TECH REPORT SCOTLAND 2022 BY ADDLESHAW GODDARD

Produced in association with
University of Strathclyde's
Fraser of Allander Institute

ADDLESHAW GODDARD

MORE IMAGINATION MORE IMPACT

FOREWORD

It's been said before and confirmed again through the publication of this report, that by building the right transformational infrastructure and working collaboratively, we can create a digital Scotland that is good for the people, the economy, the environment and the government.

As a country we're agile enough to be able to seize the opportunity that the digital economy represents and big enough to make a real impact in order to show the world how it's done.

The sector is in a strong position and backed by the Scottish Government through the publication and full acceptance of the recommendations of the Scottish Technology Ecosystem Review. A huge tangible output of which has already been achieved – the allocation of £42m of funding for the Tech Scalers project. It aims to give companies the tools, connections, and space to scale at pace.

This report by Addleshaw Goddard - in association with Fraser of Allander Institute - also highlights the challenges our sector faces. The skills gap still poses a problem, with talent attraction a continued issue. If we are to grow the digital economy in Scotland, our education system must adapt to the rapid pace of change and produce digital citizens that can help take our ambitions forward.

The right infrastructure is crucial. It will give businesses the tools they need to build and grow in this new era. Digital has never been more important and the commitment to ensuring full fibre connectivity throughout Scotland is more important now than ever, if we are to create a climate in which new companies and ventures can spin up and scale.

Scotland's digital economy is also an integral component on our journey towards Net Zero. There is little doubt we will need more climate tech innovation to achieve our ambitions. In doing so, we will create jobs which deliver economic and environmental prosperity in tandem.

The report also highlights the ambition that is inherent in our sector. The will to iterate, adapt, grow and thrive. It shows the determination, leadership and innovation that is core to our success and our ability to pivot when it needs to.

The spirit and drive of our sector, coupled with the commitments of the Scottish Government give me hope, that someday soon Scotland will be a truly digital nation.

KAREN MEECHAN
CEO Scotland IS

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EXECUTIVE SUMMARY

It has long been clear that technology underpins the future of the entire economy, with the digital arena no longer an industry and sector distinct from others such as retail or financial services. As the web has expanded, communications infrastructure has developed and data and system storage has migrated to the cloud, technology has become intrinsic in almost everything we do. It is endemic; how this shift affects individuals, society and the economy is now paramount.

In his independent review, commissioned by the Scottish government in 2020, former Skyscanner chief Mark Logan undertook a comprehensive assessment of Scotland's technology sector and ecosystem. The result was a 34-point plan to establish the country as a centre for digital expertise and innovation on the global stage.

Key to delivering this were investment in skills and education, physical infrastructure and access to funding. Logan concluded Scotland's tech sector was then at a "pre-tipping point", requiring better connected networks to support technology businesses beyond the start-up stage and into the scaling phase.

Since then, the global pandemic, increasingly extreme weather events - and Britain's role in hosting 2021's COP26 climate change negotiations in Glasgow - have focused minds more than ever on the ways technology can help improve lives and the environmental legacy we leave.

Along with the first stage implementation of the Taskforce on Climate-Related Financial Disclosures - requiring large companies and pension funds to report climate risk exposure - the world has suddenly woken up to investment and business principles that have existed on the fringes of the global economy since the 1980s.

Governments, regulators, businesses and investors increasingly judge policy and purchase decisions through the ESG lens. Environmental, social and governance factors now have a place in the boardroom alongside financial returns.

The time is now to capitalise on the Scottish Government's initiatives, which have included substantial investment into reskilling and digital education at schools and universities, establishing five new *'tech-scaler'* hubs across the country, and making digital business grants available.

During the interviews carried out for this report, it became clear that industry leaders believe significant progress has been made since 2020 – something that has been both driven by the onset of Covid and yet hindered by the health, economic and global supply chain challenges that have accompanied it.

Building a robust infrastructure capable of supporting the massive shift from copper to fibre broadband and facilitating access to 5G and the cloud is absolutely fundamental to Scotland's future success. Encouraging international investment into the country is therefore essential, with industry leaders acknowledging room for improvement in Scotland's engagement with other major trading partners.

The evolution in the way we all approach data, the use of personal data and the public perception of privacy also came across strong in discussions.

During our time gathering senior executives' insights for this report - putting concerns about the overall economy to the side - optimism in relation to technology change was a theme consistent throughout. The opportunity is there, the policy support is there, demand is rising – now we get on with it.

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SECURITY & DATA

International trade dependence and national security have risen to the top of governments' priority lists in 2022, with the Russian invasion of Ukraine halting grain exports and disrupting oil and gas supplies across western Europe. The UK's energy dependence on external sources has been exposed for the risk it represents, not just geopolitically but also within the context of national, commercial and personal financial stability.

Every contributor to this report noted security as the single biggest challenge facing the tech sector. From data security, hacking, cyber attacks on both businesses, public services and governments – preventing malicious penetration into systems was deemed a priority.

Contributors varied in the risks identified.

One pointed to geopolitical risk and international dependence, with Scotland particularly vulnerable to limited data transfer channels. The poor physical availability of data transfer infrastructure was raised as a potential "political weak point for Scotland", with questions around national security and risk front of mind.

Another focused on the corporate and domestic security challenges facing businesses and governments within the UK, with the pandemic triggering a wholesale restructuring of the employment market. Remote working continues to pose serious cyber risk for companies, they noted, with "far too little proactive investment" into cyber security at corporate and public sector level.

"Companies aren't always disclosing hacks and data breaches," they said. "Investment in systems fit to protect organisations still comes after an attack in most cases."

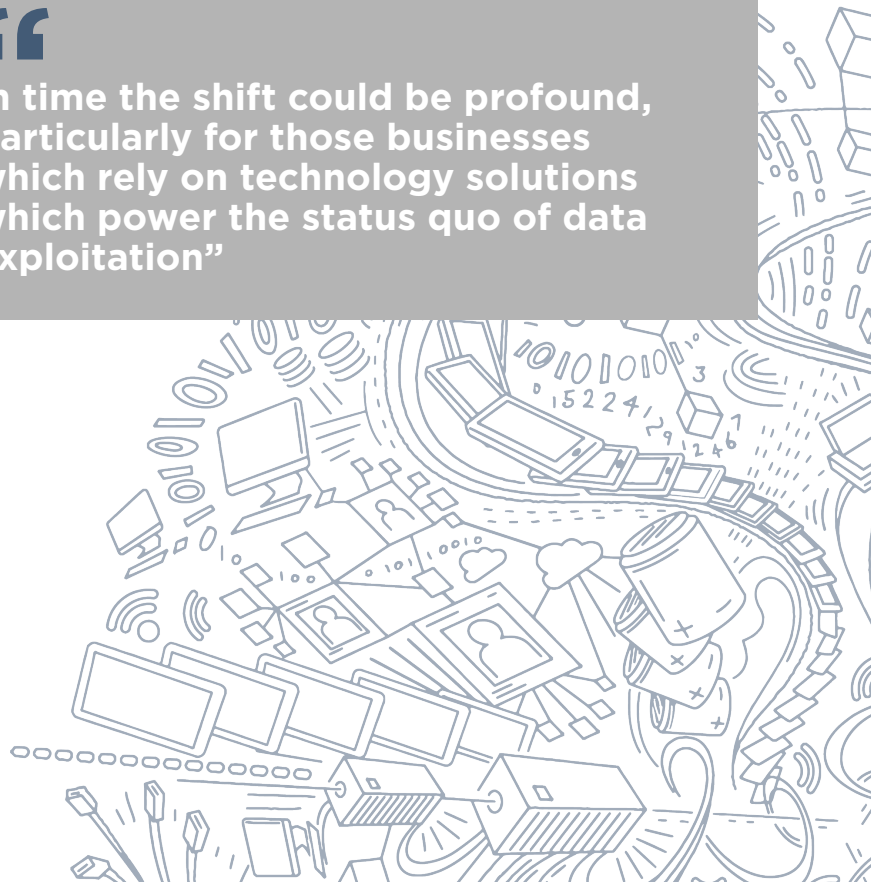
Data security is already more complex and nebulous as the cloud develops and more data is stored remotely, with one interviewee calling it a "huge security risk for companies". The physical infrastructure including data centres and fibre networks are also vulnerable to attack, posing questions about how to protect local infrastructure data security.

There was a suggestion that government, both in Westminster and in Holyrood, had over-focused on the delivery of digital infrastructure for consumer use. "They need to refocus on enterprise / business and commercial investment as that adoption will support consumer benefit."

DATA AND PRIVACY

In a connected theme, a number of contributors noted the need to pay attention to the increasing awareness by individuals of the commercial exploitation of their personal data by technology businesses. 'Data Enlightenment' - a term adopted by one contributor - has the potential to 'change the way the system works' as technology solutions come to market which empower a movement of individuals wishing to take control of their data and monetize it themselves displacing the status quo. It was further commented:

> **"In time the shift could be profound, particularly for those businesses which rely on technology solutions which power the status quo of data exploitation"**



RETHINKING INFRASTRUCTURE, ENVIRONMENT AND SOCIETY

For Scotland to survive and flourish in the global technology race, all contributors to this report agreed that investment and infrastructure are key.

One interviewee noted Scotland's ambition for connectivity "is just not yet supportable" with the current infrastructure. Another pointed to the mismatch between development costs associated with fibre rollout, required to support 5G and access to the cloud, and customer tolerance on price.

Full fibre provides the fastest and most reliable broadband and is far more energy-efficient and less carbon intensive than copper networks. The provision of 5G broadband is reliant on accessible fibre, without which download and upload speeds are significantly impaired.

"Customers won't pay 10 times more for 5G that's 10 times faster," they noted. "That money has to come from somewhere else."

This observation cuts to the quick. The point of faster broadband speeds is not to stream video without the headache of buffering, but to protect social mobility and access to education, transport and employment.

Fibre and 5G will become intrinsic to the provision of private and public services across the country. As consumers and businesses rely more and more on cloud storage and, therefore, access to it, this connectivity provision becomes critical.

Significant funding comes from the UK Infrastructure Bank, which is now working jointly with private sector investors and commercial fibre providers to extend the fibre network to rural and remote locations across the whole of the UK.

Earlier this year Holyrood extended 100% non-domestic rates relief on newly laid fibre in Scotland until March 2034, this as part of its Full Fibre Charter in a bid to secure new investment. A number of private operators are now engaged in the rollout including Axione, CityFibre, Openreach, Borderlink, Cloudnet, Hyperoptic, Lothian Broadband Group and Virgin Media O2.

79%

tech industry firms reporting a positive business outlook for 2022

76%

tech firms planning to recruit graduates in 2022

61%

Scottish businesses investing in communications tech innovation since 2020

RETHINKING INFRASTRUCTURE, ENVIRONMENT AND SOCIETY

Full fibre coverage is one factor in communications and connectivity infrastructure. The other is the role of digital assets on the ground to support evolution towards smart cities and sustainable, reliable connectivity across the nation.

Data centres have historically been few and large, with central banks of servers storing vast and rapidly increasing quantities of data. Statista figures show worldwide data storage in 2015 was 171 exabytes. In 2021, this had grown almost seven times over to 1,327 exabytes. To understand the scale of this volume, one kilobyte is equal to 1,024 bytes, one megabyte to 1,024 kilobytes, one gigabyte to 1,024 megabytes and one exabyte to one billion gigabytes.

FinancesOnline estimates that in 2020 2.5 exabytes were created every day, with data creation and storage now a critical management challenge. Several contributors argued a wholesale rethink of how connectivity and comms infrastructure is supported and delivered is needed. “The existing systems are not fit for purpose,” noted one.

The pandemic exposed the stark socio-economic disparity created by what one contributor called “the digital divide”.

Physical infrastructure availability and access also has social implications. Hardware including smartphones and computers is fundamental to connectivity; so is proximity to fibre. Concern that unequal infrastructure rollouts, influenced by commercial factors, could lead to a new “digital poor” is growing.

“The effect that has on local economies and communities will be extreme,” argued one interviewee. “It is a compelling argument for all social housing and schools to be prioritised for fibre to the premises.”

72%

tech companies reporting increased sales in 2021 compared to 44% in the previous year

56%

tech firms reporting engagement in international markets, a small dip from 60% in 2020

“LIGHTING THE WAY”

The environmental impact of social media and the vast quantity of data that must be stored and kept available for instant access is a central challenge facing governments and businesses globally. How to cut server usage and address the need for enormous substations and cooling power requires “fresh thinking”, according to one interviewee.

“Few, large substations and radio towers are history. Legacy infrastructure and tech is not built for the speed and volume of data transfer today. There is a desperate need for creative thinking on how to repurpose other existing infrastructure, thinking locally.”

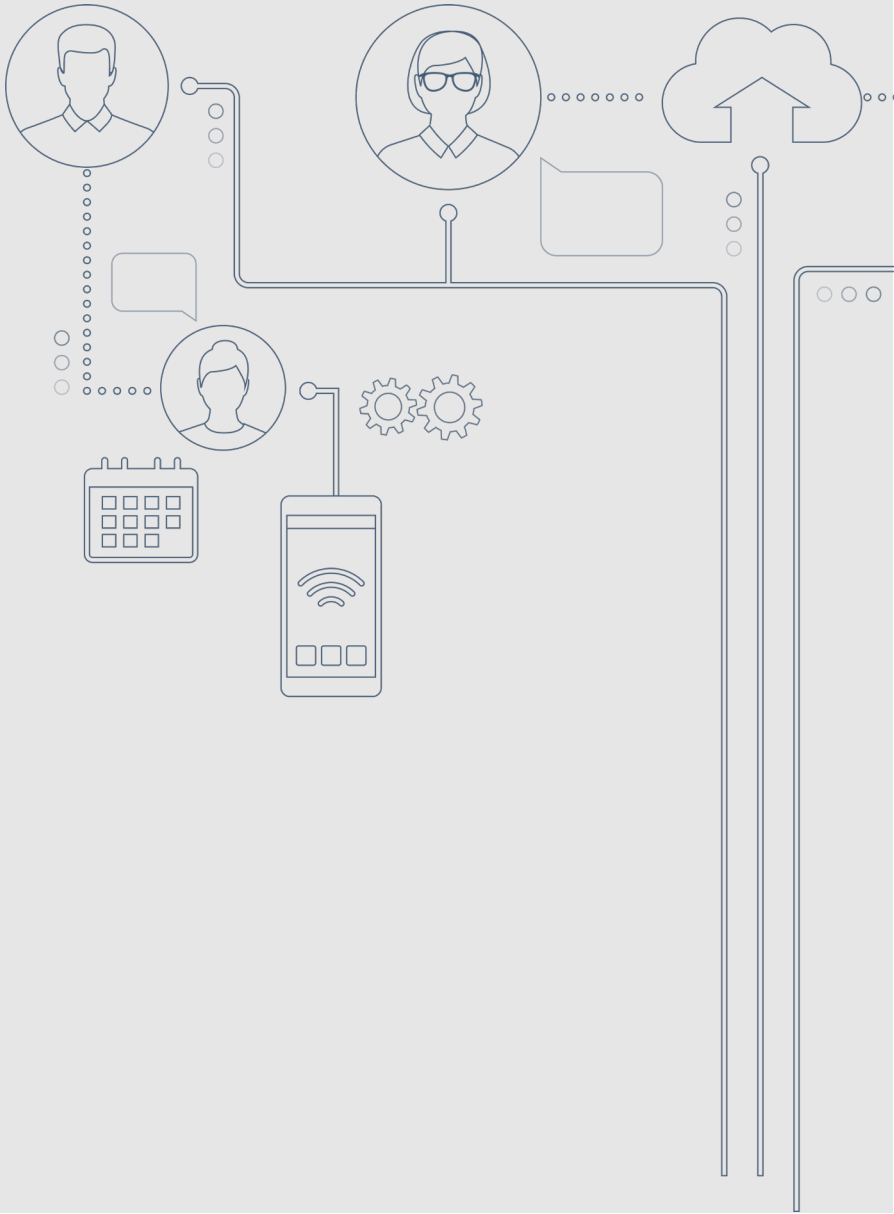
The efficiency, latency and dependability of hardware interacting with cloud network is critical but comes with high cost implications. The acquisition of land to host traditional mobile masts, transmitters and 5G radio equipment is expensive and reliant on private property owners and local councils to approve planning permissions. Expanding 5G connectivity is dependent on this infrastructure however.

Understanding the role of digital assets in offering a broader social value than simple connectivity is therefore gaining traction. A number of test cases have show an encouraging development of thought.

Take a lamppost. It offers light and connectivity to the energy grid. In some parts of the country, electric vehicle charging points are now provided by local authorities in partnership with private operators through lampposts, particularly in areas with mainly on street parking.

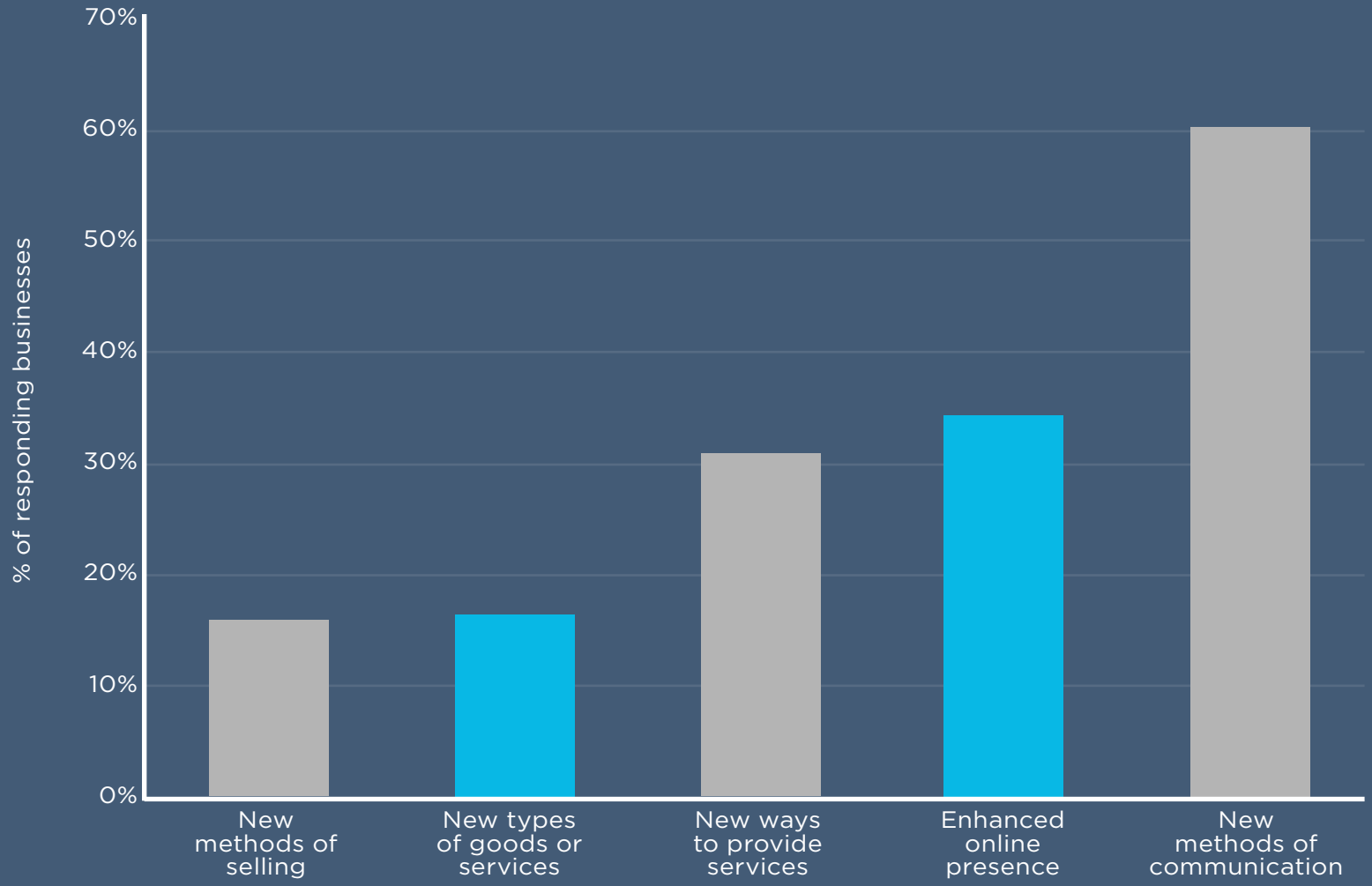
In late 2021, the UK government Department for Digital, Culture, Media & Sport announced a £4million competition to come up with “simpler and quicker solutions for mobile companies to use publicly-owned buildings and curbside infrastructure - such as CCTV poles and traffic signals - to host 5G radio equipment”. What stage is this at?

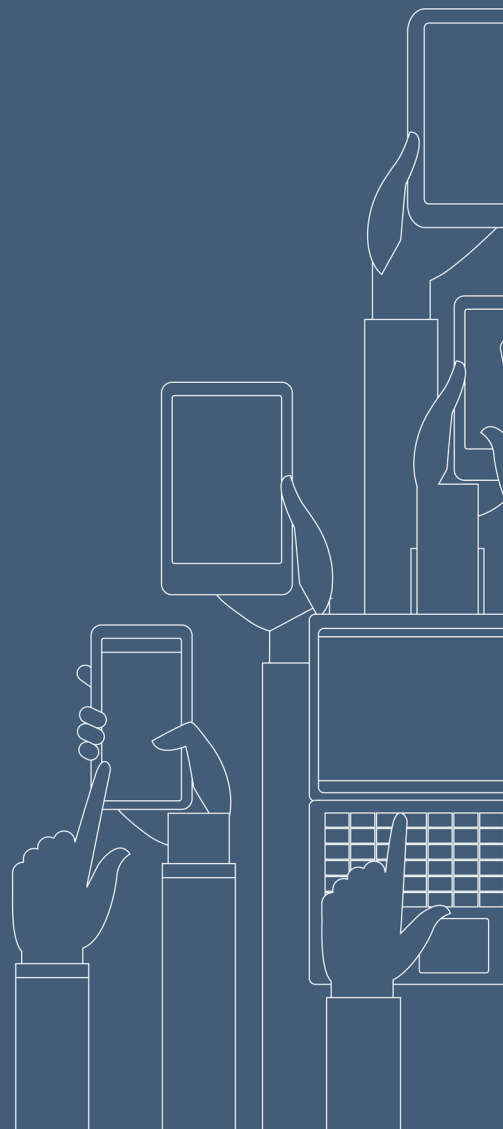
“There are enormous social benefits on offer if industry can harness and use our existing infrastructure networks, repurposing it to support future connectivity,” said an interviewee. “Using connectivity to improve safety for women, children and any vulnerable person is just one way that seems obvious. There is the potential to use that network to reimagine town planning, transport service provision and employment access too.”



FACTS & FIGURES

TECHNOLOGIES ADOPTED OR ENHANCED BY SCOTTISH BUSINESSES SINCE 2020

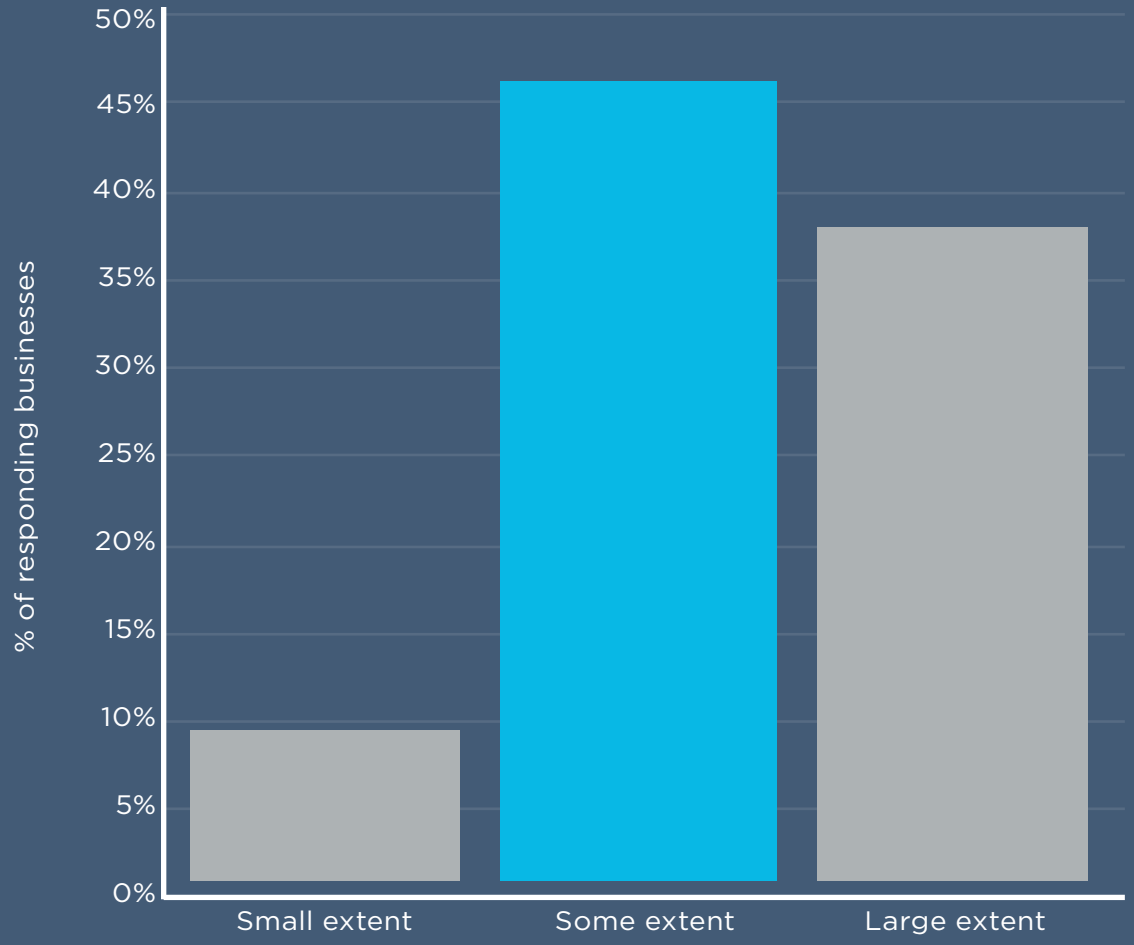




Source: Fraser of Allander 2022, Q1 Business Monitor, Addleshaw Goddard, Scottish Technology Industry Review, Scotlands)

FACTS & FIGURES

TO WHAT EXTENT DID THE PANDEMIC ACCELERATE YOUR PLANS TO MAKE A MAJOR PART OF YOUR BUSINESS MODEL DIGITAL?



6% of firms responded with N/A so percentages won't sum to 100%

- 40% of responding businesses agreed that the pandemic has accelerated their plans to make a major part of their business model digital, with 38% reporting that there was no acceleration of plans for their firm*.
- This acceleration of digital plans was most evident in the transport and storage sector (53%), followed by the information and comms (47%) and the accommodation and food services sectors (40%).
- Of those firms who said that their plans had been accelerated, 38% said that it had been to a large extent, with a further 46% reporting that it was to some extent. The remaining firms (10%) reported that it had been to a small extent.

* 22% of firms responded N/A therefore percentages won't sum to 100%.

THE METAVERSE AND A NEW ECONOMY

The metaverse - a graphic representation of reality that allows people to work, play, shop and socialise using a browser or headset - has huge potential to shape the global economy.

While it remains poorly understood by the majority of consumers globally, contributors observed, business is waking up fast to the commercial opportunities available in a virtual reality. How to maximise commercial opportunities on offer within the metaverse is now becoming integral in business planning across most industries, according to one interviewee.

Enabling virtual physical interaction – encrypted and therefore secure – without reference to physical space redefines globalism, commerce and crucially, consumerism. While high streets, television, websites, social media, video sharing sites and apps have become saturated by content, advertising and competition for visibility, the metaverse is at an earlier stage and therefore still relatively underexploited.

This is rapidly changing, noted one contributor, who said the use of virtual reality by individuals is changing how programming and the creation of content is evolving.

“The games industry influence on the metaverse is immense and is already democratising content creation and encouraging far more diverse creativity into how it develops. Its growth becomes exponential and doesn’t rely on individuals having technical knowledge and aptitude in coding.”

They described “the evolution of the internet” from two dimensional observation of sites, to three dimensional interaction through social media. “Virtual reality is a fully immersive experience and the opportunities that offers is driving massive entrepreneurial development internationally.”

CASE STUDY: JP MORGAN

Global investment bank JP Mortgage staked its claim as the first major bank to set up shop in the metaverse, announcing in February 2022 it had opened its “Onyx lounge” in blockchain based metaverse Decentraland.

At the start of the year, the bank estimated the global value of non-fungible tokens – a digital certificate of ownership – had reached £34billion. The average value of a “parcel” of virtual land, meanwhile, doubled in the second half of 2021 from £5,000 to £10,000.

Onyx, the bank’s brand of Ethereum services, provides a virtual shop front for JP Morgan’s clients and customers to interact and transact online, marking a watershed in virtual asset ownership and a new economy.

OUTLOOK - WHERE NEXT?

Business confidence is high in the tech sector, with all contributors to the report strongly of the view that Scotland is well placed to provide an environment that allows start-ups to flourish and more established businesses to scale organically.

SKILLS AND EDUCATION

Every single interviewee raised concerns about the lack of skilled resource to support the growth in technology that is currently possible. One cited a shortage of skilled graduates coming through, another pinpointed a global talent shortage which is pushing up salaries and encouraging a brain drain of talent internationally away from Scotland. This was hurting small and medium sized tech firms particularly as they lacked the financial resource to compete for highly sought after labour.

The withdrawal of the UK from the EU was also referred to as “challenging” with the pandemic adding to a fall in the number of foreign students choosing to study in the UK and Scotland. Echoing the Logan Review recommendations, several contributors said technology and computing education needs to start at school from age five. Diversity and inclusion remains problematic, with all contributors agreeing “not enough women” were attracted to the sector.

One contributor said specific thought must be given to how Scotland “reaches the right people” to encourage skilled fund-raising talent into the sector, along with project managers and sales and marketing professionals.

13,000

digital technology jobs created every year in Scotland

31%

tech firms focusing on cyber security business opportunity in 2022

OUTLOOK - WHERE NEXT?

A number of key considerations were laid out as presenting both opportunities for businesses and the Scottish economy, as well as potential challenges.

INTERNATIONAL INVESTMENT

All those interviewed for this year's report reported confidence in technology business opportunity, but cautioned that careful attention to matching investors with companies in need of funding must be made a priority to translate potential into success.

"Scotland has so much to offer in the tech sector, the expertise in this country – especially in the energy and climate tech space – is second to none around the world," observed one contributor.

"But we need to get savvy about how we export that talent – getting the message out to global investors that Scotland's tech sector is worth investing in has to be government's priority."

31%

Scottish businesses investing in new ways of providing services since 2020

75%

Scottish business reporting a permanent change in the way their business operates since 2020

WITH THANKS TO ALL THOSE WHO CONTRIBUTED TO THE THE TECH REPORT SCOTLAND 2022BY ADDLESHAW GODDARD, INCLUDING UNIVERSITY OF STRATHCLYDE'S FRASER OF ALLANDER INSTITUTE, SCOTLANDIS, SCOTTISH FUTURES TRUST, TECHNOLOGY SCOTLAND, CALNEX SOLUTIONS, COMMSWORLD AND OTHERS.

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