

Matrix Digital ICT Report 2016

EXECUTIVE SUMMARY



MATRIX DIGITAL ICT PANEL

CHAIRMAN'S FOREWORD

It is with great pleasure that we present our recommendations for the future growth of Northern Ireland's Digital ICT sector to the Minister for Enterprise, Trade and Investment. This report is the output of a specialist subpanel assembled by Matrix to examine Northern Ireland's capabilities and identify both the areas where improvements are needed and the global trends most likely to create opportunity for Northern Ireland when matched to our specific strengths.

When the first Matrix ICT report was published back in 2008, it was recognised that the global ICT sector had two drivers – radically evolving technology and fast changing market dynamics. In the eight years since then, both global opportunities and local capabilities have developed exponentially, often in unanticipated ways. We were therefore well aware of the intrinsic difficulties of predicting future trends in the sector when we began work on this report. However, we believe that it offers a valuable and unique insight into Northern Ireland's digital economy as well as an overview of the challenges specific to growing the sector.

This report followed Matrix's traditional process of panel discussions supported by commissioned research. Given how quickly technology has moved and how rapidly the market has changed, Matrix and all its sub panels are now moving towards a new methodology which is more agile and time sensitive.

Northern Ireland has a real opportunity to build on its present capability in software engineering, data analytics, networks and sensors and cyber security. The Centre for Secure Information Technologies is just one example of how Northern Ireland can become a sector leader. We have the potential to repeat that success in other areas, such as data analytics. This report's recommendations – the need for a Digital Strategy for Northern Ireland, the engagement of a Chief Digital Officer, the creation of a centre for data analytics while continuing to support cyber security and the need for government to become an expert and strategic ICT consumer – are soundly rooted in evidence gathered from a wide range of business, academic and government sources. We hope that these recommendations will form a blueprint for the further development and growth of the sector. If they are implemented fully, there is real potential to build a globally competitive economy focused on our niche strengths.

I would like to thank all the members of the Matrix Digital ICT Panel for their time and expertise given in the production of this report. I would particularly like to thank the Vice Chair of the panel, Tom Gray and the Matrix Chair, Bryan Keating for their input and support throughout.

John Healy

Managing Director - Allstate, Belfast

Introduction

MATRIX, the Northern Ireland Science Industry Panel, formed a subpanel of experts in the Digital ICT sector to look at the opportunities within the sector and produce a capability assessment and foresight study into Northern Ireland's Digital Information and Communications Technology sector.

The purpose of this report is to present an insight to the Digital ICT sector and to provide recommendations to enable the exploitation of market opportunities for the sector in Northern Ireland over a time horizon of between three to five years and beyond.

The expert panel was drawn from across Northern Ireland's Digital ICT sector, led by industry but including representatives from government, academia and the UK Digital Catapult. The panel sought to not only reach a consensus on the region's ICT strengths and capabilities, but also to identify areas of opportunity.

They also looked at other regions which are recognised to have built successful digital economies to map how the report's recommendations, along with initiatives being carried out by other stakeholders, might allow us to achieve our goals.



MATRIX Digital ICT Panel Members

John Healy (Chair)	Allstate
Tom Gray (Vice Chair)	Kainos
Bryan Keating	MATRIX NI
Neill Crockett	UK Digital Catapult
Sinclair Stockman	Digital NI 2020
Stephen McKeown	Analytics Engines
Brendan Crossey	Asystec
Rob McConnell	SQS
Professor Gerry Parr	Ulster University
Stephen Wray	Queen's University Belfast's ECIT Institute
Michael Gould	Department for Employment and Learning
David Hughes	Department for Education
Barry Lowry	Department of Finance and Personnel
Mark Maguire	Invest NI
Canice O'Doherty	Moy Park
Consultants	Deloitte LLP

Executive Summary

The Digital ICT landscape

The Northern Ireland Digital ICT sector comprises over 1,200 companies, over 100 of which are international businesses such as Allstate, SAP, Citi and Cybersource. The sector offers particular strength in its software engineering expertise and has clusters in mobile telecoms, financial software, information management, cyber security and connected health.

The sector employs around 13,000 people, with the total ICT workforce (including ICT specialists in non-ICT businesses) standing at around 28,000.

2% of Northern Ireland employees work in Digital ICT



IN 2013
THE SECTOR
ACCOUNTED FOR
£870m
OF ALL ECONOMIC OUTPUT
IN NORTHERN IRELAND,
REPRESENTING GROWTH OF
32%
OVER THE LAST 5 YEARS

THERE ARE
OVER
1,200
DIGITAL ICT
COMPANIES
IN BUSINESS ACROSS
NORTHERN IRELAND
INCLUDING
BIG NAMES LIKE:



The GVA for Digital ICT workers is

£65,514
that's **28%**
above the NI average.

In 2014 Digital ICT exports were worth

£283m
an increase of 25% over the last 3 years

Source: NISRA

Northern Ireland's core ICT strengths

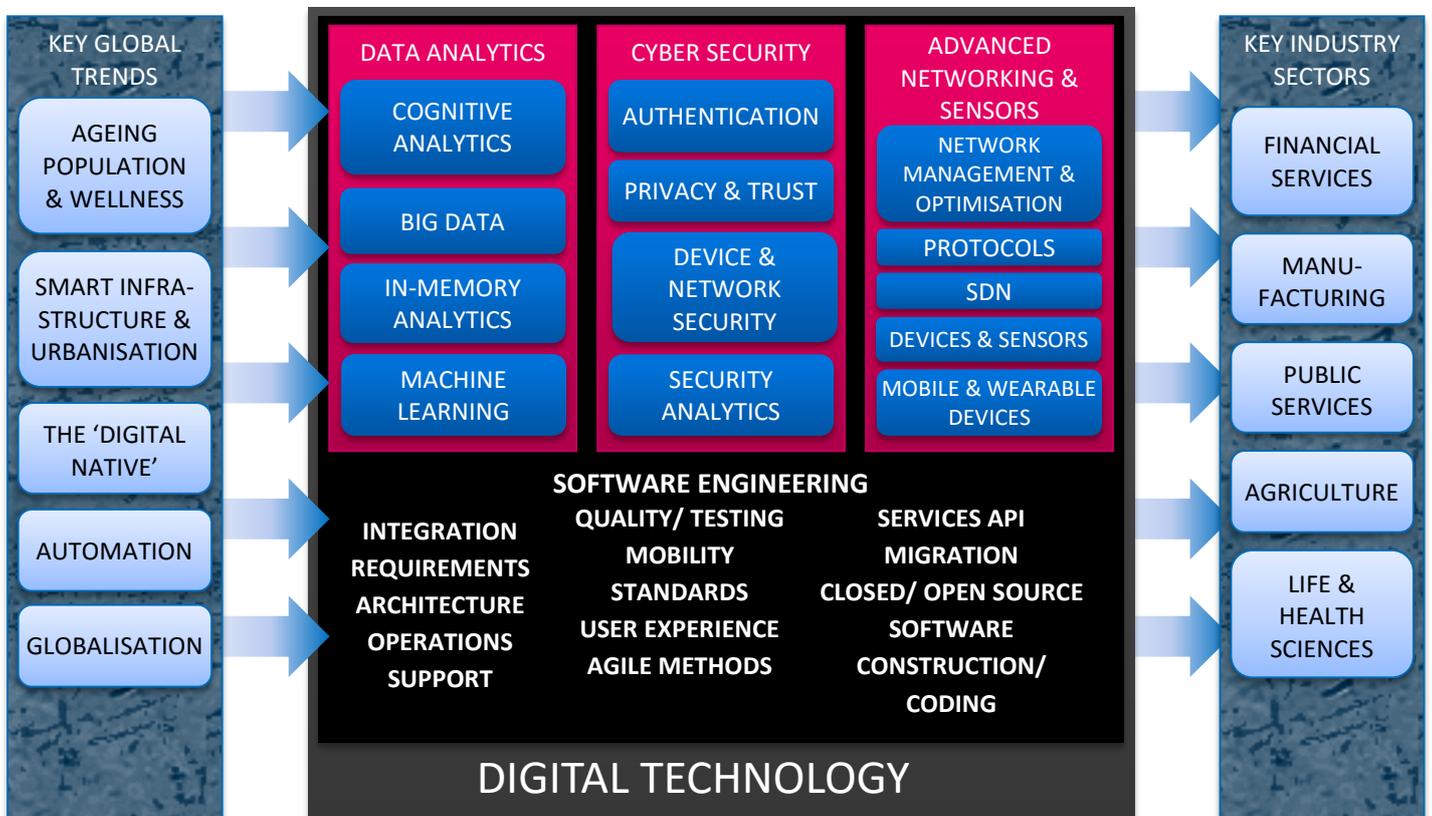
Northern Ireland's core strengths include capability in:

- software engineering
- mobile, cloud-based and internet-based application development
- cyber security
- data analytics
- advanced networks & sensors.

Northern Ireland also has specific ICT capability in particular industries, most notably financial services and health. This enables the delivery of higher value ICT services through the application of ICT skills combined with industry knowledge.

The figure below shows how a strong local base of generalist software engineering skills supporting a number of specialist strengths (Data Analytics, Cyber Security & Advanced Networking & Systems) gives Northern Ireland the opportunity to focus on key global trends which in turn help shape their output to other local business sectors.

Key global trends which inform the ICT sector and help shape their output to other sectors



Global mega trends

The panel commissioned Deloitte LLP to identify a number of global megatrends and match them to key skillsets where Northern Ireland has the best prospect for growth and innovation over the coming years.

Ageing population & wellness

Demand is increasing for ICT products which help people manage their own health and wellness. There is also increased pressure for health services to find ways to improve efficiency in the delivery of healthcare.

33% of the population is over 60
Average life expectancy is 80
Birth rate is dropping year on year (Source: UN)



THERE IS A HUGE INCREASE IN UPTAKE OF MOBILE HEALTHCARE APPS

500m

SMARTPHONE USERS
WORLDWIDE ARE USING
HEALTHCARE APPS

By
2018

50%

SMARTPHONE & TABLET USERS
WILL HAVE DOWNLOADED A
HEALTHCARE APP

Opportunities for Northern Ireland

- **Data analytics:** analysis of medical data reveals new ways to identify health risks, diagnose conditions and personalise treatment and care.
- **Applications:** wellness applications for smartphones and tablets can be tailored to the needs of an ageing population.
- **Cyber security:** medical and wellness records must be secure and trusted to be secure.
- **Sensors:** there is an opportunity for wearable sensors for diagnostic or monitoring applications.

Smart infrastructure and urbanization

Smart city infrastructure is locally relevant, and so are the opportunities globally to export solutions to urbanisation challenges

THE WORLD IS BECOMING INCREASINGLY URBANISED



% OF GLOBAL POPULATION LIVING IN URBAN AREAS (SOURCE: UN)

Urbanisation within NI is not a major factor, but there are opportunities to develop smart city infrastructures locally and to export solutions to urbanisation challenges.

THE CHALLENGES OF RAPID URBANISATION



GOOD STANDARD OF HOUSING



EFFICIENT PUBLIC SERVICE DELIVERY



INFRASTRUCTURE



HEALTHY ENVIRONMENT

Opportunities for Northern Ireland

- **Sensors:** as cities and other locations become increasingly connected, dense sensor networks connected via data aggregation and analytics platforms to multiple applications will increasingly help manage public administration, emergency services and transport.
- **Advanced networking:** urban areas require the densest networks, and have led to the development of small cell mobile networks and heterogeneous networks (HetNets).
- **Applications:** city administrative and other government functions are being transformed through the development of online and mobile applications, in areas such as payments and information services.
- **Cyber security:** as more critical data runs over city networks the networks, applications and data need new approaches to security.
- **Data analytics:** aggregation of data presents an opportunity for insight and value to be created through the combination of data sets and the analysis of rich data.

The 'digital native'

There is a need for the delivery of devices, networks, services and applications that support the demands of 'digital natives' – i.e. those whose who are fully at ease with technology.

WHAT DOES A 'DIGITAL NATIVE' LOOK LIKE?

'ALWAYS ON' OR
'ALWAYS CONNECTED'
THEY EXPECT TO ENGAGE
WITH ORGANISATIONS &
BRANDS 24 HOURS A DAY
CONNECTED THROUGH
SOCIAL MEDIA TO OTHER
PEOPLE, COMPANIES &
INSTITUTIONS INCLUDING
GOVERNMENT &
PUBLIC SERVICES

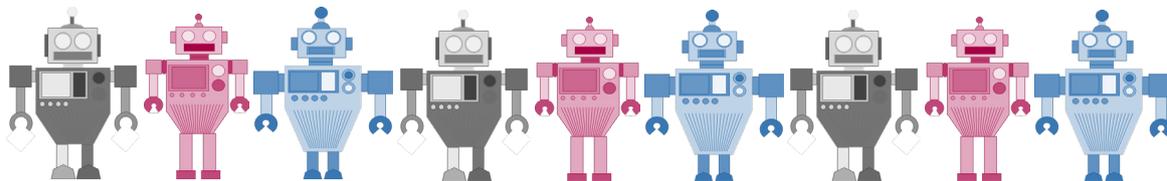


Opportunities for Northern Ireland

- **Advanced networking:** Digital natives expect to interact 24x7 with guaranteed levels of responses. Networks must be resilient and high-performing to ensure service delivery.
- **Applications:** This next generation processes information more quickly, multitasking across devices. They have access to thousands of applications, transforming and pushing the development of the user experience.
- **Cyber security:** Digital natives take security for granted, expecting technology and organizations to protect their private information. The line between public and private is far more porous than for those born before the digital age. As huge volumes of personal data are exchanged, the importance of privacy, trust and security increases.
- **Data analytics:** The ability to engage proactively with digital users will be enabled through data analytics and will assist delivering localised services by anticipating demand and proactively meeting needs. Exploitation of anonymised and aggregated data offers opportunities for innovation, the development of new services and alternative revenue streams.

Automation and the rise of machine learning

As the capabilities of computers expand beyond routine work, tasks that were once considered too complex for automation will be converted into well-defined problems capable of digital solutions.



Exponential growth in computing power, combined with a dramatic reduction in cost has seen computer technologies transform the work place, displacing labour from some jobs but also creating new types of work that call for different skills.

**GOVERNMENT &
PUBLIC SECTOR
BODIES SAY**
70%
**OF THEIR OPERATIONS
HAVE BEEN IMPROVED
THROUGH THE
AUTOMATION OF TASKS**

KNOWLEDGE WORK
AUTOMATION HAS THE
POTENTIAL TO AFFECT OVER

230m

**KNOWLEDGE WORKERS
AROUND THE WORLD
AND NEARLY**

\$9trillion

IN EMPLOYMENT COSTS

**JOB THAT BARELY EXISTED
FIVE YEARS AGO SUCH AS**

**IOS/ANDROID
DEVELOPER**

DATA SCIENTIST

CLOUD SERVICES

SPECIALIST

BIG DATA ARCHITECT

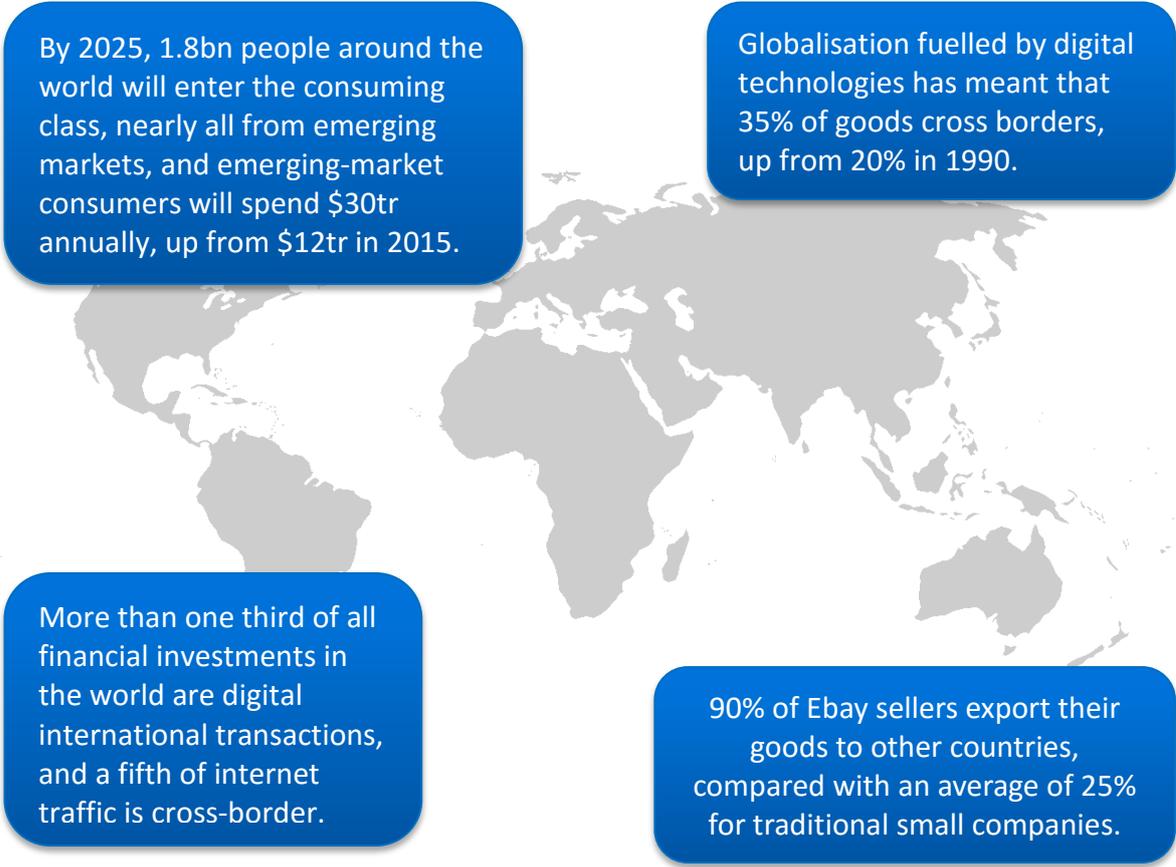
**WILL EXPERIENCE AN INCREASE
IN DEMAND BY EMPLOYERS**

Opportunities for Northern Ireland

- **Advanced networking:** the increased capability to move large amounts of data allows business activity to take place anywhere.
- **Applications:** more sophisticated applications are replacing human activity in lower-skilled work in all sectors. However there are also major job opportunities where automation can complement and enhance human activity.
- **Data analytics:** understanding of transactional data can lead to changes in the location of business functions, from manufacturing to provision of IT services, while the automation of data analysis changes the pattern and location of business processes.
- **Cyber security:** as organisations rely increasingly on networks and cloud-based services running on virtualised infrastructure, securing data becomes more challenging.

Globalisation and economic shift

Clustering, cooperation and global niche manufacturing networks can bring market opportunities through strategic partnerships & collaborative technologies.



By 2025, 1.8bn people around the world will enter the consuming class, nearly all from emerging markets, and emerging-market consumers will spend \$30tr annually, up from \$12tr in 2015.

Globalisation fuelled by digital technologies has meant that 35% of goods cross borders, up from 20% in 1990.

More than one third of all financial investments in the world are digital international transactions, and a fifth of internet traffic is cross-border.

90% of Ebay sellers export their goods to other countries, compared with an average of 25% for traditional small companies.

Opportunities for Northern Ireland

- **Advanced networking:** the increased capability to move large amounts of data anywhere, quickly and reliably changes where economic activity is located.
- **Applications:** more sophisticated applications are replacing human activity in lower-skilled ICT work.
- **Data analytics:** understanding of transactional data can lead to changes in the location of business functions, from manufacturing to provision of IT services; and automation of data analysis changes the pattern and location of business processes.
- **Cyber security:** as organisations rely increasingly on networks and cloud-based services running on virtualised infrastructure, securing data becomes harder.
- **New ICT service models:** the rise of cloud-based applications mean that IT services are no longer delivered from data centres close to the point of use, and sometimes from unknown locations.

Matching local skills to global opportunities

Focus areas were assessed against market and capability factors to establish their strength and determine how ready Northern Ireland is to exploit them. Two criteria were used to assess each of the focus areas:

- **Attractiveness** - Current market size and trajectory, attractiveness to investment over the next 3 years and the maturity of the market were considered.
- **Ability to execute** - Northern Ireland's capability to make an impact in the short and medium term, critical mass of expertise with associated R&D and infrastructure.

Focus Area	Predicted Market Growth	Summary
Big Data Analytics	IDC expects that the Big Data technology and services market will grow at a 26.4% compound annual growth rate (CAGR) to \$41.5bn through 2018.	Strong capability which can be aligned to Northern Ireland industry sector strengths to develop specialist tools and capability for export. Also supports the development of machine learning.
Software	IDC expects CAGRs of 5.1% and 5.3% for the United States and Western Europe, respectively, between 2015 and 2019.	Software engineering is the underpinning capability within Northern Ireland, supporting all the other sectors. It's important to note that the emphasis for growth in this sector is in cloud based services.
Cyber Security	MarketsandMarkets expects the global cyber market to grow from \$106.32bn in 2015 to \$170.21bn by 2020, at a CAGR of 9.8%.	Northern Ireland has a strong cyber security cluster with evidence of world class capability and research. The sector has recently created over 900 new jobs with a further 300 in the pipeline.
Internet of Things (IoT)	IDC expects the global IoT market to grow at a 17% CAGR from \$698.6bn in 2015 to nearly \$1.3tr in 2019.	Northern Ireland has specific capability in Advanced Networks and Sensors, two areas which offer opportunity for growth in terms of the IoT market. In Advanced Networks, Northern Ireland has a cluster of over 50 companies in wireless communications, internet technologies and advanced networks. While capability to manufacture sensor devices is small, there is a significant volume of R&D being conducted that could produce design and process IP which could be leveraged and exported globally.

Challenges for the Northern Ireland Digital ICT sector

Challenges specific to growing the Digital ICT sector to enable the exploitation of global markets include:

Supply of skilled, committed & passionate talent - There must be a clear pathway for young people through school, enabling and inspiring them to acquire appropriate skills within the existing curriculum, generally in STEM subjects and specifically in software development. They should be offered progression routes to Apprenticeships and Further and Higher Education. At the same time, a framework of support should be made available to allow teachers to deliver the curriculum effectively.

Leadership and the need for a digital strategy - For Northern Ireland to become a truly digital society we must engage and empower a leading industry expert as RoI and other UK regions have. The appointment of a Chief Digital Officer and the development of an ICT strategy for Northern Ireland is essential. Analysis shows that countries with robust digital economies have a clear delivery strategy aligned to their programme for government.

Government support of the sector - The UK Government has become a world leader in the provision of user-led Digital Transformation. Northern Ireland has the opportunity to use its skills and innovations for the benefit of its citizens, and to realise the cost savings and service improvements that other territories are benefiting from. Northern Ireland's size and governance structures should enable it to become a global exemplar for Digital Transformation by 2020. However, it is still difficult for local suppliers to sell effectively to our public sector.

Smart specialisation - Smart specialisation is an innovation policy concept designed to promote the efficient and effective use of public investment in research. The goal of smart specialisation is to boost regional innovation in order to achieve economic growth and prosperity, by enabling regions to focus on their strengths. Northern Ireland's challenge is to focus on smart specialisation and avoid fragmentation.

Funding the sector – Private equity is going through a period of rapid change, with the emergence of new funding models such as crowd-funding and corporate venture capital and the implications of these changes for Northern Ireland are not straightforward or easily predictable. Significant progress has been made in ensuring government support is available for companies through Invest NI, InterTradeIreland, the NI Science Park and others; however there are a range of areas where improvements are still needed. HMRC offers R&D Incentives and as incentive rates have increased and the scope of the schemes has been enhanced an increasing number of NI businesses recognise and utilise the value of R&D Tax Credits, in particular.

Characteristics of a leading digital economy

The panel identified the following characteristics that leading digital economies share and examined Northern Ireland's performance against them. They then mapped any shortcomings to current government activities and the remaining gaps were incorporated into the panel's final recommendations.

A Digital Strategy - Leading countries have industry advocate(s) who advise government on the development of its ICT sector and a focused strategy and action plan that identifies opportunities in the sector and measures its impact on the region's economic development prospects. Northern Ireland currently has no digital strategy.

Human Capital - The panel noted that while Northern Ireland has a particular strength in the calibre of its software engineers, it has a weakness in the *quantity* of talent that is available to support the growth of the ICT sector.

Foreign Direct Investment - Northern Ireland has a proven ability to attract and maintain FDI. Further opportunities for growth are being achieved by narrowing the focus (smart specialisation) to attract high-value jobs in specific target areas for growth.

R&D Capability - Whilst the trend of investment in research-based activity in Northern Ireland is positive, levels of BERD remain lower in contrast to other UK regions, which indicates that there is some way to go to become world-class.

Support for Innovation - Whilst focus on innovation is growing in Northern Ireland, it is behind exemplar regions in the UK in terms of innovative active businesses and the level of innovation or the absorption of funding to support innovation.

Funding and Investment Activity - Northern Ireland has put in place a number of tailored, publicly funded programmes for innovation and R&D, but take-up of available funding outside of Northern Ireland specific schemes such as Innovate UK and Horizon 2020 is lower than other regions in the UK.

Building Clusters - Invest NI's Collaborative Network Programme (CNP) supports the development of business-led collaborative networks but it is acknowledged that there is an opportunity to achieve more through formal clustering to assist and progress R&D and promote capability to a global marketplace.

Maintaining Digital Infrastructure - Northern Ireland is establishing itself as one of the most connected regions in Europe. The quality of the technology infrastructure must be maintained to an exemplary level going forward and be able to support 4G, 5G and beyond.

Smart Specialisation - Smart specialisation involves exploiting digital technology to transform government, business and individual processes to deliver significantly better outcomes. Northern Ireland is regarded as having a strong financial services and health

ICT capability. However, Northern Ireland does not align its industry strengths alongside ICT as much as it could do.

Strong Brand Identity - Northern Ireland’s Digital ICT brand is not as distinguishable as it could be.

Where NI needs improvement and actions being taken

Action required	Comment
Develop a dedicated digital strategy	MATRIX recommends the appointment of a Chief Digital Officer to develop and deliver a digital strategy for Northern Ireland.
Address the talent gap	An ICT Future Skills Action Plan has already been produced by DEL, and ICT is now embedded in the revised curriculum as a skill across all Key Stages. MATRIX also recommends the development of a Skills Investment Plan.
Encourage BERD	HMRC offers financial incentives to encourage businesses to carry out inhouse R&D.
Support innovation	The 2014 Northern Ireland Innovation Strategy envisions that by 2025, Northern Ireland will be recognised as an innovation hub and will be one of the UK’s leading high-growth, knowledge-based regions.
Improve take up of Horizon 2020 and Innovate UK funding	DETI is currently developing a Northern Ireland Strategy for Horizon 2020.
Develop formalised ICT clusters	MATRIX recommends a centre for Data Analytics and a focus on formal ICT clusters, plus continued focus on CSIT.
Focus on Smart Specialisation	DETI published the <u>Northern Ireland Smart Specialisation Framework</u> in 2015 detailing strategies to deliver on innovation priorities.
Improve Northern Ireland brand identity	MATRIX recommends the appointment of a Chief Digital Officer to develop and deliver a digital strategy for Northern Ireland which would incorporate brand development.

Statements in bold refer to an action which forms part of the report’s recommendations

Summary of recommendations

The report makes several recommendations and suggests owners and timescales for completion. It also suggests three supporting actions:

- A report dedicated to the creative digital and content sector in Northern Ireland.
- The Department for the Economy to clearly define the Digital ICT sector to establish the full contribution the digital economy makes to the overall economy.
- That the existing digital infrastructure is maintained and further developed.

Action	Suggested owners	Timescale
1. Develop a 3-5-10 year Skills Investment Plan for the Digital ICT sector		
Focus the skills investment plan to support the areas examined by this report and to consider ways to create the skills required in the future.	DE and DfE	6 – 12 months
Develop an action plan to support the development and delivery of digital skills and computing in schools.		
2. Create a centre for Data Analytics		
Carry out a feasibility exercise to establish the benefits innovative high technology SMEs and industry sectors will gain from a centre for Data Analytics.	DfE, DfP, QUB & UU	12-18 months
Employ a clear leadership and governance structure to attract public sector resources that complement the private sector's expertise.		
Create a centre for Data Analytics that will advance the development of commercial spin offs and new products and services for the market.		
3. Engage a Chief Digital Officer		
Commission a leading industry expert to support Government to build a digital society and an exemplar region to meet the expectations of 21st century citizens.	DfE and DfP	6 – 12 months
Develop and deliver a coordinated Digital Strategy to bring together the key stakeholders and initiatives required to transform Northern Ireland into a fully digitized and Smart society.		
4. Government as an expert and strategic customer of digital technology		
Create an agile delivery process that responds to the changing requirements of purchasing of ICT products and services to ensure solutions meet requirements.	DfP, DfE and local government	1-3 years
Ensure that NI has an exemplar digital infrastructure within and between urban areas resulting in Northern Ireland as an exemplar smart, connected region.		
Provide an integrated, agile platform, based on open standards which expose appropriate data and service APIs to nurture the development of an innovative ecosystem.		
Make it easier for local businesses, particularly SMEs, to do business with Northern Ireland Government.		
5. Ensure that the cyber security sector is supported and developed		
Continue to support CSIT with its vision of establishing a global innovation hub for cyber security.	DfE	Ongoing
Support the growth of the NI cyber security cluster with targeted support for start-ups, indigenous businesses and FDI in the sector.		
Develop a portfolio of cyber skills and training initiatives, from PhDs and MSc courses through to relevant Assured Skills programmes.		