

MATRIX REPORT
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TELECOMS HORIZON PANEL REPORT

EXPLOITING NORTHERN IRELAND'S TELECOMS INFRASTRUCTURE



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FOREWORD

Increasing private sector productivity and reducing the gap with the UK average remains an important goal of the Northern Ireland Executive. Establishing Northern Ireland as a region capable of supporting high value indigenous business growth and attracting Foreign Direct Investment is a vital element of this objective. Recognising and actively promoting our strengths is the challenge we are addressing as we strive to deliver the vision for the dynamic, innovative economy set out in the 2008-2011 Northern Ireland Programme for Government. MATRIX has been established to revitalise Northern Ireland's approach to innovation within the knowledge economy and to harness the scientific and technological capability in Northern Ireland in the pursuit of long term growth.

Addressing this challenge means supporting businesses and creating the conditions in which enterprise can flourish. It requires investment into the provision of modern, efficient infrastructure to provide the platform on which businesses can build. Telecommunications infrastructure plays a key role in facilitating economic development across the region.

This Programme for Government has seen unprecedented public sector investment into the provision of such infrastructure. Northern Ireland now benefits from its first direct international telecommunications link with North America. It is among the first-movers within the UK in the deployment of a business-focused next generation broadband access solution.

After some six months of intensive work, it is my pleasure as Chair of the Matrix Telecoms Panel to present to the Minister for Enterprise, Trade and Investment our recommendations on the business opportunities that we can exploit having regard to our telecommunications infrastructure.

Telecommunications is a key enabler for global services and growth. It is a multi-trillion pound global market. As a region, Northern Ireland is now well-placed to capture its share of that market. For a growing number of NI based businesses geographic location is almost irrelevant and, notwithstanding our position as “an island within an island”, we have the potential to act as a global hub or base for delivery of high-value services and across key business sectors.

In completing this study, the Matrix Telecoms Panel has carried out extensive research and drawn on the experience of acknowledged innovators and experts across the Advanced Engineering, Health and Life Sciences, Social and Digital Media, ICT, SmartGrids and Renewables and Financial Services sectors to develop this report into our capabilities as a region.

And the news is encouraging with our assessment of the region's level of maturity across six opportunities presented ranging from medium to high. Importantly, in terms of economic gain, each opportunity can make a significant impact on the Northern Ireland economy. It goes without saying that we must act now, to capture the benefits the opportunities present.

We believe our assessment of the quality of our telecommunications infrastructure is frank and honest, thanks in good measure to the very open and generous contributions by all our major telecoms providers to this report.

Our core network, in terms of the extent and reach of fibre, is on a par with or exceeds anything elsewhere in Europe. A remarkably high percentage of our businesses are located within 3 miles of fibre. This is the solid platform on which we can build. Direct international connectivity now gives us the distinction of being "closer" to the east coast of North America than California - with high bandwidth, low latency connectivity that puts us firmly on the map as the "bridge" between North America and Europe, and indeed into the Far East for delivery of a range of high-value services.

Telecommunications is a fast-moving sector and we cannot afford to be complacent. That is why it is particularly pleasing to see the emergence of collaborative business networks such as the Digital NI2020 network led by one of the members of the Panel, Sinclair Stockman. With vision we can capture the opportunities presented in this report.

We must also recognise the vast investments being made by other countries such as Korea and Singapore into their telecoms infrastructure. They are investing sums of money that we simply cannot afford. Nevertheless, we believe we can and we will be competitive if we are smart, by a combination of concentrating our energies on our strengths and capabilities and collaborating, when individually our companies cannot 'go it alone'.

In summary, there are a number of opportunities that NI's world-class telecommunications infrastructure can support to build on our strengths and develop NI's global niche markets, supporting our economic goals.

I would like to thank all those who provided their very valuable time and insight into this study and the preparation of this report, particularly those leaders from industry, academia and government who met to consider, corroborate and enhance the findings and recommendations developed by the Panel. In particular, I would like to recognise the input of all the telecoms vendors, who were so open and generous in their support.

I would also like to thank Norman Apsley, Vice-Chair of the Panel and Sinclair Stockman for the enormous amount of time and intellect they spent over the last six months in contributing to this body of work.

I want also to acknowledge the work of Frank O'Donnell, Kevin Moloney, Michael McClelland and Kevin Duffy of PA Consulting who coordinated the industry consultations and provided an important input into the completion of this report.

Finally the Matrix Executives and in particular Bill Stevenson and Eoin McFadden, I want to acknowledge their support and enthusiasm at all stages of this report.

Dr. Bryan Keating
Telecommunications Horizon Panel Chair



TELECOMS PANEL EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

This report finds that major advances have been achieved in the quality and extent of telecommunications provision in Northern Ireland and, combined with near term plans, the overall provision places it among the leading regions in terms of international standards. The MATRIX Telecommunications Horizon Panel found that the advanced telecoms services will support world class business activity and they have identified six economic opportunities that relate to multi-billion dollar markets with strong growth prospects,

This report builds on the work of Matrix, the NI Science-Industry panel, in which it was clearly shown that Telecommunications plays a key enabling role in the knowledge economy and in driving high technology industry opportunities¹. It is the result of a short focused exercise drawing heavily on the expertise within the Telecoms Horizon panel.

NI has made great strides in its telecoms infrastructure in recent years, bringing the region to a very competitive position:

- Since 2004 over 99% of premises are able to access a fixed line broadband service and there is 100% availability of broadband to the region;
- NI's Next Generation Broadband Project (NGBP) will make broadband with speeds up to 40Mbps available to 85% of NI businesses by 2011; and,
- Multiple external links are now in place, including direct international connectivity via Project Kelvin, which provides a low-latency link to North America.

It is the Panel's view that in a global context, this strongly positions NI to attract investment and develop indigenous business, and to stimulate innovation and competitiveness.

Opportunities for future growth were identified in the following six areas based on the existing capability in NI, the significant role of telecommunications and the overall scale of the market opportunity:

- **Social & Digital Media** - through promoting global interaction with producers and consumers of digital content, NI can create and support the development of global digital content. There are particular opportunities in the near term within the post production area;
- **ICT** – promoting NI as a base for supporting “Cloud” applications and service development, NI can position itself as a global competitor for the provision of “as-a-Service” applications for the current and next generation of Internet;

¹ The World Bank has found that for every 10% increase in broadband penetration, there is a corresponding 1.38% increase in GDP¹ for that region.

- **Advanced Engineering & Materials** – where NI can develop as an international centre for high-value collaborative design, by enabling seamless real-time design work across geographies. This is particularly relevant for existing companies in the advanced engineering area that are moving to higher value activities and in securing long term jobs;
- **Health & Life Sciences** - NI can develop in the near term as a test-bed for Connected Health deployments, and in the longer term a global delivery hub for Connected Health services using low-latency, high-speed telecoms;
- **SmartGrids** - NI can develop an open-access model which will inform domestic, industry and trade buyers (of energy), based on the aggregation and transformation of data into a graphical interface. Within this area there is the opportunity to extend into a broader concept of a “smart community”; and,
- **Financial Services** - NI can act as an information hub for world financial institutions, aggregating information from the US and European markets in as close to real time as possible.

In terms of economic gains, all six opportunities will make a medium or major impact on the NI economy. Importantly, the economic benefits of four of the six opportunities will be felt within five years, with ICT at a stage where it can make an economic impact right away.

RECOMMENDATIONS

In the course of this work it has become clear to the Horizon Panel that many of the opportunity areas are already being progressed in NI. The Panel encourages business in general to take advantage of the opportunities presented by the improved Telecoms environment and specifically endorses the activities of those progressing the opportunities listed above.

In addition the Panel makes the following recommendations for action to ensure that this overall opportunity to exploit telecoms capability is realised:

Recommendation 1: The Panel recommends that each of the opportunities is fully supported within the overall MATRIX agenda and by policy makers in NI so each will reach its full potential for the benefit of NI’s economy.

Recommendation 2: There should be sustained marketing and communications campaign, jointly delivered by Government and Telecoms suppliers that is focused on three key areas:

- Communicating the availability of next generation services across NI with an emphasis on both NI based business users and on those businesses with the potential to invest in the region;
- Articulating the business value of next generation telecommunications across different industry sectors to make the case for investment by individual companies. Opportunities to facilitate business to business interactions on this area are preferred over government or supplier led communications;
- Promotion of collaboration among businesses seeking advanced telecommunications, in alignment with the overall concept of collaboration endorsed by MATRIX, to aggregate demand and provide more cost effective solutions to their needs;

Recommendation 3: The Panel believes that, where possible, fixed line infrastructure supporting open-access telecoms should be a pre-requisite for any multi-occupancy business development and that this should be achieved through changes in planning regulations.

Recommendation 4: Further engagement between business, HE/FE institutions and government departments is required to identify and develop the skills required to support these opportunities, and future opportunities which may arise.

At this point it is clear that Northern Ireland is in a strong position with respect to the Telecommunications environment due to the 100% broadband rollout, Project Kelvin and NGBP. However, it is clear that competing countries and regions are continuing their efforts to improve in this area due to the economic necessity for advanced digital interaction. Therefore, this report represents a snapshot and continued assessments on a “light touch” basis will be necessary to support the overall agenda of MATRIX and to position NI as a leading knowledge economy.

INTRODUCTION

This section sets the context for the work of the MATRIX Telecoms Horizon Panel: the importance of telecommunications in NI, the MATRIX environment, and the objectives of the Panel.

1



1.1

THE MATRIX TELECOMS PANEL

The MATRIX Telecoms Panel is the sixth technology horizon scanning panel to be established under the Horizon Programme which has been put in place under the auspices of MATRIX - the Northern Ireland Science Industry Panel.

MATRIX has been established to revitalise Northern Ireland's approach to innovation within the knowledge economy and to harness the scientific and technological capability in Northern Ireland in the pursuit of long term growth. A series of reports has been published that highlight the capability in Northern Ireland and the potential opportunities in areas such as health, manufacturing, engineering and ICT. Within this work the infrastructure within Northern Ireland is seen as part of the necessary framework conditions for growth and Telecommunications is a core element of that infrastructure.

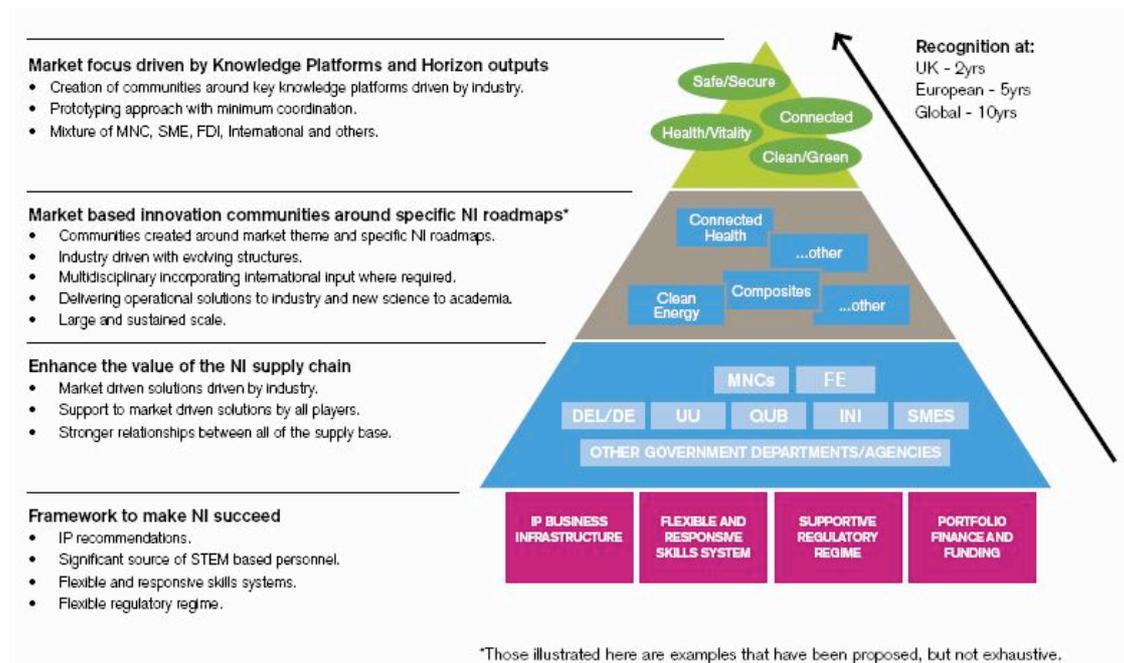
Horizon is the MATRIX flagship strategic technology foresight programme. Horizon builds on the success of past rounds of Northern Ireland Foresight and seeks to identify the key technologies which will be of specific commercial value to the Northern Ireland economy over time-spans of 5, 10 and 15 years. It is a rolling programme, seeking to inform both Northern Ireland Government Policy and private sector business planning to ensure that Northern Ireland is best placed to exploit future commercial opportunities arising from its R&D and science & technology base.

Within its deliberations the MATRIX Panel has developed a series of recommendations on key elements of the innovation ecosystem in Northern Ireland. The Panel has arrived at an overarching recommendation to deliver growth to the Northern Ireland economy based on an enhanced capability to innovate: "Connect science to exploitation through market focussed technology innovation communities that are targeted at Northern Ireland specific roadmaps".

This is shown in figure 1.1 below, a future innovation system for Northern Ireland. The model builds on existing fundamental capabilities within the science and technology base in Northern Ireland but seeks to achieve a greater level of connectedness through multidisciplinary industry-led communities and enhanced roles to market for science and technology.

Horizon Panel reports are presented to plenary MATRIX meetings as they progress and MATRIX will provide a broad base of expert quality assurance through debate and analysis to help shape the reports' development. This report, when finalised through MATRIX, will be submitted to Northern Ireland Government through DETI for consideration in future policy development.

Figure 1.1: Future focused innovation system for Northern Ireland



1.2 WHY IS TELECOMMUNICATIONS SO VITAL?

Telecommunications has become a core tenet of infrastructural requirements to support the growth of economic, social and industrial development of regions and countries². It is now seen as analogous to electricity in that it is basic necessity to support the development of communications, innovation, social inclusion and provide a global reach for its proponents. It is without doubt a central driver for the increased globalisation of world economies, and while basic telecommunications are available globally, quality telecommunications infrastructures have enabled countries to develop at a faster pace than those without. This is deepening the digital divide between advanced and developing countries.

Telecommunications has become one of the key enablers for global services and growth. It not only facilitates instantaneous communications anywhere in the world, it also enables industry to develop around it offering increased efficiency and effectiveness.

² Source OECD

Broadband is one of the key services provided by telecommunications, and the World Bank has found that for every 10% increase in broadband penetration, there is a corresponding 1.38% increase in GDP³ for that region.

Telecommunications itself is a multi-Billion pound global market⁴, with Ofcom reporting the size of the UK market to be in the region of £31Billion⁵ in 2008. In the Republic of Ireland, ComReg estimates the current size of the market to be approximately €4Billion⁶. By itself the telecoms market is a sizeable portion of the island's economy.

1.3

OBJECTIVES OF THE MATRIX TELECOMS PANEL

The MATRIX Telecommunications Panel was convened in January 2010 and tasked with:

- Identification of market opportunities for Northern Ireland;
- Assessment of the potential for investment opportunities (for business, HE and wider research base, and the public sector) in the successful exploitation of Northern Ireland's telecommunications infrastructure including direct international connectivity;
- Identification of how Northern Ireland's telecommunications infrastructure presents genuine opportunities for business and research collaboration in terms of wider global business, research and technology innovations;
- Identification of any impediment or potential impediments which may prevent the full exploitation of new market opportunities;
- Examination and presentation of examples of regional, national and global best-practice in maximising the impact of telecommunications as an enabling technology to economic development, attraction of FDI, improvement of business productivity and growth and stimulation of research and development activities;
- Identification of the additional, private sector led, infrastructure/investment needed to maximise the effective utilisation of Northern Ireland's telecommunications infrastructure in capturing significant share of identified markets; and,

³ Source: ITU Report "Confronting the Crisis" October 2009

⁴ WTO: http://www.wto.org/english/res_e/statis_e/its2009_e/section3_e/iii15.xls Estimates Telecommunications to be worth \$34Bn in 2007.

⁵ http://www.ofcom.org.uk/research/cm/cmr09/CMRMain_4.pdf Ofcom 2008 Market Report

⁶ Based on aggregate of last 4 quarterly ComReg market reports - www.comreg.ie/publications/

- Definition of the synergistic actions required across business, government and academia to fully realise the current and future market opportunities identified in the study.

1.4

THE WORK OF THE MATRIX TELECOMS PANEL

The Telecom Panel undertook individual consultations with over 40 stakeholders from a range of key sectors including:

- Health & Life Sciences;
- Advanced Engineering & Advanced Materials;
- Civil Engineering;
- Information and Communication Technology (ICT);
- Agri-Foods;
- Social & Digital Media;
- Financial Services;
- SmartGrids and Renewables;
- E-Education and e-learning;
- Telecommunications;
- Government; and
- Academia.

Based on these consultations, research of international exemplars and global markets, and Panel discussions, the Panel developed six potential opportunity areas. These were verified and refined at a cross-sectoral and cross-disciplinary stakeholder workshop hosted by the Panel on 18 May 2010. The opportunities developed are presented in chapter four.

The Panel also produced an interim report, concentrating on Project Kelvin, in March 2010.



1.5 THIS REPORT

This document represents the final report and recommendations of the Panel within the following overall structure:

- Chapter 1: Introduction to the Matrix Telecommunications Panel;
- Chapter 2: Presents the approach to the opportunity assessment taken by the Panel;
- Chapter 3: Presents and assesses the potential opportunities identified by the Panel;
- Chapter 4: Presents NI's telecommunications infrastructure and market players;
- Chapter 5: Discusses the cross-sectoral pre-requisites to successfully enable the opportunities;
- Chapter 6: Identifies the strategic and policy environment that underpins the context of the panel approach and findings; and,
- Chapter 7: Provides the Panel's recommendations and conclusions.

THE MATRIX TELECOMS PANEL'S APPROACH

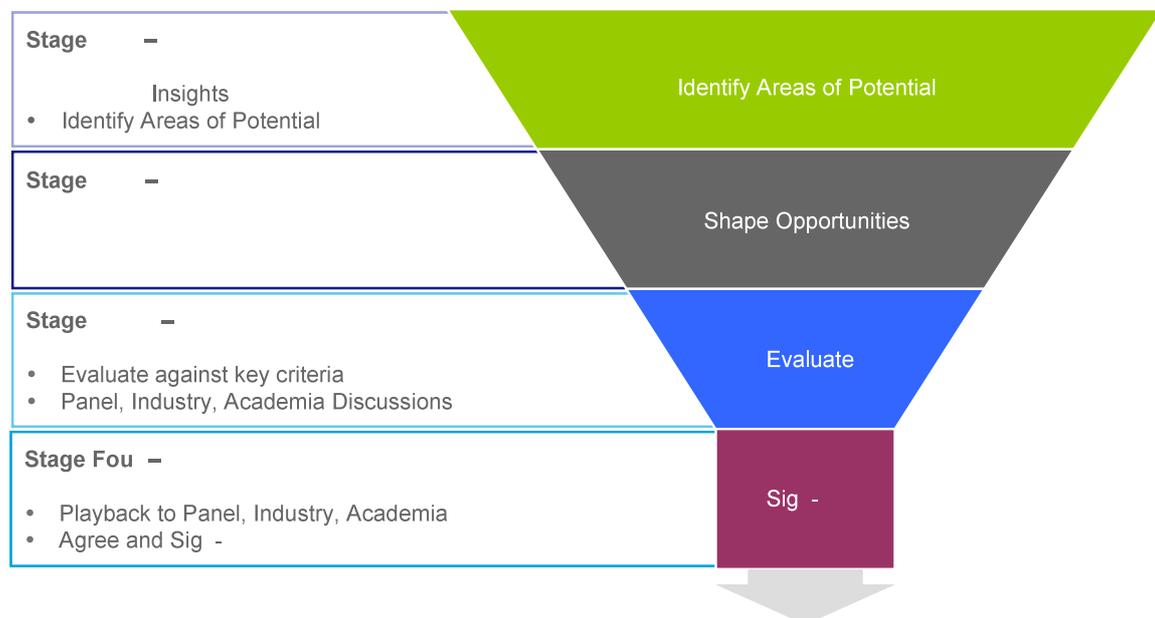
This chapter sets out the approach that was taken to select and analyse the opportunities identified by the Panel and to verify and validate the opportunity.

2

2.1 THE APPROACH

The Panel used a robust four stage approach to “funnel through” only those opportunities which will differentiate NI on a global stage. This approach is set out in the figure 2.1 below:

Figure 2.1: The Approach



2.1.1 STAGE ONE: PANEL EVALUATION

The Telecoms Panel met on Tuesday 2nd February (2010) to identify ‘areas of potential’ for NI to further exploit its telecoms infrastructure and position itself as a leading innovator on the global stage. Based on the expert Panel’s sector insights and knowledge of NI’s capability and competencies, a total of nine ‘areas of potential’ were identified:

- Advanced Engineering & Materials;
- Health & Life Sciences;
- Civil Engineering;

- Social & Digital Media;
- Agri-Foods;
- ICT;
- SmartGrids & Renewables;
- Financial Services; and
- E-Education and e-learning.

These nine areas of opportunity were then used as a basis for the wider stakeholder consultations in the next stage.

2.1.2 STAGE TWO: STAKEHOLDER CONSULTATION

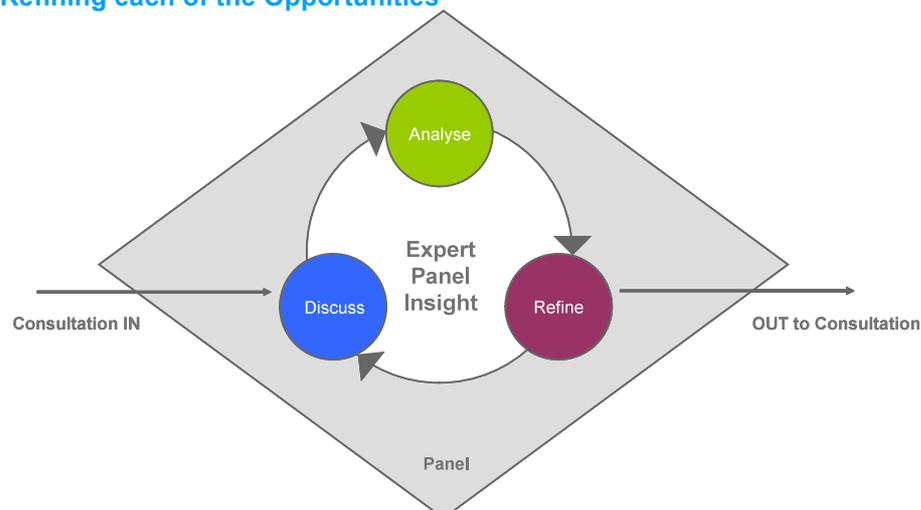
The Panel identified key individuals from Industry, Government, Service Providers, Telecommunications and Academia with links into each of the nine 'areas of potential', for consultation.

A programme of consultation lasting several weeks was then carried out, with over 50 interviews taking place. A full list of those consulted as part of this phase is provided in Appendix B.

Each interview was documented and fed back into the Panel. The panel discussed, analysed and refined each of the ideas, shaping them into more market focused, defined opportunities for NI Plc. This phase of work drew heavily on the expert panel's sectoral insights and knowledge of global developments in each of the areas of potential. The Interim Kelvin report (March 2010) also informed this process.

A SWOT (Strengths Weaknesses Opportunities Threats) analysis was carried out on each emerging opportunity, to drive out feasibility and viability. Following detailed discussion and analysis, the opportunity was then further refined, and taken back out to the stakeholder community for testing and evaluation. This iterative process is set out in Figure 2.2.

Figure 2.2: Refining each of the Opportunities



Through this process (shown above in Figure 2.2), the Panel arrived at a shortened list of opportunities. The original nine areas of potential were reduced to six, as follows:

- Advanced Engineering & Materials;
- Health & Life Sciences;
- Social & Digital Media;
- ICT;
- SmartGrids; and
- Financial Services.

From this iterative process the opportunities were refined for each sector, and the Panel sought a wider representative body to test the viability of each one.

2.1.3

STAGE THREE: TESTING THE OPPORTUNITY VIABILITY

A workshop was then held on 18th May to discuss and agree on the final set of opportunities. Attendees were drawn together from Industry, Academia and Government (as listed in Appendix B) with particular interests in the areas to assess each opportunity against an agreed set of questions:

Opportunity Assessment

1. Does this represent a realistic and concrete opportunity?
2. How critical is telecoms infrastructure to this opportunity?
3. What is NI's level of maturity in this field?
4. What is the size and direction of the world market (next 2, 5, 10 years)?
5. What is the potential size of the 'prize' for NI?
6. Does anything else need to be in place for NI to realise this opportunity?

The process resulted in the refinement of the opportunities following testing and challenge by the participants.

A spokesperson from each group was then selected to present the opportunity back to the rest of the attendees. A plenary discussion of each opportunity then took place. All comments were documented.



2.1.4

STAGE FOUR: MARKET VALIDATION

The overall output from the previous stages was then delivered to the Telecoms panel for final validation and agreement. This resulted in six key areas of opportunity further developed in the following chapter.

NI'S TELECOMMUNICATIONS SUPPORTED OPPORTUNITIES

This chapter outlines the opportunities that have been identified by the Telecoms Panel, in conjunction with Industry and Academia, reviews the cross-sector aspects of each opportunity and the prerequisites that must be in place to make them happen.

3



3.1

OPPORTUNITY 1: ADVANCED ENGINEERING & MATERIALS

Northern Ireland has long-standing expertise in complex design and project management within the Advanced Engineering area. However, high-value services like these can be expensive, and with many parent companies and clients being based in North America, they prefer to locate design and project management services within “arms reach”. There is evidence however in NI that with the right telecoms infrastructure in place, remote design and project management can work.

The growing trend of teleworking and collaborative working is being driven by 3 main factors:

- Improved platform technology
- More highly skilled workforces
- Improved connectivity

Collaborative working has seen a boom in recent years, whether you look at it in terms simple shared resources and documents as with Microsoft Sharepoint, or more complex dynamic systems such as multi-agent architecture CAD systems.

Software technologies have improved to such a point that collaborative applications are no longer a niche workstream. The growth of HTML 5 and continued product releases are bringing collaborative working ‘to the masses’, and providing an environment whereby real-time collaboration is beginning to be seen as an expected element of high-skilled working environments.

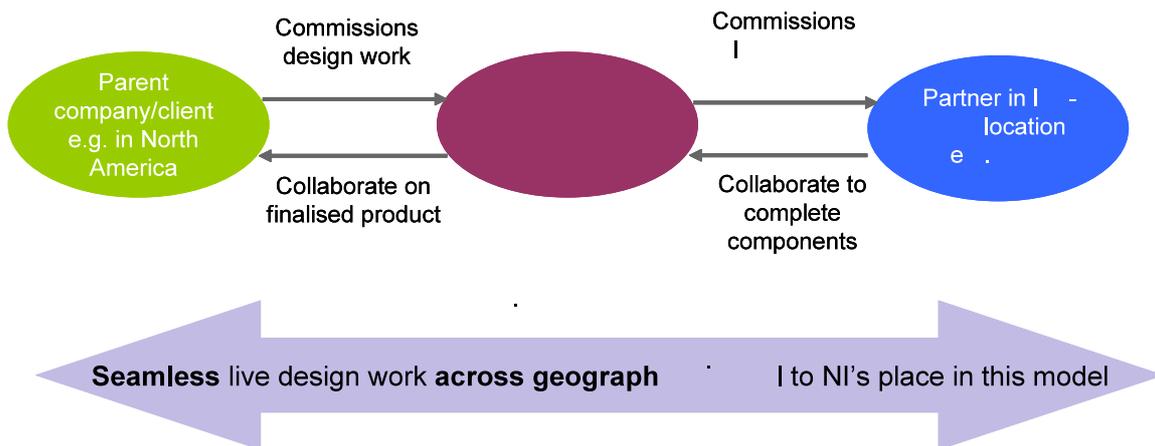
Larger technologically adept workforces, and increasingly ubiquitous connectivity, are supporting this, and many industries are adopting this method of working to align working practises with organisational strategy.

In the Advanced Materials and Engineering sector, this means that the management, design and R&D, and manufacturing elements are no longer geographically constrained. For instance Molex, a leading global engineering and supplier of electrical interconnectors firm, reported a \$5 million saving in product development due to engineers using a collaborative software solution. It was noted however that this was a conservative estimate, and that actual savings were likely to be more. This is not an isolated instance however – in the UK BIWTech’s collaborative SaaS service for construction and property projects currently has over 50,000 users, while Cisco’s chief technology expects the collaboration market to reach up to a €34 billion market.

The Panel agrees that:

NI can develop as an international centre for high-value collaborative design, by enabling seamless real-time design work across geographies.

Figure 3.1: Providing Collaborative Design Services to the Rest of the World



As set out in Figure 3.1 above, NI can become the fulcrum of a high-value chain, providing design and project management services. On the one hand they can collaborate in real time with their design colleagues in parent/ client offices in North America. On the other, they can co-ordinate and manage the delivery of lower value work, which can be off-shored to low cost locations such as India.

3.1.1 ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is a viable opportunity to become a Design Authority for global manufacturers positioning NI as the hub for value-add real-time collaborative design and project management services.

2. How critical is telecoms infrastructure to this opportunity?

Telecoms infrastructure is critical to this opportunity. Real-time collaboration and demonstration requires high bandwidth. Failure to provide this capacity and low latency will likely result in degradation of service and therefore loss of opportunity. With recent developments including the rollout of the NGB, NI has the infrastructure in place which can meet these needs.

3. What is NI's level of maturity in this field?

NI has a high level of maturity in the advanced engineering and materials area, with cases of collaborative design already taking place in NI industry today e.g. Bombardier work on shared design. The concept of the digital factory in NI in companies such as McCloskey's also points to a level of maturity, which has meant organisations like these have been able to grow internationally.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

In terms of the direction of the world market, failure to support this opportunity could result in a loss of these high cost services to other more competitive locations. This would lead to an erosion of NI's indigenous capability and thereafter the overall sustainability of the Advanced Engineering industry. It is therefore extremely important that the opportunity is taken now to build on the growing success and influence of NI companies. In terms of the size of the prize for NI, it is difficult to quantify in monetary terms just how big the global market is as design services pervade all new product development, however some indications⁷ are:

- Composites manufacturing is predicted to be worth £74Bn by 2013;
- Industrial biotechnology market is predicted to be £150-360Bn by 2025;
- Plastic electronics is forecast to be £15Bn by 2015 and £125Bn by 2025; and,
- Silicon electronics is estimated at £170Bn, with growth rates of 1% this year.

5. Does anything else need to be in place for NI to realise this opportunity?

Certain measures would need to be in place to realise this opportunity. First of all, a unified technology strategy for NI should set out a clear roadmap and protect against the fragmentation of technology solutions (applications, infrastructure, protocols etc). Digital skills should also be made available to support those with strong science and engineering backgrounds to make sure that all opportunities to position NI as a global Design Authority are taken.

⁷ Source: Department for Business, Innovation and Skills



3.2

OPPORTUNITY 2: HEALTH & LIFE SCIENCES

Within the overall Health and Life Sciences area the potential for Telecoms and ICT to offer a more effective and efficient health service has been debated heavily within the overall area of “connected health”. It is important to realise that this concept is much broader than considerations of raw data throughput and management – interconnecting all “silos” of patient care in real-time is ultimate goal for connected health, both in terms of care and technology. Connected health means more information, which means more accurate and better care pathways. The UK Wanless Report concluded that the resultant increased patient self-care could decrease doctor and hospital visits by 40 and 17 percent respectively, and that it generated returns of £150 for the NHS for every £100 spent. This move towards health “infostructures” is well underway – Germany and Italy have both already developed legal and economic frameworks, however both recognise that the underlying telematics is absolutely critical to enabling this interoperability between systems and institutions.

A recent US study found that of the \$2.3 trillion spent on healthcare in the country, almost half is avoidable excess through unnecessary care, inefficient administration, and the cost of treating preventable conditions. Most importantly though, redundant, inappropriate, or unnecessary tests and procedures accounted for almost \$210 billion. Before the systems and processes can be implemented for total connected health though, the supporting telecoms infrastructure needs to be in place.

Bandwidth and connectivity requirements are quite difficult to predict in demand terms, since data throughput requirements vary quite a lot in this area - for instance telehealth monitoring of patients would not be particularly data-intensive, while the sharing of X-Rays between hospitals or health centres could range from several Gigabytes to a Terabyte depending on the size and number being shared.

In Northern Ireland there is evidence of a number of small indigenous players already doing truly innovative work in the Connected Health space e.g. McElwaine Smart, Radox and Intelesens. Strategic focus to date has however been largely on delivery within Northern Ireland and not in the export markets.

The Panel agrees that:

NI can become a test-bed for Connected Health deployments, and a global delivery hub for Connected Health services using low-latency, high-speed telecoms

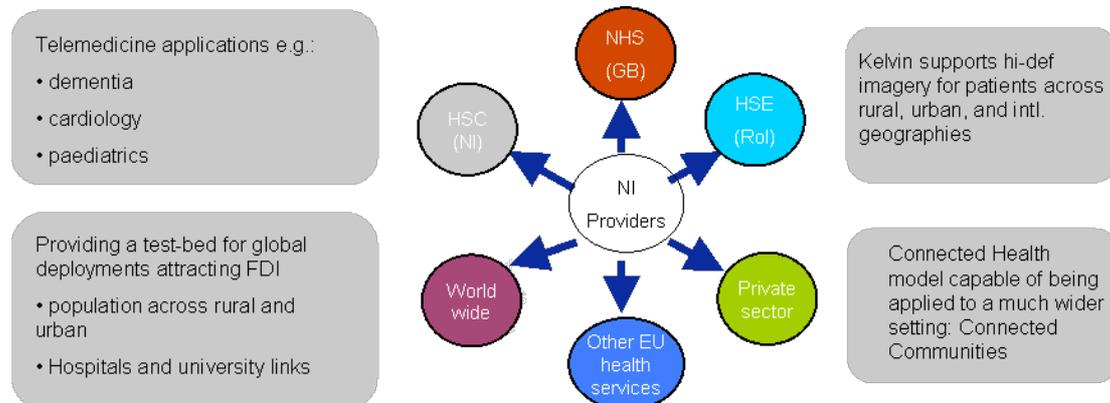


Figure 3.2: Connected Health Opportunities in NI

Figure 3.2 shows NI as a delivery hub for Connected Health services to NI, Ireland, Europe and the rest of the World. There are two key propositions – the first to become a test-bed for other countries’ planned deployments; the second to deliver telemedicine applications e.g. for paediatrics and dementia.

3.2.1 ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is a concrete opportunity for NI in the Health and Life Sciences space. The opportunity centres on NI becoming a test-bed and delivery hub for connected health services.

2. How critical is telecoms infrastructure to this opportunity?

Good, reliable telecoms infrastructure is essential to realising this opportunity. High bandwidth is not however key. Basic blood pressure readings for example are not bandwidth intensive. Instead, it is the ubiquity of basic telecoms, which will be the deciding factor – NI is therefore well-placed with 100% broadband coverage.

3. What is NI’s level of maturity in this field?

NI is mature in the Health & Life Sciences field. There is evidence of a number of small indigenous players already doing truly innovative work in this space e.g. McElwaine Smart, Radox and Intelesens. The developing trials in Ambient Assisted Living (AAL) involving five groups in NI and the universities is also further evidence of the good work already underway. The NETwell project is also a source of good insight and knowledge and the proposed Remote Telemonitoring project for Northern Ireland could provide a substantial platform for developing practice based

insight on this area. Finally, the location of the European Connected Health Campus in NI and evidence of a burgeoning collaborative network on connected health has ensured that the good momentum and brand built up in NI are sustained as we move forward.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

In terms of the direction of the world market, there is enough evidence to show that connected health is the accepted direction of travel. This is further evidenced by the significant investments being made into connected health technologies by large players like Intel, General Electric (GE), Bosch and Tunstall.

In a US Dept of Commerce report published in 2009, the estimates are that the global Telemedicine market is worth in the region of \$1.8Bn by 2013 with an annual growth rate of over 50%. Current Public Health spend in UK is approximately £100 Bn with around £5.5 Bn of that in Northern Ireland. The direction of connected health is that services which are currently provided by traditional health provision can be streamlined and delivered more efficiently through the use of connected health. This will provide lower unit cost solution which can meet the rising demand for services with an ageing population presenting more complex health needs. Connected Health therefore represents a significant market opportunity both to the public health services such as in the UK and the Private Health markets such as in the US and Europe.

5. Does anything else need to be in place for NI to realise this opportunity?

There are some important things that will need to be in place if NI is to realise this opportunity. In terms of the technology and infrastructure, it is essential that networks are reliable. It is also important that data is secure at all times. With regards to policy, Government needs to continue to support the connected health agenda. Finally, the Panel believes that a “Big Bang” implementation strategy will not work. Instead, the implementation should take place in steady increments, progressing small components of work that build up towards an overall vision.

Case Study: McElwaine Smart

McElwaine Smart is a Fermanagh based company working in the area of Ambient Assisted Living. They provide an extensive range of personal safety devices and activity monitoring tools to the elderly. They also offer around the clock support and monitoring services. The organisation is currently working with the Netwell Centre and the Bosch Group on the “Bosch Telehealth Trial”. The aim of the project is to demonstrate how a telehealth system may help patients better understand their chronic illness and motivate them to change their behaviour to improve self-management of their condition.

The Netwell Centre is based within the Dundalk Institute of Technology (DkIT), the leading 3rd level teaching, research and innovation centre in the Northeast of Ireland.



3.3

OPPORTUNITY 3: SOCIAL & DIGITAL MEDIA

Social and Digital Media is projected to comprise 80% of US internet traffic by 2015. With China expected to become the largest English-speaking area by 2013, the market for English-learning content is also flourishing. A recent CBI report suggests that the creative sector employs nearly 2m (including 800,000 in related industries), contributes between 6% and 8% of GDP and accounts for £16bn of overseas trade.⁸ Demand for bandwidth within the digital element of this industry is high and will continue to grow.

In particular, the way people consume data for entertainment purposes is changing rapidly. Specifically, the digital delivery of entertainment traditionally delivered by other channels, and the convergence of traditional entertainment and the web, is growing at huge rate.

The gaming industry is reaching a relatively mature state in this respect, with services such as Microsoft's Xbox Live, which has in excess of 23 million subscribers generating revenues of approximately \$1 billion as estimated by Bloomberg. The traditional television and movies industries are also converging with the web to improve their services. For instance, Blu-ray players for home movies are increasing adding "BD-live" services which provides real-time delivery of online content to the viewer while they are watching their film. Similarly television is moving this direction, with manufacturers such as Sony and Panasonic integrating online platforms like Google TV and Viera Cast into their television sets, allowing viewers access to web services, with the ultimate (and near-term) goal being in-programme purchases.

One example of a company taking advantage of these trends is Netflix, which is essentially an online video rental store. Originally offering the delivery of physical DVD disks via post from orders placed on the internet, the company has taken advantage of the gaming, tv, and web convergence, to allow the buying and streaming of movies directly through those channels. Of the 15 million subscribers to Netflix, approximately 62% use the company's instant streaming services through channels such as games consoles. Netflix is expecting revenues of \$580 - \$600 million by the end of 2010, which is only going to increase as integration with web-enabled TV is also planned, further expanding its distribution channels.

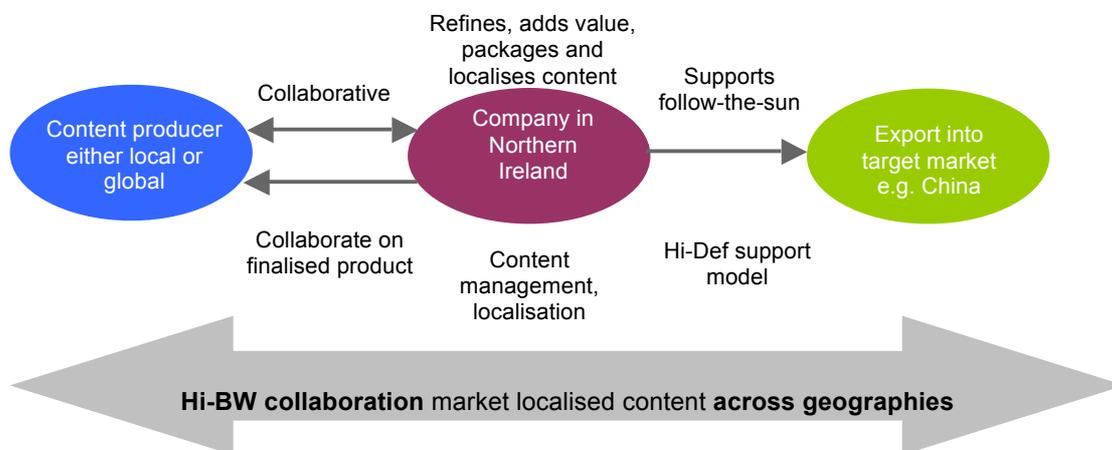
NI has a burgeoning Social & Digital Media community with approximately 10,000 people already providing content for mobile gaming, digital animation and e-learning.

The Panel agrees that:

Through promoting global interaction with producers and consumers of digital content, NI can position itself as both a creator of, and support for the development of global content.

⁸ Creating Growth; A blueprint for the creative industries

Figure 3.3: NI's positioning for Social & Digital Media



This opportunity is built around NI being a creator and supporter of digital content in niche areas such as mobile gaming and e-learning. It can collaborate with players in California for example, over low latency lines to create digital content, it can also provide a support surface to digital content consumers in countries like China.

3.3.1

ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is an opportunity for NI in Social & Digital Media. The opportunity centres around the creation and support of digital content into niche areas such as mobile gaming, digital animation, e-learning, open data and inclusion programmes.

2. How critical is telecoms infrastructure to this opportunity?

The content being created and supported is bandwidth intensive. Advanced telecoms are therefore critical to realising this opportunity.

3. What is NI's level of maturity in this field?

NI has a level of maturity in digital animation and gaming. However it lags behind countries like Iceland in other niche areas, e.g. Iceland's gaming sector is ten times the size of NI's even though its population is almost 1/6th of NI's.

The signs are encouraging however for NI. There is evidence of a growing sector with roughly 10,000 people working across Social & Digital Media in NI today. Success stories, like the decision by the American TV channel Home Box Office (HBO) to film "Game of Thrones" in the Paint Hall, have cemented NI's presence on the production scene.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

In terms of the direction of the world market, Mobile, with its deep, global penetration, remains one of the largest sectors. Mobile applications are therefore in high demand. With China expected to become the largest English-speaking area by 2013, the market for English-learning content is also flourishing.

The precise size and scale of the sector is evolving continually. According to the ITU there were approximately 4.1Bn mobile phone subscribers and 1.6Bn internet users in 2008. Thus the market for mobile applications is twice the size of that of the internet. In China alone there are an estimated 46Million people paying for games each month, with approximately \$1.3Bn⁹ being spent on games in 2009.

Digital Britain said the creative industries (in the UK) are a significant source of employment and national wealth creation, as well as almost uniquely delivering cultural and social benefits. They contribute 6.4% of GVA and have grown by an average of 4% over the past decade compared to 3% for the economy as a whole

5. Does anything else need to be in place for NI to realise this opportunity?

To make this opportunity happen, a range of supports will need to be in place. The telecoms infrastructure that is in place can meet the needs of this opportunity, including in terms of bandwidth. It is not enough, however, to have infrastructure in place – there is a perception among some stakeholders that provisioning models are not flexible enough to supply what is needed on demand. In that case, models for better bandwidth provisioning are required to give users what they want when they want it e.g. allowing access to the NI Science Park ‘pipe’ for an agreed amount of time to upload an animation clip to Dreamworks Animation in the US. According to this perception, provisioning models in NI lag behind those of the world leaders e.g. South Korea – ease of provisioning needs to be addressed. It is possible that communication is needed to educate the market on all provisioning models that are available in NI.

Secondly, a key challenge facing NI is that its talented social and digital media graduates often leave to take up employment in the US and elsewhere. A key tenet of attracting the diaspora back would be to show graduates that there are channels to market for their talents that can be tapped into from NI. It is important to publicise the many success stories that NI already has in this sector, to encourage and give confidence to those planning to stay and work in the sector in NI.

The continued nurturing of these talented individuals would also be important, with a clear need to work with higher and further education institutions to develop courses, which will draw out and hone these social and digital media skills further.

Finally, it is worth noting that in the 2008 Matrix Panel ICT report, Digital Content was not seen as an area of growth at the time. The inclusion of Social and Digital Media at this time highlights how quickly the opportunities can change and become real contenders. The Panel would urge policy makers to be open and as flexible as possible as opportunities take direction and establish themselves.

⁹ Source: Morgan Stanley:

http://www.morganstanley.com/institutional/techresearch/pdfs/Mobile_Internet_Report_Key_Themes_Final.pdf

3.4

OPPORTUNITY 4: ICT

Northern Ireland has extensive experience in application development and web services. These skills could be built on to offer a myriad of potential services that can be exported globally through the Cloud e.g. web broker services and eLearning services (C2K over the Web).

Furthermore, there is an opportunity for Northern Ireland to attract Cloud companies, mirror and backup companies, and server farm providers due to Northern Ireland's unique combination of a rapidly advancing telecoms sector, and climate.

Investment in cloud computing infrastructures and data centres is worth in excess of £120 billion a year. To put that in perspective in terms of the number of servers, it is estimated that Rackspace, one of many managed IT hosting providers, has approximately 60,000 servers. Facebook, a purely entertainment-based website, has approximately this number too, while Google is estimated to have in excess of 1 million servers. The push towards managed IT services and cloud computing is still accelerating, meaning these numbers are set to increase over the coming years.

Financially, this can have a large impact. Servers are the secret "gas guzzlers" of today requiring massive amounts of energy not only for power and operation, but critically, for cooling. The heat that must be dissipated and cooled comes from two sources – the heat produced by the servers themselves, and the environment in which the server is located. In 2009 in the US alone, data centres consumed 61.4 billion kilowatt-hours of energy.

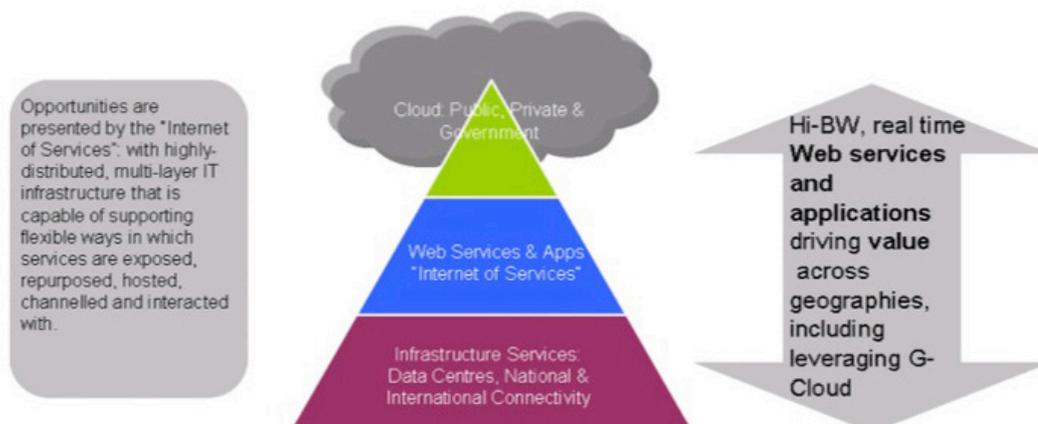
As a result, server farms and data centres in the hot climates such as the US and India are becoming less and less financially viable, as the cost of power and cooling is already far out-stripping the cost of the IT systems themselves. The move towards locating servers in cooler climates such as the UK and Ireland's has already begun, and Northern Ireland is positioned well to take advantage of this.

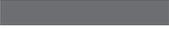
The Panel agrees that:

Through promoting NI as a base for supporting "Cloud" applications and service development, NI can position itself as a global competitor for the provision of "as-a-Service" applications for the current and next generation of Internet.

NI can leverage its web service and application development competencies to position itself as a global player in Cloud services.

Figure 3.4: Meeting the needs of Current and Next Generation of Internet





3.4.1

ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is an opportunity for NI to leverage its extensive experience in application development and web services, and become a global competitor in the provision of “as-a-service” applications to the Cloud (Public, Private and Government) for the current and next generation of internet.

2. How critical is telecoms infrastructure to this opportunity?

This is fundamentally dependent on high bandwidth world class telecommunications at key locations across Northern Ireland. This type of bandwidth is not made available on a ubiquitous basis in any competing regions, rather it is targeted infrastructure and services, in a similar way to the high capacity links that are available at the Northern Ireland Science Park.

3. What is NI’s level of maturity in this field?

NI is fairly mature in this area with a strong capability in web service development. However, a key challenge would be releasing this deep competence to benefit NI plc directly. A lot of the expertise that would be needed in this area is being exploited by FDI companies - limiting the talent available to carry out this application development work for indigenous companies.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

The world market is moving towards cloud and “as-a-service” computing. With evidence of real momentum building in this area, it is now more apparent than ever that this direction of travel will continue. Key players such as Amazon, Microsoft and Terremark continue to invest heavily, and new market entrants are springing up on a daily basis.

According to International Data Corporation (IDC), worldwide spending on Cloud Web Services is expected to reach \$42bn by 2012. A further \$15bn is forecast to be spent on application development according to Forrester. Even a fraction therefore of the global market in provisioning and application development would be highly lucrative. However, stability and consistency of revenue flow are critical to encouraging indigenous companies to invest in this area.

5. Does anything else need to be in place for NI to realise this opportunity?

The development of this opportunity will face significant levels of international competition in a highly lucrative area and additional stimulus may be needed to ensure the right level of competitiveness for NI. For example the establishment of a special economic zone with lower corporation tax might be the stimulus to encourage further FDI, creating further demand for these services.

3.5

OPPORTUNITY 5: SMARTGRIDS

SmartGrids are driving change and investment across the utilities markets of the world. NI has many of the key competencies needed to develop solutions for real-time metering, load analysis and response. The Panel agreed therefore that there was an opportunity for NI in SmartGrids.

While having a reliable telecoms network is critical to support the growth of the Smart Grid, reliability alone will not be enough. Telecommunications networks need to be planned, managed, and carefully designed to meet the requirements of a Smart Grid. Critically, with near constant data communication, contention for services and perfect interoperability between systems is essential.

The Smart Grid is important to all stakeholders in the utilities area, including the consumer or end user. Having a communications network that can anticipate demand, relay real-time information, provide feedback data, and self-heal by automatically responding to problems is a necessity for the future of any Smart Grid.

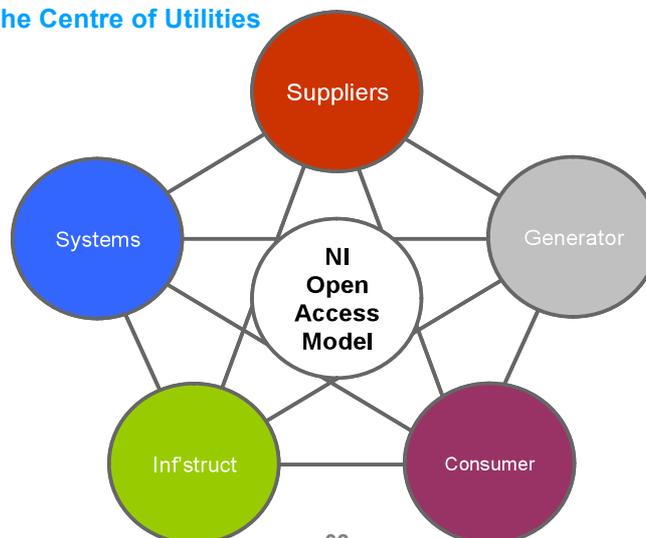
As such, a well designed telecoms infrastructure will be able to facilitate a world-class Smart Grid that can take advantage of the large investments Ireland (both North and South) is making in energy generation.

Beyond 2020, it is envisioned that Ireland will be an energy exporter due to the abundance of near-shore offshore wind energy generation. Currently there are electrical interconnectors from Ireland to Scotland and Wales, however a second one to Wales is planned to allow transmission of up to 1 GigaWatt, with another planned for connection to France. To enable efficient distribution and export of our energy, Northern Ireland needs the telecommunications infrastructure to support the Smart Grid.

The Panel agrees that:

NI can develop an open-access model which will inform domestic, industry and trade buyers (of energy), based on the aggregation and transformation of data into a graphical interface.

Figure 3.5: NI at the Centre of Utilities



As set out in Figure 3.5 above, NI can develop an open access model, placing it at the centre of utilities markets around the world. This model draws on NI's strong competence in modelling and application development.

3.5.1

ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is an opportunity for NI to lead on the development of a model for smart metering. Our natural resource of wind, wave and waste means that an open access architecture is needed, which when developed, tested and validated, could be sold to the rest of the world.

2. How critical is telecoms infrastructure to this opportunity?

It was agreed that while advanced telecoms would not be critical to making this opportunity happen, the reliability of the communications infrastructure is critical. Thus, existing telecoms provision would be more than sufficient.

3. What is NI's level of maturity in this field?

NI lags behind Denmark and other northern European counterparts in terms of maturity. However, an open access architecture solution is already in use in NI in at least one energy company. NI's competence in mathematics and physics also positions it well on the modelling side to build on the solution, which is already in place.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

EurActiv reports that the EU will invest €2Bn in research funding over the next ten years, and that annual investment in the region of €5Bn would be required to rollout SG across the EU. This is part of a wider programme that will see over €200Bn invested in energy infrastructure up to 2050.

In terms of the direction the European market is taking, the EU has mandated that any region implementing SmartGrids must do so by 2020, thus there is a real impetus behind the roll-out. Global technology companies are also developing real interests in SmartGrids. Google for example, in partnership with General Electric, have released Google PowerMeter, which it claims leads to lower usage, by bringing more detailed home energy data to consumers.

5. Does anything else need to be in place for NI to realise this opportunity?

Partnership with a major player like General Electric would help establish the open access model as a global standard. At grass roots level, the Grid would also need to be improved. Finally, the political will needs to align with industry to support investment in SmartGrids by providing a supportive policy environment which in turn should support the potential for SmartGrids thus realising the benefits of this global opportunity.

Close collaboration between business and academia to drive R&D in SmartGrid opportunities is required to develop and roll out the technology to the sector. Indeed, developing the SmartGrid could provide the impetus to develop NI's economy along the Smart Cities direction, whereby buildings, infrastructure, transport, and domestic appliances all connect to co-ordinate electricity usage and regulate supply and demand in a sustainable manner.

3.6 OPPORTUNITY 6: FINANCIAL SERVICES

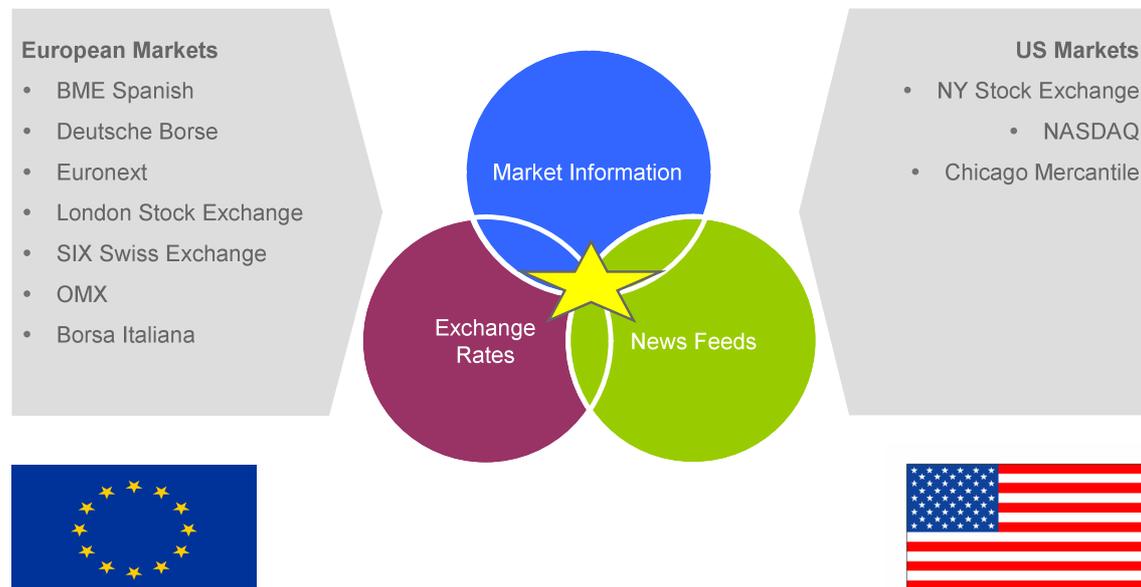
There are a growing number of companies in NI that work in Finance and Capital Markets. These range from indigenous firms like First Derivatives who provide software and people to financial institutions around the world, to large multinationals like Citi, who provide support to their EMEA operations out of NI. The Panel believes NI can become more influential in Finance and Capital markets by leveraging its low latency telecoms infrastructure and skilled people. Exploiting its geographical positioning between Europe and the US offers an opportunity for NI.

Case Study: First Derivatives

This strength in Financial Services has nurtured a lot of indigenous FS companies. One with a recent success story is First Derivatives, based in Newry, which recently won a contract to provide the Singapore Exchange (SGX) with specialist software. Advanced telecoms networks are essential to enable First Derivatives and similar companies to continue to expand globally, and particularly in the Asian markets which have a huge amount of potential opportunity.

With approximately 80% of the world's fund administration taking place in Ireland (North and South), high-speed reliable broadband is absolutely essential. As an example Ireland is seen as one of the largest hedge fund administrator in the world, with over €1.2 trillion in assets being serviced. The funds themselves are distributed to shareholders in over 60 countries across Europe, the Americas, Asia and the Pacific, the Middle East and Africa.

Figure 3.6: NI – a content hub for World financial institutions



The Panel agrees that:

NI can establish itself as a content hub for world financial institutions, aggregating information from the US and European markets in as close to real time as possible.

As set out in Figure 3.6 above, NI could become a content aggregator, drawing together financial information from US and European markets, and then sharing it back out to users (e.g. traders) in as close to real time as possible.

3.6.1 ASSESSMENT OF THE OPPORTUNITY

1. Does this represent a realistic and concrete opportunity?

There is an opportunity to position NI as a content hub for world financial institutions, leveraging its low latency links to the US and Europe and its deep competence in web services and application development.

2. How critical is telecoms infrastructure to this opportunity?

International connectivity, Kelvin, is critical to this opportunity. The key requirement is that we have low latency and can aggregate data from several dispersed sources in

near real-time. High performance infrastructure is therefore critical if we are to differentiate this service from others. This infrastructure is in place in NI.

3. What is NI's level of maturity in this field?

NI is mature in the building blocks that make up this opportunity – good application development and web services skills; and good finance knowledge. NI's spirit of collaboration should also make it possible to forge these building blocks together to deliver the solution. NI was also deemed to be well positioned geographically and culturally to exploit this opportunity.

4. What is the size and direction of the world market (next 2, 5, 10 years) and the potential size for NI?

According to Datamonitor, the global value of IT services in Financial Services is in the region of \$231Bn and predicted to grow to \$340Bn by 2014. Within this, BPO services and Application Support and Development are worth over \$80Bn each, and predicted to grow to \$110Bn and \$131Bn respectively by 2014.

Cloud Computing will have a bearing on the shape and direction of provisioning services in capital markets. It is still however too early to tell exactly how key players will exploit cloud.

5. Does anything else need to be in place for NI to realise this opportunity?

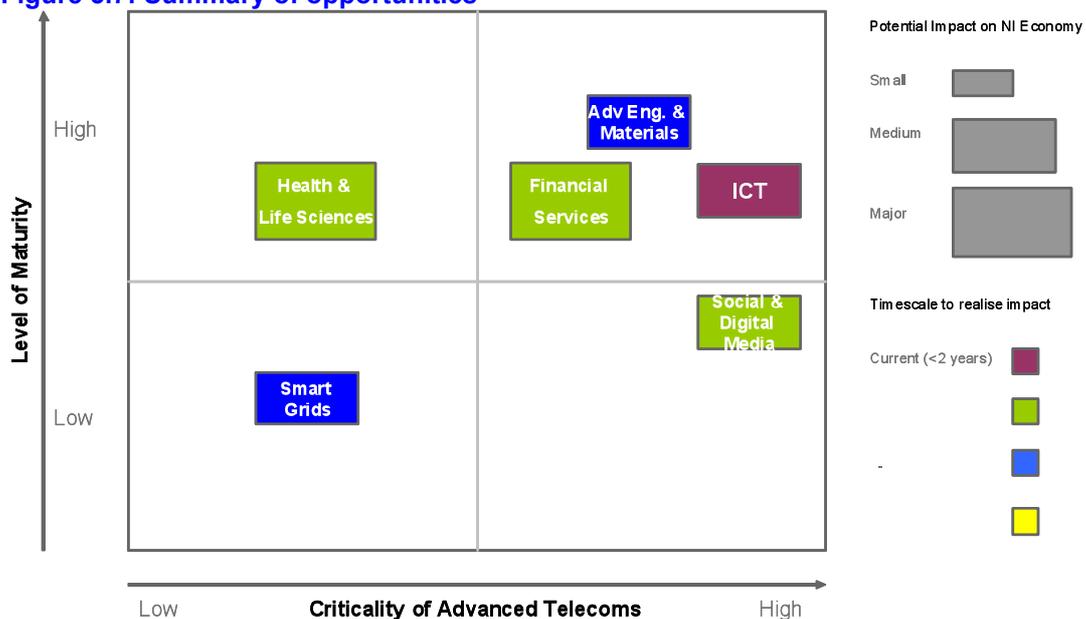
Finally, a key challenge to realise this opportunity is the cost of a high performance, low-latency service. If a content aggregation service is to be attractive to financial institutions around the world, it must perform, whilst at the same time be competitively priced.

3.7 SUMMARY OF OPPORTUNITIES

3.7.1 OVERVIEW OF THE OPPORTUNITIES

Figure 3.7 below gives an overview of all six opportunities, assessing the level of maturity, potential impact on the Northern Irish economy, and timescale to realise this impact.

Figure 3.7: Summary of opportunities



As illustrated, Northern Ireland's level of maturity in five of the six of the opportunities ranges from Medium to High. This creates a solid basis for development of the opportunities.

In terms of economic gains, all six opportunities will make a medium or major impact on the NI economy. Importantly, the economic benefits of four of the six opportunities will be felt within five years, with ICT at a stage where it can make an economic impact right away.

Overall, the figure shows a good balance between opportunities that we should act on right away, and opportunities that will build up incrementally over time.

3.7.2

TELECOMS INFRASTRUCTURE NEEDS OF THE OPPORTUNITIES

Figure 3.7.2 hereunder summarises the needs of each opportunity in terms of telecoms infrastructure and whether NI's infrastructure meets this need.

Figure 3.7.2 Opportunities' telecoms needs

	Telecoms requirement		Commentary: Is NI's current and emerging telecoms infrastructure equipped to meet the specific needs of this opportunity?
	Basic	Advanced	
Opp. 1: Advanced Engineering & Materials		✓	Yes. High bandwidth and low latency are essential. With completion of NGBP, NI will have the infrastructure in place to deliver this.
Opp. 2: Health & Life Sciences	✓		Yes. Ubiquity of basic telecoms is required. NI has 100% coverage of at least 512Kbps.
Opp. 3: Social & Digital Media		✓	Yes. High bandwidth, in some cases symmetric, will be required. With the NGBP and Kelvin NI will have the infrastructure in place to deliver this.
Opp. 4: ICT		✓	Yes. High bandwidth, low latency, and ubiquitous broadband required. With NGBP and Kelvin NI's infrastructure will provide the bandwidth necessary for application development.
Opp. 5: SmartGrids	✓		Yes. Ubiquitous low bandwidth communications required. NI's existing infrastructure is therefore sufficient.
Opp. 6: Financial Services		✓	Yes. Low latency and high bandwidth are essential. NI's future infrastructure will deliver this.

Two of the opportunities require only basic telecoms infrastructure, while four require more advanced infrastructure. In each case, NI has the infrastructure in place, or being rolled out by 2011 that will meet the particular needs of each opportunity. Any issues that remain are related to accessing this advanced infrastructure.

NORTHERN IRELAND'S TELECOMS INFRASTRUCTURE

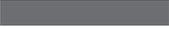
In this section Northern Ireland's existing and emerging telecoms infrastructure are examined. Provider maps are referenced in Appendix C of this document.

4



4.1

EXISTING INFRASTRUCTURE



4.1.1

BROADBAND IN NI – 2004-2009

In December 2005 Northern Ireland became the first region in the UK and Europe to be able to offer 100% access to basic, first generation broadband services. The catalyst for this achievement was the 2004 DETI Local Access Broadband Contract, awarded following a competitive tendering exercise to BT.

The £9.3m contract was “technology neutral”, with BT contracted to deliver access to a service rather than a specific technological solution. DETI did not and indeed could not specify a particular technology as to do so would have been a breach of EU competition laws prevailing at that time. Under the contract, BT upgraded all 191 of its exchanges, leaving a legacy on completion of the contract in March 2009 of in excess of 99% of premises able to access a fixed line broadband service of at least 512Kbps downstream.

For the small number of customers unable to access the fixed line service, a satellite “in-fill” solution was developed which is currently being managed by Avanti Communications, with a range of residential and business services between 512Kbps and 3Mbps.

There are now a significant number of service providers operating in Northern Ireland (approximately 100), delivering telecommunications services using fixed, mobile, wireless, cable and satellite infrastructure.



4.1.2

BROADBAND IN NI: THE NEXT GENERATION BROADBAND PROJECT

The Next Generation Broadband Project (NGBP) is scheduled to deliver next-generation broadband speeds to 85% of NI’s businesses by 2011. This will involve a public-private investment of £47.8M over an eighteen month period to May 2011, followed by a 5-year service delivery phase.

The NGBP will deliver speeds of up-to 40Mbps to end-users. This will involve the upgrade of 166 exchanges and 1,176 access points or cabinets across the region to fibre. The technology used will be a mixture of VDSL2 in cabinets that have been upgraded to fibre, and SDSL on those cabinets that are too far from the exchange to be covered by fibre upgrade. It is also understood that under its “business as usual” programme, BT will be upgrading approximately 200 additional cabinets.

The roll-out is being conducted in lots:

- Lot 1- Rural, where 85% of business premises will have at least 2Mbps. It is estimated that 69% of rural premises will be connected to a fibre-enabled cabinet capable of delivering up to 40Mbps services.
- Lot 2 – Urban, where 85% of business premises will have access to at least 10Mbps. It is estimated that 81% of urban premises will be connected to a fibre-enabled cabinet capable of delivering up to 40Mbps services.

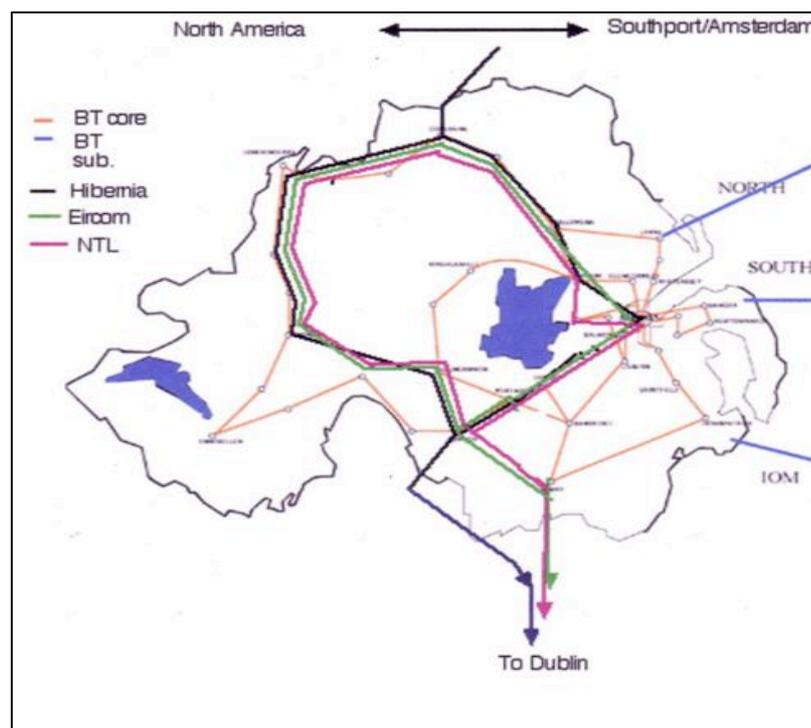
The rollout commenced in December 2009, and is proceeding to plan. The <http://www.fasterbroadbandni.com/> website provides details on what services are available where in NI throughout the roll-out.

4.2 FIXED LINE INFRASTRUCTURE

Fixed-line telecommunications infrastructure consists of two key components - core networks and access networks. Consumers generally connect to the access network, and traffic from the access network is aggregated and connected to various backbone or core networks.

In NI there are five fixed line core networks owned and managed by BT, eircom, Virgin Media, Bytel and Hibernia Atlantic. These networks have competing, fully-fibre rings around NI. All towns and cities on the backbone network can access a wide range of speeds with services of up-to 40 Gbps.

Figure 4.1: NI's fixed-line infrastructure



In the following pages, the fixed line infrastructure of each of these providers is examined.

4.2.1

BT'S FIXED LINE INFRASTRUCTURE

BT's STAR network is the most extensive deployment in NI, with approximately 200,000 km of fibre, 191 exchanges and in excess of 3,000 street cabinets from which services are provided.

The fibre infrastructure has a 10Gbps capacity and passes through many of NI's population centres, interconnecting the exchanges.

BT is a key provider of NI's external connectivity, through:

- three high performance Multi Protocol Label Switches (MPLS) located in Belfast, Londonderry and Portadown;
- three sub-sea cables connecting Donaghadee, Millisle and Larne with the UK mainland, and thereafter internationally;
- two cable connections to Dublin, providing additional resilience to the UK mainland connection; and,
- duct and fibre linking Letterkenny into the BT Northern Ireland infrastructure through Londonderry.

Each BT exchange has been upgraded to support the delivery of ADSL broadband services, which involves the use of a copper line to send high bandwidths in downlink direction and lesser bandwidths in uplink direction. Some of these exchanges have been further upgraded to support delivery of ADSL2+ services (up to 24Mbps downstream).

BT's cabinets act as distribution points for the copper lines access network (local loop) for delivering services to premises. As part of the aforementioned 100% broadband rollout, BT connected each cabinet back to its relevant exchange, via high capacity copper cable, and in some instances by fibre. The on-going NGBP will deliver increased fibre penetration to the cabinet in over 1100 locations.

The current infrastructure in place ensures that 95% of businesses in NI within 3 miles of BT fibre, indeed NI has more fibre than most other areas of the UK. All 191 exchanges have fibre going to them, and most have two fibre connections: those that do not have copper back up, so all are fully resilient. With the Next Generation rollout to be completed in 2011, BT expects to exceed the contract target for 85% of businesses covered with 10Mb service in urban and 2Mb in rural, in percentage and bandwidth terms. Up to 40Mb may be available in urban areas due to fibre to cabinet.

BT is in the process of rolling out "Etherflow", BT's Ethernet service offering. Etherflow offers easily expandable capacity (currently up-to 100Mb). By the end of 2010, almost all of NI will be covered. Etherflow is instantly expandable – it provides a base Ethernet service, and can run, for example, IP telephony as an application on

the service. It also provides the opportunity, if high capacity is needed by a user for a particular length of time, to purchase this on a user-controlled utility model.

BT is also moving to a WiFi service offering in which users obtain WiFi through BT and have an agreement that their spare capacity can be used. The customer signs up to OpenZone and can use this anywhere (this is now opt-out rather than opt-in). This offering is geared towards a future situation in which WiFi is ubiquitous.

4.2.2 VIRGIN MEDIA'S FIXED-LINE INFRASTRUCTURE

Virgin Media, formerly ntl:Telewest, operates the SATURN fibre network, linking a number of towns and cities in NI including Belfast and Londonderry. Local access networks in greater Belfast and Londonderry use SATURN as the core network.

The SATURN network includes twelve Points of Presence (PoP) across NI. In addition to SATURN and the local access networks, Virgin Media also uses third party infrastructure to provide services.

4.2.3 BYTEL'S FIXED-LINE INFRASTRUCTURE

Bytel owns and maintains over 400km of fibre on the SATURN ring, linking Belfast with towns around NI and into Dublin. The company has cross-border connections from Newry to Dublin, and Armagh to Monaghan. It has also installed fibre between Londonderry and Bridge End where it connects with eircom infrastructure in Letterkenny.

Bytel has existing points of presence in Portadown, Londonderry, Omagh and Armagh, and has, in collaboration with its sister company Atlas Communications, announced its intention to deliver a further point of presence in Newry to facilitate customer access to the Hibernia Atlantic network.

The company's distribution network is based on switching equipment at a number of strategic hub locations in Armagh, Ballymena, Belfast, Londonderry and Omagh.



4.2.4

EIRCOM NORTHERN IRELAND'S FIXED-LINE INFRASTRUCTURE

Eircom owns its own infrastructure within the SATURN network to provide backbone connectivity, as well as two cross-border connections and a link to the UK mainland via Belfast. The company also uses other carriers' infrastructure to deliver services outside its core network.

The eircom network connects Belfast, Londonderry, Ballymena, Coleraine, Omagh and Armagh in a robust high-speed telecoms network. It has nine Points of Presence in NI.

There is an eircom link from the SATURN ring to Letterkenny via Londonderry, providing an alternative option for connectivity in the North West region of NI.

Eircom's distribution network is based on MPLS switching equipment at strategic hub locations on SATURN: Armagh, Ballymena, Coleraine, Londonderry and Omagh.

Eircom operates two MPLS networks from this core infrastructure. The first is its Public Sector network which is accredited by CESH to "Restricted" security level; the second is its Enterprise MPLS network which services non public sector organisations. Both networks are supported from Eircom's Network Operations centre in Belfast.



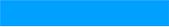
4.2.5

HIBERNIA ATLANTIC'S FIXED- LINE INFRASTRUCTURE

Hibernia Atlantic is the provider of the Kelvin infrastructure. They also provide a substantial network footprint in NI.

Hibernia has dark fibre capacity around the SATURN network and is implementing a resilient ring network around the region and connecting to international destinations.

The Hibernia network was commissioned in Q1 2010, and is currently available commercially.



4.3 WIRELESS INFRASTRUCTURE

Wireless infrastructure is key to enabling more remote rural areas to gain access to the infrastructure. Providing fixed-line services to a rural or sparsely populated area can be cost prohibitive and as a result, wireless services are the primary means of providing remotely located areas with high-speed access.

Indeed wireless technology has the ability to provide bandwidth up-to 100Mbps over short distances and in some cases, such as WiMax, distances can be up-to 70Km from the mast site. The advances in wireless technology have been significant with WiFi now pervasive across the personal computer and home office sector providing short-distance connectivity up-to 200Mbps. 3G has evolved to provide services up-to 21Mbps at distances up-to 12Km from the mast. Finally, WiMax is capable of delivering 40Mbps to cell areas of up-to 10Km radius.

The next-generation of wireless broadband include the 3GPP LTE (Long Term Evolution) standard which will provide 50-100Mbps rates at up-to 100Km distance.

Wireless services have often been used to fill in the gaps in where fixed line broadband can go. However, due primarily to economic constraints, wireless is now providing broadband packages for consumers and business across the globe, and in some cases displacing the fixed line incumbents as the fixed line speeds fail to increase.



4.3.1 FIXED WIRELESS OPERATORS

Fixed wireless operators in NI include North West Electronics and Arqiva Limited. North West Electronics is a local service provider based in Londonderry, providing coverage in the North West of Ireland, and connecting to Virgin's SATURN ring via 100Mbps fibre connections to its data centre. It delivers a range of residential and business services up to 100Mbps in the Foyle Basin and Donegal area. Arqiva mainly supplies services to other telecoms operators, in the UK and globally. It owns and operates 280 sites in NI including transmission masts and towers for mobile phone transmission and television broadcast. Arqiva has access to fibre via SATURN, which enables its three high-speed wireless networks.

4.3.2

MOBILE OPERATORS

There are currently four mobile phone service providers operating in NI, offering mobile telephony, voice and data services: O2, Orange (who have recently merged with T-Mobile in the UK), Vodafone and 3. All provide 3G and 2G services, with the exception of 3, which does not provide 2G.

3G coverage is largely provided in areas of high-density population in the east, north-east and central areas of NI: cell activations to 3G are demand-driven and therefore it is only those cells in urban and suburban areas that are generally activated to provide 3G coverage. It is therefore typically concentrated around Belfast, Portadown, Coleraine and Londonderry.

Ofcom is currently examining the issue of “not-spot” areas across the UK. The NI Minister for Enterprise, Trade and Investment has written to the regulator asking to be kept informed about any conclusions or recommendations arising from its research.

4.4

INTERNATIONAL CONNECTIVITY: CROSS-CHANNEL AND BORDER

Excluding Kelvin, Northern Ireland has nine routes providing external connectivity. These provided NI's sole means of international data transit prior to Kelvin.

There are six links in total to Great Britain (with two being supplied via the Isle of Man): three provided by BT, and the others supplied by eircom, Virgin and Cable & Wireless. There are also three links from NI to the Republic of Ireland.

The island of Ireland's total connectivity to Great Britain is shown in Appendix C.7. The island's connections range in bandwidth from 2.4Gbps to 1.8Tbps and in turn provide Ireland with comprehensive international connectivity. However, it should be noted that apart from the Hibernia Atlantic cable connecting Dublin to Southport, all the other cables were laid in the 1990s and thus are entering their second half of their lifespan. On average submarine cables have a lifespan of 15-20 years, and if there is insufficient ongoing investment there is a potential for future bottlenecks to occur.



4.5 PROJECT KELVIN

Project Kelvin provides Northern Ireland for the first time with direct connectivity outside the UK and Republic of Ireland. This section examines Kelvin and the potential impact the link may have for NI.



4.5.1 DIRECT INTERNATIONAL CONNECTIVITY: BACKGROUND TO PROJECT KELVIN

Project Kelvin is a cross border project bringing a direct link to the transatlantic submarine communications network into the North West. It has been co-financed under the INTERREG IVA programme 2007-2013, and delivered in partnership with the Department of Communication, Energy and Natural Resources (DCNER) in the Republic of Ireland. The contract to build and operate the new link was awarded to Hibernia Atlantic Limited in December 2008.

The solution for delivering direct international connectivity has involved connecting a new submarine cable to the Hibernia North Transatlantic cable located 22 miles off the North coast. The new cable comes ashore in the Portrush area, and connects with Northern Ireland's existing telecoms infrastructure on the SATURN fibre-ring network.

The new international telecommunications link interconnects with Northern Ireland's existing telecommunications infrastructure at a number of different locations throughout the region, i.e., Armagh, Ballymena, Belfast, Coleraine, Londonderry, Omagh, Portadown and Strabane.

The delivery of the infrastructure acts as a key enabler for stimulation of further competition in the Northern Ireland telecommunications market and improved speed and reliability of international telecommunications. A key aspect of the project is the pricing mechanism for services. Under the contract prices will be benchmarked, on a monthly basis, against those international links to Manchester, Glasgow and Dublin and must be delivered at a cost of 20% below the median for those locations. This confers significant opportunity for the region and those businesses and industries doing business in it.

The completed infrastructure was delivered in March 2010 and both performance and costs are guaranteed under the contract until December 2018.

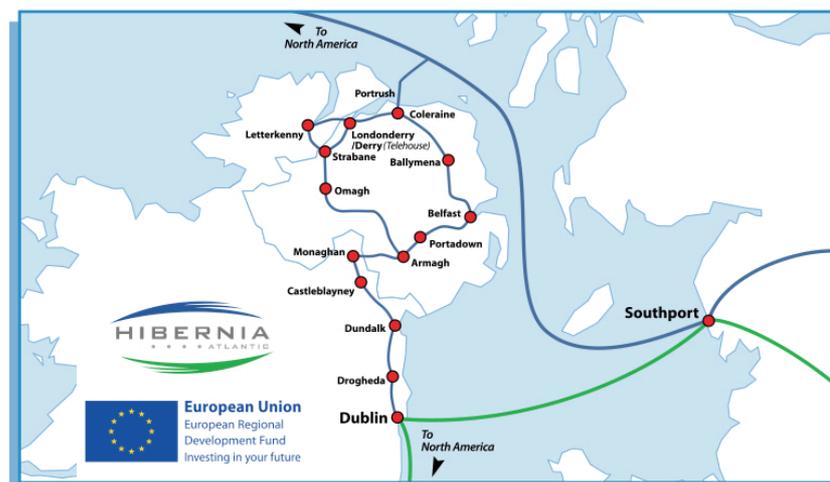
4.5.2

WHAT KELVIN LOOKS LIKE AND ITS TECHNICAL BENEFITS

The direct international link comes ashore in the Portrush area of Northern Ireland and links to the existing fibre rings in the region. The project also involves the implementation of a Telehouse in Londonderry.

The map in figure 4.5.2 below shows the links that the new international connectivity brings to NI.

Figure 4.5.2: The Kelvin direct international link



This project is part financed by the European Union's European Regional Development Fund through the INTERREG IVA Cross-border Programme managed by the Special EU Programmes Body.

The benefits deriving from the link include:

- Increased resilience to Northern Ireland and the island as the link creates a ring topology which enables traffic to flow either directly to North America via Portrush, or via Southport, or via Dublin. This re-enforces the attractiveness of the location.
- Increasing the robustness of the island of Ireland's international connectivity by adding more bandwidth and diversity of international connectivity.
- Increased bandwidth availability: Kelvin has dramatically increased the availability of the bandwidth between Northern Ireland and North America. On its own Kelvin now supplies c1.8Terabits of bandwidth. This is an enormous amount of bandwidth and sufficient for nearly 1 million concurrent 2Mbps users.
- Reduced time to send data to/from North America: Before the deployment of the direct link, traffic to North America had to either traverse through Great Britain, or through Dublin. Now the direct link has removed these extra stages and the traffic can go direct. The result, based on performance and acceptance tests conducted by Hibernia and DETI, is a reduced round-trip-time to/from New York from Northern Ireland of c.65-67milliseconds (ms). This is down from c.120-150ms. This makes Northern Ireland "closer" to the east coast of North America than California.

- Reduced time to send data to/from Europe: Before Kelvin traffic to Europe primarily used London as a transit point. Now the direct link has allowed Northern Ireland to access Europe via a route through the North of England. This has reduced the time to get to Amsterdam to approximately 15ms, and improved the resiliency of the connection by bypassing London, thus improving the security of the route as well.
- Tight integration with existing telecommunications infrastructure in the region delivering connectivity to customers via familiar service delivery arrangements.
- Unique selling point for the region and an opportunity to promote Northern Ireland as the “closest” European landmass to North America.

While these outline some of the benefits, these benefits can only support the business and industry opportunities that people will create. This is a critical success factor for the link: while sales of capacity will generate revenues for the service providers, the primary challenge and the potential to maximise benefits is in the use of the facility to capture emerging business opportunities to position Northern Ireland as a global player in key business sectors.



4.6 FUTURE INFRASTRUCTURE DEVELOPMENT IN THE REGION

All the telecommunications service provider stakeholders consulted during this process indicated that their future infrastructure investment will be based on customer demand. Where there is a need and a business case to support the investment then the supplier would consider the investment.

As stated previously, NI has an extensive reach of core communications infrastructure, including ducting, chambers, routes, PoPs and fibre itself throughout the region. This infrastructure is the basis upon which current and future fixed line development will be made. The roll-out of Fibre-to-the-Cabinet (FTTC) as part of the NGBP, accompanied by appropriate wholesale models, will enable over 85% of the region to be within 3Km of a fibre connection. This is an enormous competitive advantage and one that must be exploited for the benefit of NI.



4.7

STAKEHOLDERS' VIEWS ON CURRENT AND EMERGING INFRASTRUCTURE

Stakeholders were mainly satisfied that the current and emerging telecoms infrastructure in NI will be sufficient to enable opportunities for their sectors, including international competitiveness. The infrastructure needs in relation to each opportunity are discussed further in chapter four. There are ongoing perception and price issues that need to be addressed as part of the wider awareness campaign that will be recommended. These include:

- The “last mile” issue, where there is inability for some businesses, especially smaller-scale enterprises, to access the “pipe” providing necessary bandwidth due to what were seen as prohibitively expensive costs of extending the infrastructure. This is an acute perception as often these smaller businesses are not located in purpose built business parks with the associated infrastructure, and owners sometimes neglect to query the availability of high-bandwidth connections sufficient to their needs when investigating a location for their business.
- A concern among stakeholders was that there is a lack of diversity of telecoms supplier in NI. The perceived lack of competition was viewed by some stakeholders as something that would need to be addressed in order to effect change in pricing and access models. Again, this is perceived as there are over 100 service providers in NI offering various packages. Access to this knowledge is key, and a targeted awareness campaign needs to be undertaken.
- Upload speeds are vital for a range of sectors, but these have not always matched the available download speeds. Many stakeholders stated that symmetrical speed would be advantageous, especially in the digital media sector. The perception here is that the cost of high bandwidth is prohibitive, however tailored packages are available and these do require investigation.
- Pricing of higher bandwidth services was seen as too expensive for some businesses to maintain. NI lags behind other areas, including other parts of the UK, in provisioning models. Once fibre is rolled out to cabinets and higher backhaul speeds are available, then contention will be reduced at the access points.
- NI has been described as having world-class, state-of-the-art infrastructure, but NI’s infrastructure is behind that of countries and regions such as South Korea, Singapore and California.

Finally, Ookla Net¹⁰, a company that runs worldwide bandwidth connection testing and regularly issues reports on the quality of end-consumer broadband has placed the UK as a region in 33rd for download speeds at 7.67Mbps (though no NI city was in the UK top 30), 64th for upload speeds at 0.9 Mbps (with Belfast at 16th with 2.43Mbps), 30th for quality (with Belfast in 11th place in the UK) on a global household index.



4.8 NORTHERN IRELAND'S INFRASTRUCTURE IN A GLOBAL CONTEXT

With the completion of the NGBP rollout in 2011, NI will have a robust, globally competitive telecommunications infrastructure.

It is important to note, however, that broadband infrastructure developments are continuing at pace elsewhere, with infrastructure investment being undertaken by many countries (see also Appendix D). This means that there will be strong competition in the telecoms-supported markets in which NI will be trying to build, and some competitors will have an infrastructural advantage.

Finland, for example, is undertaking a project to provide ultra-fast broadband, with download speeds of at least 1Mbps, to every household this year, ramping up to 100Mbps for at least 99% of households by 2016. In Australia, a programme is underway to deliver 100Mbps broadband to 90% of homes, schools and businesses by 2018.

The world leaders are pressing forward with cutting edge developments. In South Korea, for example, high-speed internet services are to be upgraded to 1Gbps by 2012. There is limited evidence, however, to suggest that innovative business growth has been realised at this stage. Developments in Singapore, on the other hand, are an integral part of a national master-plan aimed at catalysing next generation business growth, as the case study below illustrates.

These ongoing developments illustrate that the investment in infrastructure must be a continuous one to ensure that NI stimulates business investment and sustains the competitiveness of the region.

¹⁰ While this testing is based on end-consumer to central peer testing, its methodology is simple: establish a connection over broadband to an end-user PC and analyse the speed and time it takes to download and upload a large file. Then, aggregate the results for an area, and issue a league table for upload, download and quality. Ookla have compiled the results of over a billion tests worldwide to date. The net index is based on the 95th percentile of tests over a 30-day period and a single test data per unique IP address in that time is included.

4.9

CONCLUSIONS ON INFRASTRUCTURE

Case study: Singapore

Singapore is currently implementing its Next Generation National Broadband Network (Next Gen NBN). By 2012, homes, offices and schools nationwide will be connected to a pervasive all-fibre ultra-high-speed broadband network, that is capable of delivering speeds of 1Gbps and above. Next Gen NBN is a project under the Intelligent National 2015 (iN2015) masterplan by the Infocomm Development Authority of Singapore (IDA).

It is envisaged that Next Gen NBN will catalyse the creation of a greater range of innovative next generation services for end-users. Some of the envisaged next generation services that could ride on Next Gen NBN include Interactive Internet Protocol TV, telemedicine, immersive learning, multi-user real-time simulation games and real-time grid computing.

The vision is that Next Gen NBN will enable Singapore to exploit new economic opportunities, providing services such as:

- Fast upload and download speeds – scalable speeds of up to 1Gbps and beyond
- High-Definition (HD) Video Conferencing
- Interactive Internet Protocol Television (Interactive IPTV)
- Telemedicine
- Grid computing services – businesses, especially SMEs, can save by tapping onto these services without having to incur heavy upfront capital costs in equipment and software licences
- Interactive Digital Signage

In summary, NI has made strides in its telecoms infrastructure in recent years, bringing the region's telecoms up to a very competitive position:

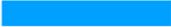
- Since 2004 over 99% of premises are able to access fixed line broadband service of 512Kbps downstream and there is 100% availability of broadband to the region;
- NGBP will make available next-generation broadband to 85% of NI businesses by 2011 with speeds up-to 40Mbps; and,
- Multiple external links are in place, including direct international connectivity via Project Kelvin, which provides a low-latency link to North America.

It is the Panel's view that in a global context, this strongly positions NI to attract investment and develop indigenous business, and to stimulate innovation and competitiveness. It is also the Panel's view that the current and emerging telecoms infrastructure will meet the requirements of the opportunities discussed in chapter three.

CROSS-SECTORAL PREREQUISITES FOR SUCCESS

The opportunities which have been identified will rely on a number of supporting factors being in place in order to fully maximise their potential. This will require commitment and action from government, industry and academia.

5



5.1 SKILLS

It is vital that these opportunities are nurtured and maintained, through the development and retention of the world-class skills required for global success in their respective sectors. The skills base in a particular location is one of the two key factors, along with cost, which influence decisions on investment.

Stakeholders identified specialist skills needs in areas such as software development and digital animation. The challenge for “NI plc” is to ensure that it has a workforce that is ready for the next generation of business: both in terms of attracting foreign direct investment, and in developing indigenous business and producing intellectual property (IP). The skilled labour pool must therefore be deep enough, and sufficiently well-equipped, to support the opportunities identified.

This will require collaboration between industry, government and academia on skills requirements and how these should be met. At a governmental level, ongoing co-operation between DETI and the Department for Employment and Learning (DEL) is vital in ensuring policy is aligned and targeted. In turn, government policy must be informed and driven by engagement with academia and with business and industry.

Northern Ireland’s higher education (HE) and further education (FE) institutions are the fulcrum of this skills imperative. By continued direct engagement with business and industry, NI’s Universities and FE Colleges can build curricula that are attuned to the future workforce and skills needs of key sectors. The relevant Sector Skills Councils (SSCs) also have a key role in articulating the needs and views of industry with regards to emerging and future skills needs.

Initiatives of these kinds exist in NI and have been carried out in recent years. A major example is the ICT Future Skills Action Plan, implementation of which is being led by a project group comprised of DEL, Invest NI, e-Skills UK (the Business and Information Technology SSC) and Momentum (the NI ICT Trade Federation), and which has involved leading employers such as Citi and Equiniti ICS.

There are synergies between some of the opportunities presented in this report, which are particularly relevant to the development of specialist skills. This is evident, for example, in the fact that some of the skills relevant to digital content development are also applicable in advanced engineering. Continued cross-fertilisation of ideas, and skills/knowledge transfer will help to sharpen NI’s competitive edge going forward.

In addition to skills development, it is also vital that NI retains its skilled people: providing assistance with channels to market is therefore a necessity. NI should also strive to repatriate skills in the form of talented NI people working abroad. In digital production, for example, people of NI origins are working in senior positions for some of world-leading studios and production companies. The need to access this skilled diaspora links to the requirement for marketing, which is highlighted in the example below.

Case study: North Carolina BioNetwork

The BioNetwork is a State-wide initiative that connects community colleges across North Carolina, providing specialized training, curricula and equipment, to develop a world-class workforce for the biotechnology, pharmaceutical and life sciences industries.

The BioNetwork's programmes are industry-driven. The network consists of seven "Centers" (e.g. Bioprocessing, Pharmaceutical, BioAgriculture), strategically and geographically located across North Carolina to provide expert training, entrepreneurial, business and industry support. At Center level, programmes organised in consultation with industry to meet their needs.

5.2

COLLABORATION AND R&D

The importance of collaboration, in particular between industry and academia, is not limited to the skills agenda.

The first MATRIX report highlights the vital role Research and Development (R&D) plays in innovation. It emphasises the need for a strong "Market Pull" dimension, and for Northern Irish businesses to become more focused on drawing through and exploiting the R&D which is already being generated by the region's science and technology base.

In realising the opportunities presented in this report, it is important that industry and academia collaborate to drive the innovation that will place NI as a market leader. This must necessarily be market-led, with industry taking a leading role. An existing example of how this collaboration can work well is the Northern Ireland Technology Centre (NITC) at Queen's University, which undertakes activities with engineering businesses that are usually 'near market' and demand for which is driven by the needs of industry.

5.3

PRICING, PROVISIONING AND ACCESS MODELS

While NI has internationally competitive infrastructure in place and under development, some businesses, especially those of a smaller scale but needing high bandwidth (such as some digital content producers), have reported difficulties in accessing its full benefits. The effect of this situation is a risk to these companies' international markets: for example, slow upload speeds reducing competitiveness to a point at which the buyer looks elsewhere. There is a range of causal issues and a corresponding set of potential resolutions.

The “last mile” issue is the inability of some businesses to access the “pipe” providing necessary bandwidth due to what was seen as prohibitively expensive private costs of extending the infrastructure. There is scope for examining how these businesses can access the necessary infrastructure through clustering or by accessing business parks' capacity on a negotiated basis.

Pricing of higher-bandwidth services has also been seen as prohibitive to smaller-scale enterprises dealing in bandwidth-hungry products. The view was expressed by some stakeholders that this issue is exacerbated by a lack of flexibility in provisioning models.

An alternative model of provisioning which might enable access is “bursting”, in which these businesses would be able to access the required bandwidth for a short, set period of time, in an on-demand utility-type model.

Case Study: Manchester

The Manchester Digital Development Agency is overseeing the largest publicly-funded fibre-to-the-home rollout in the UK. The aim of the project is reinvigorate the media and technology sector of the city, and understand the benefits and challenges of rolling out similar services to other locations in the UK.

An important by-product of the project is the shift it will bring about for consumers. Instead of using one service provider, individuals will be able to “pick and choose” those providers that best meet their requirements at a certain point of time. This flexible model is critical to those involved in Social & Digital Media industries that require a malleable, fluid arrangement when it comes to their download and upload requirements.

The project is playing an important role in a burgeoning digital media community in Manchester. The Sharp Project for example offers tenants next generation networks, with resilient power supplies, at competitive prices. This more flexible provisioning model has attracted a creative community to the Sharp Building. It has also fuelled the development of the Virtual Super Studio (VSS), which offers “follow-the-sun” digital content development services.



5.4 PUBLIC POLICY



5.4.1 EDUCATION

The public needs to understand what infrastructure is available to them now and in the future. To do this, the service providers must work diligently to get clear messages out to the marketplace, In addition the Executive needs to ensure that business support programmes include telecoms provision in their advisory services. This will clear up some of the ambiguities that surround what telecoms are/ are not available and at what cost, which could stimulate further innovation in existing businesses in NI.



5.4.2 PLANNING POLICY

Planning Policy Statement 10 (PPS10) was published in April 2002 by the Northern Ireland Planning Service. It sets out the Department of the Environment's planning policies for telecommunications development and aims to facilitate the growth of new and existing telecommunications systems whilst keeping the environmental impact to a minimum.

It is the Panel's view that planning policy should include the provision of appropriate open-access¹¹ infrastructure in any new or upgrade development work in business parks and mixed business-retail-residential developments. If, for example, the developer is required to provide a fibre ducting and chamber, which could be done at minimal cost in addition to usual services such as electricity, then the need for costly civil works to lay the infrastructure in the future would be removed, This would enable service providers to access customers at a much reduced rate and significantly increase the potential for service availability in the region.

¹¹ EU definition is "Open Access - Availability of unrestricted access to a telecommunications service"

5.4.3 ECONOMIC POLICY

There are broad areas of Economic Policy, including taxation, that pertain to the wider economic environment and will therefore impact on the opportunities outlined in this paper from a general perspective. These general areas are not dealt with any further in this report and lie outside the remit of the panel.

The panel felt strongly that the overall policy for science, technology and innovation as enshrined in the MATRIX work and endorsed further in the recent Independent Review of Economic Policy, should be fully supported. In particular, the panel felt that the ongoing work to ensure ownership and support of the MATRIX agenda across government departments was critical in ensuring a comprehensive support platform for opportunities such as those presented here.

5.4.4 MARKETING

It is important that the rest of the world knows about the talented people and innovative companies we have here in Northern Ireland. The Executive and local companies therefore have an important role to play, in showcasing the significant achievements.

Marketing is required at two levels:

1. Internally to the region creating awareness of the infrastructure and the opportunities presented, this would include service providers promoting the value of the telecommunications infrastructure to businesses, and business support organisations ensuring that businesses are aware of the availability and potential need for telecoms to the business; and,
2. Develop an external campaign to promote the telecoms in the region internationally and include in the programmes to attract FDI.

These approaches would serve to promote the opportunities available for exploitation on the advanced telecommunications infrastructure in place and soon to be in place by 2011.

TELECOMS STRATEGIC AND POLICY ENVIRONMENT

In this chapter the strategic environment under which the Panel was convened is presented. In addition, current policies that are in place that impact upon the strategic direction and context are presented.

6

6.1

STRATEGIC CONTEXT OF TELECOMS IN NORTHERN IRELAND

Both the NI Executive and the UK Government have placed telecommunications at the centre of policy developments aiming for key economic and social outcomes. There are also key initiatives being taken within business and industry in NI.

Figure 6.1 below illustrates the importance of telecommunications for NI and the wider UK from a Government position.

Figure 6.1: The strategic environment for telecoms in Northern Ireland





6.2 TELECOMS POLICY IN NORTHERN IRELAND

Telecommunications policy is a reserved rather than devolved matter. Policy responsibility therefore rests with the Department for Business, Innovation and Skills (BIS), and regulation with the Office of Communications (Ofcom).

The Communications Act 2003, however, confers a general power on DETI to make payments to persons engaged in, or commercial activities connected with:

- The provision of electronic communications networks in NI, or
- Improvements of the extent, quality and reliability of such networks.

As a fully privatised market, DETI investments in telecommunications are subject to consideration of EU competition law and State Aid regulations.

The NI Executive's Programme for Government (PfG) 2008 – 2011 demonstrates the importance placed on advanced, state-of-the-art telecommunications in enabling investment, economic development and innovation.

The PfG Priority "Growing a dynamic, innovative economy" includes the commitment to work with the business sector to deliver NGN access by 2011, while the Priority "Invest to build our infrastructure" includes the commitment to establish the direct international link in the North West (i.e. Kelvin).

Under Public Service Agreement (PSA) 1, Objective 3 ("Ensure a modern sustainable economic infrastructure to support business"), an action is placed on DETI to "Undertake a range of broadband stimulation activities to encourage the take-up and innovative use of telecommunications" and to develop NGN and the direct international link.

Associated PfG targets for DETI are:

- Increase broadband take-up to 75% of business by 2011 from a baseline of 60% in 2006;
- Increase e-business activity by 10% by 2011 from its current low base;
- Increase the availability of NGN broadband speeds to 85% of businesses by 2011; and,
- By 2009, reduce latency on communications between the North West and North America by approximately 25% and bring international communications costs in line with those in the major UK cities (e.g. Glasgow and Manchester).

It is in this context that the investments in Project Kelvin and the Next Generation Network have been made.

DETI also established a Broadband Fund in 2008, as a mechanism for providing financial assistance to businesses undertaking near to market broadband technology trials or promoting solutions for the delivery of commercial, high-speed broadband services in rural locations.

A further DETI initiative is Logon-NI, a £3.9m programme launched in 2009 as a mechanism for delivering supplier-neutral, free-of-charge broadband advice to SMEs.



6.3 TELECOMS POLICY AT UK LEVEL

The *Digital Britain* White Paper was published by BIS and the Department for Culture, Media and Sport (DCMS) in 2009, with the ambition “To secure the UK’s position as one of the world’s leading digital economies”. *Digital Britain* contained a number of proposals and commitments on “A Competitive Digital Communications Infrastructure”, including:

- Ensure delivery of the Universal Service Commitment (USC) at 2Mbps to virtually every UK household by 2012; and,
- Investment in next-generation broadband.

In March this year, BIS and DCMS published the National Plan for Digital Participation to follow on from *Digital Britain*. Its shared vision was for “everyone who wants to be online to get online, do more online and benefit from the advantages of being online”. Inclusion was a key focus of the Plan. As part of this exercise, the Northern Ireland Digital Participation Hub (formed in December 2009) which brings together government, education, media, telecoms and other stakeholders, produced “A Digital Participation Plan for Northern Ireland”. Both documents included possible strategic objectives for a NI action plan covering the 2010-2012 period and focussing on areas such as embedding accredited digital skills in the school curriculum.

Ofcom is the communications regulator, responsible for regulating fixed line and mobile telecommunications, as well as television, radio and the airwaves for wireless devices. A priority in its annual plan 2010-11 is to “Implement regulation to support effective competition and efficient investment in super-fast broadband”. Under the Digital Economy Act 2010, Ofcom is required to carry out a review every three years to report on electronic communications infrastructure throughout the UK.

Also part of the regulatory environment, from next year, there will be a new EU telecoms body, the Body of European Regulators of Electronic Communications

(BEREC), which will replace the more informal co-operation between each of the national regulators which currently exists in the European Regulators Group.

6.4 INDUSTRY DEVELOPMENTS

A number of industry developments have taken place in the region that are aimed at exploiting the telecommunications infrastructure as it is implemented.

6.4.1 DELIVERING ECONOMIC BENEFITS FROM KELVIN

On 26 November 2009 the Northern Ireland Science Park (NISP) hosted the "Monetizing Kelvin" event under the NISP CONNECT Evening Series Programme. The event, which was simultaneously streamed to Magee College in Londonderry, attracted key business and industry players.

Leaders from across the sectors, including media, cloud computing, connected health, financial services and education, provided insight into how their existing business models could be enhanced by the new infrastructure, in addition to the new opportunities emerging from the investment.

The event highlighted the services-based approach to the international markets that was being taken by these industries, and the competitive advantage of being a "mid-Atlantic" portal for US - Europe data traffic.

6.4.2 INDUSTRY DRIVEN ACTIVITY

Some key industry-led collaborations and innovation communities are also starting to emerge, to examine ways to exploit the telecoms infrastructure and position Northern Ireland as a global player.

Since the Monetizing Kelvin event there has been significant activity on the ground. Specifically, there have been several press releases in the regional media, and these have provided general awareness and coverage on both the infrastructure and a case study on the media services that exploit the link.

On the ground there have been several 100Mbps+ capacity sales, with the Kelvin link being especially useful for other telecoms carriers for resiliency and direct North American connectivity the primary benefits. This is the “low-hanging fruit” in terms of delivery of benefits and is a welcome endorsement of the services available, but needs to be built on to drive out the full opportunities to differentiate Northern Ireland plc and position its strengths globally.

The business sectors are therefore the key to the exploitation of this important new asset. Their ability to identify opportunities that the infrastructure presents and seize them will provide fresh impetus to indigenous and foreign investment in the region.

A significant industry-led initiative is Digital NI 2020; which seeks to create a holistic exploitation approach across business and community to achieve economic and social uplift. The Digital NI 2020 work will both identify and encourage the deployment of those elements necessary to complete the digital infrastructure. In particular, related to creating a global Cloud Hub, and will work proactively with business/industry sectors, education, health, government and community bodies to stimulate exploitation of the opportunities created by the availability of this infrastructure.

Digital NI 2020 therefore complements what has been delivered by the investment in infrastructure by helping businesses and individuals turn this into opportunity.

Finally, the Northern Ireland Software Innovation Network (NISINE) aims to enable international companies that procure software development or products from overseas to have a better insight into NI software. NISINE are developing an industry-led cloud forum to support the exploitation of NI’s infrastructure.

CONCLUSIONS AND RECOMMENDATIONS

This chapter outlines the conclusions of the Panel, covering NI's telecoms infrastructure, the economic and business opportunities for NI building on these opportunities, and the factors that need to be addressed in order to maximise these opportunities. It also sets out recommendations and actions in this regard.

7



7.1

NI'S TELECOMS INFRASTRUCTURE

Northern Ireland has made strides in its telecoms infrastructure in recent years, bringing the region up to a very competitive position:

- Since 2004 over 99% of premises are able to access fixed line broadband service of 512Kbps downstream and there is 100% availability of broadband to the region;
- NGBP will make available next-generation broadband to 85% of NI businesses by 2011 with speeds up-to 40Mbps; and,
- Multiple external links are in place, including direct international connectivity via Project Kelvin, which provides a low-latency link to North America.

NI therefore has sufficiently robust infrastructure to meet most business requirements, and aspects of the network are world class. In a global context, while being somewhat behind cutting-edge world leaders such as Singapore and South Korea, this positions NI well to attract investment and develop indigenous business, and to stimulate innovation and competitiveness.



7.2

OPPORTUNITIES

The Panel, in close consultation with the stakeholder community in business and industry, government and academia, has identified six key opportunities that are enabled by this infrastructure, and in which NI is placed to develop and reap economic benefits:

Opportunity 1: Advanced Engineering & Materials.

NI can develop as an international centre for high-value collaborative design, by enabling seamless real-time design work across geographies.

Opportunity 2: Health & Life Sciences.

NI can become a test-bed for Connected Health deployments, and a global delivery hub for Connected Health services using low-latency, high-speed telecoms.

Opportunity 3: Social & Digital Media.

Through promoting global interaction with producers and consumers of digital content, NI can position itself as both a creator of, and support for the development of global content.

Opportunity 4: ICT.

Through promoting NI as a base for supporting “Cloud” applications and service development, NI can position itself as a global competitor for the provision of “as-a-Service” applications for the current and next generation of Internet.

Opportunity 5: SmartGrids.

NI can develop an open-access model which will inform domestic, industry and trade buyers (of energy), based on the aggregation and transformation of data into a graphical interface.

Opportunity 6: Financial Services.

NI can establish itself as a content hub for world financial institutions, aggregating information from the US and European markets in as close to real time as possible.



7.3 RECOMMENDATIONS

In the course of this work it has become clear to the Horizon Panel that many of the opportunity areas are already being progressed in NI. The Panel encourages business in general to take advantage of the opportunities presented by the improved Telecoms environment and specifically endorses the activities of those progressing the opportunities listed above.

In addition the Panel makes the following recommendations for action to ensure that this overall opportunity to exploit telecoms capability is realised:

Recommendation 1: The Panel recommends that each of the opportunities are fully supported within the overall MATRIX agenda and by policy makers in NI so each will reach its full potential for the benefit of NI’s economy.

Recommendation 2: There should be sustained marketing and communications campaign, jointly delivered by Government and Telecoms suppliers that is focused on three key areas:

- Communicate the availability of next generation services across NI with an emphasis on both NI based business users and on those businesses with the potential to invest in the region;
- Articulate the business value of next generation telecommunications across different industry sectors to make the case for investment by individual companies. Opportunities to facilitate business to business interactions on this area are preferred over government or supplier led communications;
- Promotion of collaboration among businesses seeking advanced telecommunications, in alignment with the overall concept endorsed by MATRIX, to aggregate demand and provide more cost effective solutions to their needs;

NI has an enviable telecommunications infrastructure, and with the ongoing roll-out of the NGBP, and the launch of Kelvin in 2010, it brings high bandwidth fixed line services availability to within 3Km of 85% of the business population. Coupled with the ongoing advances in wireless telecommunications delivering better and faster bandwidth, the availability of the high bandwidth telecommunications for the majority is within reach.

The business community must be made aware of the availability of these services, and the business support organisations must be in a position to ensure that due consideration is given to high bandwidth availability when a business is starting up or expanding.

Finally, NI has many success stories to tell, in terms of the talented people and innovative companies that are here. To date, the telling of these stories, even to the many Northern Irish people working in leading roles in places such as the United States, has been muted. Marketing of NI's success stories and abilities will help to stimulate FDI and to attract talent to return to NI, bringing skills, knowledge and their influential networks.

Recommendation 3: The Panel believes that, where possible, fixed line infrastructure supporting open-access telecoms should be a pre-requisite for any multi-occupancy business development and that this should be achieved through changes in planning regulations.

This will enable telecoms providers to "pull" fibre into a multi-occupancy site at a much lower cost than currently is the case and enable the provision of high-bandwidth fixed line services to those that require them for their business. It is also noted that wireless telecommunications can also provide high bandwidth last-mile access, however the provision of fixed line communications as standard would greatly improve the awareness of the availability of high bandwidth services, and thus promote the use of high bandwidth services and applications

Recommendation 4: Further engagement between business, HE/FE institutions and government departments is required to identify and develop the skills required to support these opportunities, and future opportunities which may arise.

The opportunities identified must be nurtured and maintained through the development and retention of the world-class skills required for success in their respective sectors. The skilled labour pool must be deep enough and sufficiently equipped, to support the opportunities identified.



7.4 FUTURE DEVELOPMENTS

Finally, it is clear that Northern Ireland is in a strong position with respect to the Telecommunications environment due to the 100% broadband rollout, Project Kelvin and NGBP. However, it is also clear that competing countries and regions are continuing their efforts to improve in this area due to the economic necessity for advanced digital interaction. Therefore, this report represents a snapshot and continued assessments on a “light touch” basis will be necessary to support the overall agenda of MATRIX and to position NI as a leading knowledge economy.

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
Algorithmic trading	Is the use of computer programs for entering trading orders with the computer algorithm deciding on aspects of the order such as the timing, price, or quantity of the order, or in many cases initiating the order without human intervention
anything-as-a-service	Form of cloud computing that allows for the provision of any type of service to be provided over the cloud.
Bandwidth	Bandwidth refers to data transmission rate measured in bits per second.
Broadband	High data rate Internet access—typically contrasted with dial-up access using a 56k modem
Cloud Computing "The Cloud"	A style of Computing where scalable and elastic IT capabilities are provided as a service to multiple customers using Internet technologies
Content Caching and Streaming Nodes	A system of computers containing copies of data, placed at various points in a network so as to maximize bandwidth for access to the data from clients throughout the network
Digital rights management	Generic term for access control technologies that can be used by hardware manufacturers, publishers, copyright holders and individuals to impose limitations on the usage of digital content and device
eLearning	Delivery of course content and activities or program of study online.
Fibre	A glass or plastic fibre that carries light along its length. Fibre optics is the overlap of applied science and engineering concerned with the design and application of optical fibres.
INTERREG	Community initiative which aims to stimulate interregional cooperation in the European Union.
Latency	Bandwidth Latency is the difference in time from when a message is send until it is received.

Term	Definition
Mbps	Megabit per second (Mbps) is a unit of data transfer rates equal to 1,000,000 bits per second (this equals 1,000 kilobits per second)
ms	Millisecond – one thousandth of a second
NGN	A next generation network (NGN) is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, Quality of Service-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies
SaaS	Software as a service (SaaS, typically pronounced 'sass') is a model of software deployment whereby a provider licenses an application to customers for use as a service on demand
Resilience	The ability to provide and maintain an acceptable level of service in the face of faults and challenges to normal operation
SmartGrids	An electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies.
SATURN	The high capacity fibre optic backbone network, originally built by ntl, and now used by a number of major operators. It loops around the north and centre of Northern Ireland
Telehouse	A major carrier neutral co-location facility
Terabits	1 terabit = 10^{12} bits = 1,000,000,000,000 bits (one trillion). 1 terabit is equal to 1,000 gigabits.

APPENDIX B: ACKNOWLEDGEMENTS

The Panel would like to thank the following stakeholders for their valued input.

B.1 CONSULTED STAKEHOLDERS

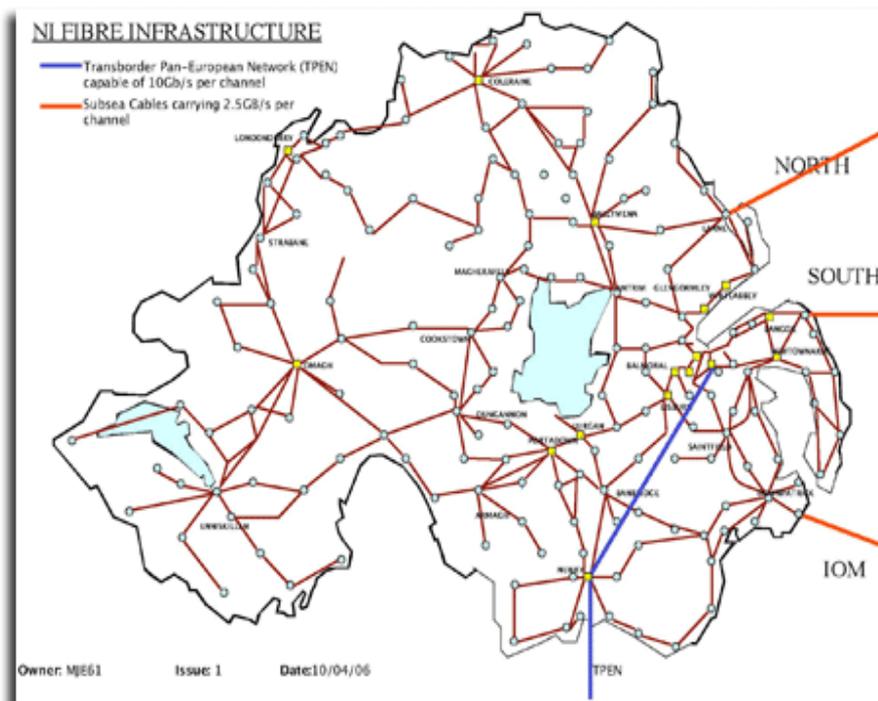
Name	Organisation	Name	Organisation
William Hamilton	Liberty IT	Juliet Whitford	DEL
Trevor Forsythe	DETI	Judith Millar	Invest NI
Paul Robinson	DETI	Jimmy Stewart	C2K
Tom Kennedy	Delivery & Innovation Division, DFP	Chris Spice	UU
Thomas O'Brien	Airtricity/SSE Renewables	Jayne Brady	Intune Networks
Shane Mulholland	First Derivatives	Greg Maguire	Zoogloo
Rob McConnell	SQS	Gráinne McVeigh	Invest NI
Richard Williams	Northern Ireland Screen	Barry King	Quinn Group
Andrew Reid	Northern Ireland Screen	Geoff Hicks	Broadsoft
Paul McElvaney	Learning Pool	Gavin Campbell	Bombardier
Niall Casey	Invest NI	Gary Hamilton	Omiino
Michael Murray	BT	Eddie Ritson	European Centre for Connected Health
Michael Maguire	Datum Tool Design	Derek Bullock	Hibernia Atlantic
Matt Johnson	Digital Circle	David Brown	Dale Farm
Mary-Jo Kurth	Randox	Darren Lemon	Eircom
Martin Hamill	Rainbow Telecoms	Colm Hayden	Anaeko
Mark Baxter	Mivan	Clive Shaw	Citigroup
Liam Downey	Belfast HSC Trust	Andrew Trimble	UU
Les Curran	Kelsius	Gareth McAleese	UU
Ciaran Hamill	CAFRE		

B.2 ACKNOWLEDGEMENTS: WORKSHOP DELEGATES

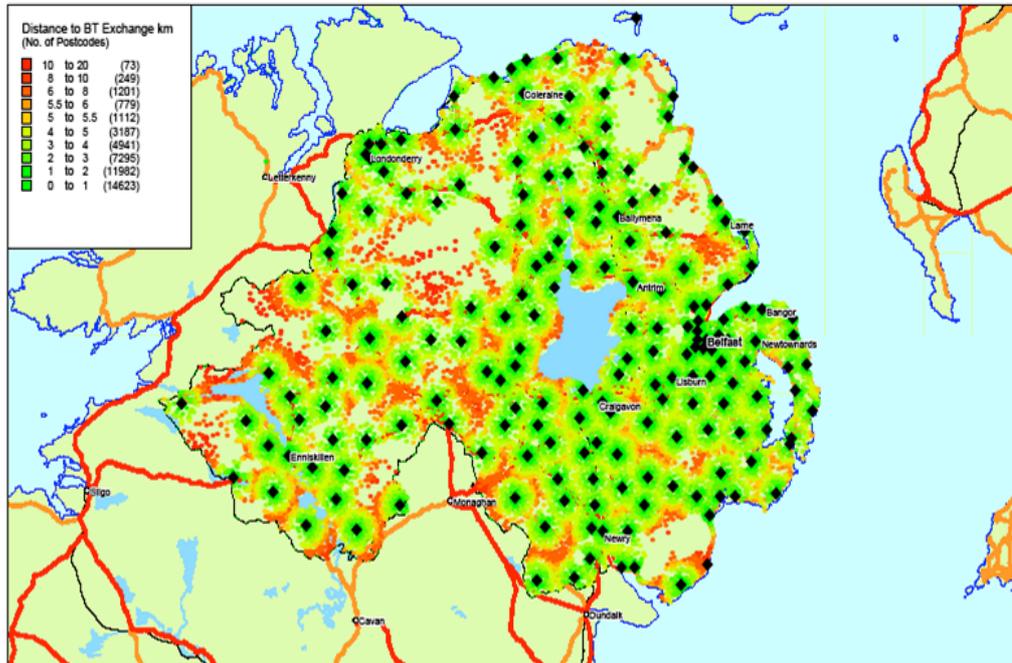
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Thomas O'Brien	Airtricity/SSE Renewables	Jayne Brady	Intune Networks
Ian Graham	Momentum	Greg Maguire	Zoogloo
Niall Casey	Invest NI	Colm Higgins	QUB (NI Technology Centre)
Pat O'Neill	Strategic Investment Board	Tom Edgar	QUB (NI Technology Centre)
Michael Murray	BT	Darren Lemon	Eircom
Matt Johnson	Digital Circle	Colm Hayden	Anaeko
Ciaran Hamill	CAFRE		

APPENDIX C: NORTHERN IRELAND'S TELECOMS INFRASTRUCTURE ILLUSTRATION

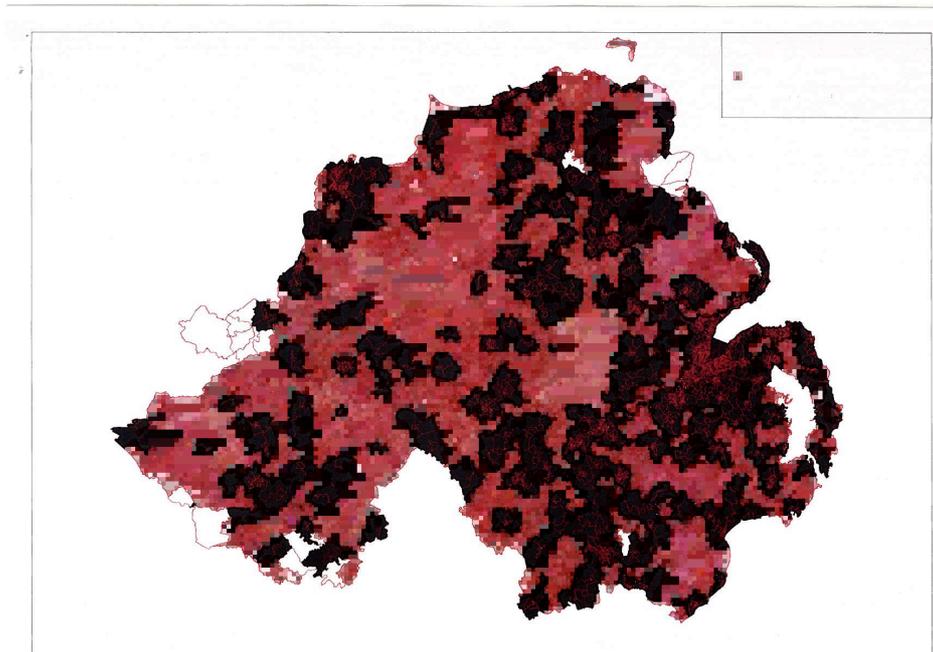
C.1 BT'S FIXED LINE INFRASTRUCTURE



Distribution of BT's ADSL-enabled exchanges

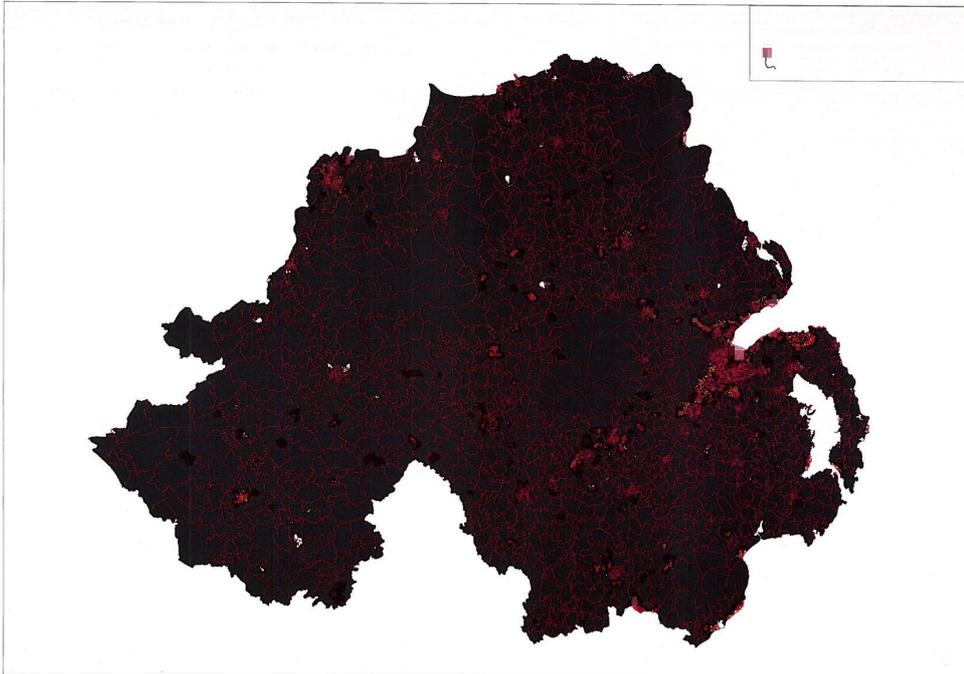


Coverage of NGBP – Lot1 Rural



Areas in red are being targeted in Lot1.

Coverage of NGBP – Lot2 Urban



The areas in white are being targeted in Lot2 to provide 10Mbps+ connectivity.

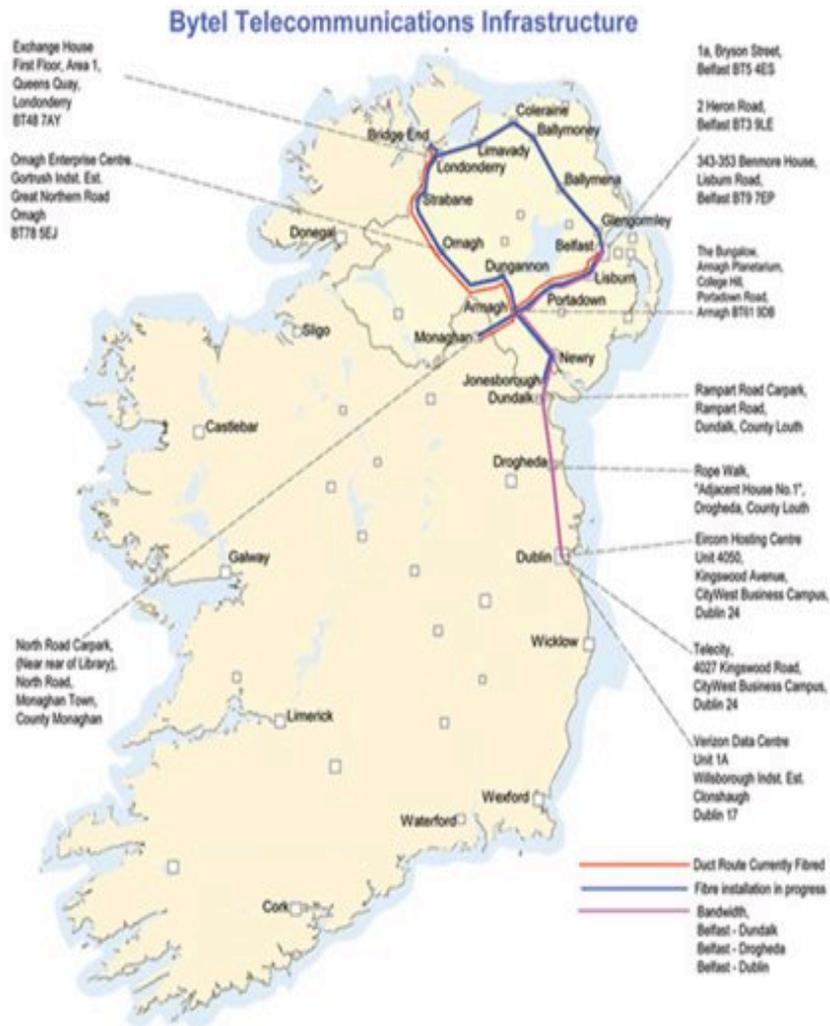
C.2 VIRGIN MEDIA'S FIXED-LINE INFRASTRUCTURE

Virgin Media's SATURN network



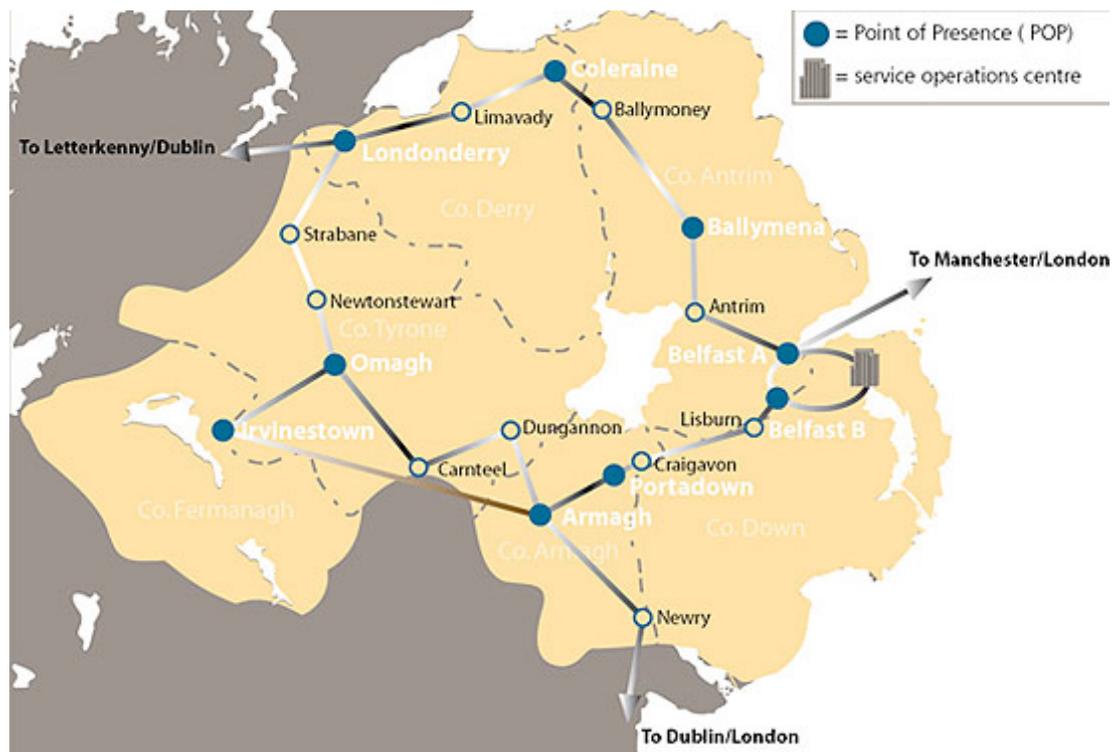
C.3 BYTEL'S FIXED-LINE INFRASTRUCTURE

Bytel's core network



C.4 EIRCOM NORTHERN IRELAND'S FIXED-LINE INFRASTRUCTURE

EircomNIs core network



C.5 HIBERNIA ATLANTIC'S FIXED-LINE INFRASTRUCTURE

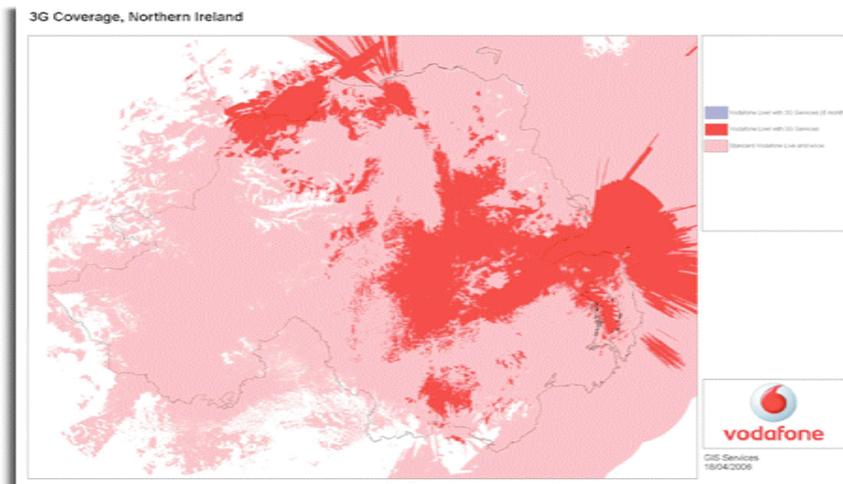
Hibernia Atlantic's core network



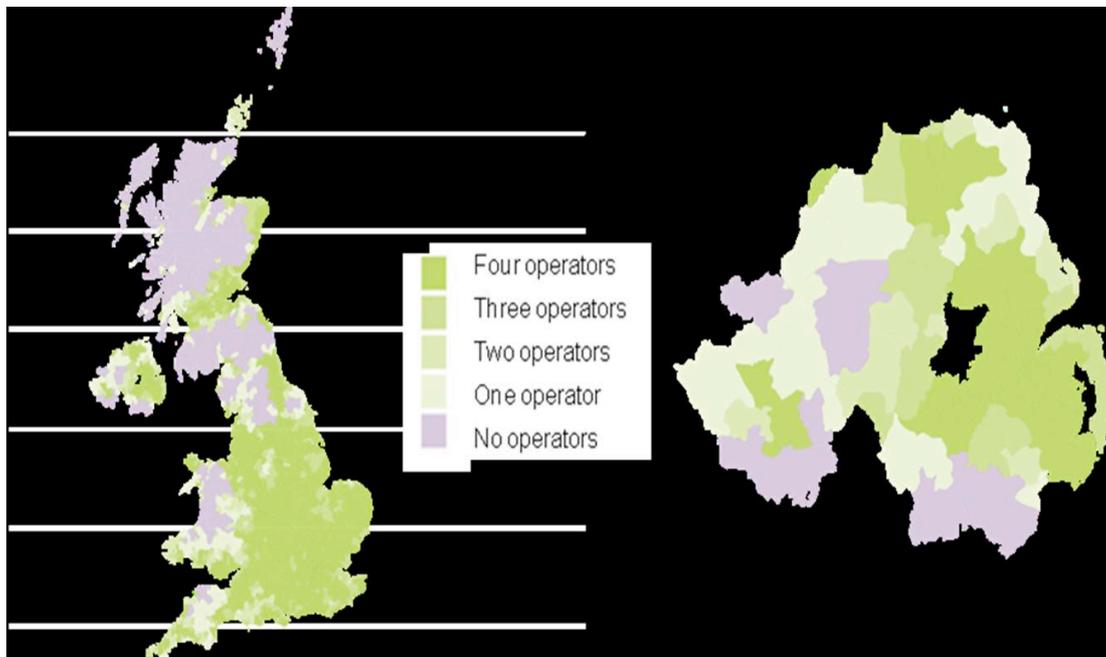
This project is part financed by the European Union's European Regional Development Fund through the INTERREG IVA Cross-border Programme managed by the Special EU Programmes Body.

C.6 WIRELESS NETWORK

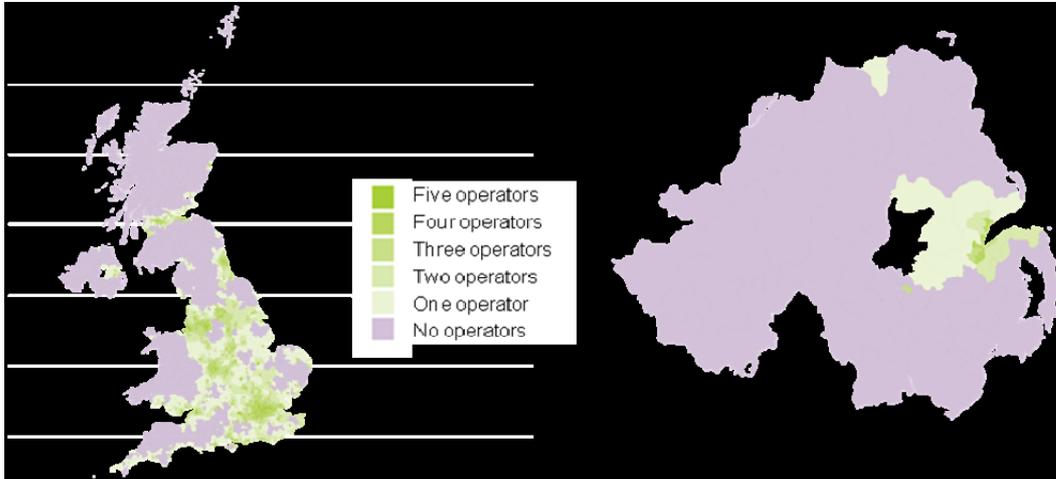
Vodafone 3G coverage in NI



2G coverage UK wide and in NI (Ofcom)

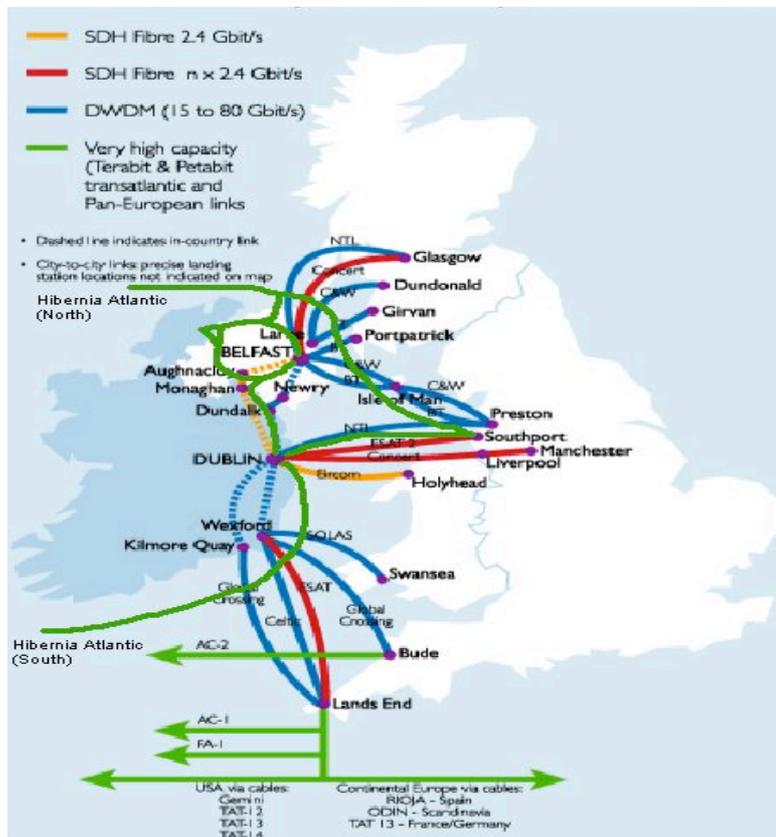


3G coverage UK-wide and in NI (Ofcom)



C.7 INTERNATIONAL CONNECTIVITY: CROSS-CHANNEL AND BORDER

The island of Ireland's external connectivity



APPENDIX D: INTERNATIONAL EXAMPLES OF INFRASTRUCTURE INVESTMENT

Countries	Timeframe	Description
Australia	8 years from 2010	To deliver broadband at speed of 100 Mbps to 90% of Australian homes, schools and businesses through fibre-optic cables connected directly to buildings.
Finland	7 years (2009-2015)	To provide ultra-fast broadband to every household in Finland, with download speeds of at least 1Mbps by 2010, with a ramp-up to 100Mbps by 2016 for at least 99% of households
Republic of Korea	5 years (2009-2013)	High-speed Internet services to be upgraded to 1 Gbps by 2012; existing communications networks to be enhanced to Internet Protocol (IP)-based systems; subscriber capacity on 3G broadband services to be increased to 40 million.
France	5 years (2008-2012)	To provide ultra broadband networks to 4 million households through FTTH access by 2012. Moreover, 400 cyber bases will be created in schools over the next five years and schools which already have access will be modernized. Provision of universal access to broadband Internet at affordable prices is to be made available throughout France before the end of 2010.
Germany	10 years (2009-2018)	The second phase is to bring broadband access at 50 Mbps or above to 75% of the households by 2014. The first phase of the strategy is for all homes in Germany to have broadband access at 1 Mbps by the end of 2010.
Portugal	2 years (2009-2010)	For up to 1.5 million homes and businesses to be connected to the new fibre networks and improvements in high-speed internet, television and voice services. The Portuguese government had also set a goal of 50% home broadband penetration by 2010, and this latest investment should allow the operators to significantly surpass the target.
Singapore	4 years (2009-2012)	For homes and offices nationwide to be connected to Singapore's ultra high-speed and pervasive Next Generation National Broadband Network by 2012; and for 60% of homes and offices to have access to this new, pervasive, all-fibre network by the end of 2010.

MATRIX

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