a more personalised technology-diffusion ecosystem, a business digital ID could benefit the economy through reducing administration costs and fraud. In the financial sector alone, a digital-identity system could save £1.7 billion in compliance costs per year.[107]

Recommendation: *Develop an AI CTO assistant to amplify the scale of traditional support functions, combining AI tools with human advisors so the same resources can reach more businesses.*

The traditional advisor-led model of business support has long struggled to scale, with personnel costs typically determining the limits of reach. An "always-on" AI CTO assistant would allow the UK to both scale up advisory capacity and integrate the array of services that firms need to engage with across an adoption journey into a single system. Core functions would include:

- **Targeted support:** The AI CTO assistant would deliver immediate and personalised guidance around technology adoption based on information in a business's digital identity and past interactions with the service. It would be accessed via the digital CTO platform and guide firms through relevant services including: automatically developing firm action plans

through the technology-compass diagnostic and recommending appropriate solutions from the technology catalogue; guiding firms to the right financial support and facilitating applications for technology-adoption vouchers and loan guarantees; and connecting firms directly with university technology-adoption centres or peer-learning networks.

- **Augmenting advisors:** Complex cases would be triaged to human advisors across the existing UK support system or mentors affiliated with university technology-adoption centres, for whom the AI assistant would act as a "second advisor". For those advisors, the AI tool could pool experience across the wider ecosystem to provide standardised training and guidance as well as insights on firms, including their adoption history and previous interactions.
- **Feedback mechanism:** The AI CTO assistant would provide a mechanism through which firms could review the technologies or services they use and report back the results of advice at different stages of the adoption journey. This feedback loop would generate insight into the effectiveness of the system, enabling government to refine offers in real time and design policy in response.

The AI CTO assistant would be trained and tested in stages. Initial training of the model would use high-quality data from the Made Smarter manufacturing and professional business-services pilots, using anonymised advisor-to-firm interactions, diagnostics and outcomes. The prototype would be tested within those same sectors to refine how the model handles queries, learns from feedback and integrates with the digital CTO platform. Lessons from the pilots would be used to design sector-specific input protocols, allowing the AI tool to absorb structured information from other industries – such as the eight strategic sectors identified in the government's industrial strategy – and learn rapidly as data volumes grow. Once established, the tool would be self-reinforcing, improving with every interaction.

Developing the AI CTO assistant is ambitious but worthwhile. Singapore has demonstrated the scaling potential of pairing digital tools with human expertise.[108] Its SMEs Go Digital programme,[109] which uses the digital tool Go Digital Advisor,[110] reaches 3.4 per cent of its SMEs per year. The contrast

with the UK is stark: Made Smarter extends support to barely 0.1 per cent of UK manufacturers.[111] And while the UK's advisory network has a wider reach, around £900 million, or a fifth of the total business-support budget excluding tax reliefs, is spent annually by the Department for Business & Trade on traditional advisory, which usually lacks a focus on managing technological change.[112]

Based on international examples, an AI CTO assistant would cost up to £25 million[113] by the end of this parliament, including pilot development and testing within the first two years, and after that, cross-sector functionality, integration with existing infrastructure and iterative refinement of the AI model.

Conclusion

Technology diffusion is no longer a secondary issue in economic policy – it is a core growth challenge. Without it, productivity gains from the unfolding technology revolution will remain trapped at the frontier and the wider economy misses out. The choice for the UK is urgent and unavoidable: step up on diffusion or be left behind.

If the UK fails to capitalise on the opportunity presented by new technologies, the consequences will be stark. The two-speed economy will continue to diverge, with a small set of frontier firms and workers racing ahead while the majority fall behind. Other countries with more powerful diffusion engines will pull past the UK, attracting investment and securing greater productivity gains. Britain risks not just low growth, but lost competitiveness and, over time, geopolitical irrelevance.

But if the UK can step up its own diffusion engine, a brighter future awaits. Broad-based diffusion can break the cycle of low growth and strengthen resilience in the face of global shocks. A modern diffusion ecosystem is central to that. With the right mix of modernised services and enabling infrastructure, government can de-risk adoption, giving firms of every size, in every sector and in every region the opportunity to integrate the tools that will define competitiveness in the AI era.

Annex

Download the annex as a PDF.

Endnotes

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34 https://assets.publishing.service.gov.uk/media/65a6a60864060200143cb791/help-to-grow-digital-final-report.pdf

35 https://isomer-user-content.by.gov.sg/166/b217fb7b-7dd0-4e02-a094-7ff650ac4bff/FA%5F1Q2023.pdf

36 https://www.imda.gov.sg/how-we-can-help/smes-go-digital/industry-digital-plans#:~:text=Aligned%20with%20the%20Industry%20Transformation,stage%20of%20their%20digitalisation%20journey.

37 A UK review of past adoption programmes has also found that interoperability and functionality standards for digital tools can increase adoption by building user confidence and assurance. https://assets.publishing.service.gov.uk/media/688a43c9b223ff124d388902/sme-digital-adoption-taskforce-interim-report.pdf

38 Approval criteria for pre-approved technologies: https://www.imda.gov.sg/how-we-can-help/smes-go-digital/pre-approval-of-icm-vendors-solutions

39 https://www.gov.uk/government/news/one-stop-shop-for-tech-could-save-taxpayers-12-billion-and-overhaul-how-government-buys-digital-tools

40 https://www.gov.uk/government/calls-for-evidence/small-business-access-to-finance/small-business-access-to-finance https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2010/understanding-the-weakness-of-bank-lending.pdf

41 https://www.bankofengland.co.uk/quarterly-bulletin/2024/2024/identifying-barriers-to-productive-investment-and-external-finance-a-survey-of-uk-smes

42 https://www.gov.uk/government/publications/insights-from-the-uk-innovation-diffusion-and-adoption-survey/insights-from-the-uk-innovation-diffusion-and-adoption-survey-executive-summary#executive-summary

43 https://www.british-business-bank.co.uk/about/research-and-publications/small-business-finance-markets-report-2025

44 https://www.elibrary.imf.org/display/book/9798400255632/CH002.xml

45 https://www.oecd.org/en/publications/fostering-an-inclusive-digital-transformation-as-ai-spreads-among-firms%5F5876200c-en.html

46 https://assets.publishing.service.gov.uk/media/65a6a608640602001143cb791/help-to-grow-digital-final-report.pdf

47 https://isomer-user-content.by.gov.sg/166/b217fb7b-7dd0-4e02-a094-7ff650ac4bff/FA%5F1Q2023.pdf

48 https://www.mittelstand-digital.de/MD/Redaktion/DE/Publikationen/Zwischenbericht-Digital-Jetzt-NEU.pdf?__blob=publicationFile&v=4

49 The cap is set above the £5,000 limit of Help to Grow: Digital, but below the £20,000 offered through Made Smarter Adoption and Singapore's Productivity Solutions Grant, which averages around £18,000. Spain's Digital Kit provides a comparable benchmark, capped between £10,000 and £25,000. This balance reflects both tools and training, while keeping the scheme scalable.

50 Past voucher schemes suggest that companies do not, on average, draw down the maximum value of the grant cap. Based on the number of projects and the expenditure on grants between FY 2022–2023 and FY 2024–2025 in the Made Smarter Adoption programme, the average value of grants corresponds on average to 70 per cent of the cap of the grants. https://www.madesmarter.uk/resources/news-made-smarter-adoption-kpi-statistics-fy202223-fy-202425/

51 This is based on a mid scenario of sector-specific technology adoption in Singapore and between the range of the central estimates of Singapore and Germany. (See Annex for more details)

52 For example, Spain has recognised the need for investment at scale: its Digital Kit programme has delivered €1.9 billion (£1.65 billion) in grants for digital adoption between 2021 and 2024, reaching 460,000 firms, or around 13 per cent of the country's SMEs: https://stripe.com/gb/resources/more/kit-digital

53 The scheme provides the lender with a 70 per cent government-backed guarantee against the outstanding balance of the facility after it has completed its normal recovery process. The borrower always remains liable for the debt: https://www.british-business-bank.co.uk/finance-options/debt-finance/growth-guarantee-scheme#:~:text=Guarantee%20is%20to%20the%20lender,100%25%20liable%20for%20the%20debt%3B

54 https://www.eif.org/news%5Fcentre/publications/eif%5Fwp%5F29%5Feconomic-impact-guarantees%5Fjuly15%5Ffv.pdf

55 https://www.british-business-bank.co.uk/about/research-and-publications/economic-impact-evaluation-enterprise-finance-guarantee-efg-scheme

56 In total, the scheme has delivered more than £2.5 billion in lending to smaller businesses across the UK since its launch in July 2024. Too early for a full evaluation but feedback is positive: https://www.themanufacturer.com/articles/manufacturing-sector-receives-more-than-368m-through-british-business-banks-growth-guarantee-scheme/#:~:text=The%20Growth%20Guarantee%20Scheme%20has,200m%20to%20professional%20services%20firms.

57 By mid-2025 the UK's Growth Guarantee Scheme had already enabled £2.5 billion in SME lending, with a worst-case contingent liability of £1.75 billion. Actual expected losses are far lower, and the Chancellor has previously expanded the scheme by £500 million in capacity to address specific shocks. https://www.british-business-bank.co.uk/finance-options/debt-finance/growth-guarantee-scheme#:~:text=Open%20for%20applications

58 Anchoring the expected gains to the benchmark of EU Guarantees on Credit to SMEs (around 2.5 per cent productivity growth) is therefore reasonable and consistent with the stronger growth potential of technology-oriented investments. (See Annex for more details)

59 https://www.gov.uk/government/publications/insights-from-the-uk-innovation-diffusion-and-adoption-survey/insights-from-the-uk-innovation-diffusion-and-adoption-survey-executive-summary

60 https://www.productivity.ac.uk/wp-content/uploads/2025/01/WP049-Adoption-of-Digital-Technologies-and-Platforms-January-2025.pdf

61 https://www.bcg.com/press/24october2024-ai-adoption-in-2024-74-of-companies-struggle-to-achieve-and-scale-value#:~:text=BOSTON%E2%80%94%20After%20years%20of%20investing%2C,BCG

62 https://www.mittelstand-digital.de/MD/Redaktion/DE/PDF-Anlagen/Executive%5FSummary-EN%5FFinal%5FReport%5FEvaluation%5FMittelstand%5FDigital%5F2025.pdf?%5F%5Fblob=publicationFile&v=3

63 https://www.nist.gov/news-events/news/2025/03/mep-economic-impacts-boost-business-and-jobs#:~:text=At%20MEP%20Centers%20in%20every,resilience%2C%20continuous%20improvement%2C%20and%20more

64 https://assets.publishing.service.gov.uk/media/64b53a0c71749c000d89ec80/evaluation-of-the-growth-hubs.pdf

65 https://www.universitiesuk.ac.uk/sites/default/files/field/downloads/2024-09/opportunity-growth-and-partnership-a-blueprint-for-change%5F0.pdf

66 https://ec.europa.eu/information%5Fsociety/newsroom/image/document/2019-32/country%5Freport%5F-%5Fgermany%5F-%5Ffinal%5F2019%5F0D303AC9-00B0-5F1A-

A0DF3E5B4391E9B5%5F61206.pdf

67 https://www.contractsfinder.service.gov.uk/notice/8b12221f-0a6d-4a96-bee4-c25b4d0f9c79?origin=SearchResults&p=3

68 Growth Hubs have an approximate annual average between £234,285 and £470,000. There are 38 Growth Hubs in England with an approximate annual budget of £13 million. https://www.london.gov.uk/md3268-leap-and-growth-hub-funding-2024-25#:~:text=London's%20allocation%20of%20Growth%20Hub,the%20South%20East%20England%20region.

69 https://www.gov.uk/government/publications/the-wider-economic-impacts-of-emerging-technologies-in-the-uk/the-wider-economic-impacts-of-emerging-technologies-in-the-uk-html

70 https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/articles/managementpracticesandtheadoptionoftechnologyandartificialintelligenceinukfirms2023/2025-03-24

71 Firm-specific training has declined since the financial crisis, and organisational-capital growth has slowed from 7 to 2.8 per cent. https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/bulletins/investmentinintangibleassetsintheuk/2022

72 Efforts being developed under the Skills and Growth Levy and under the priority skills for 2030: https://www.gov.uk/government/publications/assessment-of-priority-skills-to-2030/assessment-of-priority-skills-to-2030

73 The 12-week course is already delivered through business schools, combines mentoring, peer learning and practical workshops and has had strong uptake and overwhelmingly positive feedback since launch in 2021. https://www.gov.uk/government/publications/barriers-and-enablers-to-advanced-technology-adoption-for-uk-businesses/factors-influencing-firms-adoption-of-advanced-technologies-a-rapid-evidence-review

74 This could include skills bootcamps, apprenticeships, vendor-led micro-courses surfaced through the trusted technology catalogue, industry-led AI training initiatives, and provision from local further-education institutions or national bodies such as the Digital Skills Council.

75 Approximately £6,750 in course fees per student plus £2,750 (40 per cent) to cover facilitation and programme management, with firms contributing £750 each. https://www.enterprisenation.com/learn-something/help-to-grow-mentors-national-awards/

76 Independent evaluation of Help to Grow: Management found a benefit–cost ratio of 2.3:1. Using this benchmark, an investment of £400 million over the four-year parliamentary period would yield total benefits of approximately £900 million. Distributed across the expected 40,000 participants, this equates to an average GVA gain of roughly £23,000 per firm. To translate this into a productivity effect, we focus on employing SMEs – the target size range of the programme – of which there are approximately 1.4 million in the UK, generating a combined GVA of around £786 billion. Assuming the 40,000 participating firms represent roughly 3 per cent of this population, and

that they experience the above productivity improvements, the implied average uplift in productivity is around 4.2 per cent. (See Annex for more details)

77 https://www.gov.uk/government/publications/beis-government-major-projects-portfolio-accounting-officer-assessments/help-to-grow-management-programme-accounting-officer-assessment-2021-html#:~:text=Based%20on%20this%20analysis%2C%20we,for%20money%20test%20is%20satisfied.

78 https://www.gov.uk/government/publications/insights-from-the-uk-innovation-diffusion-and-adoption-survey/insights-from-the-uk-innovation-diffusion-and-adoption-survey-executive-summary#key-findings-on-innovation-adoption

79 https://media.bethebusiness.com/documents/BtB%5FAmazon%5FWhitepaper%5F25Sep%5F2023.pdf#:~:text=SMEs%20lack%20a%20%E2%80%98go,28%2027%2025

80 https://www.walesonline.co.uk/business/5000-business-leaders-enroll-national-26551886

81 https://www.nolimits.ukri.org/partner/digital-boost

82 https://www.royalvoluntaryservice.org.uk/our-services/advice-support/guide-to-retirement/

83 https://www.techlondonadvocates.org.uk/about/

84 Help to Grow: Management has more than 4,700 mentors, and Digital Boost over 4,000 voluntary mentors that guide businesses in technology adoption. Tech London Advocates has community of over 15,000 entrepreneurs and industry leaders and The Royal Voluntary Service connects 55,000 retirees to volunteer opportunities.

85 The US SCORE programme mobilises over 10,000 retired executives to provide free mentoring, supporting the growth of 60,000 new businesses in 2024, with a return of $45 for every $1 of federal funding. https://projects.propublica.org/nonprofits/organizations/521067290/202541839349300419/full

86 We estimate that the peer-learning and mentoring network would generate an average productivity uplift of approximately 1.5 per cent among participating firms. This is the midpoint between two estimates around the impact of peer-learning, drawn from the Be the Business: Mentoring for Growth programme and the Made Smarter Adoption experience. (See Annex for more details)

87 https://www.gov.uk/government/publications/insights-from-the-uk-innovation-diffusion-and-adoption-survey/insights-from-the-uk-innovation-diffusion-and-adoption-survey-executive-summary

88 Singapore's SMEs Go Digital partners with universities and agencies to embed talent into firms for digital execution, Germany's Baden-Württemberg Cooperative State University alternates academic training with company placements, and Canada's work-integrated learning and co-operative education alternates classroom terms with paid work placements even integrating digital

internships into degrees.

89 Evidence shows that KTPs deliver between £4.20 and £5.50 in net economic benefit per £1 invested. Adopting a conservative 4.2:1 benefit–cost ratio, a £300 million investment over the remainder of this parliament would yield around £1.3 billion in additional GDP and £0.5 billion in tax revenue. Distributed across the 10,000 firms expected to participate over the period – around 4 per cent of all small and medium-sized firms (with 10 to 249 employees) – this equates to an average benefit of approximately £135,000 per participating firm, or a 5.8 per cent increase in productivity relative to each firm's average GVA of £2.2 million. (See Annex for more details)

90 https://www.enterpriseresearch.ac.uk/publications/the-state-of-small-business-britain-report-2024/

91 https://assets.publishing.service.gov.uk/media/688c89b4e8ba9507fc1b08cd/backing%5Fyour%5Fbusiness%5Fevidence%5Fannex.pdf

92 https://www.nao.org.uk/reports/business-support-schemes/

93 https://www.nao.org.uk/reports/business-support-schemes/

94 https://www.techuk.org/resource/industry-led-sme-digital-adoption-taskforce-release-final-report-with-uk-government-response.html

95 https://assets.publishing.service.gov.uk/media/6857e0995225e4ed0bf3ceb5/dsit%5Ftechnology%5Fadoption%5Freview%5Fweb.pdf

96 https://www.nao.org.uk/wp-content/uploads/2020/01/Business-support-schemes.pdf

97 https://media.bethebusiness.com/documents/BtB%5FAmazon%5FWhitepaper%5F25Sep%5F2023.pdf#:~:text=of%20support%20in%20general%20are,up%20to%20thre

98 https://www.enterpriseresearch.ac.uk/publications/what-kind-of-business-advice-improves-small-business-productivity/

99 https://www.business.gov.uk/

100 Costing is benchmarked against the UK government's One Login programme, launched in 2021 to integrate digital access across multiple public services. The platform-development component of One Login was budgeted at approximately £100 million (within a wider £400 million programme). Adjusted to 2025 prices, a comparable investment for the digital CTO platform is estimated at around £130 million by the end of this parliament. https://www.computerweekly.com/news/252506595/UK-governments-new-digital-identity-system-to-cost-up-to-400m (See Annex for more details)

101 https://www.imda.gov.sg/how-we-can-help/smes-go-digital

102 https://spotlight.digitalboost.co.nz/spotlight-3

103 Other countries have shown how transformative a digital identity can be. Singapore's Corppass allows firms to access over 130 services with a single identity, reducing administrative burdens and improving service delivery https://statrys.com/guides/singa company-formation/what-is-corppass, https://www.iras.gov.sg/digital-services/others/corppass; Canada's corporate-verific system has benefited 46 per cent of businesses surveyed in that country from improved security measures https://cfit.org.uk/ uploads/2025/03/CFIT-Blueprint-Report-March-2025-Final.pdf; in Europe, Estonia's e-Business Register has become the cor state, while the EU is mandating that member states provide businesses with interoperable digital IDs by 2026 https://www.rik business-register/e-business-register-portal, https://digital-strategy.ec.europa.eu/en/policies/eudi-regulation#:~:text=Under%20the%20eIDAS%20regulation%2C%20EU,services%2C%20eliminating%20unnecessary%20da

104 https://www.finextra.com/newsarticle/46571/most-smes-would-pay-for-a-digital-company-id-service

105 https://www.computerweekly.com/news/252506595/UK-governments-new-digital-identity-system-to-cost-up-to-400m

106 Costing draws on prior UK digital-identity initiatives. GOV.UK Verify cost approximately £154 million (2011 to 2018), while One Login, launched in 2021, was budgeted at around £400 million for full implementation. Adjusting for inflation and for the added complexity of a business-facing identity system, the expected total cost of the business digital ID is around £500 million by the end of this parliament. (See Annex for more details)

107 https://institute.global/insights/economic-prosperity/a-pro-growth-roadmap-for-business-tax-reform

108 International benchmarks range from simpler versions such as the "Sunny" chatbot in Denver, Colorado, for accessing public services, to more cutting-edge, multi-domain platforms such as Estonia's Bürokratt which is an interoperable network of AI-powered virtual assistants connecting all public agencies services, or Finland's AuroraAI which takes it further with a national AI network that proactively offers tailored, cross-sector services, public and private, based on user needs.

109 https://accesspartnership.com/wp-content/uploads/2023/03/unlocking-singapores-digital-potential.pdf

110 https://www.businesstimes.com.sg/singapore/smes/imda-launches-new-tool-help-smes-identify-business-solutions-quickly

111 https://www.madesmarter.uk/resources/news-made-smarter-adoption-kpi-statistics-fy202223-fy-202425

112 https://www.nao.org.uk/wp-content/uploads/2020/01/Business-support-schemes.pdf

113 Developing an AI CTO assistant for the UK is estimated at up to £20 million for a pilot phase – covering manufacturing and professional services – and up to £25 million when scaled economy-wide by the end of this parliament. Based on the Bürokratt reference and adding a range of £5-£10 million to include system training. Estonia's Bürokratt, which is an interoperable network of

AI-powered virtual assistants connecting all public agencies' services, has cost approximately €13 million over four years (2019; £15 million 2025). (See Annex for more details)

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