Digital Vision for Scotland
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The dramatic effects on Scotland of digital technologies are evident every day. Recent research shows that take-up of digital devices has been happening faster in Scotland than in any other part of the UK. Businesses in Scotland – as in the rest of the UK – are transforming their operations, often radically, to keep pace with rapid technological advances. We are on the verge of another revolution as artificial intelligence, combined with the Internet of Things, robotics and, soon, quantum computing, enter the mainstream.

There is now great potential for Scotland to create a competitive advantage in today’s global economy. This era of digital change brings with it huge opportunity to enhance citizens’ lives and enable organisations to deliver their key priorities. This paper looks at just some of the opportunities and challenges on the journey of digital transformation for Scottish businesses, infrastructure and public services. My team and I look forward to helping to meet those challenges and deliver the potential of digital technologies in Scotland.

The pace of digital change is now so fast that today’s organisations need to find ways to operate in a permanently disrupted state. In Scotland, new digital enterprises are being formed in the face of these demands, with world-class examples of innovation and digital leadership. Scotland’s expanding tech ecosystem, globally recognised universities, its talent and research, together with government support through its evolving Digital Strategy are all essential elements of Scotland’s response to the digital age.

Of course, there are challenges. Still more needs to be done to continue to build digital inclusion, grow digital maturity in all sectors, and ensure cyber security and resilience as the threat landscape evolves. There is now a drive to reshape and develop the workforce as technologies serve to redefine job roles. Through partnerships between industry and government, we can share experience and solutions to accelerate progress. Collaboration and innovation are key to realising Scotland’s ambition to be a vibrant, inclusive, open and outward-looking digital nation.

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Scotland at the heart

5.4 million
Scotland’s population reached 5.4 million in July 2018

95.5%
of homes and businesses in Scotland can access Digital Scotland’s Superfast Fibre Broadband

30
The Scottish Government is committed to ensuring that every premise in Scotland can access broadband speeds of at least 30 megabits per second by 2021

150,000
Digital technology roles set to rise to 150,000 by 2023 across Scotland

£1bn
Better data-sharing can generate new insights, stimulate new ideas and deliver potential public-sector savings of over £1 billion

£10.3bn
Digital sector contributed over £10.3 billion to the Scottish economy in 2017

15
Scottish universities provide computer science courses
of businesses are taking steps to develop their employees’ digital skills⁴

of women account for digital technology roles across Scotland, compared to 39% working in other skilled occupations⁴

Directors and Chief Executives from across the public sector have participated in the Digital Leadership Programme⁵

of ScotlandIS members found that offering flexible working helped them recruit more women into IT⁶

Digital technology businesses in Scotland increased by 60%, to around 3,500 companies between 2010 and 2017⁶

The digital sector’s gross value-added is forecast to grow by 38% by 2024, making it the fastest-growing sector in Scotland⁶

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⁵ beta.gov.scot/policies/digital/digital-transformation
⁶ www.holyrood.com/articles/news/outlook-positive-it-sector-scotland-scotlandis-survey-finds/?utm_medium=email&utm_campaign=Holyrood%20Morning%20Roundup%202103&utm_content=Holyrood%20Morning%20Roundup%202103+CID_fd04e6a5c144c2d318b694c04a999b3&utm_source=Email%20newsletters&utm_term=Outlook%20positive%20for%20IT%20sector%20in%20Scotland%20ScotlandIS%20survey%20finds
Who leads in a digital world – policy-makers or users?

It wasn't too long ago that many private and public service providers were developing channel strategies that attempted to control how services would be provided to their customers. Many were, and still are, acting on the belief that it was the provider, rather than the user, who could decide how and where their services were consumed.

Then things changed, and as many companies have discovered to their expense, the balance of power shifted and customers started voting with their feet. At the same time, people recognised the potential for their complaints to instantly reach an audience of thousands as well as the ears of local politicians. Who do customers complain to now – their service provider or Twitter?

Digital by default or digital disruption
Despite public-sector organisations’ efforts to address this shift, a review of published digital strategies quickly identifies that for many, digitalisation has only focused on developing more interactive websites and tapping into social media channels.

Too many private sector companies have already taken this short-sighted approach to their peril. By being too late to adapt, or by failing to recognise that digital disruption is turning well-established business models, markets and services on their head, many household names have been rendered obsolete. Those who have survived have done so by radically overhauling and reinventing the way they perform every aspect of their business. They have applied digital thinking to their assets, properties, supply chain and most importantly by upskilling and retraining their people.

Some public bodies are still largely dependent on websites as their main or only digital channel. These organisations have no single view of their customer (that is, all of the services that are provided to the same individual), or any understanding of their personal needs or preferences. Compare that to the companies who are driving digital disruption with their ability to predict and satisfy the needs of millions. They do this by combining mass customisation with powerful analytics, providing the ultimate tailored experience and often at a much lower cost than their traditional competitors.

Ask anyone to name the world’s leading digital companies and expect to hear the same collection of brands. Ask the same people for an example of a good digital experience they have received recently from a public service provider and the answers will be more mixed.

Agile governance
Problems with several recent high-profile IT projects delivered using traditional ‘waterfall’ IT development methods have also highlighted the need to modernise approaches to managing complex technology developments. Agile is the means to deliver change with the pace and flexibility needed for the digital age; the reality is that traditional governance and capital approval processes cannot operate alongside this new more responsive, incremental approach.

Some public procurement practices, which can take up to a year to complete, can lead to technology solutions becoming outmoded by the time they are finally procured and potentially obsolete by the time they are introduced into service. Compare that to how often your favourite digital platform for shopping, entertainment, banking or booking travel is overhauled to keep pace with the latest consumer demands and technology developments.

Doing things differently
There are three key approaches that digital leaders consistently adopt.

- Successful digital companies put the customer in control of their services, by using consumer trends and behaviours to drive the direction of their business instead of being restricted by established policies.
- Digital is at the heart of successful modern businesses and is not exclusive to a centralised department of experts. It is now recognised as the lifeblood of every successful company’s future. Digital skills are embedded throughout their entire organisation and digital thinking drives every aspect of their value chain.
- As well as adopting agile methodologies to develop new technology solutions, digitally mature organisations also adopt agile governance, decision-making processes, and an agile culture. When it comes to procurement, they select IT suppliers on their ability to partner, innovate and align with their desired business outcomes.

Each of these approaches requires current mindsets and established protocols to evolve. Digital technologies offer public services a means to meet some of their most urgent priorities. These technologies are at their most powerful when they are embraced in a way that truly transforms organisational cultures and ways of working.
As a key driver of economic and inclusive growth, digital technology is transforming the way we live our lives. The Scottish Government is committed to ensuring that Scotland becomes a leading digital nation and we are committed to ensuring our future workforce and businesses are fully prepared and ready to embrace the digital revolution.

Derek Mackay MSP, Cabinet Secretary for Finance, Economy and Fair Work, Scottish Government

I want everybody to be secure, included and confident in the digital society that Scotland will become.

Fiona Hyslop MSP, Cabinet Secretary for Culture, Tourism and External Affairs, Scottish Government
Making Scotland a leading digital nation

The Scottish Government, with its Digital Strategy refreshed and published last year, has a bold ambition to ensure Scotland is ‘recognised throughout the world as a vibrant, inclusive, open and outward-looking digital nation’. This places a strong emphasis on developing new technologies and embedding a ‘digital first’ approach to everything, from public service reform to economic growth and future skills policy.

Connecting the nation
Given Scotland’s geography, there has been a particular focus in recent years on improving connectivity and digital infrastructure. The 2017/18 Programme for Government aims for Scotland to be “fully digitally connected” by 2021, by exceeding a target for 95% of properties to have access to fibre broadband and taking forward the ‘Reaching 100%’ project to expand superfast broadband. Programmes such as the Mobile Connectivity Action Plan look to improve the telecoms network and address ‘not spots’ for wi-fi and 4G mobile coverage.

These initiatives and the overriding vision of Scotland as a world-class digital economy are to be welcomed. Yet there is more to do. Superfast broadband coverage for SMEs and digital skills shortages for both the public and private sectors are a pressing concern across the UK, as is the need to diversify the future workforce. The digital economy in Scotland is already worth an estimated £4.45 billion, but there is enormous potential for further growth if some of these issues are tackled.

Economic impacts
Digital services are an essential part of the wider business services industry. According to research by Oxford Economics on behalf of the BSA, business services account for 10.5% of jobs and 9.5% of Gross Value Added across Scotland. This economic impact is not just based in Edinburgh or other cities but spread across the board - accounting for at least 6.5% of jobs in every part of Scotland, and in some cases this figure reaches 20%. This demonstrates the industry’s vital role in the Scottish economy and the contribution it can make in delivering a digital Scotland.

As a major employer of apprentices, business services companies are training the future workforce, equipping them with both the digital and non-digital skills needed to thrive. BSA members work with extensive supply chains and through their contracts can improve access to technology and innovation for SMEs and local communities. Above all, these companies are at the forefront of digital innovation through their service delivery across the public and private sectors - providing information dashboards to hospitals, modelling building information in business headquarters and constructing the next generation of smart infrastructure in cities across the UK.

Increasing collaboration
Healthcare is one area the Scottish Government, through its Digital Health and Social Care Strategy, is seeking to harness the benefits of digital transformation. It outlines a vision where citizens have clear and simple digital access to services. Digitisation in health and social care has the potential to improve efficiency and reduce cost but more importantly create genuinely ‘person-centred’ services. Government alone cannot achieve this transformation. BSA members deliver a wide range of innovative, cutting-edge technologies both to NHSScotland and health providers across the globe, from telehealth solutions to the improved collection and use of data. Realising a digital vision for healthcare in Scotland, as in other sectors, is not simply a matter of technology but also requires culture change and collaborative working.

Scotland has taken significant strides to become a leading digital nation within the UK and Europe. To fully realise its ambitions and deliver a lasting digital vision will require even deeper collaboration across the public and private sector between citizens, businesses, local authorities and central government in the years ahead.

The British Services Association (BSA) is a policy and research organisation. It brings together all those who are interested in delivering efficient, flexible and cost-effective service and infrastructure projects across the private and public sectors.
Digital transformation has the potential to deliver improved outcomes for people and is already revolutionising how infrastructure is being designed, delivered and maintained. Better data means better information and enhanced long-term decision-making. Everyone in the built environment - from design to operation and use - stands to benefit if we make best use of our information resources, collaborate and share best practice in a rapidly changing industry.

Sara Thiam, Regional Director, Institution of Civil Engineers Scotland
Accelerating Scotland’s digital revolution

The scale and pace of change in the digital era is evident not just in new and emerging technologies, but in the way organisations function. Over the last decade, public and private sector organisations have been focused on achieving some level of digital transformation. This too is changing. It’s notable for Atos that we’re increasingly engaged with enabling our customers to remain in a constantly adaptive end-state if they are to survive and thrive amid ongoing disruption.

**Useful indicators**

Scotland’s digital vision is also evolving. The Government’s latest digital ambitions are encapsulated in its Digital Strategy to be recognised as a vibrant, inclusive, open and outward-looking digital nation.1 While the Strategy has a number of components, to gauge the implementation of Scotland’s digital ambitions, there are two indicators worth examining.

The first is a global Digital Evolution Index,2 which plots the countries whose digital economies are moving fast and those whose might be in trouble. It paints an interesting picture, and although there are many countries behind the UK when it comes to digital, there are others – Singapore, UAE and New Zealand – who are ahead. There are lessons for Scotland here; all three of those digital leaders are relatively small countries who have the advantage of agility. Given that New Zealand is comparable to Scotland in geography and population size, I’ve looked more closely at how it has been so successful, such as its effectiveness at identifying the economic benefits of digital, with an emphasis for organisations on higher revenues and faster growth.

The second indicator is Scotland’s Digital Economy Maturity Index,3 which measures and categorises the digital maturity of Scottish businesses. This shows that although businesses exhibit a wide range of digital maturity, between 2014 and 2017, there was no significant increase (with a rise, for instance, from 3% to 7% of organisations in the highest two categories of digital maturity). One stand-out statistic is that 67% of Scottish organisations say they have a skills gap in relation to digital (rising to 72% for the most digitally mature).

**Key priorities**

So, while Scotland’s digital ambitions are important, tangible and clearly articulated, there are signs that there’s still some way to go – and opportunities now to step up the pace of digital evolution. As an outward-looking country, Scotland can learn from others’ experiences and focus on three key priorities.

1. **Accelerate adoption and exploitation of digital by organisations.** There are opportunities now to develop a more coordinated approach to evaluating and increasing digital maturity. At Atos, for example, we use a digital maturity framework that enables organisations to identify what they need to do strategically, culturally, organisationally, and in terms of capability. This has proved effective in helping to understand strengths, opportunities and gaps, as well as to articulate more clearly the enterprise merits of digital. There are also opportunities to accelerate and share the experiences of government agencies and digital leaders as exemplars of digital adoption.

2. **Close the skills gap.** Given Scotland’s educational credentials and resources, there is the potential to excel here. Firstly, the education system needs to be further developed to fully exploit digital content and tools, such as digital learning platforms and materials from global providers – not just to learn digital skills but to develop the adaptable workforce of the future. Secondly, schools, universities, government and industry partners need to find new ways to ignite Scotland’s entrepreneurial spirit and inspire, encourage and raise awareness of digital opportunities, just as Scandinavian countries have done.

3. **Develop a systems leadership approach to manage high levels of complexity.** With continuous disruption the new norm, organisations in every sector must operate in a context of ongoing volatility and uncertainty. This creates fresh leadership challenges and the need to take a more systemic approach to evolving Scotland’s digital economy. Systems leadership means thinking, planning and implementing activities and interventions in a more holistic, connected and integrated way. By recognising all the factors at work and understanding their interdependencies, much more can be achieved – just as Finland has done with its improvements to healthcare, and now education.

Scotland clearly has the vision, talent, capabilities and creativity to be a thriving digital economy. While advances have certainly been made, it’s time to accelerate the journey and coordinate progress in speeding up the adoption and exploitation of the digital revolution, closing the skills gap and developing a systems leadership approach to realise Scotland’s full potential.

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2. Digital Evolution Index 2017, The Fletcher School at Tufts University and Mastercard
3. Scotland’s Digital Economy Maturity Index 2017, Ipsos MORI Scotland on behalf of the Scottish Government, March 2018
“Digital innovation doesn’t have to mean digital invention. Business can reap the benefits of digital enablement by embedding technology systems within existing business practices, enabling faster knowledge exchange, better customer service, streamlined supply chain and increased market share. Key to this is to ensure workforce training and reskilling to ensure people are equipped to take on opportunities around digital disruption.

Nora Senior, Chair Enterprise and Skills Strategic Board, Scottish Government

As a Scot living in Scandinavia I often find myself thinking “Scotland should do this”. Scandinavia has so much in common with Scotland; geography, relative size, education and global cultural impact but from a digital perspective there is much to learn. It’s predicted that Sweden will become the first cashless society, Denmark’s centralised ID system offers a unified digital channel for all citizens, even ex-pat Scots! The Scandinavian digital model is supported by deep public and private sector partnership, something Scotland does well.

Alasdair Anderson, Executive Vice President, Nordea"
How can local authorities embrace digital?

Local government in Scotland, as elsewhere, faces complex challenges to meet the demand for services while delivering cost savings. Radical, transformational change in the way that local authorities deliver services is necessary to increase public sector productivity, drive out waste and meet key policy objectives.

In parallel, citizens are demanding improved quality, more information and greater integration from the services they receive locally. And in Scotland we face additional challenges: the specific issues of geography, social inequality and demographic changes all increase demands further.

Digital innovation must play a key role in addressing these challenges, but the question is how to enable digital transformation in such a complex, highly-pressurised environment with so many variables. At Atos, we believe in four core principles of excellence to unlock new digital opportunities.

- **Focus on the Customer** by maintaining focus on the service user as the person around whom all services should be designed, built and provided. In applying this principle to local government, the benefits of new technology, cost savings and efficiency gains must all be clearly visible to the citizen, and be measurable in terms that are relevant to them, not the provider.
- **Foster greater Collaboration**. For local government, for example, collaboration between local authorities, health, education, emergency services and other agencies can unlock value from the data they hold by using analytics tools and techniques. Working together also creates opportunities to share learning and increase the use of shared services and common technology platforms to reduce costs.
- **Be Brave** in embracing new technologies, changing approaches and challenging established thinking. This is the key to successful innovation. There is little benefit from technology investments if processes and structures are not also transformed and improved. For local government, this encompasses everything from changes to procurement, delivery and support services to the wholesale transformation of established service models via new channels and practices.
- **Learn Fast** by gaining valuable insight and understanding digital possibilities, by developing the skills and capabilities needed to deliver, and staying up to date and informed in a fast-moving world. This is also about becoming agile in delivery and being able to continually adapt as new information or understanding emerges.

Atos employs these principles in our own approach to digital transformation, using them to ensure that we harness all opportunities to develop, capitalise on the latest technology advances and maintain sight of our objectives. For local authorities, whatever their stage of digital maturity, we believe in using this framework to evolve and embrace digital thinking, enabling the radical transformation that is now needed.

“We will achieve our vision that, by 2020, all councils in Scotland will be digital businesses.”

Lorraine McMillan, Chief Executive, East Renfrewshire Council and Chair of the Local Government Transformation Board
Building digital inclusion

There are a multitude of forces driving the adoption of new technology. Availability, commoditisation, pay-as-you-go contracts, minimum upfront investment, emerging technologies, trends and citizen demand have all influenced and created new products and services over the years.

The pace of change and technology adoption is faster now than ever. For Scotland, there are three compelling reasons which mean that now is the time for public services to take advantage of the opportunities that digital transformation brings to create a new relationship with citizens:

1. Reduced budgets
Scottish Government targets and ongoing cost pressures mean that Local Authorities and other public services in Scotland will be required to deliver ‘more for less’ in the years ahead. To face the challenges of increasing public expectation, population growth and value for money, leadership within Scottish public services must be decisive, brave, learn fast, leverage innovation and accelerate collaboration between silos across all sectors.

2. Increased citizen demand and expectation
Many Scottish citizens expect a personalised and digital public service, tailored and predictive – just like their Amazon account. Receiving excellent online services or even using mobile apps that exceed expectation used to be a pleasant surprise. Yet now, Scottish citizens are beginning to want much more from technology in all areas. Our citizens are digitally maturing and will soon simply expect their local councils, hospitals, transport and education services to provide the same kind of automated, personalised and modernised experience that they have in all other aspects of their lives.

3. The technology is available
More and more people are using mobile devices, anywhere at anytime. Some public services recognise that this new operating environment enables them to adopt a more pragmatic, two-speed technology investment: balancing traditional IT priorities such as stability, reliability, security, and efficiency, with digital speed and agility to deliver innovation and real-time cutting-edge services. As citizens become more digitally connected with public services, the data that they generate will enable Scottish public services to gain actionable intelligence about behaviour and preferences that has never before been available, establishing a virtuous circle of data informed continuous public service improvement.

Progress to date
The excitement and benefits that mobile devices ‘anywhere anytime’ can bring has to be balanced with the reality of a digital skills gap in Scotland and the availability of robust, good-quality underpinning communications. Yet progress is being made - both with the implementation of core infrastructure and with digital inclusion for Scottish citizens. There is an ambition, outlined in the Scottish Government’s Digital Strategy, to ensure that every premise in Scotland can access faster broadband speeds (at least 30 megabits per second) by 2021 and over 700,000 homes and businesses across Scotland now have access to superfast broadband. The digital margins are also shrinking, with the gap in internet usage between the most and least deprived areas of Scotland falling. 82% of adults use the internet for personal use, 81% have basic digital literacy and almost 75% of adults over 75 now use the internet.

The way forward
The skills gap is also being addressed, with many Government-sponsored and other digital initiatives in Scotland changing people’s lives - helping them communicate with friends and family, shop, send email, apply for jobs and gain help with government platforms online. However, we must think outside the box, and with pace, for the benefit of people to whom basic communications infrastructure is still not available. Today there are numerous ways, including more widespread use of wireless, satellite and microwave technologies, which intelligently overcome communications blackspots and bypass the need to dig up roads over extended periods of time in an attempt to lay fibres. There are faster, more economic, more resilient options to underpin the communications infrastructure and digital journey for the rurally isolated in Scotland.
With 91% of firms ranking digital networks as a crucial factor in investment decisions, there has never been a more important time to focus on digital connectivity. If we want to attract high tech, high growth sectors to Scotland, with firms that will drive our economy and deliver high-skilled jobs for generations to come, then we need to underpin this with digital infrastructure that’s fit for the future.

Tracy Black, CBI Scotland Director
Digital Policing

Policing has always had the challenge of finite resources and almost limitless public demand for preventative and responsive police services, with the additional need for reassurance in the form of a visible presence of officers on the streets.

Over the decades, given budgetary constraints and the increasing impact of pension costs, the proportion of police budgets spent on workforce-related costs has increased, with a corresponding reduction in the resources available for other things, including ICT.

**A new strategy**

The rapid evolution of the internet has led to a rise in crime that is either ‘cyber dependent’ (which didn’t exist before computers, such as hacking) or ‘cyber enabled’ (providing new ways of carrying out traditional crimes, such as fraud). Cyber crime is now more prevalent and more important in policing; at the same time, the development of computer forensics and technologies such as automatic number plate recognition bring new capabilities into intelligence, crime investigation and analytics. Together, these create new resource demands.

In response to these challenges, Police Scotland has published ‘Policing 2026: Serving a Changing Scotland’, a strategy focused on creating capacity to improve, working smarter and achieving more connected services, with Local Approaches to Policing, for example:

“Mobile technology will provide our people with immediate access to the information they may need and enable officers to spend more time visible within communities. Improved access to data and information, along with specialist training, will provide our people with the capabilities to meet future policing demand in areas such as cybercrime and mental health”.

The strategy commits to scaling up and changing cyber capability to respond to emerging cyber-related crimes and a continued investment in Scotland’s forensic science capabilities.

**Capitalising on digital transformation**

In Atos’ work with the Metropolitan Police, we’ve learned that there are four key transformation challenges - business reinvention, operational excellence, customer experience, and trust and compliance - that apply to policing just as they do to other types of organisation. The imperative is to ensure that scarce resources are deployed to optimum effect - in essence, that these resources are in the right place at the right time with the right sort of intelligence and accurate up-to-date information to enable them to act most effectively. This will only be possible through collaborative ‘game-changing’ digital transformation across the end-to-end business of policing. This is not about buying new computers, nor is it about changing policing priorities and objectives; it’s about transforming how policing is supported by technology to achieve a step change in effectiveness and efficiency.

The establishment of one national police organisation, Police Scotland, brings with it the need to better integrate and rationalise information and communications capability across the former forces’ infrastructures. The last major re-structuring of policing in Scotland, in 1975, came at a time when there were only a couple of national ICT systems and only embryonic use of ICT across forces. This time, the change is happening against a background of, on the one hand, disparate legacy systems, and on the other, technological advances that afford potential access to cloud-based and ‘as a service’ offerings in the market, together with advanced analytics. These open up new possibilities for how the police in Scotland can capitalise on digital transformation.

**Smarter use of data**

By deploying more responsive, capable and real-time technology, a plethora of benefits become available. Digital transformation of policing will enable intelligence to be extracted and delivered to whoever needs it via mobile technologies. The sharing of appropriate information within the service and across other organisations means citizens’ issues will be dealt with more swiftly, repeat work will be reduced and incidents that are not directly related to the police can be redirected earlier. Solutions such as these deliver cost savings whilst also reducing the time an officer spends on administration, freeing up valuable hours for frontline services. Smarter use of data would enable the service to react more swiftly to crime and will create a more predictive, proactive and pre-emptive police service.

The Policing 2026 strategy has highlighted that emerging technologies are likely to have major additional implications for the police services’ ways of working. Digital capabilities emerge quickly, so revisiting the ICT aspects of a long-term strategy is crucial. Digital capabilities in 2026 will include things we have not even conceived of today.
Changing Crime
- Cyber
- Terrorism
- Shifting patterns
- Non-geographical

Financial Constraints
- Budget cuts
- Maintain officer presence and morale
- Manage growing demand
- Funding the transformation

Public Expectation
- Personal when needed
- Multi-channel contact
- Fast resolution
- Real time joined up information

Intelligence and Advanced Analytics
Analysis of comprehensive information from many sources to identify patterns and support effective decision making about where and when to target resources to detect, prevent and prosecute crime.

Digital Transformation
Understanding how the public can best engage with the police, shifting to digital channels and solutions where appropriate, and re-engineering end-to-end business processes and systems to accelerate workflow, resolve cases and improve speed to justice. Freeing up officer time for where and when it is needed.

Technology and Integration for efficiency
Providing officers and staff with the information resources they need to be efficient and effective. Enabling collaboration - integration across force, alliance, regional and national levels, as well as inter-agency - to minimise duplication and maximise efficiency. Equipping the police service to deal with the changing shape of crime and provide the best possible public service.
A vision for cyber security in Scotland

Public concerns about cyber security are growing: people are looking for reassurance that their personal data will be kept safe and managed effectively and ethically.

In the wake of a growing threat and to deepen our understanding of consumer trust and expectations when it comes to cyber security, Atos commissioned independent research among users of UK public and private sector services. This revealed that while recent incidents have made 63% of citizens more aware of cyber security, 38% currently feel they can’t trust organisations with their personal data. Clearly, establishing and retaining trust (or regaining it after an attack) have become key to the success of online relationships. At the same time, if organisations in Scotland are to reap the full benefits of digital transformation, cyber security must be achieved in a way that does not constrain innovation.

The Scottish Government’s Cyber Resilience Strategy is committed to achieving a safe, secure and prosperous nation in which:

“Our people are informed and prepared to make the most of digital technologies.

Our businesses and organisations recognise the risks in the digital world and are well prepared to manage them.

We have confidence and trust in our digital public services.

We have a growing and renowned cyber resilience research community.

We have a global reputation for being a secure place to live and learn, and to set up and invest in business.

We have an innovative cyber security, goods and services industry that can help meet global demand.”

Managing the threat

For residents and businesses in Scotland, recent global incidents have proved that you don’t need to be the target of an attack to be affected or damaged by it. Increased connectivity has resulted in exposure to collateral damage. Public confidence is already being tested.

Public services in Scotland have recently suffered malicious or financially motivated cyber attacks. It is therefore crucial that digitally enhancing infrastructures (such as utilities, transport and health) doesn’t increase cyber security vulnerability. Services must be ‘secured by design’ from the outset. And as the move to the cloud accelerates, there is a pressing need to ensure that cyber security capability, monitoring and response are incorporated into cloud services from the start. Effective cyber security strategies help organisations not only to manage existing and emerging cyber security risks, but also to enhance their digital capabilities while staying compliant with data protection laws.

For small and micro businesses there are other challenges. Some of these business operate mostly from mobile devices and use social media to advertise their products and services. Often their livelihoods depend on whatever security is provided by the apps they use and their smartphone provider. It is just as important that these smaller enterprises assess their vulnerabilities to embrace new market opportunities.

Cyber trust as an enabler

In our survey, more than half those consulted say the biggest reason to trust an organisation is that it has a rigorous security process. A similar proportion believe that after an attack, an organisation must prove it has learned from its mistakes by developing better security.

For residents, commuters, retailers, public services and commercial organisations across Scotland, digital relationships need to flourish within an effective trust and compliance regime that inherently protects against cyber threats and maintains privacy. This enables businesses to succeed and empowers citizens to engage with public services safely and effectively. In this way, cyber security can flip over from being simply a risk, to becoming an enabler for organisations to reap all the advantages of digital transformation.

Read more about Digital Vision for Cyber Security at atos.net/digital-vision-cyber-security
In the future, there will be two big challenges for leadership – building a viable digital trust into their sales platforms for clients and customers and how ready they are for international marketing platforms. Leadership in a smarter Scotland will be about supplying an increasingly sophisticated client demand, as the digital global marketplace evolves through platforms like Amazon Fulfilment; will Scottish leaders be ready to supply that demand and how will they protect their digital trust and brand when criminality will be at its most sophisticated in impersonating it?

Mandy Haeburn-Little, CEO, Scottish Business Resilience Centre
The future for cloud services in Scotland

Where would the world’s digital technology capabilities be without Scotland?

This is an interesting question given the rich history of Scottish inventors whose work has, in some way, contributed to the development of the computing and communications that are now so pervasive in our lives. Notable individuals include John Napier and his revolutionary 17th-century manually operated computer known as ‘Napier’s bones’; Alexander Graham Bell, who invented the telephone in 1876; and John Logie Baird, with his mechanical television, first demonstrated in 1926. They all brought to life some of the foundational yet revolutionary thinking reflected in today’s digital technologies. We should perhaps also add Clerk Maxwell, whose work inspired quantum mechanics and helped pave the way for the next predicted major wave of disruptive technology: quantum computing. For a country that, even today, has a population of only 5.4 million and one of the lowest population densities in Europe, there can be little doubt that Scotland has a record of punching well above its weight.

Levelling the playing field for businesses

Fast forward to the present day and it’s clear that the current acceleration of cloud computing technology is transforming the way IT systems can be delivered. From flexible pay-as-you-use commercial models, to scalable on-demand and highly available infrastructures and configurable platforms, powerful compute capability can be bought online in minutes, not months. What’s more, access to this seemingly limitless capacity and on-demand functionality is only a network connection away. In principle, a one-person business can gain fast access to the same level of compute power and functionality that might previously have been restricted to the largest enterprises. Given that over 98% of Scottish private businesses have less than 50 employees, cloud can help level the digital playing-field, yet again enabling Scottish entrepreneurs to punch above their weight.

As technologies such as the Internet of Things, Industry 4.0, 5G networks and artificial intelligence progress to maturity, the demand for cost-effective, flexible and scalable compute platforms will only increase - some would say exponentially. Scottish enterprises at all points along the size spectrum need to be ready to embrace the continually emerging potential of digital technologies. Challenges of migrating applications to the cloud and managing services in an environment that includes both legacy and cloud must, and can, be overcome so that Scotland can reach its cloud-enabled potential.

Modernising public services

With 21.5% of Scottish jobs in the public sector¹, delivering digital government services that are efficient, effective, secure, reliable and usable is critically important, especially with the requirement to support a widely dispersed and diverse population. Use of public and private cloud services can be the basis for complete transformation of traditional government service models - not just through the type of infrastructure deployed, but in the way that previously disparate applications and data sources can be integrated.

Cloud implementations will usually reflect a mix of public and private cloud solutions, managed and orchestrated as an integrated service delivery platform. Using such platforms to securely share and exchange information between public agencies - for example the police, health services and social services (subject to data protection requirements) - enables government to improve citizens’ lives. For instance, through cloud-based analytics of multi-source government data, the police can make targeted interventions earlier to protect vulnerable individuals and tackle repeat offending. With the flexibility and simplicity offered by cloud, processes can be streamlined and simplified; and manual processes can be redesigned and digitalised. In this way, cloud is a foundation for government modernisation, bringing better value and more functionally-rich services.

Thinking bigger, why could Scotland not become its own centre for cloud services? After all, its relatively low average annual temperatures of 8°C and abundance of renewable energy sources make Scotland an ideal location for powering and cooling highly efficient cloud datacentres. The prospect of Scotland establishing itself as a leader in cloud service provision and consumption must surely be more than Scotch mist!

¹ Gov.Scot: Public Sector Employment in Scotland - Statistics for 1st Quarter 2018
The Scottish public sector is forecast to invest considerably in cloud infrastructure and services in the next five years. Growth in expenditure on hybrid and private cloud services is expected to exceed 50%. (2)
Glasgow 2018 European Championships: another first for Scotland

With some of today’s most popular international sports, including football, golf, hockey, rugby and tennis, rooted in Scotland, the country’s impact on sport worldwide is undisputed.

Reflecting Scotland’s continuing role in global sport, on 2-12 August 2018, the biggest sporting event in Scotland since the 2014 Commonwealth Games will come to Glasgow. The European Championships is a new multi-sport event which, every four years, will bring together the existing European Championships of some of the continent’s leading sports. For the inaugural European Championships, Glasgow 2018 will host 3,000 athletes competing across six events: Aquatics, Cycling, Golf, Gymnastics, Rowing and Triathlon. In association, a further 1,500 athletes will compete in Berlin as part of the European Athletics Championships.

A must-watch event

Behind the scenes, and increasingly centre stage, technology is transforming how major sporting events are delivered. With athletes, fans and organisers better connected than ever before, expectations are high. Broadcasters require detailed results in real time; fans not only desire instant scores but highlights of the latest action wherever they are, and from any device.

As well as being the official Timing, Scoring and Results Provider and Proud Supporter of the Glasgow 2018 European Championships, Atos is creating a robust digital presence for the event as Digital Media and Central Results Services Provider. With a mission to deliver a must-attend, must-watch experience, and using Atos’ strong track record in digital services for large-scale sports events, the team is working with one of its SME partners, Edinburgh-based agency Signal, to design and develop the Glasgow 2018 and European Championships websites. There’s also an app available to fans from summer 2018 that will bring them all the medal tables, news, live schedules and results.

Continuing digital transformation

Part of Atos’ responsibility is also to process and distribute live results for all seven sports across Glasgow and Berlin, and to deliver live schedule and results pages to give sports fans and attendees up-to-date Championships information. Attendances of up to 250,000 are expected at venues across Glasgow and Scotland, with a potential TV audience of up to 1.03 billion.

With the spotlight on Scotland, Atos is drawing on its vast experience as worldwide IT partner and lead integrator of the Olympic Games since 2001. Atos has delivered vital IT solutions for every Olympic Games since 1992 and been a crucial partner in the digital transformation of the Games, with PyeongChang 2018 as the first fully cloud-enabled Olympic Games, as all critical Games IT systems (Olympic Management Systems and Olympic Diffusion Systems) were hosted in the Atos Canopy Hybrid cloud. That digital transformation continues as every event brings new innovations which, in future, look set to encompass augmented reality for connected fans inside the stadia to alter and replay their views of the action. Glasgow 2018 will be the first multi-sports event in Scotland to have its Central Results Service hosted on a hybrid cloud.

Beyond the Games, Atos supports elite sports all over the world. In Scotland, Atos was an Official Supporter of the Glasgow 2014 Commonwealth Games, delivering the Games Management Systems and Games Information Systems that proved vital in helping Scotland to deliver a world-class event. And with the bar raised so high, Glasgow 2018 looks set to achieve the same gold standard.
We have delivered innovative IT solutions for the Olympic and Paralympic Games for over 25 years and, once again, the digital transformation involved in bringing events like Glasgow 2018 to an increasingly sophisticated worldwide audience is a challenge we relish. Glasgow has an internationally-acclaimed reputation for hosting major sporting events and this is another key opportunity to showcase the city, the athletes and the support sponsors involved.

Nacho Moros, Chief Operating Officer, Major Events, Atos
The future of health and wellbeing in Scotland

Adopting digital technologies creates important opportunities for the NHS in Scotland to respond to ever-rising and complex demands together with ongoing budget challenges. By having digital access to services, citizens and patients can gain more control of their own healthcare. And digitally-enabled working optimises the use of resources, provides a better working environment for staff, and reduces environmental impacts.

Giving more power and control to citizens
Wearable devices that monitor our vital signs and activity levels are increasingly used by people of all ages, whether they are well or already have a long-term condition. We’re moving into a world in which all citizens will have access to these kinds of self-service tools to manage their own health and wellbeing. With smart clothing and wearable devices, data can be captured and used to help people make more informed lifestyle choices.

For the ‘worried well’, digital technologies will make available more personalised, reliable information and advice to reduce demand on traditional services. For example, like-minded groups will, increasingly, be able to support each other to meet their personal goals to stay fit and healthy. People living at home who need care will be able to choose which information to share with their care providers, families and other carers (called their ‘circle of care’) so that, for example, the wellbeing of the elderly can be monitored remotely by authorised relatives.

Supporting and empowering patients
When citizens become patients, digital technologies can help to manage their conditions and treatment regimes. Social media is one way of sharing information and supporting people day to day through online communities. More and more patients will use video calls and share data online with clinicians to get advice and, where appropriate, self-diagnose, triage or refine dosages. Digital channels and tools will help patients more quickly connect to the right service, at a time of their choosing, and progress their healthcare journey. Again, smart devices will monitor any changes, instantly informing the relevant medical professional to take required actions.

With huge progress being made in genomic research, personalised medicine will also become a day-to-day reality. This means that prescriptions and care plans are created for each person based on their genetics and preferences as well as their condition.

With information shared between the patient’s circle of care, carers will be able to use digital channels to attend appointments via video-conferencing and view key indicators online. Patients will have access to world-class specialists from the comfort of their home, with emergency care data available instantly across the world. Should the patient require any supporting services, these will be available from a variety of providers and automatically provisioned at the time of patient need. If a prescription is needed, these will be ordered and processed digitally and patients will be able to collect them at a time and place convenient to them.

Enabling and supporting staff
Digital technologies and communication tools also help NHS staff. Increasingly, they will have access to powerful analytical and cognitive tools to support timely day-to-day clinical decision-making, with the potential for the following to be implemented:

- Stressful and time-consuming travel could be reduced by holding case conferences and multi-agency meetings online, with video links where needed
- Staff will be able to develop their skills and gain qualifications through virtual reality sessions at home
- The automation of administration processes such as rostering will free up more time for patient care.

Transforming service provision
Digital technologies for storing and analysing data will enable a major shift in the delivery of care. With more and more patient consultations happening remotely, expensive hospital facilities will be used for more complex cases. The design and location of healthcare services will be informed by sophisticated analytics that draw on population stratification and demographic information. Increasingly, analysis of data will mean that ward and clinic staffing levels will be automatically
predictable on an hour-by-hour basis using information on patient conditions and dependency levels, as well as weather and other datasets.

**Delivering digital transformation**
Delivering transformational change and embedding new technologies into high-pressure clinical settings is always challenging. It demands new thinking to do things differently, optimising and maintaining core services while delivering transformation through a roadmap of digital innovation. Scotland is blazing a trail with its national e-Health strategy and action plan for Technology Enabled Care to drive efficiency and improve outcomes.

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**Accelerating efficient delivery of digital services**
In today’s climate, making any digital vision a reality demands that organisations think strategically and optimise all available resources. One key enabler is a secure web-based Digital Health and Care Platform developed with NHS 24. This is ready for use by services that want to connect providers and offer information-sharing, appointment-scheduling and care-planning to people in their own homes. Crucially, the platform was built using open source software and international standards for exchanging health and care information electronically. It means new digitally-enabled services can come onstream quickly and cost-effectively – so Scotland can deliver innovative digital services as part of a longer-term national strategy.

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“In our work with customers, it’s clear that ongoing innovation and digital transformation are key to meeting ever-widening medical challenges and ever-growing demand. Delivering this transformation will involve citizens, families, carers, providers and voluntary organisations working together, helping to shape the future of health and social care for the people of Scotland.”

*Gary Smith, Client Executive, NHSScotland, Atos UK&I*
Digital first: removing paper from NHSScotland

As part of the national digital health strategy NHSScotland is on a journey to remove paper across its entire organisation and build the digital healthcare services of the future.

Every year, NHSScotland Practitioner Services pays out around £2.4 billion, 20% of the entire NHSScotland budget, to GPs, pharmacies, opticians, dentists and orthodontists for the services they provide to patients. As custodians of Scottish taxpayers’ money, we process around 10 million claims for payment each month on behalf of Scottish Health Boards.

NHSScotland’s objective is to remove paper from all these transactions, replacing it with digital interactions and automated processing of claims wherever possible. Given our increasingly digitalised world, citizens and practitioners are increasingly comfortable with electronic transactions and interactions. With the pressing need to do more with less and achieve cash-releasing efficiency savings of 5% a year, we’re moving to digital to improve efficiency as well as accuracy and customer satisfaction.

Re-using digital infrastructure

The first practitioner service to go digital was ePharmacy. And while we still currently use paper prescriptions for patients, pharmacists can now scan a paper prescription to retrieve the electronic prescription, dispense from it, then click to send a claim for prompt validation and payment. There are benefits across the whole dispensing process, eliminating the margin for human error and enabling a much faster and cheaper processing of claims.

To achieve this, we commissioned the development of an IT platform that’s scalable, completely secure (messages are encrypted to guarantee patient confidentiality) and stores data for use in real time. At the heart of our technology strategy is to re-use technology wherever possible - so we customised the same IT platform to roll out eOphthalmics. Instead of having to print and post claims forms, opticians can get their claims validated and paid digitally, again eliminating margins for error and making our job, and that of the practitioner, much easier.
Multiple benefits

For Scottish pharmacies, opticians - and now also dentists and orthodontists - the savings on volumes of paper being printed and posted are colossal. Of the 9 million items for pharmacies, 0.25 million are for opticians and 0.5 million for dentists, around 85% now arrive electronically. For pharmacies, we automated the processing of 77% of prescriptions and claims from the electronic data without using the paper prescription. For dentists, we have eliminated all paper claims, with opticians not far behind, and a Scottish Government target for all dental and ophthalmic services to be digital first by 2019.

Not only is the processing of claims more efficient, but the data we hold in a new data warehouse is more accurate, more complete and offers us a much richer view, both of individual patients’ histories from cradle to grave, and also of broader population health. Analysis of this data improves clinical decision-making and financial governance, all within patient confidentiality stipulations.

Key to the success of the whole project has been face-to-face engagement with practitioners, to overcome any barriers, build confidence and gain mindshare. Similar to the airline industry’s transition to e-tickets, this has been a cultural and behavioural change that requires support.

What next?

Having converted the larger volumes first, plans are now to bring smaller communities on board, such as nurses in GP practices, dispensing doctors and hospital outpatient prescriptions. Yet it’s the elimination of paper prescriptions that will be our next major challenge, involving integration with mobile devices and a portal for patients. This will require the redesign of processes and technology, as well as wider cultural change so that patients feel more confident about the transition to digital prescriptions.

What’s more, the platform is a foundation onto which more digital functionality can be added. We have the capabilities and a universal claim framework for any new community pharmacy-provided public service which can be delivered in just a couple of weeks, already used for public health services such as smoking cessation, emergency contraception and gluten-free foods. This means that any new service deployments can be rapid and cost-effective. The digital systems are much more adaptable to changing health requirements; for example, the Government has just completed a review of eye care, which we will adapt the systems to reflect. We’re also becoming more sophisticated in data analytics, both providing rigorous financial management and to give clinicians new insights into patient health and any evolving requirements for practitioner services. It’s all part of creating a more efficient, agile and user-centric digital infrastructure as digital access to healthcare expands.
A look into future healthcare at home

When it comes to our health, there’s good news and bad news. The good news is that we are living longer; the bad news is that the longer we live, the more health conditions we are living with. In fact, by the time we are in our 80s, more than 85% of us will have one or more long-term health condition. Currently this equates to around 2 million people in Scotland, or about 37% of the population.

Older people with long-term conditions such as diabetes, congestive heart failure and chronic obstructive pulmonary disease are far more likely than the general population to need emergency hospital admission; they tend to spend longer in hospital than the rest of us; and very often they cannot be discharged home for lack of a care package provided by community health and social services. In NHSScotland hospitals during 2016/17, people over 75 years-old took up around 375,000 bed days, 70% of the total occupied by people delayed in their discharge. This puts a huge strain on the operational and financial resources of the NHS and social care systems, and we urgently need to find affordable, effective solutions.

Reducing avoidable admissions

People living with long-term conditions are best managed, and enjoy a far higher quality of life, at home in familiar surroundings close to family and friends. Through close monitoring of key indicators such as blood pressure, heart rate, weight and compliance to drug or other medical regimes, it is possible to identify trends, anticipate problems and reduce or eliminate acute episodes requiring emergency hospital admission.

In crude economic terms, this is also very beneficial, since it costs around 80% less to provide care at home than in an acute hospital (£357 per day versus £1,925 per day) and, when an older patient with a long-term condition is admitted to hospital, they tend to stay over 11 days each time, and for every additional day they stay in bed, they lose some of their mobility (around 5% muscle strength for each day) and independence, increasing their need for home-based care packages without which they have a higher likelihood of re-admission.

The health system’s ability to cope with the growing demand for community teams to monitor and manage these patients can be greatly enhanced through the use of remote monitoring equipment and services. Over 175,000 homes in Scotland have been equipped with monitoring equipment; however, the majority of this is ageing. This is often hard-wired requiring fixed phone-lines, and most are based on closed proprietary systems, exposing commissioners to vendor lock-in and making it cost-prohibitive and near-obsolete.

A new paradigm: enabling people to stay safe and well at home

The breakthrough that is changing this situation has been the emergence of digital Smart Home or Internet of Things (IoT) technology. The global adoption, mass manufacture and consequent lower prices of IoT sensors and connected medical devices mean that it is now possible to build comprehensive and highly extensible monitoring solutions. These use reliable, proven equipment, combined with open industry standards and rigorous encryption and security for a fraction of the cost of analogue legacy systems.

This new paradigm has enabled companies such as Caburn Health to create fully integrated Health & Social Care monitoring solutions that enable clinicians to remotely monitor medical data from many more patients than is possible with home visits alone, and to view the medical data in the normally-unavailable context of both the patient’s home environment (temperature, humidity) and their daily living activities (time of rising and sleeping, carer visits, kitchen and bathroom use). In addition, this data can provide care providers with activity and efficiency monitoring and reassurance to carers and families. All of this helps patients to remain safe and well at home for longer, reducing the social dislocation and isolation that can be associated with a move to a care home.

Data sources:
NHSScotland, National Services Scotland: Delayed Discharges in NHS Scotland December 2017
UK Office for National Statistics: Overview of UK Population, July 2017
The King’s Fund: (various reports)
Deloitte: Digital Health in the UK. An industry study for OLS September 2015
UK Department of Health: Long term conditions, compendium of information
BMJ 2013; 346: f1035 Cost effectiveness of telehealth for patients with long-term conditions
Caburn Health Analysis & industry estimates
Home and healthcare monitoring
Looking after a patient with congestive heart failure:

Jim is admitted as an emergency patient to A&E and diagnosed with congestive heart failure.

Following stabilisation and successful treatment of his condition, he is ready for discharge from hospital.

The last thing anyone wants is for Jim to get acutely ill again and need readmission. Normally his discharge would have to wait for the community health team and the local social services to assess his needs and home environment, then agree and implement the appropriate care package; this can take weeks and cost thousands.

This time, on being discharged, as well as his medication, Jim is given an assisted living and health monitoring pack to keep track of his movement, blood pressure and weight.

Jim’s care team make one home visit to plug in the monitoring unit, put the movement sensor in the hallway, the blood pressure monitor in the living room and the scales in the bathroom.

Now, every morning Jim takes his blood pressure and stands on the scales; his activity around the house is sensed and the information is sent to a connected digital platform for analysis.

During the week, Jim’s visits to the bathroom decrease. He has an elevated blood pressure reading and his weight increases by 2kg over two days, triggering an amber alert via a text to Jim’s specialist nurse.

The nurse reviews Jim’s data and, rather than make a visit, calls him to discuss his condition. The nurse recommends an increase in the dosage of his diuretic medication to reduce fluid build-up caused by the congestive heart failure.

Jim takes more of his diuretic medication; his weight and activity are monitored daily to ensure that the nurse’s intervention has prevented another emergency admission.
Scotland’s Big Data landscape

The amount of data being created every day can be seen as both a challenge and an opportunity for Scottish businesses and government.

Every day, 2.5 quintillion bytes of data are generated. Around 90% of the data in the world today has been created in the last two years. A recent EMC survey found that 75% of organisations in Scotland (against 57% in the UK as a whole) have the infrastructure to analyse data. Scotland also has world-class research capabilities, with a disproportionately large academic base in comparison to the size of the country. This is particularly true for the informatics and data science fields, both are packed with outstanding facilities and researchers. We believe closer collaborations between industry, public sector and world-class academics can help transform data opportunities into tangible economic and social benefits to Scottish citizens.

With the economic potential of data estimated to be worth £20 billion to Scotland, we need to harness our data advantages now, to unlock this potential and future-proof the industry. Data can help improve efficiencies, automate processes, and predict outcomes and behaviours; the potential is infinite. From a public sector perspective, data science can help improve citizens’ lives and the services they receive from government.

Few other countries have this degree of opportunity to link high-quality, consistent data that has national coverage for public service improvement. However, data science talent is in high demand and in short supply. It is critical that we ensure there is a robust plan to support a pipeline of data science talent now in order to meet the growing demand for these skills in the future. Of course, this includes university and post-graduate courses and professional development; but we believe we should start earlier, exposing school pupils to data science and the opportunities that it offers for future careers across every industry.

The need to address critical shortages of digital and data skills has been recognised by Scottish universities. There are now 26 BSc and 26 MSc Data Science-related programmes being delivered by 13 universities in Scotland, with more courses expected to come online in 2018/2019. The Data Lab has developed a web application that details what each course offers. This includes the courses that are currently part of The Data Lab MSc, a fully funded challenge-based learning programme, now in its second year, which offers 130 funded places across nine programmes in seven Scottish universities for 2017/18.

In the past few years, Scotland’s data science community is becoming stronger, evidenced by the number of technology-and data science-related meet-ups now happening across the country. The Data Lab and MBN Solutions are hosts to the Scotland Data Science and Technology meet-up. With over 2,500 members, this brings data enthusiasts together every month, with the aim of further nurturing this community and facilitating discussions and collaborations.

£104.5 million
Value projected to be added to Scottish economy by The Data Lab

1 https://www.thedatalab.com/about-us
A new data economy: funding Scottish city services

Given today’s financial and operational pressures, cities are looking for new ways to drive change and fund local services – and data is a largely untapped resource.

Across any city’s infrastructure – its roads, transport systems, sewers, communications networks and energy grids – more and more citizen services are provided using digital technologies. All around us, there are growing numbers of sensors in public spaces and underground. With the recent City Deals¹ and the Scottish Cities Alliance ‘8th City’ programme², significant investments are being made in city and digital infrastructure. As a result, an ever-increasing flow of data will be collected and stored by private companies and city departments across Scotland.

For city services departments, this data is a highly valuable asset. It could be harnessed to:

• help partners work more collaboratively to deliver smarter, more integrated services
• achieve goals such as reducing congestion, improving air quality and enhancing safety
• fund improvements to city services, with minimal up-front investment and risk.

So, how can this work in practice?

A multi-sided model

In any city, a plethora of companies and public bodies provide various services. Let’s take street lighting as an example: the city needs to supply and pay for its lighting; a value chain of partners provide services and infrastructure, from the power, to the light-bulbs, to the maintenance and management. With cameras, sensors and control systems all gathering huge volumes of data in the process, how could all that data be used by these partners to help improve the service? To take it further, the data itself is an asset that could become part of a new city financing model whereby the city and its partners can form mutually beneficial agreements by sharing and trading access to data.

Service providers – transport operators, waste collection, traffic management, road maintenance and so on – can grant access to the data they capture as part of their contract with the city, or they can pay for access to data in order to improve or lower the cost of their services.

In this way, the data becomes a currency that’s exchanged and used in a new multi-sided market to finance city services and provide further benefits for citizens.

Smarter, more sustainable services

To make this new ‘data economy’ possible, cities need to start making changes at various levels. Today’s service contracts are unlikely to address the complexity of arrangements required for the legal and secure exchange of data in this way; and siloed organisational models limit collaboration between different providers and domains.

For instance, waste collection contracts are focused on routes and weights of waste collected (with this information often buried in static reports). Data from sensors in bins is most likely used only to optimise the waste collection process. Yet if combined, it could provide intelligence on waste at the neighbourhood level to reduce truck mileage, cut the numbers of trucks, and improve traffic flow around the city. It could also be used more proactively to empower and incentivise citizens to reduce waste.

And there are many other examples; for instance, public transport. Providers are already connecting and sharing data to offer a smarter, more connected transport infrastructure on which citizens can make real-time choices about which service to use. If data was triangulated with other agencies, it could also be used to improve road safety, reduce pollution and reduce emergency response times. Cities can use and share data, via apps and connected devices, to help citizens make those better-informed choices and to target city services more effectively.

² www.scottishcities.org.uk/media/blog/scotlands-8th-city-the-smart-city
Cultural shifts
The key point here is that the city no longer buys point solutions; it facilitates an ecosystem of partners to use its connected infrastructure to make savings and enhance quality of life. It also generates business opportunities and invites start-ups, universities, knowledge centres and other innovators to create new solutions.

Initiatives like Glasgow’s Future City programme and the Local Government Digital Office are already making inroads into ensuring that data is more accessible and shared securely. Yet to fully realise and operate this kind of multi-sided model will also require a shift in culture and mindset. Our future will be data-driven, and cities can pave the way for transformation to create secure and prosperous environments in which Scottish citizens, communities and businesses can thrive.

“A Future, Smarter, Digital Scotland would be an international leader in digital technologies, such as artificial intelligence, data science, FinTech and cyber, with world leading research and innovation in industry relevant fields. Both Edinburgh and Glasgow will be major start-up hubs, and Scotland’s cities top European locations for international technology businesses. All our citizens will understand the benefits of digital, be highly skilled in using digital solutions to improve productivity and the quality of life for themselves and others, and actively promote Scotland as a world-class location.”

Polly Purvis OBE, CEO, ScotlandIS
Delivering utilities for Scotland on the Internet of Things

By fusing the physical and virtual environments, the Internet of Things (IoT) creates many more touchpoints for gathering real-time data and turning it into an advantage. Here’s an overview of how Scottish utilities companies can use IoT technologies to transform the way they manage, control and maintain their infrastructures.

Connected assets
- Given the multiple assets that utility companies maintain – pipelines, electricity lines, treatment works, power stations and so on – getting real-time data on the condition and activity of those assets can provide major operational and financial benefit.
- Scotland’s geography amplifies these benefits; with large numbers of dispersed assets, sometimes in difficult-to-access locations, it’s both costly and time-consuming to keep sending workers to check the condition of assets.
- Maintenance departments can better control their assets, get insight into how they’re performing, and predict when assets need maintenance and repair.
- Asset management is much more focused and efficient, with the ability to predict and prevent problems, lengthen the life of assets and reduce costs.
- This detailed data can be used to plan when and where assets will be needed in the future and get the best value for these major investments.

Connected people
- The case is similar for connected workers; by better disseminating knowledge and operating more cohesively as a team, assets can be fixed and maintained faster and more effectively, with the cost and risk reduction benefits that implies.
- Given the logistics and geography of Scotland, cutting down on travel and working more collaboratively will help to make asset maintenance and repair more effective and efficient.
- Using IoT and technologies such as augmented reality glasses (which ‘augment’ the real-world environment with computer-generated information and objects), utilities companies can better inform and support workers.
- Connected working can be extended to include ‘digital twins’: virtual copies of physical assets. Using a complete 3D real-time model, technicians can find problems not easily identifiable out in the field; they can work collaboratively, sharing detailed asset information definitions in order to understand what needs to be done.

Wider benefits
While the case for utilities companies is compelling, any organisation that owns, manages and maintains complex static assets can benefit from these connected technologies, especially where it is costly and time-consuming to get workers out on location. These could be oil and gas companies, manufacturing companies, vehicle maintenance and patrol organisations, fire services, even hospitals – anywhere where workers are doing technical engineering jobs.
Digital is at the heart of our strategic projections and underpins our ambitions to deliver a consistently leading customer experience, keep customer prices low and increase the reliability, resilience and sustainability of our services.

More of our assets are being digitally connected every day, creating an intelligent water and waste water infrastructure. Over time, this provides the intelligence that shapes our operations decisions and maintenance actions. Where possible our assets are remotely controlled in a secure fashion, enabling careful and strategic management of the infrastructure.

We will continue to exploit the emerging sensor explosion to find new ways of understanding the performance of our network, ultimately providing the insight that allows us to make critical investment decisions that keep customer prices low.

John Cairney,
Head of Digital Strategy & Architecture,
Scottish Water Digital Directorate
Putting Scotland on the global FinTech map

Over the last century, Scotland has cemented its reputation as one of the world’s most important financial capitals. Now, a combination of Scottish talent, vision and capability is creating a new wealth of opportunities for Scotland as a global leader in financial services.

The scale and pace of change in the financial services industry is unprecedented – not least thanks to innovative new FinTech companies who leverage data and technology to improve and transform services for customers and create radical new business models that will change this industry forever. In these fast-moving times, Scotland is well positioned to capitalise on this new fusion of financial services and technology.

**FinTech centre of excellence**

For one thing, Scotland’s reputation for banking, asset management and insurance is matched by its history of innovation, most recently in areas such as artificial intelligence and data analytics. There’s also Scotland’s rich seam of academia, the pipeline of new talent from our world-leading universities and our thriving tech industry in cities like Edinburgh, Glasgow, Stirling and Dundee. Put this heritage and expertise together – all enabled by a government that recognises the value of a digital economy and the imperative of having the right digital infrastructure – there is huge opportunity for Scotland to become a FinTech centre of excellence on a global scale.

In response, FinTech Scotland was created to help catalyse the development of a thriving FinTech ecosystem. As a collaboration between the private and public sectors, FinTech Scotland’s core objectives are to drive growth and innovation, with an ambition to move from our current ranking at 15th on the list of the 50 top global FinTech centres to being one of the top five by 2020.

**Achieving the ambition**

To achieve our objectives, FinTech Scotland works in partnership with innovators and leaders in financial services, law, professional services, technology, academia, the public sector and others in five key areas.

- Supporting new enterprises. We support, encourage and enable FinTech start-ups, helping them to secure funding, source business services, find office space and so on. This is about providing the right environment for innovators to start, scale up and thrive.
- Facilitating a collaborative ecosystem. For bigger companies, past legacy and scale can make innovation challenging; yet they also bring vital expertise in digital transformation, data-driven technologies and so on. We support Scotland’s increasingly thriving FinTech ecosystem of large and smaller technology companies, together with service organisations, legal specialists and so on, to orchestrate change in a connected way.
- Developing and channelling skills and diverse talent. With deep knowledge and capabilities in technology, data and so on, Scotland needs to deploy this effectively in commercial settings. We help match the supply of academic and industry talent with what companies need. Fundamental to this is ensuring that we field more diverse and inclusive talent in all domains.
- Achieving global reach. This is about promoting Scotland as a place to bring your business, either as a start-up or as an incumbent looking for a European base, as well as encouraging international investment in Scottish businesses. It’s also about enabling Scottish businesses to expand internationally and exporting Scottish FinTech to other parts of the world.
- Building Scotland’s profile. We want FinTech in Scotland to be as famous as Scottish whisky or salmon. This requires us to communicate and present Scottish FinTech as a competitor on the world stage.
Wider social change
Ultimately, our vision is to make a real difference, not just to economic growth but also to our broader society. Part of what FinTechs do is to make personal finance easier and give citizens more choice and information for budgeting, saving and borrowing, not only to help them financially but to give them more peace of mind.

More widely, Scottish citizens will see the benefits of being part of a digital economy. Through being better connected and more empowered, their lives will be improved – especially in areas of geographical, digital or financial exclusion. This is not solely about financial services; it’s about how transformation and collaboration can help to cut through silos and effect positive social change. This kind of evolution certainly won’t happen overnight, but by working together, we can see a world in which Scotland is leading the way.

Over 86,000 people in Scotland are employed in banking, asset management, asset servicing, insurance and pensions

1 www.fintechscotland.com/why-scotland
Building digital skills for Scotland’s future

There is a well-documented skills shortage in the technology industry. Increasingly, digital is everywhere: at work, socially and in our daily lives, so the demand for digital skills at all levels is accelerating rapidly.

Software, electronic and telecoms engineering skills have been around for a while, but whilst the fundamentals of these disciplines haven’t changed, the speed of development in new applications, techniques, programming languages and tools have created a fast-moving environment where everyone has to continually add to their skills and knowledge.

The continuing convergence of digital technologies has spawned the fast-developing fields of data science, cyber security, the Internet of Things, augmented reality (AR) and robotics. The growth of e-commerce, with its reliance on mobile and web technologies, is creating new specialisms and roles which blend commercial expertise with technical skills. These new areas, often combining existing expertise in fields such as sensors and artificial intelligence (AI), with new capabilities like big data, offer huge opportunities. They bring disruptive technologies to a range of markets, including finance (FinTech), health (MedTech) and agriculture (AgriTech). Yet if we are already short of software engineers, there is an even greater dearth of people with the skills for these new fields.

So, what do we need for the future?

**Digital citizen skills**

Everyone will need to become a digital native or digital migrant, not only to use devices such as mobile phones, AR headsets and tablets, but also a wealth of applications from chatbots to transport apps or virtual digital assistants. They will need to access online services to interact with local and national government services, from refuse collection to income tax and benefits, to order shopping and travel services, and check bank and payments systems. They also need to be able to spot digital scams and fraud, manage the security of their personal data and use critical thinking to understand how digital services may be programmed to manipulate their behaviour.

**Digital business skills**

In the workplace, we are seeing an increasing need for business skills that have a significant digital element. Whether that’s designing online surveys, analysing digital marketing statistics, creating web/mobile friendly content, or using more sophisticated tools for project management, research and financial planning, this is a level up from digital citizen skills. Users will need to know how some of the underlying technology works and interacts.

The growing world of e-commerce needs individuals who can blend the latest developments in digital marketing, customer profiling and customer relationship management with fulfilment, automated translation and payment systems. They need to understand how to code, use APIs to interact with other businesses, and integrate with back-end systems.

**Digital technologies skills**

Businesses selling software products and services, from search specialists to games companies, need a combination of software developers and engineers, product and project managers, digital marketing and sales people and customer support teams. Understanding how these functions interconnect and how digital technologies underpin these businesses is an increasing requirement. There is also the need for softer digital skills, which may help to close the gender gap within Science, Technology, Engineering and Mathematics (STEM) industries: psychology skills, ergonomics and usability design are all critical to developing engaging customer experiences that will give companies competitive edge.

The growing demand for computer science and software development skills highlights the move to an increasingly digital economy. These are the engineers of the digital world, building the structures and frameworks that turn data into systems, products and knowledge. A new set of skills is beginning to emerge that combines software development, electronic engineering and computing skills with an in-depth of understanding of data. This is being manifested in data science, bio informatics, the Internet of Things (IoT) and cyber security.

Developing this new range of skills is challenging schools, colleges, private sector trainers and universities. They are all working to ensure we have the curricula materials, training provisions and skilled teaching staff to provide the skills of the future for Scotland.
Emerging technologies bring exciting and often lucrative opportunities for those who can adapt their skill sets accordingly. We now need to focus skills development on longer-term advances such as quantum computing, advanced robotics and human machine interfaces.

While understanding data and logic are essentials, increasingly we also need to apply softer skills like behavioural science, design thinking and ethics. Crucially, we need to teach our children how to continually learn and adapt.

John Hall, Head of Portfolio, Atos UK&I
Shaping the future with Scotland’s millennials

While technology and digital transformation are ever changing, the expectations of a digital native illustrate what this transition can offer us. This opinion piece demonstrates a Scottish millennial’s experience of living in the digital era.

What are the typical attributes that spring to mind when you think of a millennial? I’d say that, among other things, millennials are entrepreneurial idealists – and, of course, the first generation ever to have grown up totally immersed in a digital world. For these reasons, I’m proud to be a millennial.

First, let’s be clear about definitions. Broadly speaking, a millennial is anyone born between the early 1980s and the turn of the 21st century. According to Scotland’s National Records, 1.4 million Scots residents were born between 1980 and 2000, with slightly more women than men.

Education and innovation
Millennials in Scotland reflect Scotland’s already-established reputation for innovation and excellence in education through our prestigious universities and thriving technology sector. All this means that right now there is an abundance of opportunities, accelerated and increased by advances in technology and the growth of social media. While I explored various options at university, I realised that my real passion lay with technology and business start-ups, so I decided to co-found a technology company called Monomise.

Monomise is a reward-based smoking cessation programme comprising a carbon monoxide reader and a motivational app. The reader calculates daily the levels of harmful carbon monoxide present in the smoker’s body so that real progress can be tracked; the supporting app tracks progress using visual aids, similar to fitness trackers. Alongside studying, I was pitching Monomise to several investors, start-up accelerators and product developers. Eventually, in 2015, I was named one of the UK’s top young entrepreneurs and sponsored to go to San Francisco to pitch the business to players such as Apple, Facebook and Monkey Inferno. That trip, and Monomise itself, were life-changing and taught me that there are endless opportunities for millennials to pursue what they are passionate about. It also confirmed that my passion lies in working in fast-paced, exciting, constantly-evolving environments where I am in charge of my own success.

Career opportunities
After university and Monomise, I needed to start focusing on my career. I knew I wasn’t going to be suited to a typical office job with repetitive days merging into one. But at the same time, I did want stability and security. In 2016, I began my career with Atos at the Customer Experience (CX) Lab in Glasgow, working in the Customer-Centric Design team. To start with, I was sceptical about working for a corporate company; but Atos is very forward-thinking, with great support for people who want to explore new challenges. Working within CX is similar to working in a start-up in many ways. Firstly, the Labs are full of the latest technology, so I can challenge myself technically. Secondly, my team has never inhibited any creativity, so I can be innovative even when that questions established norms. Thirdly, no two days are the same. We work on discovery, designs, prototyping, pitching the ideas and launching them into businesses.

While this is just the beginning of my journey, it encapsulates how being an entrepreneurial millennial in this digital age can lead to amazing opportunities – and Scotland is constantly providing more. I’ve experienced these opportunities first hand, through the support I received from start-up accelerators and networks throughout Scotland and by working in a creative, technologically-advanced environment. And with much more talent being bred now in Scotland, this is an exciting time to work here and to watch how the next generation – Gen Z – will take things forward.
Acknowledgements

We would like to thank the following contributors. If you wish to send feedback, please tweet using #DVfScot or email: AtosDigitalVisions@atos.net

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About Atos

Atos is a global leader in digital transformation with approximately 100,000 employees in 73 countries and annual revenue of around €12 billion. European number one in Big Data, Cybersecurity, High Performance Computing and Digital Workplace, the Group provides Cloud services, Infrastructure & Data Management, Business & Platform solutions, as well as transactional services through Worldline, the European leader in the payment industry. With its cutting-edge technologies, digital expertise and industry knowledge, Atos supports the digital transformation of its clients across various business sectors: Defense, Financial Services, Health, Manufacturing, Media, Energy & Utilities, Public sector, Retail, Telecommunications and Transportation. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline. Atos SE (Societas Europaea) is listed on the CAC40 Paris stock index.

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Let’s start a discussion together

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