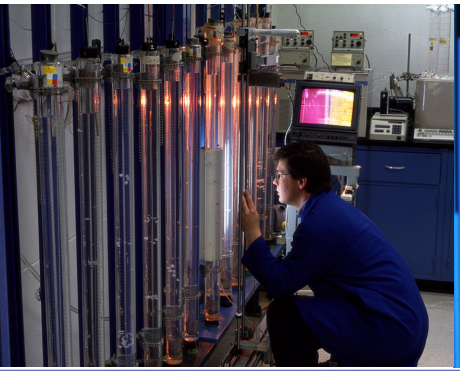
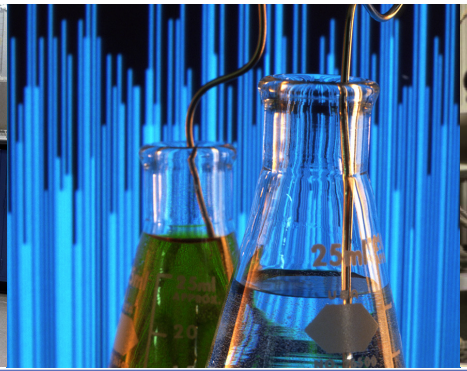
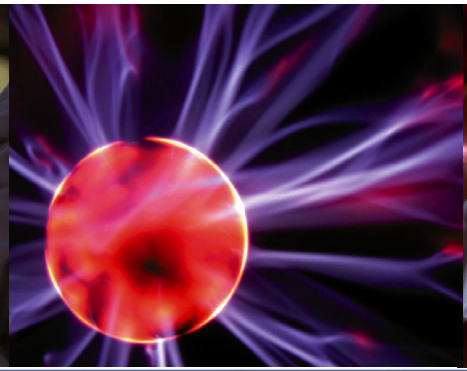
A Phase 1-3 Sector Skills Agreement for the Cogent Sector in Northern Ireland

June 2008 **Publication Number COR 049**

Innovation — Competence — Productivity — Sustainability

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Executive Summary

Many of the employers in the Cogent sector are already heavily dependent on high level skills. Science, technology and engineering underpin their successes and indeed there are 100s of high performing employers in the Cogent footprint which are continually moving up the value chain through skills and innovation.

The research carried out for the Sector Skills Agreement (SSA) for the Cogent industries in Northern Ireland identified the skills needs, an assessment of current provision to meet these needs, and the gaps in provision to meet current and future needs.

From the research conducted for the SSA a number of issues were identified:

The key issues affecting the Northern Ireland Cogent sector:

- Cogent industries have poor image and understanding of the range of potential career opportunities is low. The industry fails to attract women and minorities, seriously limiting the pool from which it recruits current and future employees.

- The sector reports skills gaps above the UK average and the continuous evolution of the Cogent industries challenges its employees to embark upon learning as a life long process. In addition, the Cogent industries report that their knowledge and understanding of how to access available provision is weak.

- There are insufficient technicians entering the industries within the sector to meet forecast demand and the routes for existing employees to become technicians are poorly defined.

- The hazardous nature of the industries within the Cogent footprint requires excellence in management practices. Such practices exist but there is no standard to facilitate benchmarking, this is especially relevant to hazardous chemicals manufacture.

Key Policies
The key policies driving the skills agenda in Northern Ireland are 'Success through Skills' and Prosperity For All'.

Success through Skills: the implementation of the NI skills strategy is grouped under four themes: (i) understanding the demand for skills; (ii) improving skills levels of the workforce; (iii) improving the quality and relevance of education and training; and (iv) tackling skills barriers to employment. The latest PSA targets relating to the strategy are:

- By March 2011, 42,000 adult learners will have achieved a recognised qualification in Essential Skills;
- Increase the proportion of the working age population who are qualified at skills Level 2 and above to 80% by 2015;
- Increase the proportion of the working age population who are qualified at skills Level 3 and above to 60% by 2015.

Prosperity for All includes four themes and 16 related recommendations. The four themes are: (i) making the UK a world leader in skills; (ii) a demand-led system; (iii) employer engagement in skills; and (iv) embedding a culture of learning. DEL has considered how Success through Skills contributes to these themes, as set out below.

The Cogent sector within the Irish context

The Cogent sector encompasses a wide range of industries. The sector provides direct employment for over 900,000 people, structured around some 19,000 businesses. The Cogent sector is made up of 6 industries, however only 4 are identifiable in Northern Ireland:

- Chemicals
- Petroleum (mainly fuel distribution and retail sale of automotive fuel)
- Pharmaceuticals
- Polymers

There are approximately 15,000 employees in the Cogent sector in Northern Ireland making up 2.5 per cent of the overall Cogent sector workforce (including forecourt retail).

About the Industries

- According to national statistics[1] the gross Northern Ireland sales for chemicals, pharmaceuticals and polymers in 2005 were £1.3 billion – with 60% of this derived from exports. This level of sales for the Cogent footprint represents potentially 20-25% of the total for manufacturing, and a very significant part of exports (approx 18%) – and as such forms a vital part of the overall Northern Ireland economy.

- Employment in the chemicals industry in Northern Ireland has been approximately 3000[2] for over 20 years since its peak in 1977, when employment in the industry stood at over 10,000. This decline has been mainly as a result of the closure of man-made fibres operations. In spite of this the GVA for chemicals has been growing steadily since 1990, and is currently (2007) 3 times higher than the GVA of 1989 – with the productivity trend showing a similar growth pattern.

- The pharmaceuticals industry in Northern Ireland is still evolving and developing – to date approximately 2200 are employed in pharmaceuticals manufacture – 96% of which are based in 5 companies. In recent years there have been a significant number of takeovers and joint ventures as pharmaceutical companies look for ways to develop new products and reduce costs. The sector benefits from public support, both through scientific research budgets and tax credits for research and development.

- The plastics industry in Northern Ireland, which employs 6502 people: has a GVA per employee of £46273 – putting polymers in Northern Ireland in the higher value added end of manufacture.

- Although the polymer/plastics industry is dominated by small and medium sized owner-managed businesses – approx 10% of businesses in the industry are parts of multinationals. It is an industry in which innovation lies across everything it does – and it is impacted on by the pressures operating within the markets it serves: for example the medical sector, which has the highest rate of innovation.

- The sector is characterised as having an increasingly high level of technical content in operational roles, and an underlying need to develop a greater range of solution provision skills, such as design and innovation, in order to create new opportunities and to meet customer needs.

[1] National Statistics – Regional Trends 2006 – Table 39

[2] This figure includes man-made fibres - the current employment figure for chemicals is 1761 - source D&B; InvestNI

Emerging Skill Needs

- Innovation is fundamental to the sustainability of the sector as whole – and employers tell us it is a top priority. Competing on cost alone will no longer guarantee a sustainable future – meeting and anticipating the demand for new and innovative products, services and processes is now key to the overall long term success of the sector.

- Overall, there has been a clear need articulated for technical skills, growing the population of technicians able to control, maintain and contribute to the improvement of processes and equipment, as well as engineers and scientists to innovate and design products and processes.

- The future shape of the sector is one that is likely to be:
    - Serving those markets less open to competition, where the cost of transportation would preclude sourcing from abroad.
    - Making continuous improvements in the design and innovation of new products, followed through to ensuring the processing and production costs are minimised (requiring workforce skills interventions.)
- The impact of future direction on the current workforce of the whole sector requires a higher level of awareness of the processes used, and the interventions required. In some cases, the skills level of the entire employment base requires a step change – with numbers required at level 1 declining, a proportion of S/NVQ L2 moving up to L3, L3 to L4. It is accepted that there will always be a requirement for a certain number of employees entering or remaining in the workforce at a basic level, however these are already in decline

Entry to the Sector

- There is a continued lack of understanding about the Cogent sector and the employment opportunities..Cogent's challenge is to therefore continue to present the sector as a positive career option, encouraging 'new talent' which will ensure the sustainability of Cogent's industries in Northern Ireland.

The Cogent sector depends on entry level qualifications related to STEM subjects (Science, Technology, Engineering and Maths. It is Cogent's challenge to encourage the continued uptake of post compulsory STEM subjects, ensuring Northern Ireland have a highly skills pool to recruit from.

Provision

- At present there are no Modern Apprenticeship schemes or Foundation Degrees relating to the Cogent sector in Northern Ireland. Cogent has been working with stakeholders in the industry to develop an Apprenticeship programme for the polymer sector, which is scheduled to commence in September 2008 - fifteen companies have already registered an expression of interest to support the programme.

- The range of available FE opportunities is narrow, with the decline in sector specific HNC and HND offerings being most noted by employers. This is having an adverse at the technical entry level and there is an overall need to develop or re-develop qualifications reflecting industry needs.

- UK wide undergraduate opportunities with content specific to the Cogent sector are limited - six institutions offer courses with this type of content (four in England, one in Scotland, one in Northern Ireland). Employers in the Northern Ireland polymer industry tell us that the students graduating from these programmes are seen to be of good quality, and sufficient in number to meet their local needs.

- There is a strategic partnership (facilitated by NIPA) between the industry in Northern Ireland and the Polymer Processing Research Centre at Queens University Belfast – with strong links between the PPRC and many polymer processing businesses through its: START programme; Knowledge Transfer programmes; provision of bespoke training.

- With the exception of the polymer industry, there are very few industry-specific opportunities for development, and there is no clear route or benchmark in place

to guide employers and employees. The larger companies have management training schemes, CPD models, and extensive health, safety and environmental training programmes, but in many cases these are developed and delivered in-house, and receive no recognition from other employers and academia.

- No distinctive interventions have been put in place to address the emerging skills needs in business improvement for current employees, to drive forward process and productivity improvement.

An analysis of the political, economic, social and technical factors identifies eight factors driving change in the Cogent sector:

Political
- Energy Policy
- Environment, Health and Safety

Economic
- Globalisation
- Markets
- Sustainability

Social
- Reputation
- Skills Policy

Technical
- Technological Solutions
- Environment

Cogent Working in Northern Ireland

Cogent currently has field staff, supported by an integrated team at our head office, working in Northern Ireland developing strong working relationships with all major stakeholders independently and in partnership with other NI SSC's through the Alliance of Sector Skills Councils.

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Introduction

Cogent is the Sector Skills Council (SSC) for the Chemicals and Pharmaceuticals, Oil and Gas, Nuclear, Petroleum and Polymer Industries. It is one of 25 SSCs which form the Skills for Business Network (SfBN).

Cogent is licensed by the Government to provide employers in our sector with the opportunity for coherent leadership and strategic action to meet their skills needs.

Our key national objectives are to:

- Reduce the sector's skills gaps and shortages and anticipate future needs in the Cogent industries
- Improve productivity and business performance through specific strategic actions, based on our analysis of sectoral priorities.
- Increase opportunities to develop the productivity of the sector's workforce.
- Improve learning supply, including the development of apprenticeships, higher education and of national occupational standards.

Driven by the Cogent industries themselves in response to tangible skills gaps and shortages, Cogent has grown steadily in both stature and influence. It now presents a clear and powerful voice, enabling sector employers to influence Government policy development and shape the outputs of training and education providers.

Sector Skills Agreements are being produced for every sector which is supported by a Sector Skills Council including Cogent, which covers the chemical and pharmaceutical, nuclear, oil and gas, petroleum and polymers industries. The aim of these agreements is to secure for each sector the range and level of skills necessary to achieve productivity at internationally competitive levels. In partnership with employers, the Government and others, Cogent will use the Sector Skills Agreement as a framework for delivery of the skilled workforce which employers in the sector want.

The Agreement will:

- lead to better planned and more integrated delivery of skills training;
- help to produce credible, cost effective, quality assured and better-tailored training provision;
- help to target public funding more efficiently;
- encourage employers to invest more in developing their workforce.

This Northern Ireland Sector Skills Agreement (SSA) Phases 1 – 3 for the Chemical, Pharmaceutical, Petroleum and Polymers industries provides an overview of their size, shape and future needs. This report does not include the oil and gas nor the nuclear industry due to the level of presence within the Northern Irish economy. The UK National SSA is available and has been developed through a five stage process, to reflect both statistical evidence from national sources, and direct discussions with employers and stakeholders. It builds on the previously published documents:

- **Skills Need Assessment (Chemical, Pharmaceutical, Polymers and Petroleum)**
- **Assessment of Current Provision (Chemical, Pharmaceutical, Polymers and Petroleum)**
- **Gap Analysis**

Methodology

As part of the Sector Skills Agreement process in Northern Ireland Cogent conducted further research in order to boost the evidence available. This work was supported and funded by the Department for Employment and Learning (DEL) and engaged with 87 employers. Alongside this a further 35 were engaged directly or with partner bodies to provide a total sample of 122 employers.
The research collected labour market intelligence from Chemical, Pharmaceutical, Petroleum and Polymer employers. The evidence has been used throughout this document to illustrate the skills and training issues faced by Northern Ireland employers in the Cogent sector.

The Northern Ireland Sector Skills Agreement involved 5 main phases of work:

A **literature review** to analyse key policies influencing the skills and training agenda in Northern Ireland. This review also considered social, environmental and technological issues affecting the Cogent sector with regards to both industry and workforce.

Data Analysis of Labour Market Intelligence sources ensured there was no duplication of existing research. The SSA draws from existing data, research reports and intelligence sources in the investigation of productivity, current and future employment demand, skills needs and training provision.

A **telephone survey** was conducted from a sample of 600 Northern Ireland employers in the Chemical, Pharmaceutical, Petroleum and Polymer industries to explore skills issues and training needs within the industries. The survey included questions on skills gaps and skills shortages. The telephone survey achieved 77 responses which equates to 12.8% response rate. It is interesting to note that of the 77 who responded to the survey, the majority did so in the first week and despite a further three weeks of telephone calls, little or no additional respondents were gained.

In-depth interviews with sector employers seeking more detailed information on short – medium term demand for employment by occupations, skills required (detail around technical, management & leadership), and impacts upon training needs. 10 in-depth interviews were conducted. These interviews lasted approximately 90 minutes to 2 hours.

Employer engagement with key trade associations including:

- Northern Ireland Polymers Association (NIPA)
- All Island Polymer and Plastics Network
- Association of the British Pharmaceutical Industry (ABPI)
- Northern Ireland Oil Distributors Association (NIODA)
- Northern Ireland Oil Federation (NIOF)

In NI much of Cogent's activities are in partnership with other SSC's or industry bodies. The petrol distribution & supply network is shared with Skillsmart Retail and Skills for Logistics and the Polymer and Pharmaceutical industries overlap with SEMTA. In addition, Cogent works closely with Industry bodies in NI such as the Northern Ireland Polymers Association, the All Island Polymer & Plastics Network and the NI Oil Federation.

In the Pharmaceutical sector the representative body are the UK wide Association of the British Pharmaceutical Industries and Cogent work closely them to help develop a sustainable and efficient industry across GB and NI.

Through this employer engagement process Cogent has engaged with an additional 35 employers in Northern Ireland.

1. Context

This section of the report examines the social and economic policy context in Northern Ireland and the current policies for skills development in the country. The following chapter provides a comprehensive overview of Northern Ireland in terms of population, industrial structure, labour market, and productivity. There is also an exploration of key public sector intervention to raise productivity and skills within the Northern Ireland economy.

1.1 Social and Economic Policy Context

Population: Northern Ireland covers an area of 13,576 km^2 and has a population estimated at just over 1.7 million. The landscape is predominantly rural, but approximately 67% of the population live in urban areas and almost 40% live in the Belfast Metropolitan Area. The Derry City Council area in the Northwest is the only other area with a sizeable concentration of population. The west is more rural, centres of settlement are more dispersed and there is a greater dependence on agriculture, with food processing also relatively more important.

Just over 20% of the NI population is aged under 15 years, compared with less than 18% for the UK as a whole. Northern Ireland is projected to have a higher proportion of working age population than the UK from 2010 to 2021 and this expected increase in labour supply should impact positively on economic growth, providing it is accompanied by adequate demand for labour.

Net Output: one consequence of a younger population is a higher dependency rate and this is one of the factors contributing to a gap in Gross Value Added (GVA) per capita between NI and the other regions of the UK. There has only been marginal convergence in GVA per capita since 1990 and NI now stands at 81% of the UK average.

Industrial structure: Northern Ireland's low level of productivity, relative to the rest of the UK, can partly be explained by industrial structure:

- NI has proportionately more employment than the UK in industries with low average productivity such as construction, agriculture and the public sector and, conversely, fewer people employed in transport and communications and financial services;
- Additionally, the local economy remains relatively reliant on traditional industries that are declining as they continue to experience difficulty operating in an increasingly competitive global economy;
- The services sector is becoming increasingly important in NI in employment terms, but the employment growth has been in services that offer predominantly low skilled and low paying jobs (e.g. retailing an distribution).

Labour Market: employment in NI has been growing at a faster rate than elsewhere in the UK over recent years and the official unemployment rate is the second lowest of all UK regions. However, there are several caveats:

- Employment growth has not made any meaningful contribution to regional productivity improvement and NI still lags behind the UK average in terms of GVA per head;
- One important reason is the nature of the employment growth, which has been mainly in private services (retailing, distribution etc), which tends to be low paid and low value-added;
- NI also has the highest economic inactivity levels in the UK. The major underlying reasons are long-term sickness, participation in full-time education and the need to provide homecare.

Earnings: NI earnings performance remains poor, at around 88% of the UK average for all employees - the second lowest of all UK regions.

- *NI private sector earnings* are the lowest of the UK regions and the NI public sector offers considerably higher pay levels than the local private sector.

- *NI public sector earnings* carry a significant premium (almost 20%, the highest in the UK), even after allowing for the differential occupational mix between the UK and NI.

When public employment is measured as a proportion of population, NI reflects other parts of the UK, pointing towards issues about the relative size of the NI private sector, rather than the size of the NI public sector per se.

Competitiveness: the economic outlook for NI remains favourable, and globalisation will offer new opportunities to local businesses prepared to compete in external markets. However, as a small open economy, increasing competition from emerging economies is likely. Presently, NI compares poorly, both nationally and internationally, in terms of competitiveness.

- Research (2006) comparing NI's overall competitiveness with other EU regions suggested that its main strength was in the area of skills/education, due mainly to the relatively large share of the economically active qualified to tertiary education level.
- Within the UK context, evidence suggests that business costs in the region are relatively competitive, mainly due to cheaper labour costs and below average commercial property costs.

External Markets: local companies need to be able to successfully compete in external markets if they are to succeed in the global economy. Exports from NI increased from 15% of GVA in 1996 to 20% in 2006. This improvement has resulted largely from increasing exports to the RoI and North America. The Budget Document asserts that the emphasis should now be on promoting exports in high value products in sectors such as IT and *pharmaceuticals*.

North-South Economic Co-operation: NI can exploit the relative advantage of being part of a strong UK economy and can also maximize trading opportunities within the island of Ireland. The Governments of both NI and the RoI have placed a focus on increased co-operation, to deliver mutual benefits, particularly in the areas of trade and investment, energy, telecommunications, research and development and *skills*.

The Economic Vision for Northern Ireland is: *a high value-added, highly skilled, innovative and enterprising economy, that enables us to compete globally leading to greater wealth-creation and better employment opportunities for all.*

Productivity drivers: the main challenge for the Executive in delivering the Economic Vision is the need to improve regional productivity, requiring focused policy intervention to ensure that resources are targeted on the four key drivers of productivity, namely: skills; enterprise; innovation; and infrastructure.

- **Skills:** NI has consistently been amongst the best regions in the UK in terms of educational performance at GCSE and A-level and has the lowest proportion of pupils who leave school without any GCSE qualifications. NI also compares reasonably well with other (UK) countries in terms of the proportion of working age adults with high levels of qualifications.
- However, the number of working-age people with no qualifications is almost 10% higher than the UK average. Likely explanatory factors are:
  - Poor educational achievement amongst older sections of the workforce;
  - Emigration – an estimated 9% of full-time students studying in NI in 2005-06 left after graduation, whilst 64% of those who studied in GB did not return.
- In the latest (2005) Skills Monitoring Survey, 9% of employers reported a skills gap amongst their existing staff. Local skills gaps were most prevalent within financial services, health and social care, and other services. However, the proportion reporting skills gaps in Scotland, Wales and England is much higher.
- **Enterprise and Innovation:** recent data suggest that NI is falling further behind the UK average in terms of entrepreneurial activity, and ranks in the bottom three of the 12 UK regions. Additionally, the level of resources devoted to R&D by NI businesses remains low relative to the rest of the UK, despite increases in NI R&D expenditure.

The key public sector interventions to improve NI's capabilities relating to productivity drivers include:

- Implementing the NI skills strategy, *Success through Skills*, and the *FE Means Business Strategy* to improve individuals' skills;
- Increasingly refocusing business support measures on exports, R&D and innovation;
- Implementing the *Regional Innovation Strategy* and enhancing the education and business sectors;
- Implementing the *Investment Strategy for NI* to improve infrastructure.

In brief, headline economic indicators suggest that the NI economy is performing well, particularly in terms of the labour market, but there are several caveats:

- Structural weaknesses remain, including the high level of economic inactivity amongst the working age population, and urgently need to be addressed;
- Substantial improvement in productivity performance is required. Despite record employment growth, there has been no meaningful convergence in GVA per capita with the rest of the UK;
- The fundamental problem is that employment growth has been in low value, low wage jobs, which will have little positive impact on raising regional productivity;

The NI economy needs to move up the value-chain in terms of the quality of employment created, and this will require a change in the focus of economic development policy.

1.2 Policies for Skill Development in Northern Ireland

Department for Employment and Learning (DEL): primary responsibility for the skills agenda in Northern Ireland lies with DEL. The overall aim of the Department is to promote learning and skills, to prepare people for work and to support the economy. The key objectives in pursuit of this aim are: to promote economic, social and personal development through high quality learning, research and skills training; and to help people into employment and promote good working practices.

The skills agenda has been the key priority for the Department in recent years. There is recognition that:

- The skills levels of the workforce will play a vital role in raising productivity and increasing competitiveness within the economy;
- Skills are important in promoting social inclusion, providing individuals with a route to stable employment, better wages, and long-term prosperity, as well as to personal development and fulfilment;
- NI needs to compete globally but, as with other developed economies, cannot compete on cost for manufacturing investment and must therefore aim for high value knowledge-based jobs, requiring a high level of skills across all areas of business and industry.

Employment and skills are devolved matters, but there is clear recognition that Northern Ireland policy must operate within the context of, and contribute to, the employment and skills policies of the UK as a whole and, indeed, integrate with the skills policies of the Republic of Ireland (RoI). The NI skills policy is enshrined in *Success through Skills*. The relevant contextual documents for England and the RoI, respectively, are *Prosperity for All* (the Leitch Review) and *Tomorrow's Skills*.

Success through Skills: the implementation of the NI skills strategy is grouped under four themes: (i) understanding the demand for skills; (ii) improving skills levels of the workforce; (iii) improving the quality and relevance of education and training; and (iv) tackling skills barriers to employment. The latest PSA targets relating to the strategy are:

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Prosperity for All includes four themes and 16 related recommendations. The four themes are: (i) making the UK a world leader in skills; (ii) a demand-led system; (iii) employer engagement in skills; and (iv) embedding a culture of learning. DEL has considered how Success through Skills contributes to these themes, as set out below.

Making the UK a World Leader in Skills

Increasing attainments – NI will make a contribution to the (Prosperity for All) targets through continuing to implement Success through Skills (with its associated targets). In line with the NI Economic Vision, Success through Skills will work towards realising its skills targets by 2015.

Delivering world-class skills – DEL is currently piloting an Adult Upskilling Programme, which may be rolled out further, subject to positive evaluation and resource availability.

A new partnership – there is agreement, in principle, with a balance of responsibility between Government, employers and individuals to invest in skills, but also recognition that the NI economy consists primarily of micro-business and SMEs with limited resources. Presently, Government covers the cost of a significant number of Level 2 and Level 3 qualifications, in line with the rest of the UK.

A Demand-Led System

Strengthening the employer voice – DEL has agreed to the appointment of the Chair of the new Commission for Employment and Skills and will also facilitate engagement between the new Commission and the NI Higher Education institutions regarding the development of a demand-led higher-level skills system in NI through the Sector Skills Agreement (SSA) process.

In addition, DEL has already introduced a requirement that employers and employer bodies (especially SSCs) must play a significant role in the development and delivery of Foundation Degrees. The implementation of the FE Means Business strategy also addresses this issue and seeks to make the FE sector more responsive to employer needs.

The Department has established an international Skills Expert Group (SEG) and is finalising the establishment of six sub-regional Workforce Development Forums (WDF) to help identify skills needs at regional and local levels across NI.

- The SEG has been operating since February 2006, with a remit to advise and make recommendations to DEL and other Departments and agencies on matters affecting Success through Skills;
- The six WDF will each be chaired by a prominent local employer with the secretariat function provided by new regional FE colleges. WDF are charged with identifying local skills shortages and implementation of appropriate local interventions.

Increasing employer engagement – NI has developed a network comprising the WDF, SEG and SSCs. There is also regular dialogue through the (NI) Economic Development Forum and bi-lateral meetings with employer representative bodies.

Economically valuable qualifications – there is agreement in principle that SSCs should continue to have a key role in developing National Occupational Standards and DEL is content to agree with proposals for an integral SSC role in the approval of qualifications below level 4.

Employer Engagement in Skills

Management and Leadership – DEL published a new comprehensive Management and Learning Strategy (Leading…to Success) in 2007, outlining the challenges, vision for the future and actions required to deliver it.

Training low-skilled employees - the relevance of the Skills Pledge to companies in NI is to be considered, in tandem with the business community. Currently one Cogent employer in Northern Ireland has signed up to the pledge.

Investment in higher skills levels – there is agreement from DEL that a step-change is needed in the numbers of people who have qualifications at Level 4 and the Department is supporting the expansion of Foundation Degrees in NI. In addition:

- It is the Department's policy to increase part-time participation on Foundation Degrees, especially by people in employment;
- DEL is also to seek increased employer engagement and investment in skills by developing a methodology to support co-funding of HE provision for those already in employment.

To meet the challenge for higher-level skills, ensure that employers secure the high-level technical upskilling / retraining they require, and that employees can acquire accredited qualifications, DEL, in co-operation with HE and employers, is also to:

- Support the development of new short-cycle work-based provision to meet identified high-level skills needs within sectors;
- Establish the accreditation and credit accumulation mechanisms needed to ensure continued progression.

Embedding a Culture of Learning

In terms of raising aspirations and awareness, DEL and DE have jointly published Preparing for Success, an impartial all-age Careers Education, Information, Advice and Guidance (CEIAG) strategy for NI. The overall aim is to develop effective career decision makers, leading to increased participation in education, training and employment.

The challenges facing DEL over the next three years include:

- The rising cost of student support and the need to enhance the skills levels of the present and future workforce through implementation of the Skills Strategy;
- Involvement in maintaining and enhancing the teaching and research capacity of the local Universities;
- Merger of the six FE Colleges, which will continue alongside the further roll-out of the FE Means Business strategy.

The Department of Education has recognised the importance of primary and post-primary education to the overall thrust of the NI skills agenda and began rolling out a revised curriculum from 2007, allowing a stronger emphasis on numeracy and literacy skills and access to applied courses from 14 years onwards. There is also a strong emphasis throughout education on preparation for work and life.

Cross-Border Co-operation: there is recognition that the Irish economy has been transformed in the last 10-15 years, with the co-ordination of policies across skills and employment matters having contributed substantially to this success. There is also recognition that much can be gained, particularly in FDI markets, from closer alignment of relevant policies on both sides of the border.

Over recent years, there has been a considerable increase in cross-border co-operation on the shared skills and employment agenda. DEL is in regular contact with RoI Government bodies to share information and best practice and, where appropriate, undertake joint work.[3]

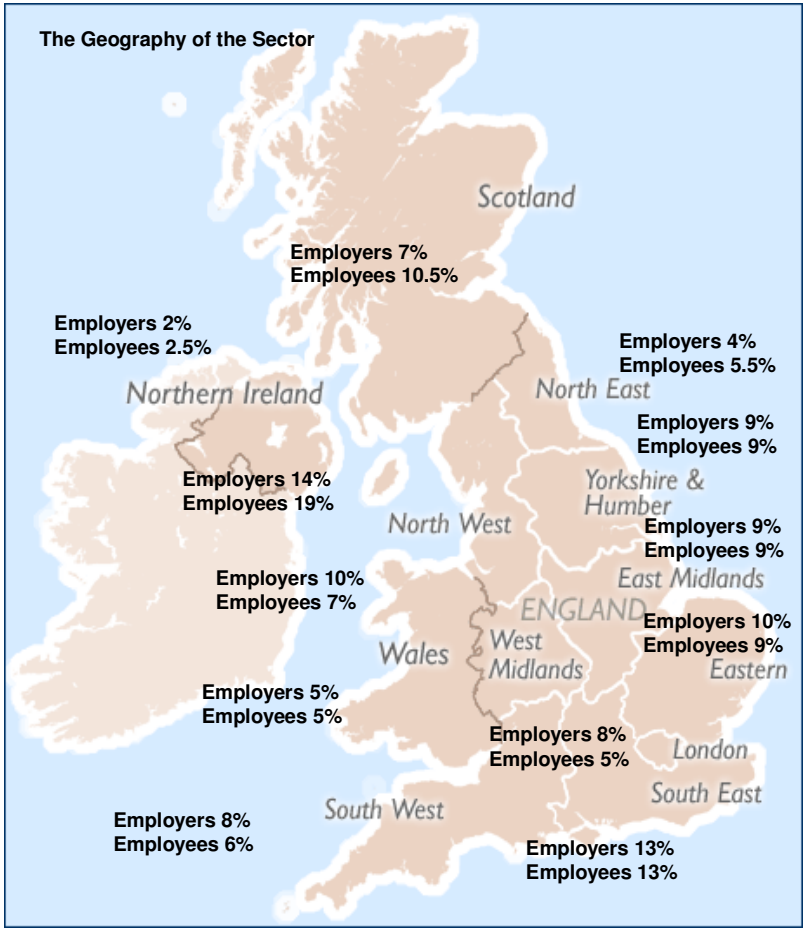
Some cross-border activity has already been undertaken to address issues of mutual concern and, in the North West, there is close local liaison at WDF level, to jointly undertake practical initiatives to assist the sub-regional economy.

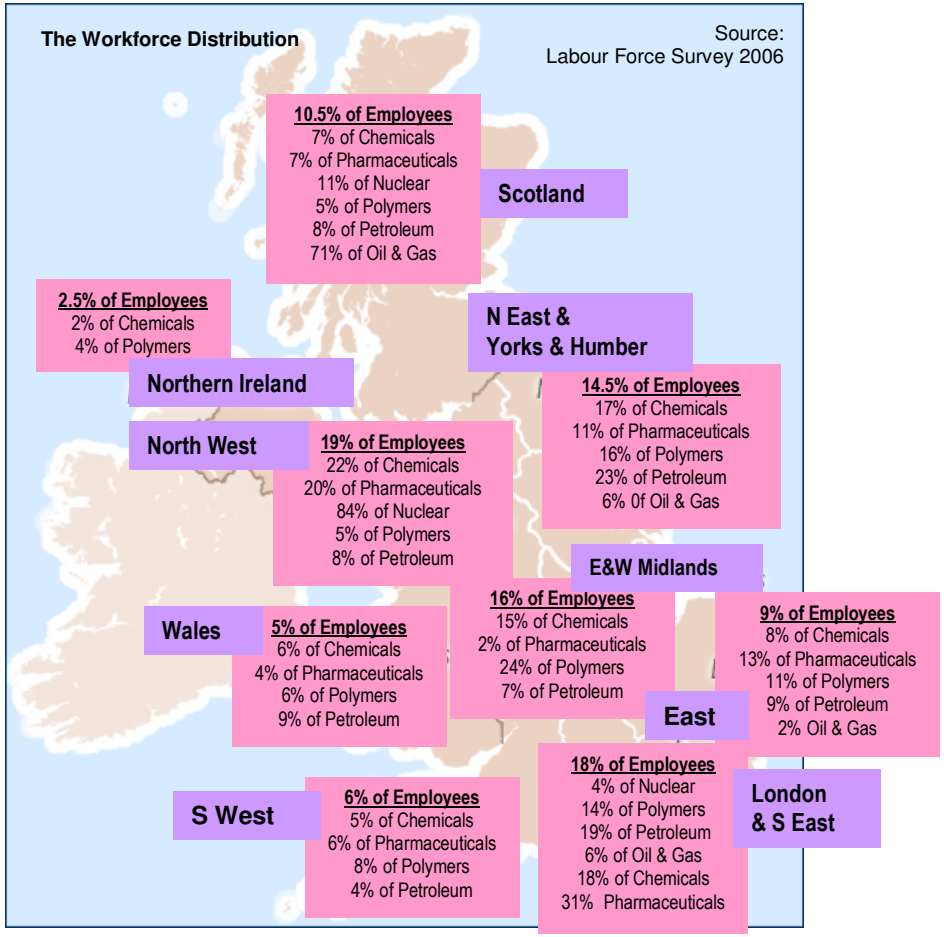
[3] For example, Foras Áiseanna Saothair (FÁS) – the Training and Employment Authority, and Forfás – Ireland's national policy and advisory board for enterprise, trade, science, technology and innovation.

2. The Cogent Sector in Northern Ireland

2.1 Size and shape of the Sector in UK

The maps below demonstrate the geographical spread of the Cogent sector across the UK. The data for Northern Ireland from the Labour Force Survey highlights the Chemicals and the Polymers industry. It is important to note that the data differs from the data in Table 1. in the following section[4].





[4] The differences are due to the national data sources used. The map above is based on Standard Industrial Classification (SIC) Only Chemical (24) and Polymer (25) can be extracted.

Employment levels in the UK sector have fluctuated in recent years, with steady decline in overall numbers. This masks significant differences within the individual industries, with some parts showing higher levels of improvement, and others in decline due to inability to compete with emerging economies such as those of China, India and in some cases Eastern Europe, as just another low skill, low value added player. It is known that the segments of the industries have already changed direction into higher added-value products, to serve markets where quality and specification are paramount.

The Annual Business Inquiry (ABI) shows a population of 498,000 directly employed in the Cogent sector in the UK, including the manufacture and process of chemicals, pharmaceuticals, plastics, rubber and petroleum, and direct employment related to oil and gas extraction. Together, they contribute in excess of £27bn to UK GDP. The highest concentration of employment is in manufacture of plastics products, at 181,000.

There are approximately 19,000[5] employers within the UK Cogent sector, with company size varying from less than ten up to more than 1000. Numbers employed in the sector, as reported in the ABI, do not reflect industry estimates of the true population. This is affected by the way in which statistics are gathered. The regional picture can be distorted by "head office" count rather than manufacturing location. Similarly, some polymers processing operations are masked, where they have become integrated within another overall manufacturing process. Industry estimates of the true population are as high as 276,000 Although employment levels in the UK sector have fluctuated in recent years, with a steady decline overall, there have been significant improvements in both turnover and productivity. In the six years from 1998 to 2005, turnover increased by 15% and GVA by 10%, the "star performer" of the chemical industry was pharmaceutical manufacture, where GVA rose by more than 30%. Influencing factors, such as the emerging economies of China, India and in some cases Eastern Europe have led to segments of the industries changing direction into higher added-value products, to serve markets where quality and specification are paramount, focussing on bulk manufacture only where there is still a viable market.

The distribution of employers in NI is heavily loaded to areas with quick access to Belfast and the city itself to make use of the transport & freight infrastructure. In the Polymer industry, 53% of the employers are located in the Co Armagh and Co Antrim areas with a further 23% in Co Down. This reflects not only the areas of population but the transport infrastructure to deliver their goods to the UK and European Markets. Petroleum products are spread over NI in line with the population statistics. However, many local distributors are increasingly joining a larger organisation through acquisition or alliance, especially in fuel distribution where they can benefit from an economy of scale. Chemical & Pharmaceutical industries are, again, located close to the main transportation links within and leaving NI with 87% of employers located in Co Down, Co Antrim & Co Armagh. However the two main pharmaceutical employers in the province are located in Newry and Portadown. The map opposites aids in illustrating the geography of Northern Ireland and the positions of the Cogent industries.

[5] ABI (2005), includes forecourt retailers

Table 1. Northern Ireland Employment in the Cogent Sector

Industry	Total Employment
Chemical	1,561
Pharmaceutical	1,541
Polymer	7,258
Petroleum*	4,602
TOTAL	14,962

Source: Census of Employment 2005
* Only includes Retail Sale of Automotive Fuel

When analysing the sector using LFS data the Cogent sector in Northern Ireland represents 2% of employers and 2.5% of employees within the Cogent footprint. The Chemical and Pharmaceutical industry in Northern Ireland accounts for 2% of the total employment in the in UK industry and the Northern Ireland Polymers industry accounts for 4% of the total industry employment. The LFS data however does not allow pharmaceutical and petroleum retail to be extracted.

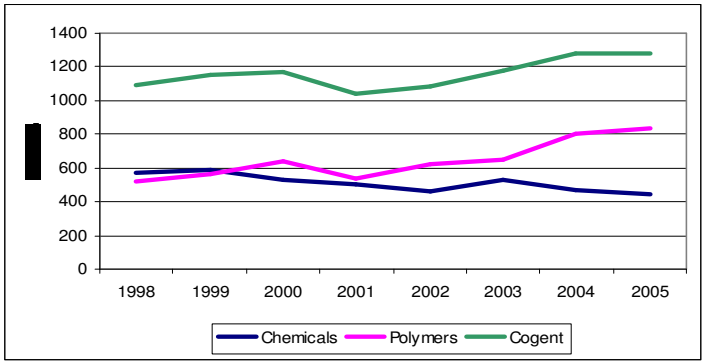
The Census of Employment 2005 puts the total sector employment at 14,962. This figure includes the retail sale of automotive fuel. Industry estimations can differ from the national data sources. When direct supply chain and sub-sectors are included figures for industry can almost double in some cases. It could be therefore estimated that approximately 3% of the Cogent sector employment is based in Northern Ireland. The Census of employment reveals that 49% of employment in the Cogent sector in NI is within the Polymers industry and the 31% of the sector employment is based in 'Retail Sale of Automotive fuel'.[6] Chemical and Pharmaceutical industries each account for 10% of the sector workforce.

The general perception is that NI has a higher percentage of Micro and SME organisations. While this is true, the survey, and in particular the face to face interviews, indicated a trend for small companies in the petrol distribution and retail sector to come together in alliances or to merge with larger organisations to increase buying power. This not only helps them in respect of their profitability, but also helps coordinate skills development as this can be organised by the "hub organisation".

Economic Profile of the Cogent Sector in Northern Ireland

This section examines the economic profile of the Cogent sector within Northern Ireland. Data has been used for the overall Chemical industry, which includes Pharmaceutical and the Polymer industry. Data for the Petroleum industry cannot be isolated for the analysis of the headline economic indicators. The figures below show the trends for turnover, GVA[7] and employment levels over the period from 1998 to 2005.

Figure 3. Turnover in the Cogent sector in Northern Ireland from 1998-2005

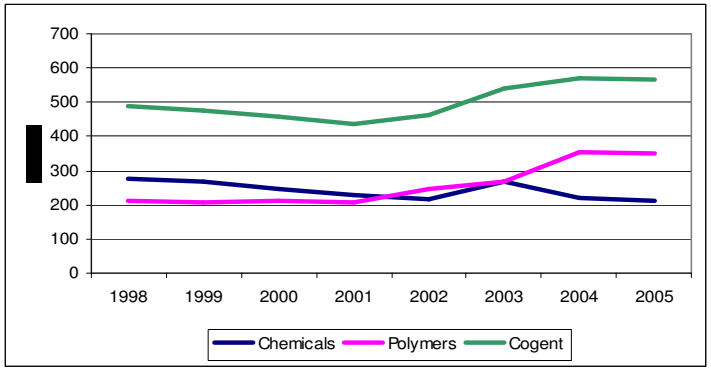


Source: Annual Business Inquiry 2005

The turnover within the sector has risen since 1998 although not significantly. The Polymer industry has increased its turnover whilst the Chemicals and Pharmaceuticals industry turnover has actually decreased over the time period.

[6] SIC Code 50.50
[7] GVA is the difference between the value of goods and services produced and the cost of raw materials and other inputs which are used up in production

Figure 4. GVA in the Cogent sector in Northern Ireland from 1998-2005

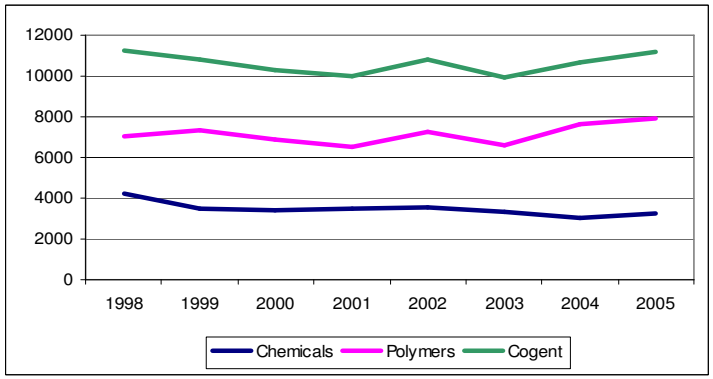


Source: Annual Business Inquiry 2005

Northern Ireland's approximate Gross Value Added (GVA) in 2005 was recorded by the Annual Business Inquiry to stand at £16 billion. Cogent industries contributed approximately £0.6 billion to the Northern Ireland GVA.

A similar pattern is identified with GVA. The Polymer industry appears to be performing better than the Chemicals and Pharmaceuticals industry. The data shows that whist the Chemical and Pharmaceutical industry has remained stable the Polymers industry GVA started to rise in 2001 and has continued to so in Northern Ireland.

Figure 5. Employment in the Cogent sector in Northern Ireland from 1998-2005



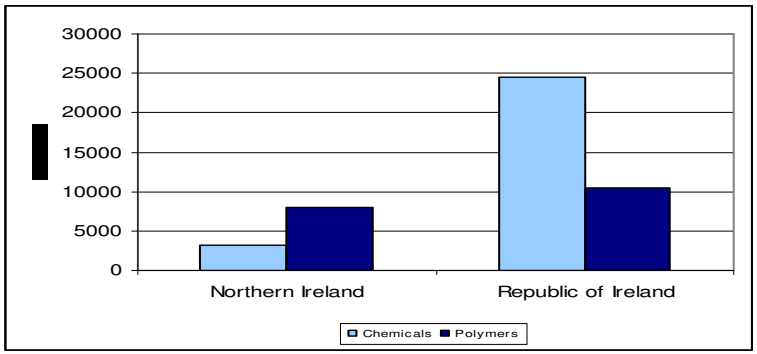
Source: Annual Business Inquiry 2005

Overall employment within the Cogent sector in Northern Ireland has remained relatively static since 1998. However it is again notable that the Polymer industry employment has increased whilst the Chemical and Pharmaceutical employment has decreased.

Comparisons with the Island of Ireland

Within the context of this report it is important to examine the differing performances of the Northern Ireland and the Republic of Ireland economies. The tables below outline the differing economic performance of the Chemical and Pharmaceutical industry and the Polymer industry. These two industries are highlighted again due to data availability. The figures below highlight key differences between productivity in the North and the South of Ireland.

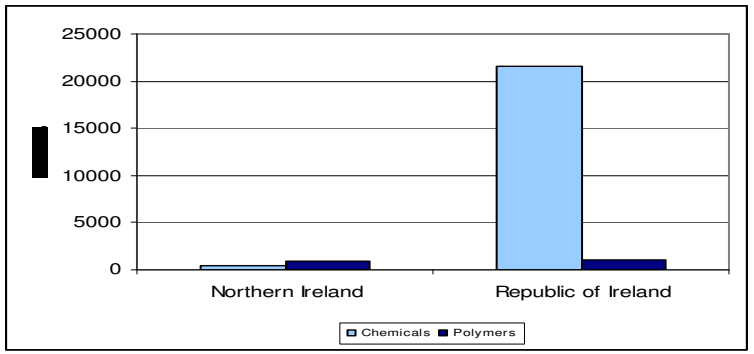
Figure 6. Employment in the Chemical and Polymers industries on the Island of Ireland



Source: NI ABI 2005, Central Statistics Office Census of Industrial Production 2006

The level of employment within Northern Ireland and the Republic of Ireland shows vastly greater numbers in the Chemical and Pharmaceutical industry in the south. The Polymer industry employs similar numbers which shows the greater concentration of Polymer industry employment in the north.

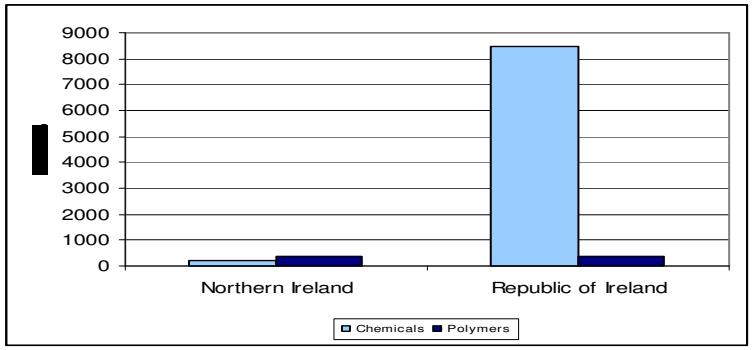
Figure 7. Turnover in the Chemical and Polymer industries on the Island of Ireland



Source: NI ABI 2005, Central Statistics Office Census of Industrial Production 2006
Euro to GBP exchange rate 1.41 – 01/01/05 conversion rate

The above diagram illustrate that the turnover of both the Chemical and Pharmaceutical industry and the Polymer industry in Northern Ireland is greatly overshadowed by the turnover in the Republic of Ireland Chemicals and Pharmaceutical industry (£21.6billion). Although the turnover of the Polymer industry is similar in both the North and South.

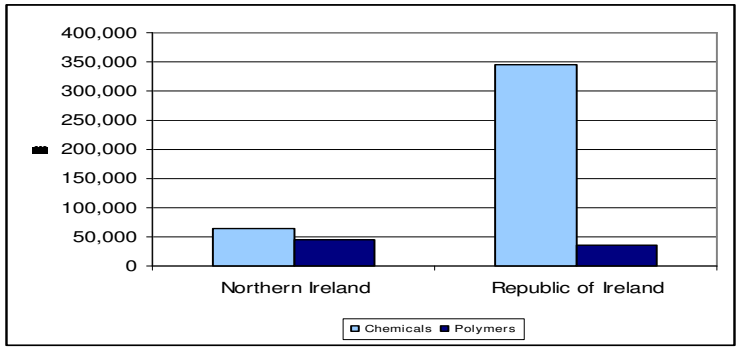
Figure 8. Gross Value Added in the Chemical and Polymer industries on the Island of Ireland



Source: NI ABI 2005 and Central Statistics Office Census of Industrial Production 2006
Euro to GBP exchange rate 1.41 – 01/01/05 conversion rate

The table above illustrates that as a consequence of the huge turnover of the Republic of Ireland Chemicals and Pharmaceuticals industry GVA is again significantly higher than the other areas of industry.

Figure 9. GVA per Employee in the Chemical and Polymer industries on the Island of Ireland



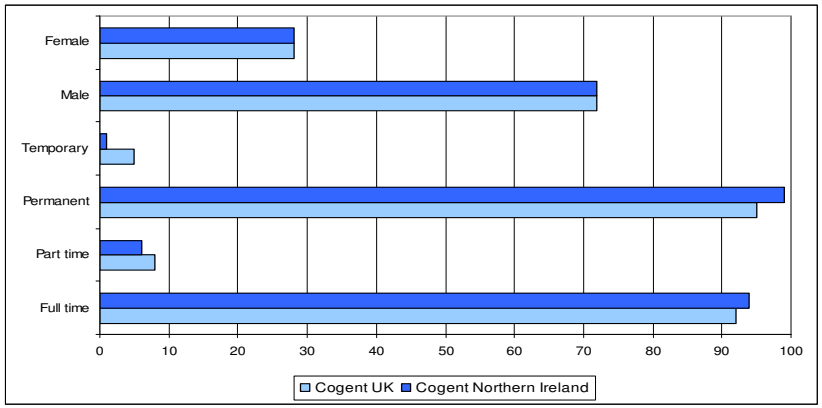
Source: NI ABI 2005 and Central Statistics Office Census of Industrial Production 2006
Euro to GBP exchange rate 1.41 – 01/01/05 conversion rate

Important to note the diagram above highlights the performance of the Northern Ireland Polymers industry. The GVA per employee is higher than the industry in the South.

The figures above show very clearly that whilst the Chemical and Pharmaceutical industry in Northern Ireland may not be performing as well as the South, the Northern Ireland Polymers industry is performing well and is very productive. The increased GVA per employee is a strong indicator that the industry is doing well.

2.1.2 Current occupation, skills and qualifications profile of the sector

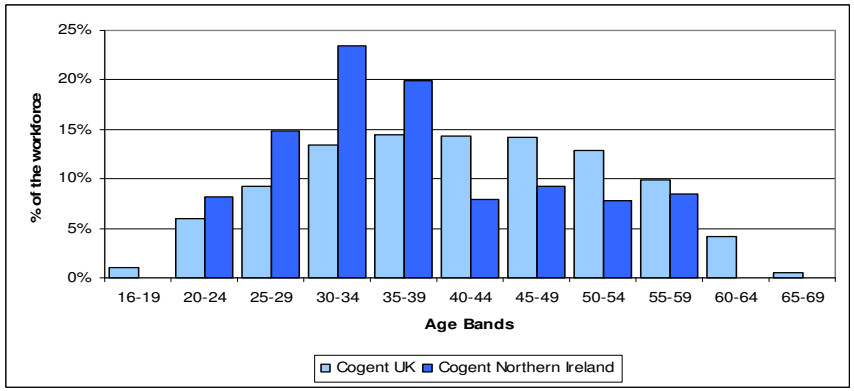
Figure 10. Workforce distribution of the Cogent Workforce in Northern Ireland



Source: Labour Force Survey Quarter 3 2006 – Quarter 2 2007

The current Cogent workforce in Northern Ireland shows a very similar picture to the UK Cogent workforce. The split between male and female workers is about the same. The differences occur between the localities with regards to permanent versus temporary workers and full and part time workers. Northern Ireland shows a higher proportion of full time, permanent workers in the Cogent sector.

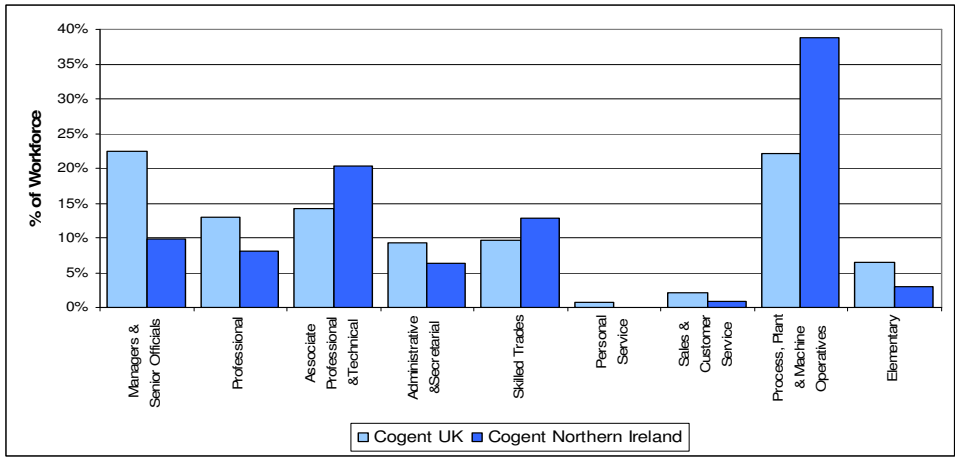
Figure 11. Age Distribution of the Cogent Workforce



Source: Labour Force Survey Quarter 3 2006 – Quarter 2 2007

The age distribution of the Cogent workforce in Northern Ireland is interesting. The distribution in the figure shows a clear skew towards a younger workforce, 74% of the workforce is under 45. In the Northern Ireland workforce the 30-34 year old age band is the most notable for being different to the overall age distribution. Also of importance is the is that the two older age bands, 60-64 and 65-69 are not represented in the Northern Ireland Cogent workforce.

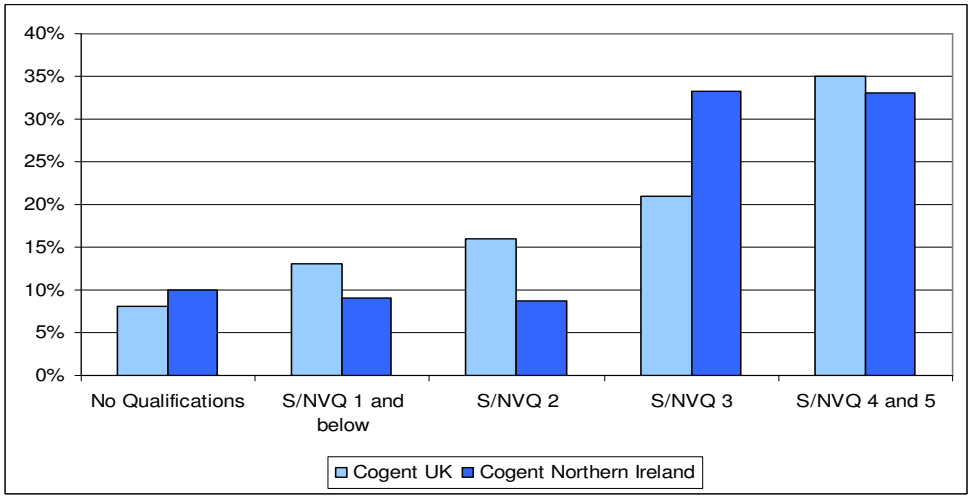
Figure 12. Occupational Distribution in the Cogent Workforce



Source: Labour Force Survey Quarter 3 2006 – Quarter 2 2007

The profile of the Cogent workforce in Northern Ireland shows a larger proportion of the workforce in Process Operative roles (39%). There is also a significant proportion of the workforce in Associate professional roles. These roles are the core technical workforce within the Cogent industries in Northern Ireland.

Figure 13. Qualification Profile of the Cogent Workforce



Source: Labour Force Survey Quarter 3 2006 – Quarter 2 2007

The Cogent workforce in Northern Ireland shows a higher proportion of the workforce qualified to level 3 than the overall UK picture. In all other levels the Northern Ireland qualifications pattern is lower than the UK pattern. Later in the report there is an analysis of the skills gap between occupation and qualifications and the implications for the industries in Northern Ireland.

2.2 The Employer Response

Throughout the SSA process Cogent has engaged with some 122 employers covering approximately 7,500 employees in the Chemical, Pharmaceutical, Petroleum and Polymers industries, representing approximately 50% of the workforce. Through this interaction the recommendations and identification of priority skills issues and potential interventions has been identified.

This section focuses on the in-depth interviews and telephone survey responses conducted early 2008. Research conducted by Cogent in Northern Ireland covered 1,584 employees. 54% of these employers were Petroleum industry, 29% Polymer employers and 17% Chemical and Pharmaceutical employers. 80% of the respondents were based only at one location.

Table 2. Occupational Distribution of Employees in the Cogent NI Employers Survey

Occupation	%
Managers	18
Professionals	13
Associate Professionals	12
Skilled Trades	18
Process Operators	26
Elementary	13

Key Finding from the Cogent Employer Survey 2008

- 75% of the employers questioned in the survey were not Investors in People.

Table 3. Single site establishments in Northern Ireland

%	ALL	Pharmaceutical and Chemical	Petroleum	Polymer
Yes	80	73	77	89
No	20	27	23	11

- The majority of employers in the survey (80%) were single site businesses. However, through the in-depth interview process it became apparent that although registered as single site independents, many companies are affiliating themselves with larger companies for some aspects of the business. Such as Health and Safety training.

- 83% of those employers questioned did not employ migrant workers. Of the 17% that did the majority of workers came from Poland (45%) and Lithuania (27%).

Table 4. Market for Industry Service/Product

%	ALL	Pharmaceutical and Chemical	Petroleum	Polymer
Local	54	9	86	21
All Ireland	20	64	3	26
Regional - Northern Ireland	12	0	9	26
National - UK	8	0	3	21
International	6	27	0	5

- The employers included in the survey were predominantly (54%) locally market based, with a further 12% operating within Northern Ireland. 20% of the employers were operating in all Ireland markets and only 8% of employers supplied and operated in UK markets.

- 77% of the employers in the survey did not employ contract or temporary staff. This indicates that employers in Northern Ireland favour a core workforce rather than a relying on casual staff. However the chemical and pharmaceutical industry was the largest recruiter of contract staff, with almost half the employers (45%) currently employing contract workforce.

- 95% of the employers had no concerns about the availability of contract workers and 94% of employers also had no concern about the skills of the contractor workforce.

Table 5.Employment of contract/temporary staff

%	ALL	Pharmaceutical and Chemical	Petroleum	Polymer
Yes	23	45	17	21
No	77	55	83	79

- 28% of the employers had employed staff under 24 to their first full time job on leaving school, college and university in the last 12 months. The majority of this recruitment had taken place in the Polymers industry, 42% of those who had recruited. Recruitment concentrated on those aged 17-18 from school and college (56%), this was again dominated by Polymer industry recruitment with 75% of the positions being in this industry. Graduate recruitment was lower at 39% of those employers who had recruited younger members of staff in the last 12 months.

Table 6. Recruitment of anyone aged under 24 to first full time job on leaving school, college or university in the last 12 months

%	ALL	Pharmaceutical and Chemical	Petroleum	Polymer
Yes	28	9	26	42
No	71	82	74	58

- The employers reported that the 16 year olds employed direct from school were in the main well prepared (60%). However, 40% of employers reported that the 16 year olds recruits were poorly prepared for work, citing lack of common sense and lack of basic skills as the main reasons.

- Employers who had recruited 17-18 year olds were positive about the readiness for employment of this age group. All employers recruiting this age group said that recruits were very well to well prepared. This was echoed with the employers who recruited graduates where no specific skill issues were raised.

- **Vacancy rates** were low, only 15 vacancies were listed by respondents. The most vacancies were in Process Operative roles, followed by Professional and Skilled Trade occupations.

- When employers asked about hard-to-fill vacancies they indicated that half the positions were hard to fill. Difficulties were cited as low numbers of applicants and lack of experience. These reasons were stated for Professional and Skilled trade occupations, and in particular a lack of generic IT skills was the skills need highlighted by employers. When employers were asked about the reason behind recruitment difficulties within Process Operative roles, no real reasons could be assigned. There was a clear indication that within Professional and Skills Trade occupations **skills shortages** were increasingly becoming an issue.

- These **hard-to-fill vacancies** due, in the main, to **skills shortages** were said to be having a major impact on the business and employers stated that they were unable to develop new products and services and were having to delay plans due to the difficulty in recruiting into the positions mentioned above. Employers also commented that difficulty in recruiting also lead to increased pressures on existing staff. Employers are proactively pursuing new recruitment practices to over the issue of hard-to-fill vacancies.

- 79% of employers considered staff proficient at their jobs. Overall employers did not identify clear skills gaps in any one particular area. However there were specific areas highlighted and these are explored below.

Occupation	Skills Gap
Managers and Senior Officials	New recruits and a failure to train and develop staff Technical skills Inability to manage outside their specific expertise so become less transferable within organisations.
Professional occupations	Inability of the workforce to keep up with change – involving both industry changes and technological changes IT mentioned as key skills requirement Literacy and numeracy skills
Associate Professional and Technical Occupations	Problem solving Literacy skills
Skilled Trades	Failure to train and develop staff Difficulty in understanding how to operate equipment and machinery
Process Operatives	Lack of experience and lack of motivation of staff Team working skills

- Although employers commented on some staff not being fully proficient, this did not have a major impact on the business. The main impact on the business was increased workload for other staff and also on a lower impact was increased operating costs.

- The majority of employers, 50%, were doing nothing to tackle the lack of proficiency with staff. However, 42% of employers mentioned increasing the training given to their existing workforce.

- Employers in the survey were not consistently business planning, with 42% of respondents saying that a business plan setting objectives for the next 12 months did not exist. In addition 46% of employers did not have any formal training plan. Further evidence of training not being a priority is that 74% of Northern Ireland employers questioned did not have a training budget.

- 57% of companies were not evaluating staff skills gaps and 57% of companies did not conduct annual performance reviews.

- 51% of companies had not funded or arranged off-the-job training in the last 12 months. The majority of training was provided for mangers 67%. The average time spent on off-the-job training was three to four days. Chemical and Pharmaceutical employers and Polymer employers were more likely to spread training provision through out occupations, whereas the petroleum was more likely to concentrate on management roles. This however, may be due to the size of organisation as Petroleum employers tend to be the smaller employers and will often have working and fully operational management staff.

- 62% of employers had not conducted informal or on-the-job training. Where on-the-job training was conducted the focus was on Management and Skilled Trade occupations. One third of on-the-job training was devoted to Health and Safety training.

- Employers were asked about qualifications they had funded or arranged for staff over the last 12 months, 65% of employers had not funded or arranged for training relating to qualifications. 80% of employers also stated that they had no staff working towards NVQ qualifications.

2.3 Drivers of Change in the Sector

Key Drivers of Business Competitiveness

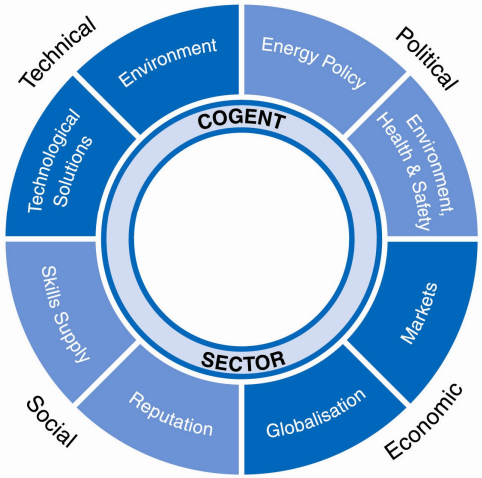
This section provides an exploration of the key drivers affecting the Cogent industries in Northern Ireland. Further analysis can also be found in the Cogent Skills Needs Assessment available on www.cogent-ssc.com.

In the examination of the drivers of business competitiveness we look in this section at the external factors which drive change within the industries and the effect that these have. We also look at the internal factors that affect sectoral productivity and the associated impact on skills demand. The impetus of the Sector Skills Agreement lies in identifying how skills and workforce development can be used as a tool to impact upon these drivers to improve business, industry and sector productivity. In the figure to the left the outer circle identifies external factors that drive change within the Cogent sector which sits within these factors (in the white central band).

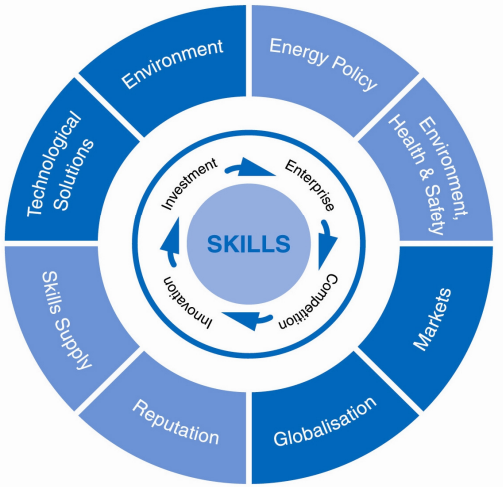
Drivers of change

The sector's primary aim is to ensure sustainability of the chemical and pharmaceutical, petroleum and polymer industries. The sector depends on a range of skills relating to science, technology and engineering. Investment in ensuring the right people with the right skills are in place is critical to productivity, competency and innovation. An analysis of the political, economic, social and technical factors affecting the industry identifies eight key factors driving change in the Cogent sector as illustrated in the diagram to the right.

External Drivers of the Cogent Sector



Competitiveness of the Cogent Sector



2.3.1 Political

The UK is a relatively stable political and economic environment however in turn the UK and Europe have strict regulatory and employment frameworks which increase operating costs in comparison to other countries. Of the legislation affecting the industries, approximately 80% of the relevant UK legislation is EU-wide. There are several strands of energy related policy and activities that impact on the Cogent industries.

The 2003 Energy White Paper

- sets out targets for reducing carbon emissions (exceeding those requirements signed up to through the Kyoto agreement),
- kept open the potential for new build nuclear power stations,

The impacts of the Energy White Paper upon the Cogent industries:

- Energy focus on renewables. Government focus was firmly placed on development of renewable energies with significant public investment to exclusion of hydrocarbon and nuclear energies;
- Long term energy supply dependant upon imports. The UK is forecast to remain self sufficient for oil until 2009 but is already a net importer of gas. To maintain energy supply the UK will be increasingly dependent upon other countries and developing infrastructure of oil and gas;

Climate Change Levy (CCL)

Signposted as having a significant impact upon the sector the Levy came into force in April 2001, representing a new energy tax within the non domestic/business sector. The cost was to be matched by a cut in employers National Insurance contributions.

The impact upon the Cogent industries:

- Only one-fifth of costs recouped. Companies report they will only recoup one fifth of the taxation.
- Impact on competitiveness. The impact of the Levy weakens the competitiveness of domestic operations and attractiveness of the entire UK economy as a location in which to manufacture
- Increased fuel costs to industry. Estimates indicate, on average, in Q4 2004, the CCL increased the average prices of fuels to industry by 11.5% for coal, 5.3% for electricity and 4.7% for gas[8].

Powering Future Vehicles Strategy

Aims to ensure the UK takes a lead role in the global shift to low carbon transport promoting development, introduction and take up of new vehicle technologies and fuels. The first hydrogen fuel retail filling station has opened in London. Commercially viable production of hydrogen fuelled cars is anticipated in the next two years.

- Short term impact on investment. The strategy has a major impact on the petroleum industry in the short term although investment in new technology and capital equipment may be stalled as it may have a shortened lifespan.
- Long term shift of primary fuel source. The strategy presents a new vision of the future direction of transport fuels. By 2050 the predominant transport fuel may be hydrogen derived from renewable or low carbon energy sources.

[8] DTI Energy Trends (March 2005)

- Collaboration with other industries. Petroleum companies are working alongside the automotive and electronics industries in the development of fuel cell technology moving towards commercial viability as an alternative energy source

Environment, Health & Safety Regulation and Policies

Over recent years the changes in Health, Safety & Environment related directives from Europe and regulations and legislation in the UK has placed significant requirement for additional processes and monitoring upon employers. This is particularly an issue for smaller employers large enough to be subject to these provisions but need to make significant investment in time and resources to meeting them. While industry recognise the requirement and welcome better regulation, there is concern about the: volume; administrative burden and; potentially conflicting or repetitious aims of Health, Safety & Environment regulation coming from the EU and various UK government departments. This has serious implications for the competitiveness of the UK sector in terms of costs, investment and innovation.

Chemicals Policy

The 2001 white paper 'Strategy for a Future Chemicals Policy' introduced a new system of chemicals control for both new and existing substances under the acronym of "REACH" – Registration, Evaluation and Authorisation of Chemicals. In 2003 the commission adopted it and passed it to the European Parliament for debate and agreement.

Impacting upon the UK Chemicals industry there is concern among employers:

- Current proposals overly bureaucratic impacting on competitiveness. While supporting the proposal's goals to restore public confidence in safe use of chemicals, there are concerns that in its current form REACH would be bureaucratic impacting on international competitiveness and may still not meet policy goals.
- Majority of costs borne by minority of companies. It is anticipated that 20% of the total chemical industry will carry over 80% of the cost of the testing and administration[9].
- Speciality and small niche market companies hardest hit. SMEs and the speciality, fine and performance chemicals sub-sector will be the most affected. 20-40% of substances produced in quantities in the 1-100 tonnes range are commercially jeopardized[3].
- Impact upon competitiveness and innovation. "Introducing a new chemical substance in the EU presently takes three times longer and costs ten times more than in the US, resulting in a relatively low number of notifications of new substances"[10]. Implications of a bureaucratic rather than better framework for regulation are clear.

Emissions Trading Schemes

A UK greenhouse gas emission trading scheme was set up in 2002. In 2005, the EU established their Emissions Trading Scheme. Until 2007 this scheme covers only CO_2 emissions before extending further.

- Caps are set on the level of emissions those covered by the scheme can make e.g. refineries and manufacturing.
- This sets the overall level of emissions which are then reduced over time to meet agreed targets such as the Kyoto agreement.
- Establishments assess the level of emissions they will make and can either trade excess allowance or purchase additional emissions allowance as appropriate. The net result is that overall emissions are reduced where it is most cost effective for these to be met.

Impact on the Cogent industries:

- Subject to the scheme. Refineries, oil & gas extraction and large chemical manufacturing companies are subject to this scheme.

[9] Chemicals Industry Association, www.cia.org.uk
[10] European Chemical Industry Council, Horizon 2015: Perspectives for the European Chemical Industry (2004)

- Monitoring and verification is costly. It is agreed the scheme is valuable however compliance costs for monitoring and verifying emissions are considerable and not suitable for small companies.
- Overlapping schemes. The overlapping UK and EU schemes have potential to add to the administrative burden of compliance.

2.3.2 Economic

The Cogent industries are of both economic and strategic importance to Northern Ireland, contributing £0.6bn to its Gross Value Added. The economic conditions have affected the industries in different ways. The following sections look at the impacts of globalisation and markets that the industries operate in.

Globalisation

Globalisation has an effect on each of the Cogent industries. Globalisation has lead to increasingly intensified competition across all aspects of manufacturing.

Chemicals and pharmaceuticals are amongst the most globalised manufacturing industries. This ever increasingly complex business environment has led to a worldwide distribution of a multicultural workforce and there is continued consolidation among companies on a global level.

The UK *Nuclear* industry has a significant international element providing services in reprocessing of nuclear fuel provided for Europe and East Asia. As worldwide first generation nuclear facilities move into decommissioning the skills and expertise developed in the UK dealing with domestic clean-up projects will also be in demand internationally.

The competition entering the *Polymers* industry means companies are increasingly choosing to base its operations outside the UK, in an attempt to take advantage of low labour and material costs. In this respect the sector has similar concerns to the chemicals industry.

Cogent Sector Markets

Market sectors served by the Cogent industries vary. Products from the Petroleum Refining, Chemical and Pharmaceutical industries are sold in global markets, the nuclear industry also provides services on the international market. Conversely, Polymers, Petrol Retail Forecourts and Heating Oil Distributors are more likely to be selling their products in the domestic market. In the most the markets are other industry sectors with the exception of petroleum forecourts where the industry has a direct interface with the general public.

Refined petroleum products are sold by forecourts; heating suppliers; the heating markets and; as raw material inputs for the chemical and polymer industries. Product demand trends have changed - the transport fuels market is growing and fuel oils declining.

Pressure is being placed on the polymer industry in Northern Ireland from trading partners such as China, India and Eastern Europe with the advantage of low labour costs. This is also attracting Original Equipment Manufacturers to relocate, having a direct impact on their UK first and second tier supplier base, of which polymers feature extensively. The markets supplied by the polymer industry such as aerospace, automotive and medical industries and the expanding wind energy industry currently remain within the UK.

2.3.3 Social

The social drivers of the Cogent sector are most closely related to reputation and public perception of the industries. This impacts upon the products and services offered by the sector, how they are produced and also upon the attractiveness of the industries as a potential employer.

Reputation & Public Perception

The industries are working to improve their public reputation through awareness raising to improve understanding of what they do and the vital role their products play in society and modern living.

Many chemical based products are essential to how modern society operates. However, public perception continues to deteriorate. The primary reason is thought to be the perceived impact of chemical products on health and environment.

Perceptions of the petroleum industry are largely based upon retail prices on the forecourts. The price of petrol and diesel pre-tax in the UK is among the lowest in Europe the forecourt price is among the highest and profit margin for storage and distribution and forecourt retailers is minimal. Consumers are also becoming increasingly environmentally aware.[11]

Certain markets pervaded by polymers (domestic and electrical goods), are influenced by fashion and design, such as coloured vacuum cleaners and kitchen appliances. Equally markets for mobile phones, MP3 players, iPods, flat screen LCD & Plasma TVs rely on volume sales driven not only by their technological capability but increasingly by aesthetic qualities: colour, texture, robust but light weight features.

Attracting Skilled Workforce

Productivity and sustainability of the Cogent industries in Northern Ireland is dependant upon availability of suitably skilled, trained and qualified workforce. The workforce in Northern Ireland continues to suffer form the low skill equilibrium. The need to upskill at Level 2 and 3 is a high priority. The sector needs highly skilled people able to contribute, innovate and take organisations beyond their current ambitions, to support corporate goals and ambitions in an increasingly aggressive global market place. Infrastructure supporting skill supply will be investigated in depth in the Assessment of Current provision. Other issues include:

The impacts of attractiveness issues on sector skills supply include:

- Competing for skilled and qualified workforce. Cogent industries along with other science, engineering & technical based industries will be competing to attract a shrinking potential resource.
- Investment in upskilling and retention of existing workforce. To retain the current workforce the industries must work to ensure the skills held maintain their currency and are also the skills required to meet changing industry needs.
- Availability of engineering construction resources to support the industries. For the reasons outlined above, the industries may find it difficult to resource construction of new facilities and plant for the future. Skills in engineering construction and related sectors are of high importance to the Cogent sector.
- Increasingly looking to the wider European Union and Eastern Block countries. As a short-to-medium term solution to skill shortages employers are broadening the scope of recruitment activities. Whilst this brings skilled workforce into the UK to meet industry requirements it does not address the other supply chain issues relating to the UK education and training system.

[11] UKPIA Website www.ukpia.org.uk

Environment

The **chemical and pharmaceutical** industry has made a commitment to performance improvement through the International Responsible Care programme. A membership prerequisite of the Chemical Industries Association is a self assessment against the responsible care criteria enabling consistent measurements. Environment related measures and targets are:

- Improve energy efficiency & reduce emissions. The industry has a climate change agreement to reduce energy consumption by 35% between 1990 and 2010 thereby reducing CO_2 emissions. Targets and measures are also in place for volatile organic compound emissions which contribute to smog.
- Reduction in waste disposal. The industry is working to increase the level of recycling and reduce use of land fill disposal. This includes process R&D to reduce waste and reprocessing of waste.
- Reduction in water usage. Target to reduce use by 20% by 2010.

The **petroleum** industry continually seeks to enhance environmental management processes. This is essential if the industry is to improve its public perception. In addition to reducing emissions from the refining process, as well as energy requirements, the industry has been driven by the need to improve the quality of the products they produce such as fuels to reduce their impact upon the environment. Despite increased demand for road travel, improvements in vehicle technology and fuel quality have ensured sulphur benzene and particulates have reduced and CO_2 emissions have remained static.

The **polymer** industry continues to be a world leader in material specification and design[12] and is also developing technology to limit any adverse impact upon the environment. Discarded plastics and packaging add to the growing problem of municipal solid waste. Currently, R&D is ongoing to develop recyclable polymers. Both biodegradable polymers and 'solid state shear pulverisation' (recycling of unsorted pre or post consumer waste) are examples of technological developments thus far however the UK industry is behind Europe on developments in this area.

To contribute to legislative and operational cost reductions on fuel consumption and CO_2 emissions replacement of conventional materials with plastics and composites in the automotive and transport industries has been necessary to reduce the weight of vehicles. Innovation, design and technology advancement in these areas provides continued growth opportunities for the polymer industry.

The political, economic, social and technological factors driving change have been examined in this section looking at the impacts upon each of the industries in the Cogent sector. The following section takes these drivers forward into the examination of the competitive position of the sector in a national and international context and the strategies adopted to improve their prospects.

2.3.4 Technological

Within **Chemicals and Pharmaceuticals**, the report 'Trends and Research Priorities for the Chemical Industry – Looking to the Future' (which makes explicit reference to both chemical and pharmaceutical industries), provides market information and intelligence on research and development needs and issues. The primary science and technology research priorities can be placed into the broad headings:

Pacing Technologies e.g. Bioscience, Catalysis, Combinatorial Technologies, Nanotechnology and Process Intensification.

Key Technologies e.g. Computational Technology, Environmental Technology, New Materials Research, Measurement Sciences, Formulation and Separation Sciences.

Platform/Base Technologies e.g. each division of chemistry and chemical engineering and their interface with additional disciplines (for example, materials and biotechnology). This is an area of significant growth. The report highlights high–growth areas (e.g. pharmaceuticals and high value added chemicals) should be given future support. In addition, there will be increasing importance placed on speciality or 'effect' chemicals.

[12] The Official Yearbook of the UK and Northern Ireland, 2003. Crown Copyright

It is important to remember that 6 out of the world's top 25 medicines were developed in British laboratories, and that on average, it takes around 10 to 12 years and £350 million to develop a new medicine.

In the **Polymer industry** process technology is becoming increasingly important. Automation is a key driver for lowering production costs and improving efficiencies. Computer-aided control of manufacturing is again a focus, particularly in terms of the overlap and interchange between/ within company systems and the internet, and the need to have both linked, to deal with customers. It is also now common practice on the newest machines to run machines remotely and to make operating and process adjustments over the internet e-business and commerce Impacting on both buying and selling, and also impacting on training, design, collaboration, networking, creation of virtual companies, use of expensive software on a pay-as-you-go basis, recruitment etc. Internet and worldwide web - Particularly important to gain market intelligence in addition to the applications listed above.

2.4 Implications for Skills and Employment

Chemicals and Pharmaceuticals
Given the factors of global competition, advancing technology, changing working practices etc; workplace activities, skills and working practices are changing at a pace. Managers and leaders require the skills to be able to cope with change and lead their organisations through it. This ongoing process of change also drives the requirement for the overall workforce to increase their skill levels. Leaders and managers across the industry have a role to play in encouraging and supporting workforce development associated with change and motivating their teams.

Future scenarios point to a continuation of the current trend away from bulk chemicals manufacture, towards higher added value, or speciality products – that is, those sold on quality and effect. This will drive a need to invest in research and development, in order to maintain a competitive edge. The UK is already considered to lag behind the rest of the world in this respect, although when compared to other industries, it compares favourably (7th versus a global position of 8th, but with percentage spend in 2004 of 3.5%, compared to 5.1% in the global picture). For pharmaceuticals, the UK has a dominant position, with R&D expenditure far exceeding the global picture – this is reflected in its position at number 1 in the UK.

Whilst the employment base is not expected to rise, there remains a significant demand for workforce to replace leavers (either retirements, transfers from UK sector to international operations, transfer to other UK domestic operations in different industries etc.) at all occupational levels. There will also have to be a step change in the skills levels of employees, to reflect the advances in technology and product lines.

Greater emphasis for employability is being placed upon “softer skills”. In the face of stringent Environment, Health & Safety requirements, the drive to reduce costs through more efficient and less wasteful operations and the push for higher quality outputs, employers are recognising that behavioural aspects of the job role are extremely important. The ability to work effectively as a member of a team, using initiative in problem solving skills and fault diagnosis are highly valued by employers. Among Chemicals employers skill gaps were most pressing in smaller-medium companies.

Skill gaps are a greater issue for employers in the sector than skill shortages however, shortages of suitably skilled applicants serves to exacerbate the gaps where non-proficient personnel are recruited. Induction training and setting clear training and development plans is becoming increasingly important for the sector.

Petroleum Distribution
In **distribution**, other than the actual driving skills (solely covered by Skills for Logistics) the main need is provision of training in handing of hazardous materials. The fragmentation of the industry, with the majority of drivers employed by contract companies, makes such training relatively difficult to implement and even more difficult to track. Operators have to meet the standards laid down by individual oil companies. This is easier for the larger operators but there are concerns over the

smaller contractor operating in the 'spot hire' market. Many logistics companies transport petroleum as a part of their business, with activity in moving food products e.g. milk as well as dry goods forming the other part of their business. Drivers may transfer between types of load carried and delivery routes undertaken. The rewards of transporting dry goods have caught up with petroleum distribution, without a match for the added responsibilities of ADR etc. It should be noted that not all companies experience these difficulties – larger companies tend to have fewer issues.

The likely change of dominant companies in the **retail** market highlights the growing need to implement some structured programme, to ensure that employees involved in retail activities have some means of addressing the crucial skills associated with fuel handling, in conjunction with the skills associated with actual retail. Such a programme would have to accessible by companies of all sizes, and in all parts of the UK.

The ageing of the UK population will most likely impact on the recruitment of retail operatives, which has the largest number of female employees (35%) and part-time working opportunities (average of 30% of employees). Lower retention rates in such lower-paid employment serves to increase recruitment demand – dependence on school leavers will be made more difficult, given the reduced population levels in 10 years time.

Polymer

The increasing pace of change in the industry, coupled with the strengthening of manufacturing bases outside the UK, leads to a challenge for employers. Whilst there will always be a need for employees working in lower-skilled jobs (at levels 1 and 2) these opportunities will decline. The demand for graduates is expected to increase, as the industry changes gear to maintain the competitive edge.

This graduate recruitment is particularly important, as it is through innovation and design that the industry will firstly remain sustainable, and secondly will grow to be market leaders. The "low value added" manufacturing base is equally dependent on these skills, such as bulk production viability. Continuous improvements in design, leading to lower materials use has the benefit of significantly reducing the cost base.

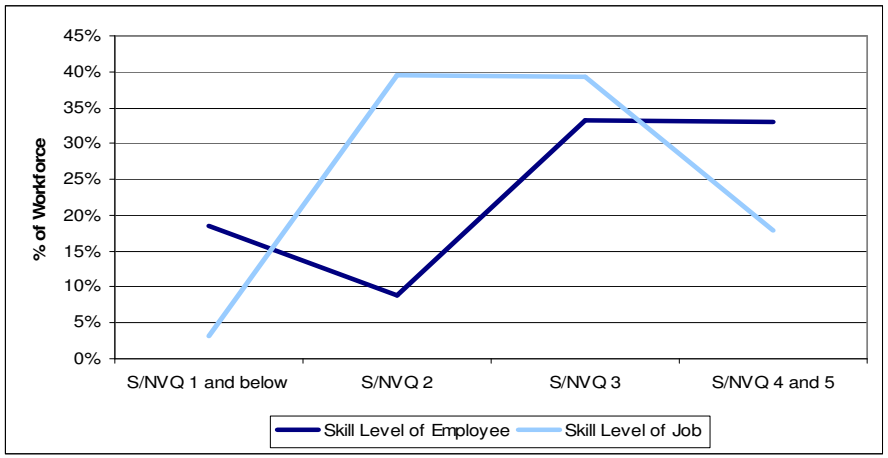
The predicted rise in need at graduate level, to fuel research in universities as well as in industry is potentially threatened by cost-driven closures in materials and minerals departments of universities.

The difference between current skills levels of employees in the plastics and rubber industries (categorised in National Statistics as SIC 25) and the actual skills levels required reveals a challenging picture for both industry and providers. The figure to the right shows that more than 30% of the workforce has qualifications at Level 1 or less, and less than 20% are qualified to level 2, where there is already a requirement, before any future issues are introduced, for closer to 40% to be qualified.

The proportion of candidates qualifying at level 2 is not being progressed to an increase in candidates at level 3, perhaps influenced by the current funding regimes where entitlement to funding ceases when the individual gains qualifications at level 2. There is no evidence of a lack of opportunity for employers to access training and qualifications at level 3 and above, however historically such skills were developed without necessarily being accredited.

2.4.1 Skill Shortages and Skills[13]

Figure 14. Cogent Skills Gap in Northern Ireland



Source: Labour Force Survey, Quarter 3 2006 – Quarter 2 2007

The skills gap in Northern Ireland shows very distinctive gaps. The Northern Ireland Cogent workforce shows a large gap at level two. The data indicates that there is deficit of people qualified to level 2. The skill demand at level 2 is approximately 40%, however the current supply is only lying at 10%. This shows that there is around a 30% deficit in people qualified to level 2. There is a clear opportunity for skills interventions at this level.

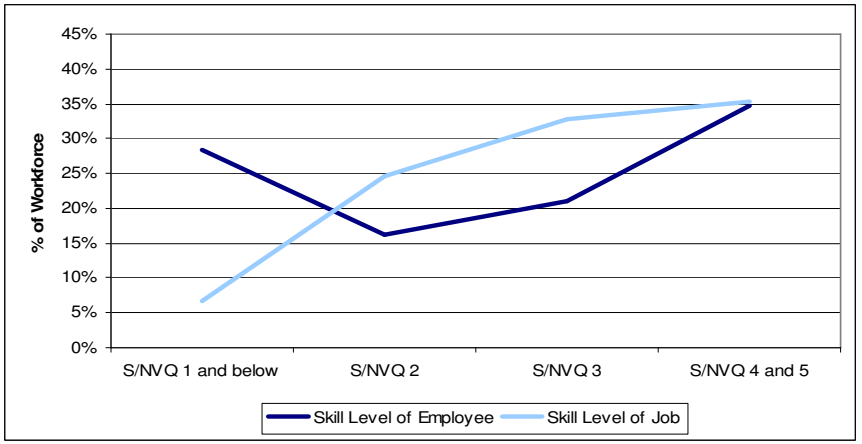
There is also a gap at level 3 although not as significant. The skills gap within the Northern Ireland workforce shows that the core workforce of technicians and operators need upskilling.

Interestingly there appears to be a surplus of people qualified to level 4 and above, however within the workforce there is not the demand for these workers. It could therefore be argued that there are workers with higher level skills not being utilised within the Cogent industries in Northern Ireland.

The Northern Ireland skills gap is distinctively different to the UK Cogent chart. Within the overall UK picture there is no gap at levels 4 and 5 and the gaps at level 2 and 3 are not as prominent.

The UPSKILL agenda is an important area for Northern Ireland employers to focus on. However caution has to taken when analysing these charts. Many people operating in jobs will have built up competence and experience whilst performing their job roles, however this experience will have not been formally accredited through qualifications.

Figure 15. Cogent Skills Gap in the UK



Source: Labour Force Survey, Quarter 3 2006 – Quarter 2 2007

[13] For technical explanation of data used in this section refer to the Technical Annex and Methodology on page 72

Section Summary and conclusions

Priorities for the Polymers Industry

Today's skills needs reflect the development of the industry over the last 5 years, with the active support of the NIPA, the Sector Training Council.

Since the development and commitment to the Workforce Development Plan (WDP) of 2002-2003 (by the plastics industry through NIPA), there have been a series of studies both across Ireland and across the UK, which have aided in the development of a longer term view of the Northern Ireland polymer industry.

The WDP plan identified six priority areas, which have formed the basis for the skills work of NIPA to-date.

Workforce Development Plan 2002-2003 for NI Polymer Industry

- Increase availability of and access to external technical training programmes
- Implement key essential skill/transferable skill training provision
- Design and implement a new innovative polymer technology programme and qualifications
- Facilitate access to and attainment of relevant best practice standards
- Create a centralised knowledge bureau for the industry
- Build the relationship between industry and the post-18 education establishments

Priorities for the Pharmaceuticals Industry

The pharmaceuticals industry in Northern Ireland is still evolving and developing – in recent years there have been a significant number of takeovers and joint ventures as pharmaceutical companies look for ways to develop new products and reduce costs.

The industry is dominated by a few large companies and their operations. The changes in ownership, through external acquisition and management buy-out, often bring with them changes in direction and business focus, which can impact on the skill sets required. As such this makes it difficult to readily discern the exact skills needs. We have therefore sought to develop some initial understanding of the industry, and its needs:

- *Almac* – long term focus on developing a fully integrated pharmaceutical services from discovery, development, right through to delivery of commercial product[14] and also in the provision of services (currently to 600+ companies) supporting the needs of other pharmaceutical companies at each stage of the drug product life cycle.
- *Norbrook* – covers full range from research, chemical synthesis (internal and external use), and secondary manufacture (tablets, capsules, aerosols, creams, sterile injections of solutions, suspensions, and powders), and produces 800+ products[15] the bulk of which are for export (90%). The growth of the business has been both organic and through acquisition e.g. purchase of Synthesia in 2005. Norbrook have worked closely with Queens University Belfast and the University of Ulster.
- *Randox* – part of the fast growing group of companies meeting clinical diagnostic needs and solutions, and builds upon excellence in being able to identify proteins associated with specific diseases. It also represents the cross-over of technologies between sectors as users are seeking faster, cheaper ways to screen patients' conditions. They currently service 30,000 clients, and have worked closely with Queens University Belfast. The development of the Centre of Excellence at the company has further extended its capability.
- *Kiel Laboratories* – are exploiting TCT technology to manufacture extended-release prescription products for the treatment of coughs, colds and allergies. They Work closely with Queens University Belfast and the University of Ulster and were attracted to Northern Ireland due to the ability to attract and retain high quality employees.

[14] Company sources, February 2007
[15] Sources: company information, 2007; Inter Trade Ireland

Priorities for the Chemicals Industry

In overview the net effect of these key drivers in terms of their impact on skills can be seen as:

- Reduced overall workforce demand by the industry
- Increase in skills levels required of workforce
- Continuous business and process improvement

The table below lists the priority skills issues highlighted by the industry:

Generic Skills Issues	Specific Skills Issues
Management skills • Communications • Leadership • Marketing • Managing inter-disciplinery teams • project managment	• More highly skilled and technology literate operators showing greater flexibility – particularly at NVQ Level III • Physical and organic and chemists, and greater cross-over with other key disciplines e.g. engineering • Lack of clarity as to career entry and career development • Lack of a common standard for operating and productivity improvement across the industry

Source: Chemistry Leadership Council – Skills Network Group sponsored by the DTI

Priorities for the Petroleum Industry

There is a real concern amongst distributors that new drivers are not entering the industry. In addition there is little evidence of any new young blood entering the industry - as it is seen as unattractive with little or no career opportunities.

3. Entry to the Sector

The industries covered by the Cogent footprint have access to a wealth of education and training provision, from National and Vocational Qualifications, through to Honours and Masters Degrees. What the industries do not have, however, is a clearly defined pathway through the range of sector-specific and generic qualifications, to enable them to plan progression as both employers and employees. The sheer number of opportunities in some areas, such as higher education provision in Chemistry is not reflected in the potential articulation routes, such as N/SVQs, HNC, HND or foundation degrees. This has led to a lack of engagement between employers and providers, with the employer view of need not being clearly articulated (or uniformly expressed) to the providers. In turn, providers have addressed course content by expanding choices to reflect the perceived need of learners, with little input from industry. There are, in contrast, a number of examples of successful co-operative developments between industry and provider, which has benefited all parties, not least the learners, who have entered or enhanced their role within industry by having the most appropriate range of skills and knowledge.

The key issues emerging from the assessment of provision fall into four broad categories: attracting people with the right skills, meeting the needs of current employees (upskilling and progression), sources of information on access and quality of provision, and issues related to decline in student numbers.

3.1 Qualifications profile of the Cogent Sector in Northern Ireland

The occupational structure of the industries is quite varied. It should further be noted that the Labour Force Survey (LFS) does not allow data for Petroleum Forecourt Operations to be extracted separate from sale and maintenance of motor vehicles – as a result the data for Petroleum does not include forecourt operations. Chemicals (including pharmaceuticals) and petroleum show high proportions of Process and Machine Operatives – particularly in comparison to the whole economy - while this makes up the largest proportion of the polymers industry.

Greater emphasis for employability is being placed upon “softer skills”. In the face of stringent Environment, Health & Safety requirements, the drive to reduce costs through more efficient and less wasteful operations and the push for higher quality outputs employers are recognising that behavioural aspects of the job role are extremely important. The ability to work effectively as a member of a team, using initiative in problem solving skills and fault diagnosis are highly valued by employers.

Entry level qualifications required by employers at graduate level (preferably with some work experience) are from the following subject areas:

- Chemical Engineering / Chemical, Process & Energy Engineering
- Chemistry
- Electrical & Electronic Engineering
- Geology
- Mechanical Engineering
- Physics
- Polymers & Textiles
- Other Materials Science

There is a mismatch in between the level of qualifications held by the workforce and the skills level at which they are employed to operate, most notably at the elementary workforce level one, skilled workforce at level two and in managerial and senior official workforce at level four and five.

3.2 School Age Education

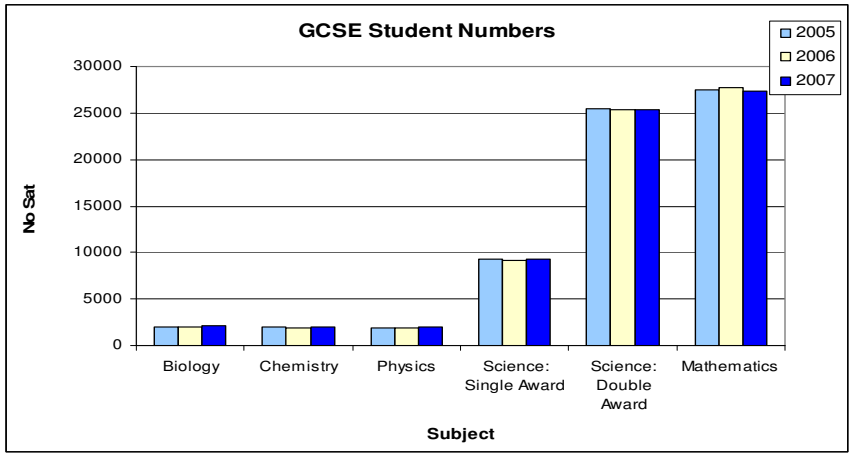
3.2.1 Throughput Trends & Achievements

3.2.1.1 GCSEs

The number of pupils in Northern Ireland studying Cogent related GCSE subjects are shown below. Figure 1 shows the number of pupils sitting GCSE Sciences: Biology; Chemistry; Physics; and Science (Single and Double Award) and GCSE Mathematics in Northern Ireland have remained fairly constant from 2005 to 2007, with minimal fluctuations being reported. For example, there was a 1% increase in the number of pupils sitting GCSE Sciences (All) from 2006 to 2007, and a 1% increase in the number of pupils sitting GCSE Mathematics from 2005 to 2006.

Of all the pupils in Northern Ireland studying GCSEs, 35% studied STEM subjects in each academic year; 2005, 2006 and 2007.[16]

Figure 16: Northern Ireland GCSE Student Numbers by Subject from 2005 - 2007



Source: Joint Council for Qualifications (2007, 2006 & 2005)

According to the BBC News website (2007), pupils in Northern Ireland studying GCSE's achieved A* - C grades in almost ¾ of exams, with approximately ¼ achieving A* grades. The GCSE subjects attracting highest entries in Northern Ireland in both 2007 and 2006 were Maths, Science (Double Award), English, English Literature and Religious Studies, with a decline in the number of entries apparent in Economics, Business Studies and History.

It was reported on the BBC News website (2006), that Northern Ireland GCSE pupils outperformed their peers in England and Wales. Almost a ¼ of pupils in Northern Ireland achieved GCSE grades A or A*, compared to a fifth of GCSE pupils elsewhere. However, it was reported by the BBC (2006) that the number of pupils sitting traditional GCSEs were dropping, due to falling pupil numbers.

In Northern Ireland the school education system slightly differs to that of the education systems in both England and Wales. In Northern Ireland secondary schools are classified as either; ***Grammar*** or ***Secondary/Non Grammar*** schools. Grammar schools use academic selection as a method of determining pupil entry, whereas non-grammar schools do not use academic selection as a method of determining pupil entry. Table 3 details attainment data for pupils studying GCSEs related to the Cogent sector in 2005-06, in both grammar and non-grammar schools.

[16] Based on: Total number of ALL GCSE students: 19,7485 in 2007, 19,5530 in 2006 and 19,8891 in 2006. Total number of all STEM GCSE students: 68,174 in 2007, 67,965 in 2006 and 68,074 in 2005.

Table 3: Northern Ireland GCSE Attainment Data 2005-06

GCSE Subject	Attainment Levels									
	A* - C		D - G		Q		U		X	
	G	NG	G	NG	G	NG	G	NG	G	NG
Biology	1,738	61	53	5	-	0	1	0	0	0
Chemistry	1,705	62	65	8	-	0	8	0	0	0
Physics	1,629	53	117	6	-	0	3	0	0	0
Science/Single Award	265	2,337	69	5,869	-	1	3	225	2	108
Double Science Award	6,600	3,694	440	1,475	-	0	45	70	2	0
Mathematics	8,408	5,652	226	7,674	-	0	100	682	2	60
	20,345	***11,859***	***970***	***15,037***	***-***	***1***	***160***	***977***	***6***	***168***

Source: DELNI (2007)

Note: **G: Grammar school data**
NG: Non Grammar school data
Grade Q: Grade pending in non-grammar schools.
Grade U: Un-graded or unclassified
Grade X: Pupils who are absent or have no results/results pending

Pupils attending grammar schools, who studied Cogent related subjects: GCSE Sciences (Biology, Chemistry, Physics, Since: Single/Double Award) and GCSE Mathematics, on the whole outperformed their peers in non-grammar schools. Almost double the number of grammar school pupils achieved GCSE grades A* - C in science subjects and mathematics, compared to non-grammar school pupils. Significantly more non-grammar school pupils achieved GCSE grades D – G, grade U and grade X compared to their grammar school counterparts.

Table 4 details Northern Ireland GCSE attainments, compared to England and Wales GCSE attainments. Northern Ireland data includes both grammar school and non-grammar school data for the academic period 2005-06.

Table 4: Total Northern Ireland and Total England and Wales GCSE Attainments 2005-06

GCSE Subject	Attainment Level							
	A* - C		D - G		U		X	
	NI	Eng & Wales	NI	Eng & Wales	NI	Eng & Wales	NI	Eng & Wales
Biology	1,799	49,840	58	5,430	1	235	0	0
Chemistry	1,767	48,200	73	4,680	8	100	0	0
Physics	1,682	47,970	123	4,550	3	100	0	0
Science/Single Award	2,602	17,495	5,938	56,030	228	5,000	110	500
Double Science Award	10,294	282,140	1,915	203,825	115	8,630	2	500
Mathematics	14,060	408,020	7,900	282,520	782	19,530	62	2,400
	32,204	***853,665***	***16,007***	***557,035***	***1,137***	***33,415***	***174***	***3,400***

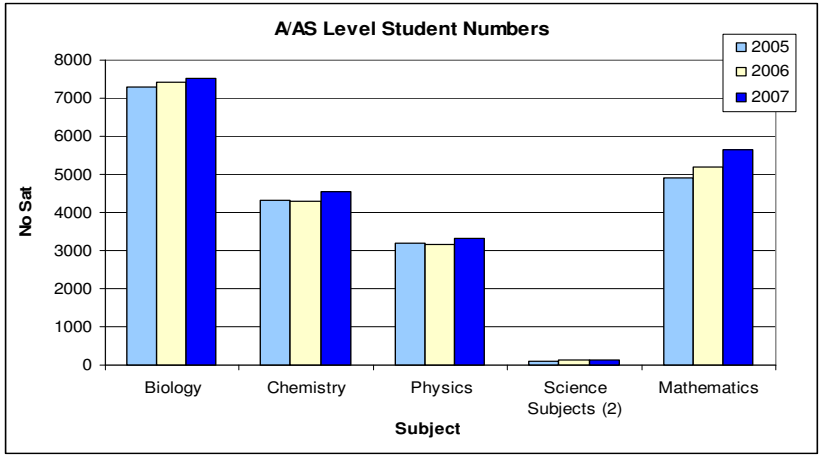
Source: DELNI (2007); DFES (2008); Welsh Assembly Government (2008): GCSE/GNVQ and GCE A, AS and AVCE results in Wales, 2006 (Table 4).

Note: **NI: Northern Ireland school data (including Grammar and Non Grammar school data)**
Eng & Wales: England & Wales GCSE attainment data.
Grade U: Un-graded or unclassified
Grade X: Pupils who are absent or have no results/results pending

The number of students in Northern Ireland studying Cogent related subjects (Biology; Chemistry; Physics; Science Subjects (2) and Mathematics) are shown below.

Of all students studying A/AS Levels, approximately 30% studied STEM related subjects in each of the academic years.[17]

Figure 17: Northern Ireland A/AS Level Student Numbers by Subject from 2005 – 2007



According to the BBC News Website (2006), in Northern Ireland pupils achieved better A Level results compared to their peers in England and Wales. Pupils in Northern Ireland achieved a pass rates of 97.7% compared to 96.9% in Wales and 96.5% in England. Also, 32.4% of students in Northern Ireland were awarded A grades, compared to 23.9% of students in Wales and 23.8% of pupils in England.

Source: Joint Council for Qualifications (2007, 2006 & 2005)[18]

Figure 17 shows the number of students in Northern Ireland studying Science and Mathematics A/AS Levels has increased year-on-year since 2005. For example, the number of students studying Science (Biology; Chemistry; Physics; and Science Subjects 2) A/AS Levels has increased by 4% from 2005 to 2007, with the number of students studying A/AS Level Mathematics increasing by 15% from 2005 to 2007.

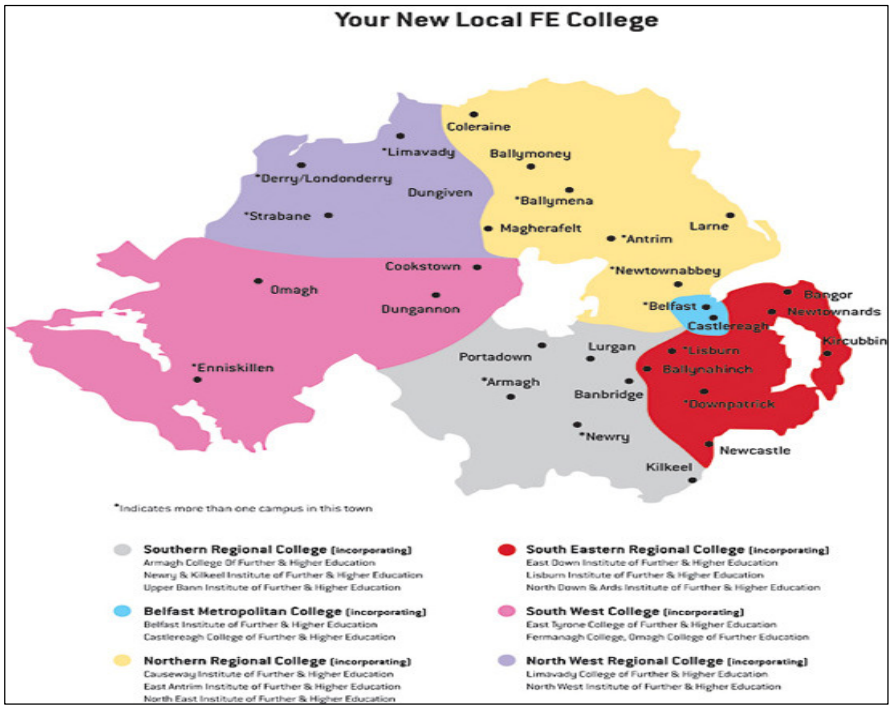
3.3 Further Education

According to the Association of Northern Ireland Colleges FE colleges in Northern Ireland[19]:

- attract one in three 16 – 17 year old school leavers
- have an intake of over 170,000 students every year
- are the main skills provider for Northern Ireland industry and business
- are based in 400 out-centres, 47 campuses and 16 colleges

[17] Based on: Total number of all A/AS Level Students: 69,701 in 2007, 69,336 in 2006 and 68,819 in 2005. Total of all STEM A/AS Level Students: 21,127 in 2007, 20,198 in 2006 and 19,830 in 2005.
[18] JCQ data covers number of completers and entrants in exam. DEL data only includes starters on courses
[19] Source: Association of Northern Ireland Colleges (2004) Go further – ANIC: Who we are, What we do

Figure 18: FE and HE Institutes across Northern Ireland



Source: Association of Northern Ireland Colleges (2008)

The Association of Northern Ireland Colleges (ANIC) was established in Northern Ireland in 1998 following the incorporation of 16 colleges[20] of further and higher education. A key aim of the Skills Strategy for Northern Ireland was to improve the quality and relevance of education and training in Northern Ireland, which included the reorganisation of the FE sector. Further and higher education institutes have been clustered to reflect a new local FE college network in Northern Ireland.

3.3.1 Qualification Framework

Currently, the National Qualifications Framework (NQF) for Northern Ireland sets out the levels at which qualifications can be recognised. However, changes to the Framework are underway, with the development of the Qualifications and Credit Framework (QCF). Funding for the NQF will begin to be removed from August 2009, with a proposed date for funding to completely cease in July 2010. The last date for accreditation of qualifications into the NQF is scheduled for December 2010.

The QCF is a new framework, which will recognise an individual's skills by awarding credit for qualifications and units. The new Framework will award credit for small steps of learning and provide individuals in Northern Ireland with a more flexible route to learning. The Framework represents a big change to the current arrangement of qualifications in Northern Ireland, therefore regulators of external qualifications have been asked to test and trial the framework.

[20] Armagh College; Belfast Institute; Castlereagh College; Causeway Institute; East Antrim Institute; East Down Institute; East Tyrone Institute; Fermanagh College; Limavady College; Lisburn Institute; Newry & Kilkeel Institute; North Down & Ards Institute; North East Institute; North West Institute; Omagh College and Upper Bann Institute

3.3.2 Apprenticeships

Until early September 2007, apprenticeships in Northern Ireland were described under the 'Jobskills' Programme. Under this programme, awards were described as Traineeships (Level 2) or Modern Apprenticeships (MA Level 3). Those on Traineeships could progress onto Modern Apprenticeships, or students could enter the Modern Apprenticeship directly by completing a Level 2 qualification on route to Level 3. Following the end of the Jobskills Programme, 'Training for Success' came into practice on 3rd September 2007. Under Training for Success are Level 2 and Level 3 Apprenticeships.

DELNI supplied data for the apprenticeships; Mechanical Engineering, Electrical Engineering and Electronic Engineering. At this time this was the only data available related to science and engineering. Please see tables 3 – 5 for starts and achievements on each of these apprenticeship routes, at Level 2 and Level 3.

Table 4: Jobskills Apprenticeship Data: Traineeships & Modern Apprenticeships by Training Occupational Classification: X11 Mechanical Engineering

Academic Year	Traineeship L2		MA L3: Entry from Traineeship L2		MA L3: Direct Entrant	
	Starts	Achievers	Starts	Achiever	Starts	Achievers
2003/04	374	214	106	53	105	48
2004/05*	398	199	114	59	109	29
2005/06*	269	161	152	26	140	1
2006/07	272	17	116	2	122	0
2007/08	32	0	41	0	24	0
Total	***1,345***	***591***	***529***	***140***	***500***	***78***

*** - Due to administration procedures in 2004/05 and 2005/06, not all achievements had been approved, therefore figures may be higher.** *Source: DELNI (2008)*

Table 5: Jobskills Apprenticeship Data: Traineeships & Modern Apprenticeships by Training Occupational Classification: X12 Electrical Engineering

Academic Year	Traineeship L2		MA L3: Entry from Traineeship L2		MA L3: Direct Entrant	
	Starts	Achievers	Starts	Achiever	Starts	Achievers
2003/04	87	62	44	30	444	327
2004/05*	58	32	54	46	386	2
2005/06*	44	29	24	8	359	14
2006/07	75	5	18	1	388	2
2007/08	3	0	2	0	1	0
Total	***267***	***128***	***142***	***85***	***1,578***	***345***

*** - Due to administration procedures in 2004/05 and 2005/06, not all achievements had been approved, therefore figures may be higher.** *Source: DELNI (2008)*

Table 6: Jobskills Apprenticeship Data: Traineeships & Modern Apprenticeships by Training Occupational Classification: X12 Electronic Engineering

Academic Year	Traineeship L2		MA L3: Entry from Traineeship L2		MA L3: Direct Entrant	
	Starts	Achievers	Starts	Achiever	Starts	Achievers
2003/04	32	18	7	4	3	2
2004/05*	17	10	1	1	4	3
2005/06*	23	15	2	0	0	0
2006/07	32	0	9	0	1	0
2007/08	0	0	4	0	0	0
Total	***104***	***43***	***23***	***5***	***8***	***5***

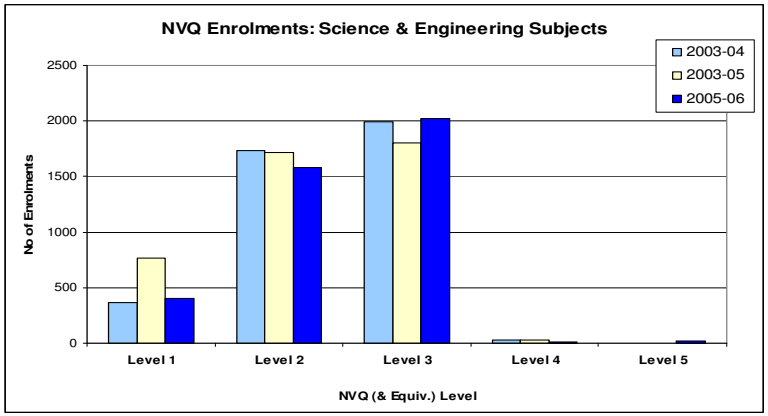
*** - Due to administration procedures in 2004/05 and 2005/06, not all achievements had been approved, therefore figures may be higher.** *Source: DELNI (2008)*

As a result of the end of the Jobskills programme, the number of starts and achievers for both Traineeships and Modern Apprenticeships on all apprenticeship routes were in decline from 2006/07 and 2007/08. At present there is no data available for each of the apprenticeships above within the Training for Success programme, however, Cogent SSC hopes to gain this data from DELNI in the near future.

3.3.3 National Vocational Qualifications: Enrolments and Achievements in the Northern Ireland Further Education Sector

Enrolments, retention and achievement rates of those studying science and engineering related NVQs were provided by the Department for Employment and Learning in Northern Ireland (DELNI).

Figure 19: NVQ Enrolments in Science & Engineering Subjects from 2003-04 to 2005-06



Source: DELNI (2007)

The largest number of enrolments on science and engineering NVQs were at Level 3, followed by Level 2.

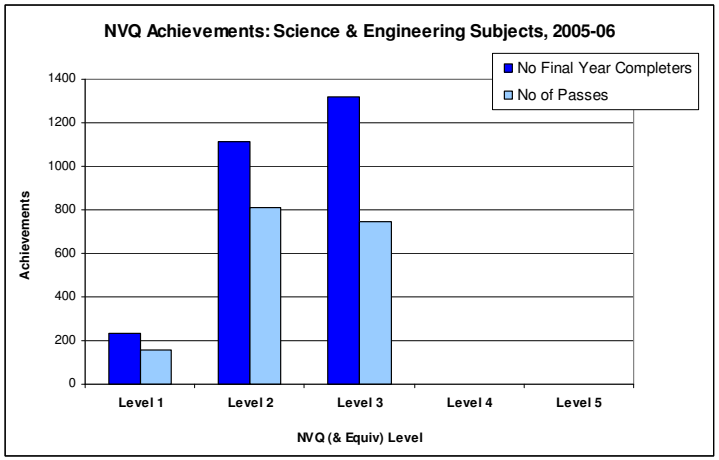
On closer inspection, across the three academic periods, the largest proportion of students undertaking science and engineering related NVQs in Northern Ireland were aged 19 years and under, were male and were predominately studying on a part-time basis (Source: DELNI 2007).

Figure 19 details the number of NVQ enrolments on science and engineering subjects by level of qualification for the academic periods 2003-04 to 2005-06.

Please refer to **Appendix 1** for a list of Science and Engineering enrolments by NVQ Level (& Equivalent).

According to DELNI the low achievement rate in 2005/06 was mainly due to a large intake of school pupils studying GCSE Mathematics, as during this academic period schools pupils were topping up on their learning whilst sitting examinations in their school.

Figure 20: NVQ Achievements in Science and Engineering Subjects, 2005-06



Source: DELNI (2007)

Figure 20 details the number of NVQ achievements in science and engineering subjects by level of qualification in 2005-06.

In 2005-06, there were over 1,300 Level 3 final year completers in science and engineering related NVQs. The largest proportion of passes in science and engineering related NVQs were at Level 2 (approximately 800). In 2005-05, there were a very low number of passes and completers reported at Level 4, with none reported at Level 5.

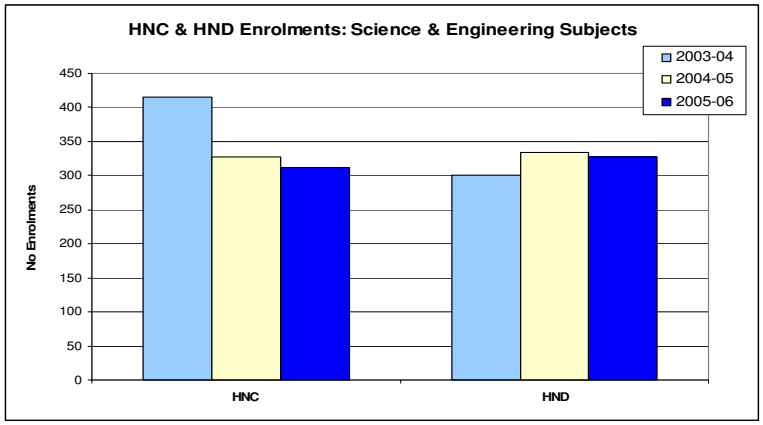
At Level 1, 67% of final year completers were 'passes'
At Level 2, 73% of final year completers were 'passes'
At Level 3, 56% of final year completers were 'passes'

Please refer to **Appendix 2** for a list of Science and Engineering achievements by NVQ Level (& Equivalent).

3.3.4 Higher National Certificates (HNC) and Higher National Diplomas (HND): Enrolments and Achievements in the Northern Ireland Further Education Sector

Enrolments, retention and achievement rates of those studying science and engineering related HNC/Ds were provided by the DELNI.

Figure 21: HNC and HND Enrolments in Science & Engineering Subjects from 2003-04 to 2005-06



Source: DELNI (2007)

Figure 21 details the number of science and engineering enrolments on HNC/Ds from 2003-04 to 2005-06.

There were more enrolments on science and engineering HNCs (1,054) compared to HNDs (963) over the last 3 years.

The number of enrolments on science and engineering related HNCs has been in decline since 2003-04, with the number of enrolments on HNDs remaining fairly constant across the three academic periods. In 2003-04, there were clearly more enrolments on science and engineering HNCs compared to HNDs, however in the following academic years the number of students enrolled on HNC and HNDs remained fairly constant.

Please refer to **Appendix 3** for a list of Science and Engineering enrolments on HNC/Ds.

Figure22: HNC & HND Achievements in Science & Engineering Subjects, 2005-06

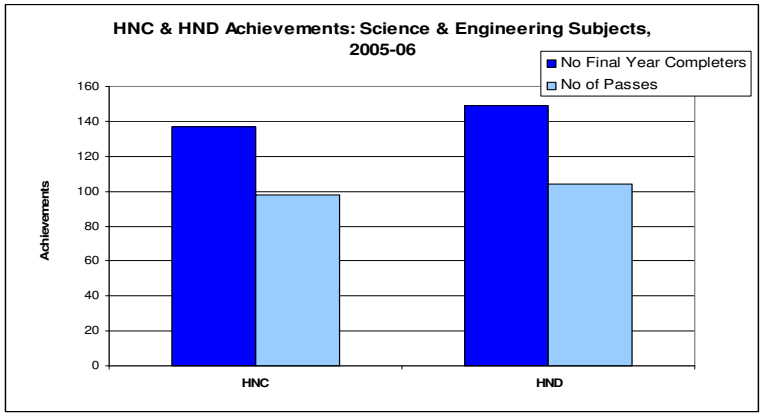


Figure 22 details the number of science and engineering HNC/D achievements in 2005-06.

Achievement rates were fairly similar for both science and engineering HNCs and HNDs in 2005-06 in the Northern Ireland Further Education Sector.

Approximately ¾ of HNC and HND final year completers were 'passes' in 2005-06.

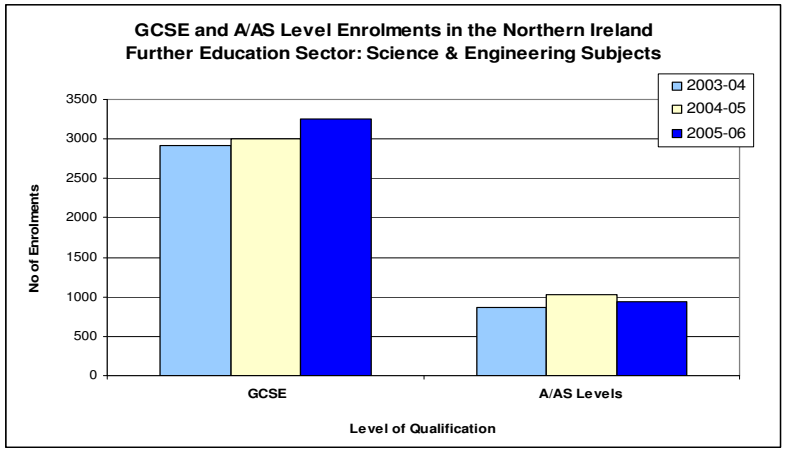
Please refer to **Appendix 4** for a list of Science and Engineering HNC/D achievements.

Source: DELNI (2007)

3.3.5 GCSE and A/AS Level: Enrolments and Achievements in the Northern Ireland Further Education sector

Enrolments, retention and achievement rates of those studying science and engineering related GCSE and A/AS Levels in the Northern Ireland Further Education sector were provided by the DELNI.

Figure 23: GCSE & A/AS Level Enrolments in Science & Engineering Subjects from 2003-04 to 2005-06



Source: DELNI (2007)

Figure 23 details the number of science and engineering enrolments on GCSE and A/AS Levels from 2003-04 to 2005-06.

There were significantly more enrolments on science and engineering GCSEs compared to A/AS Levels over the three academic periods.

The number of enrolments on science and engineering GCSE's at FE colleges in Northern Ireland has been increasing since 2003-04, with the most marked increase from 2004-05 to 2005-06 (8%).

The number of enrolments on science and engineering A/AS Levels at FE colleges in Northern Ireland increased by 20% from 2003-04 to 2004-05, however there was a 9% decrease in the number of enrolments from 2004-05 to 2005-06.

Please refer to **Appendix 5** for a list of Science and Engineering enrolments on GCSE and A/AS Levels

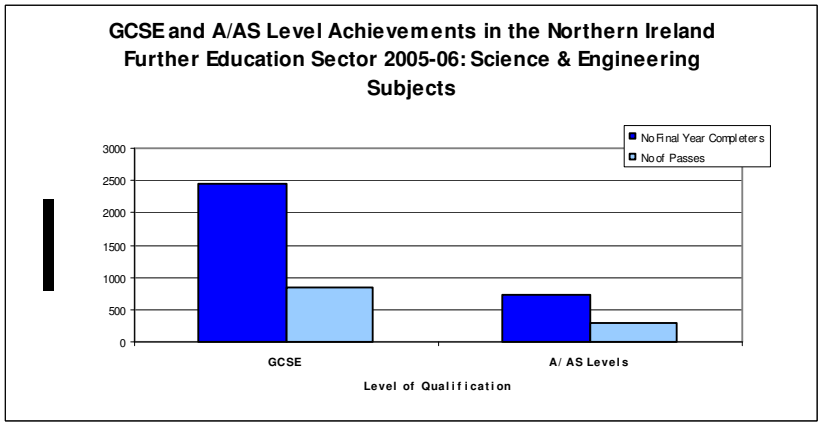
Figure 24: GCSE& A/AS Level Achievements in Science & Engineering Subjects, 2005-06

Figure 24 details the number of science and engineering achievements on GCSE and A/AS Levels in 2005-06.

GCSE Achievements
- 34% of all final year completers were passes.

A/AS Level Achievements
- 41% of all final year completers were passes.

Please refer to **Appendix 6** for a list of Science and Engineering GCSE and A/AS Level achievements.



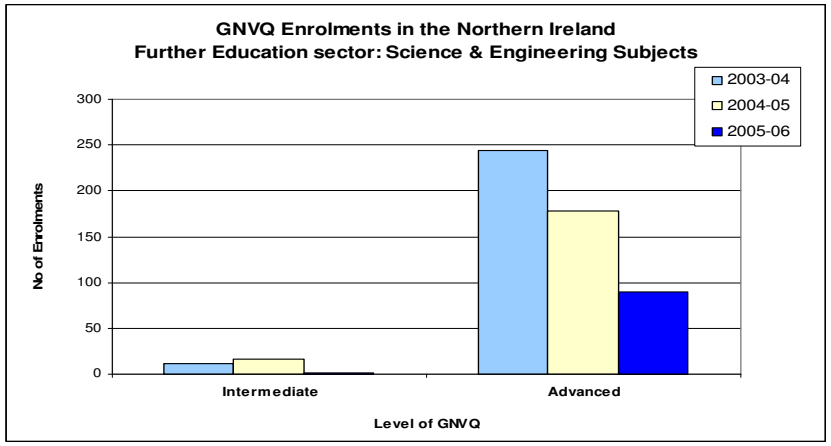
Source: DELNI (2007)

3.3.6 GNVQ: Enrolments and Achievements in the Northern Ireland Further Education Sector

In 2003 the QCA announced the withdrawal of General National Vocational Qualifications (GNVQ), with the formal end to these qualifications commencing in 2007. Successor qualifications include BTECs, as the view stands that "BTECs enthuse students, provide progression to work or further study and are highly valued by employers" *(Quote: Edexcel website: http://gnvq.edexcel.org.uk/home/vocational-qualifications/)*.

Data provided by DELNI highlighted the GNVQ enrolments and achievements in science and engineering subjects in the Further Education sector from 2003-04 to 2005-06. GNVQ's were listed as either Intermediate or Advanced.

Figure 25: GNVQ Enrolments in Science & Engineering Subjects from 2003-04 to 2005-06



Source: DELNI (2007)

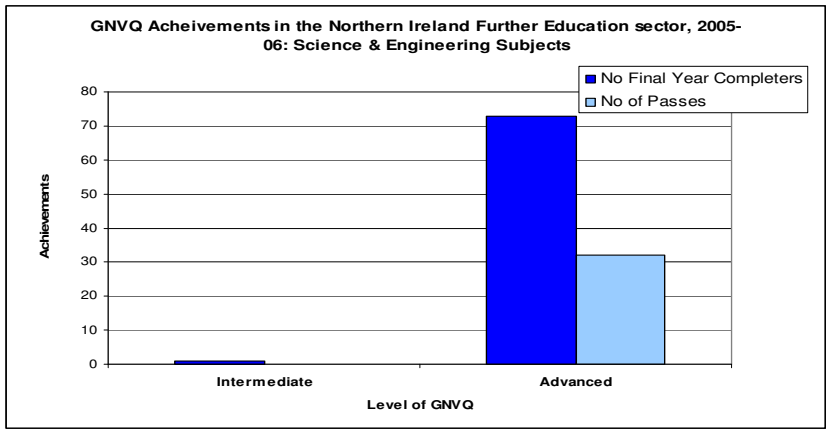
Figure 25 details the number of science and engineering enrolments on GNVQs in the Northern Ireland Further Education sector from 2003-04 to 2005-06.

There were few enrolments on science and engineering Intermediate GNVQs, with just 1enrolment in 2005-06.

Due to the withdrawal of GNVQs, the number of enrolments on Advanced GNVQs has declined since 2003-04, with a 27% decline from 2003-04 to 2004-05, and a 49% decline from 2004-05 to 2005-06.

Please refer to **Appendix 7** for a list of Science and Engineering enrolments on GNVQs in the Further Education Sector.

Figure26: GNVQ Achievements in Science & Engineering Subjects, 2005-06



Source: DELNI (2007)

Figure 26 details the science and engineering GNVQ achievements in 2005-06.

In 2005-06, for Intermediate science and engineering GNVQs, there was 1 final year completer and 0 passes.

44% of final year completers on Advanced science and engineering GNVQs were passes.

Please refer to **Appendix 8** for a list of Science and Engineering GNVQ achievements.

3.4 Higher Education

In Northern Ireland the Higher Education (HE) sector consists of three Universities and two University colleges:

- Queens University, Belfast
- University of Ulster
- The Open University (UK wide distance learning institute)
- Stranmillis University College
- St Mary's University College

Numerous opportunities are available in Higher Education Institutions (HEIs) in Northern Ireland, including part time and full time courses, vocational and degree level courses, including undergraduate and postgraduate level study. For a full list of programmes offered by level of qualification and institution please refer to **Appendix 9**.

3.4.1 Student 'Accepts' in Northern Ireland

Data was extracted from UCAS to investigate the student 'inputs' into Higher Education in Northern Ireland. The data below presents the total number of applicants and accepts (both degree level and HND level) to Northern Ireland HEIs, broken down by STEM subject group.

Table 7: University Accepts in STEM Subjects in Northern Ireland, 2006

Subject	Total			
	All Applicants	All Accepts	Degree Accepts	HND Accepts
Biology	90	114	114	0
Chemical, Process and Energy Engineering	8	24	24	0
Chemistry	49	68	68	0
Civil Engineering	**183**	**181**	**180**	**1**
Electronic and Electrical Engineering	52	56	54	**2**
General Engineering	30	80	78	**2**
Genetics	6	13	13	0
Geology	17	16	16	0
Industrial Biotechnology	1	0	0	0
Mathematics	119	**136**	**136**	0
Mechanical Engineering	**141**	**136**	134	**2**
Microbiology	3	11	11	0
Molecular Biology, Biophysics & Biochemistry	18	22	22	0
Physical & Terrestrial Geographical & Environmental Science	**155**	**210**	**210**	0
Physics	68	65	65	0
Production and Manufacturing Engineering	18	70	70	0
Total	***958***	***1202***	***1195***	***7***

Source: UCAS (2007)

There were relatively low numbers of applicants on Chemical, Process and Energy Engineering (8), Chemistry (49) and other subjects of close relevance to the Cogent footprint, highlighting a strong message that there are a small number of 'Cogent Graduates' in Northern Ireland.
The number of STEM applicants to HEIs in Northern Ireland in 2006 was significantly less (20%) than the number of students accepted onto STEM related courses. On closer inspection, it can be seen that the majority of students applied for Civil Engineering (183), Physical and Terrestrial Geographical and Environmental Science (155) and Mechanical Engineering (141). The majority of students were accepted onto Physical and Terrestrial Geographical and Environmental Science (210), Civil Engineering (181), Mechanical Engineering (136) and Mathematics (136). 99% of all 'accepts' were degree accepts, with the majority being in Physical & Terrestrial Geographical & Environmental Science (210), followed by Civil Engineering (180) and Mathematics (136). HND accepts were in the following subject areas: Electronic and Electrical Engineering (2), General Engineering (2), Mechanical Engineering (2) and Civil Engineering (1).

3.4.2 Student enrolments in Higher Education

Data was extracted from the Department for Employment and Learning in Northern Ireland (DELNI), detailing Northern Ireland domiciled students on higher education courses in the United Kingdom.

The table below details the number of male and female student enrolments, studying both full time and part time. The table details both first year Northern Ireland domiciled students and ALL Northern Ireland domiciled students enrolled on higher education courses in the United Kingdom, during the academic year 2005/06. The data has been broken down by subject group. Data was not available by specific subject area.

Table 8: Northern Ireland domiciled students enrolled on higher education courses in the UK 2005/06

Subject Groups	First Year Students				All Students			
	Male		Female		Male		Female	
	FT	PT	FT	PT	FT	PT	FT	PT
Biological Science	510	160	780	260	1,250	355	2,150	605
Physical Science	350	125	350	60	940	315	920	180
Mathematical Sciences	335	330	170	280	650	470	375	340
Engineering & Technology	870	625	160	160	2,430	1,260	500	250
Total: Above Subject grps	***2,065***	***1,240***	***1,460***	***760***	***5,270***	***2,400***	***3,945***	***1,375***
Total: All HE Subject grps	***8,305***	***6,375***	***10,835***	***11,430***	***20,745***	***11,690***	***27,990***	***46,875***

Figures in the table are rounded to the nearest 5, with 0, 1, 2 rounded to 0. *Source: DELNI (2007)*

- **36%** more female first year students (1,040) were enrolled on **Biological Science** courses, compared to male first year students (670).
- The number of male and female first year students enrolled on **Physical Sciences** were comparable (475 and 410 respectively)
- **32%** more male first year students (665) were enrolled on **Mathematical Science** courses, compared to female first year students.
- Significantly more (**79%**) male first year students (1,495) were enrolled on **Engineering and Technology** courses, compared to female first year students (320).
- More first year students (**43%**), both male and female, were enrolled on **full time courses** (3,525), compared to part time courses (2,000).
- When investigating ALL Northern Ireland domiciled students enrolled on higher education courses in the UK, a very similar pattern emerges to that of first year students domiciled in Northern Ireland. For example, more females were enrolled on Biological Sciences courses, whereas more males were enrolled on Mathematical Science courses.

The table below details the number of enrolments, both first year enrolments and all student enrolments, on higher education courses in Northern Ireland for the academic period 2005/06. The data has been broken down by gender, mode of study and subject group. Data was not available by specific subject area.

Table 9: Enrolments on higher education courses in Northern Ireland Institutions 2005/06

Subject Groups	First Year Students				All Students			
	Male		Female		Male		Female	
	FT	PT	FT	PT	FT	PT	FT	PT
Biological Science	350	120	615	200	870	220	1,700	410
Physical Science	255	100	270	40	715	290	725	150
Mathematical Sciences	300	310	150	260	525	415	295	305
Engineering & Technology	860	590	185	155	2,250	1,220	495	270
Total: Above Subject grps	***1,765***	***1,120***	***1,220***	***655***	***4,360***	***2,145***	***3,215***	***1,135***
Total: All HE Subject grps	***6,790***	***5,610***	***9,210***	***10,740***	***16,580***	***10,130***	***23,085***	***17,635***

Figures in the table are rounded to the nearest 5, with 0, 1, 2 rounded to 0. *Source: DELNI (2007)*

As above, a similar pattern arises with enrolments on higher education courses in Northern Ireland institutions as it can be seen:

- **43%** more female first year students (815) were enrolled on **Biological Science** courses, compared to male first year students (470).
- The number of male and female first year students enrolled on **Physical Science** courses was fairly comparable (355 and 310 respectively).
- **33%** more male first year students (610) were enrolled on **Mathematical Science** courses, compared to female first year students (410).
- **77%** more male first year students (1,450) were enrolled on **Engineering and Technology** courses, compared to female first year students (340).
- A similar pattern is apparent when investigating ALL students enrolled on higher education courses in Northern Ireland institutions in 2005/06.

3.4.3 Student Enrolment trends by Institution[21]

Student enrolments on higher education courses in Northern Ireland Higher Education Institutions was investigated further. At Queen's University Belfast there was an increase in all enrolments by 6% from 2001/02 to 2005/06. At St. Mary' University College there was an increase in all enrolments by 10% from 2001/02 to 2005/06. At Stranmillis University College enrolments have decreased by 3% between 2001/02 and 2005/06.
And at the University of Ulster there has been an increase in all enrolments by 19% from 2001/02 to 2005/06.

There are few undergraduate and postgraduate courses listed at Stranmillis University College and St Mary's University college that are directly related to the Cogent footprint. Stranmillis University College predominantly delivers teacher education and early childhood education courses. St Mary's University College has two predominant faculties; Faculty of Education and the Faculty of Liberal Arts, delivering courses aimed at teacher education, human development and preparation for living in a changing world.

The table below details student enrolments on higher education courses in the UK and Republic of Ireland by type of institution, level of study and mode of study. This data could not be broken down by subject group or subject area, therefore the data presented below refers to all subjects, not just those within the Cogent footprint.

Table 10: Northern Ireland domiciled students enrolled on higher education courses in the UK and Republic of Ireland by type of institution, level and mode of study 2005/06

Type of Institution	First Degree		Other Undergraduate		Postgraduate	
	FT	PT	FT	PT	FT	PT
Northern Ireland Universities	26,045	3,495	1,120	6,820	2,620	5,135
Northern Ireland University Colleges	1,940	150	0	20	50	215
Northern Ireland Further Education Colleges	310	750	3,340	7,550	0	70
Total	***28,295***	***4,395***	***4,460***	***14,390***	***2,670***	***5,420***

Figures in the table are rounded to the nearest 5, with 0, 1, 2 rounded to 0. *Source: DELNI (2007)*

- Most Northern Ireland domiciled students (43,235) were enrolled onto higher education courses at **Northern Ireland Universities** in 2005/06, followed by over 12,000 students enrolled on higher education courses at **Northern Ireland Further Education colleges.**
- Just 2,375 students were enrolled at **Northern Ireland University Colleges** in 2005/06.

[21] DELNI (2007) Statistical Bulletin: Student enrolments on Higher Education courses: Northern Ireland 2005-06.

- Most Northern Ireland domiciled students were enrolled onto **full time, first degree courses** (28,295), followed by **part time, other undergraduate courses** (14,390) and **part time, postgraduate courses** (5,420).

The table below details the number of student enrolments on higher education courses at HEIs in Northern Ireland for the academic period 2005-06. Again, this data could not be broken down by subject group or subject area, therefore the data presented below refers to all subjects, not just those within the Cogent footprint.

Table 11: Enrolments on higher education courses at Northern Ireland institutions by institution 2005-06

Type of Institution	First Degree		Other Undergraduate		Postgraduate	
	FT	PT	FT	PT	FT	PT
Queen's University Belfast	12,790	1,215	465	4,695	2,120	3,275
St Mary's University College	990	10	0	0	15	100
Stranmillis University College	1,010	155	5	20	40	115
University of Ulster	15,665	2,610	760	2,560	1,810	4,185
NI Further Education Colleges	310	790	3,680	7,910	0	115
Total	***30,765***	***4,780***	***4,910***	***15,185***	***3,985***	***7,790***

Figures in the table are rounded to the nearest 5, with 0, 1, 2 rounded to 0. *Source: DELNI (2007)*

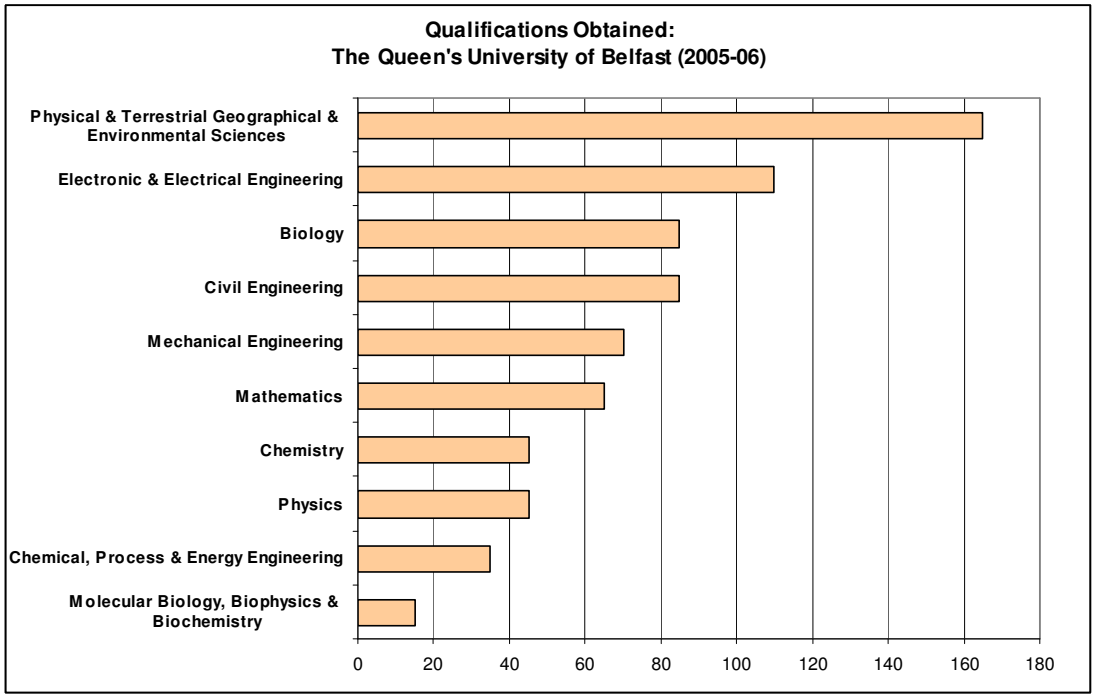
- The largest number of all student enrolments were at the **University of Ulster** (27,590), followed by **Queens University Belfast** (24,560).
- The smallest number of student enrolments were at **St Mary's University College** (1,115).
- As above, most enrolments on higher education courses at Northern Ireland Institutions were on **full time, first degree courses** (30,765), followed by **part time, other undergraduate courses** (15,185) and **part time, postgraduate courses** (7,790).

3.4.4 HE Qualifications Gained in Northern Ireland

Data was extracted from the Higher Education Statistics Agency (HESA)[22], detailing the qualifications[23] obtained in HEIs in Northern Ireland. The figures below detail the qualifications gained by STEM subject for each institution. Please note, data revealed there were no STEM subject qualifications gained at both; St Mary's University College and Stranmillis University College.

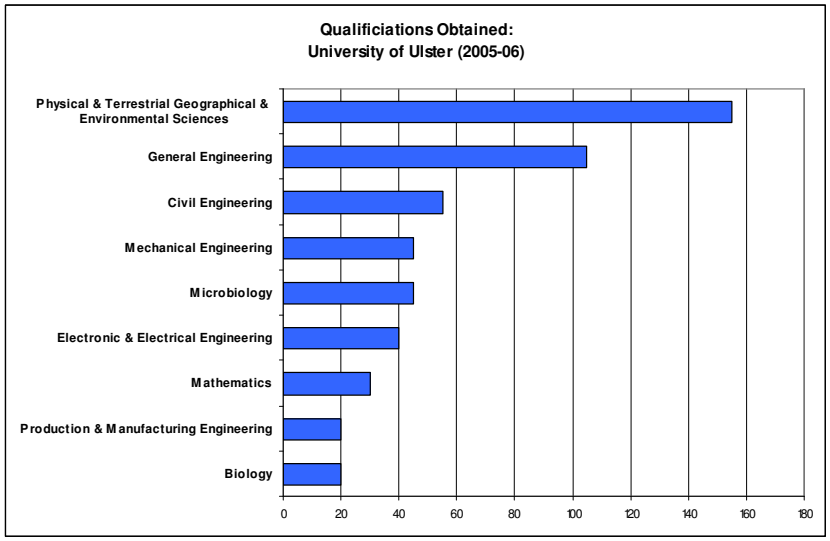
[22] Due to Data Protection, HESA apply a rounding strategy to total numbers whereby 0,1,2 are rounded to 0 and all other numbers are rounded to the nearest multiple of 5
[23] Includes all awards: Postgraduate, First Degree and Undergraduate

Figure 27 All Qualifications Gained by STEM Subject at The Queen's University of Belfast



Source: HESA, Table 15e (2007)

Figure 28: All Qualifications Gained by STEM Subject at The University of Ulster



Source: HESA. Table 15e(2007)

- In both institutions, most students gained awards in **Physical & Terrestrial Geographical & Environmental Sciences**.
- At Queens University Belfast, **49%** of qualifications gained were **Science Awards**, **42%** of qualifications gained were **Engineering Awards** and **9%** of qualifications gained with **Mathematical Awards**.
- At the University of Ulster, **51%** of qualifications gained were **Engineering Awards**, **43%** of qualifications gained were **Science Awards** and **6%** of qualifications gained were **Mathematical Awards**.

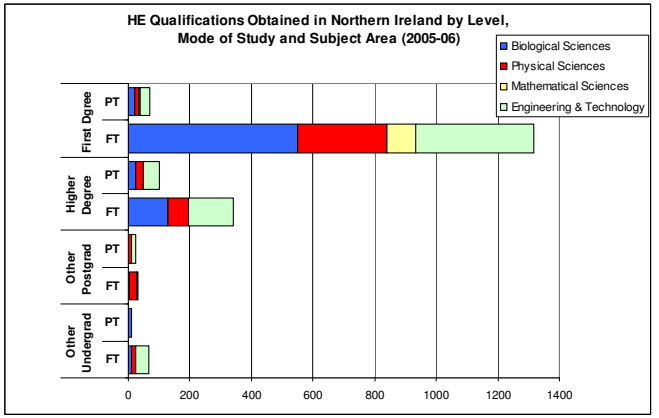
3.4.5 HE Qualifications Obtained in Northern Ireland by Level, Mode of Study and Subject Area (2005-06)

Again, data was extracted from HESA, detailing the HE qualifications gained by level of study, mode of study (full and part time) and by subject group. Data was not available by STEM subjects of interest to Cogent.

Across all subject groups, the largest proportion of qualifications gained were **Full Time First Degrees (1,315).**
The most popular subject group was **Biological Sciences** (**747** qualifications awarded in total), followed by **Engineering and Technology** (**665** qualifications awarded in total).

Table 12: Science & Engineering Subjects by level and mode of study, 2005-06

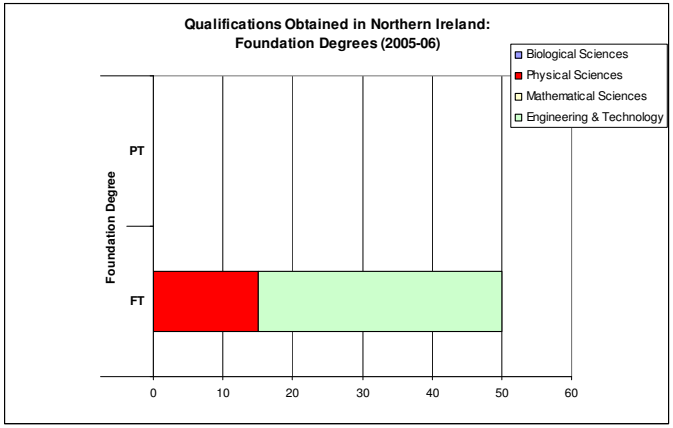
	First Degree		Higher Degree		Other Postgrad		Other Undergrad	
	FT	PT	FT	PT	FT	PT	FT	PT
Biological Sciences	550	20	130	25	5	0	10	10
Physical Sciences	290	15	65	25	25	10	15	0
Mathematical Sciences	95	5	0	0	0	0	0	0
Engineering & Technology	380	30	145	50	5	15	40	0
	1,315	***70***	***340***	***100***	***35***	***25***	***65***	***10***



Source: HESA, Table 14d (2007)

3.4.6 Qualifications Obtained in Northern Ireland: Foundation Degrees

Below are the Foundation Degrees obtained in Northern Ireland HEIs by mode of study and subject group. Again, data was not available by STEM subjects of interest to Cogent.



Source: HESA, Table 14d (2007)

Table 13: Science & Engineering Foundation Degrees by Mode, 2005-06

	Foundation Degree	
	FT	PT
Biological Sciences	0	0
Physical Sciences	15	0
Mathematical Sciences	0	0
Engineering & Technology	35	0
	50	***0***

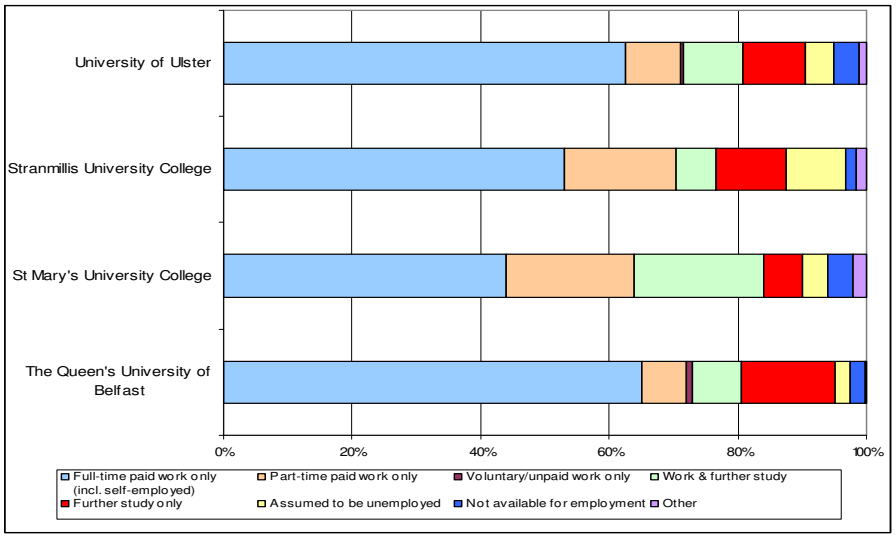
- Very small numbers of students obtaining Foundation Degrees were reported by HESA, with the largest numbers obtaining **Engineering & Technology** Foundation Degrees.
- Small numbers of Foundation Degrees obtained indicates a need for more workforce development in this area.

3.4.7 Graduate Destinations in Northern Ireland

Data was extracted from HESA, and draws on the Destination of Leavers from Higher Education Survey, which covers leavers from full and part time programmes and is limited to those of UK and other EU domicile[24]. The data extracted on graduate destinations in Northern Ireland was very sparse, which has highlighted a need for more in-depth intelligence. Ideally Cogent requires destinations data that can be broken down by gender, level of study, mode of study and Standard Industrial Classification and Standard Occupational Classification.

The figure below highlights graduate destinations from Northern Ireland Higher Education providers in the academic year; 2005-06. Please note, this data could not be broken down by subject group or subject area, therefore, the figure refers to all graduate destinations from all subjects of study.

Figure 29: Graduate Destinations from Northern Ireland HE Providers 2005-06[25]



Clearly, the largest proportion of graduates entered full time paid employment following graduation.

The smallest proportion of students entered voluntary/unpaid work following graduation.

Source: HESA (2007), Tables 8a – 8f.

[24] Data is based on a 74% return rate.
[25] Includes all awards: Postgraduate, First Degree and Undergraduate; and all modes: Full Time and Part Time courses

4. Gap Analysis

4.1 Future Sector Scenarios

The Cogent footprint brings together six distinct industries (and many identifiable sub-groups) which, as previously stated, all have a dependence on science, engineering and technology. It is the advances in these fields which will have an impact on the future shape, size and needs of the sector as a whole.

The possible futures for each of the three main industries within the Northern Ireland Cogent footprint cannot be easily described in a unified fashion, however the effect on the skills base and qualifications requirements are similar. Initial discussions with employers and currently available research show that the potential future shape of each industry can be described as follows:

Chemicals	• Serving those markets less open to competition, where the cost of transportation would preclude sourcing from abroad. • Continuous improvement in design and innovation of new products, followed through to ensuring the processing and production costs are minimised (workforce skills interventions)
Polymer	• Serving those markets less open to competition, where the cost of transportation would preclude sourcing from abroad. • continuous improvement in design and innovation of new products, followed through to ensuring the processing and production costs are minimised (workforce skills interventions)
Petroleum	• Continuation of current processing regime – Including continued changes and refinements to current products • Change in product line (processing of heavier crudes) whilst keeping pace with environmental legislation, i.e. zero sulphur fuel.

In recent years, there has been a trend amongst manufacturing companies to transfer some operations to countries where materials and labour are less costly than in the UK. Labour costs are a significant part of the overall cost of the goods produced, therefore it is currently economically preferable to manufacture in countries with a lower cost base.

The impact of future direction on the current workforce in all cases requires a higher level of awareness of the processes used, and the interventions required. In some (but not all) cases, the skills level of the entire employment base requires a step change – the numbers required at level 1 declining, a proportion of L2 moving up to L3, L3 to L4 etc. It is accepted that there will always be a requirement for a certain number of employees entering or remaining in the workforce at a basic level, however these are already in decline.

Overall, there has been a clear need articulated for technical skills, growing the population of technicians able to control, maintain and contribute to the improvement of processes and equipment, as well as engineers and scientists to innovate and design products and processes.

The following tables demonstrate short, medium and long term objectives in the Northern Ireland Cogent Sector across four key strategic areas; productivity of existing workforce, attraction, supply and age profile, innovation and management and leadership..

Priorities in the Chemical and Pharmaceuticals Industry

Key strategic skill issues to be addressed in the short, medium and longer term in order to enhance sector competitiveness.				
		Short Term	**Medium Term**	**Long Term**
Chemicals	Productivity of existing workforce	**Performance Improvement:** Employers reporting greater issue with skill gaps than skill shortages (particularly in SMEs). Greatest issue among Process / Machine Operatives. Also a need for Technical / Operational workers currently operating at level 2 to up-skill to level 3 with a focus upon: o Knowledge & understanding of EHS legislation o Awareness of how personal and team behaviour can positively impact upon EHS performance o Improving performance through building team working skills and associated leadership skills o Cross skilling Operators to undertake first line maintenance – specific areas for improvement in fault diagnosis, problem solving, decision making o Basic and specialist IT applications to meet requirements of new technologies implemented	**Performance Improvement:** Continuing to tackle skill gaps and transition of a proportion of level 2 Technical / Operational workers towards level 3 to meet demands of more complex process technologies and changing product lines: o Basic chemistry for understanding processes, rapid/lean manufacture & changeover of product lines o Rapid manufacture techniques o Behavioural aspects of job roles in rapid/lean manufacturing processes including attention to detail, and concern for standards	
	Attraction, supply & age profile	**Workforce Demand:** o Retention of current workforce **Recruitment Focussed upon:** o Apprenticeships & graduates o Industry experienced personnel, local community o Upskilling/career progression for existing workforce **Skills Issues Faced:** o Difficult to attract skilled/qualified staff into operator/technician roles o Applicants do not have required skills	**Workforce Demand:** o Overall reduction in industry employment however replacement demand still outstripping contraction demand **Recruitment Focussed upon:** o Areas of recruitment as short term **Issues Faced:** o Ensuring awareness of industry and career opportunities by young people, those in mid-career situations and influencers o Improving core / soft skills of graduates	**Workforce Demand:** o Estimated net workforce demand across whole Cogent sector (not just Chemicals) of approx. 24,000 people in process and machine operative roles over next 10 years **Issues Faced:** o Increase (or at least maintain) levels of young people studying maths, sciences, engineering and technical subjects at school, college and university

		o Lack of understanding about industry and type of work o Gender diversity of workforce and those studying industry related subjects dominated by males	and interdisciplinary understanding of engineering and sciences o Improving levels of females entering the industry – particularly in science, engineering and technical job roles	
	Innovation	**Operational Improvement:** o Expand customer base and product portfolio to improve international competitiveness ie move into higher value added speciality/fine chemicals & pharmaceuticals **Process & Quality Improvement:** o Improve business & manufacturing processes e.g. lean manufacturing, IPQ. Skills required in business improvement techniques o Meet customer requirements on time, on cost, meeting needs. Skill needs in customer care & team working **Product Improvement:** o R&D to develop domestic strengths into commercial opportunities to meet demands of growth	**Operational Improvement:** o Continued industry consolidation to reduce operating costs and improve profitability **Process & Quality Improvement:** o Improve process efficiency and product quality to reduce energy and materials demand o Scaling up of new and existing activities to enable commercial and responsive manufacture **Product Improvement:** o Integration of chemistry with other science and engineering disciplines & skill sets to improve innovative working o Focus on high value added product R&D and manufacture i.e. University spin-out	**Meeting Strategic Objectives including:** o Transform manufacturing process o Expand operations in Europe
	Management & Leadership	**Management & Leadership Improvement:** Areas for upskilling managers and leaders where gaps have been identified o Understanding legislative & regulatory requirements e.g. IPPC, COMAH etc and impact upon workforce activities and skills required o Process & Quality Improvement techniques to meet competitiveness drivers o Financial management skills (general & specific e.g. SAP, Sarbanes-Oxley US owned companies only) o Management Skills e.g. managing: change, performance, people development, projects etc o Foreign Language skills for international trade	**Management & Leadership Improvement:** Required to enable the workforce to achieve performance, product, process & quality improvement. o Continuation of short term areas identified o Development of innovative working practices to meet challenges o Skills related to lean manufacturing processes such as stream mapping and supply chain logistics o Legislative driven changes and identification of implications for skill requirements	**Management & Leadership Improvement:** o Critical in turning industry vision into a practical reality and achievement in the four strategic themes o Estimated net workforce demand across whole Cogent sector (not just Chemicals) of approximately 24,000 managers over next 10 years

Priorities in Polymer Industry

Key strategic skills issues to be addressed in the short, medium and longer term in order to enhance sector competitiveness.				
		Short Term	**Medium Term**	**Long Term**
Polymers	Productivity of existing workforce	**Performance Improvement:** Employers reporting greater issue with skill gaps than skill shortages (particularly in small-medium companies). Greatest issue among Process / Machine Operatives. Technical / Operational workers – required at level 2 with a proportion moving up to level 3: o Knowledge & understanding of EHS legislation o Improving performance through building team working skills and associated leadership skills o Basic and specialist IT applications to meet requirements of new technologies implemented o Basic skills – particularly numeracy required in quality and waste control by machine operators o Cross skilling Operators to undertake first line maintenance – specific areas for improvement in fault diagnosis, problem solving, decision making	**Performance Improvement:** Continuing to tackle skill gaps and transition of a proportion of level 2 Technical / Operational workers towards level 3 specifically in: o Technical skills to meet new product lines, processes and technologies o Continuation of multi-skilling e.g. first line maintenance for operators Development of a stronger NVQ Structure	
	Attraction, supply & age profile	**Workforce Demand:** o Expansion / new business cited by some companies – not as an overall industry trend o Pockets of high turnover in some areas o New technology investment changing skill demand **Recruitment Focussed upon:** o Industry experienced workers & agency workers o Internal promotions / upskilling existing workforce o Immigration from new EU member countries **Issues Faced:** o Overall poor industry image resulting in lack of applicants – particularly from young people	**Workforce Demand:** o Overall reduction in industry employment however replacement demand still outstripping contraction demand o Further investment required in apprenticeship programmes to meet growth requirements within this occupation **Recruitment Focussed upon:** o Areas of recruitment will continue in the medium term **Issues Faced:** o Ensuring awareness of industry and career opportunities by young people, those in mid-career situations and those who influence them	**Workforce Demand:** o Estimated net workforce demand across whole Cogent sector (not just Polymer industry) of approximately 24,000 people within the process and machine operatives group over next 10 years **Issues Faced:** o Increase (or at least maintain) levels of young people studying maths, sciences, engineering and technical subjects at school, college and university

		o Local labour markets supply not suitably skilled o Diversity of workforce and those studying industry related subjects dominated by white males	o Improving levels of females and ethnic minorities entering the industry – particularly in science, engineering and technical job roles	
	Innovation	**Operational Improvement:** o Maintain competitiveness, growth / expansion o Increase turnover and improve on productivity related targets **Process & Quality Improvement:** o Introduce modern manufacturing processes skills required in business improvement techniques o Environmental management – increasing skills of operators to reduce materials usage o Achieving efficiency targets through implementation of business improvement methods **Product Improvement:** o R&D to develop domestic strengths into commercial opportunities to meet demands of growth industries. Build links between innovation spin outs and commercial businesses o Diversification in product lines – flexibility and product knowledge development for operators	**Operational Improvement:** o Investment in new technology o Expansion into Europe **Process & Quality Improvement:** o Improve process efficiency and product quality to reduce energy and materials demand o Development of processes to meet demand for rapid delivery of bespoke / short-run high quality products **Product Improvement:** o Focus on high value added product R&D and manufacture i.e. University spin-out o Developing new uses for existing products for niche markets and domestic demand o Implementing outputs from R&D programmes e.g. Biopolymers, Smart Materials	**Meeting Strategic Objectives including:** o Recognition as a world leader o Transform manufacturing process o Expand operations in Europe o Expansion into Europe and other foreign markets o Rationalisation of sites
	Management & Leadership	**Management & Leadership Improvement:** Areas for upskilling managers and leaders where gaps have been identified o Business acumen to realise commercial opportunities and meet efficiency drivers for competitiveness o Effective management skills – people management, change management, personal development etc	**Management & Leadership Improvement:** Required to enable the workforce to achieve performance, product, process & quality improvement. o Continuation of areas identified in short term o Development of innovative working practices to meet challenges o Skills related to lean manufacturing processes such as stream mapping and supply chain logistics	**Management & Leadership Improvement:** o Critical in turning industry vision into practical reality and achievement of the four strategic themes o Estimated net workforce demand across whole Cogent sector (not just **Polymer**s) of approx. 24,000 mangers over the next 10 years

4.1.1 Employment Trends

For analysis of future skills needs this section utilises Working Futures 2 projection data which has been developed using various national data sources to examine trends over the next ten years within the Cogent sector. These sources allow trends to be identified within the employment levels and composition of the Cogent workforce – based on Standard Industrial Classification (SIC) codes. Unfortunately, the data is not available at a disaggregated level and individual industry projection data is not available at present in a comparable form.

It is important to note that the baseline employment data used in other sections of this report is different to that used for the projection analysis. This is due to different sources being available and also the way in which employment may be classified. Both sources are both valid and provide a consistent basis for analysis. This section concentrates on future skills needs and examines changes to employment levels and composition between 2004 and 2014. The percentage of the population who will be economically active in 2014 is projected to 77% of the population between the ages of 16 to 64. This is an increase of 1% from 2005, and the increase is projected to rise to a rate of over 78% by 2020. Estimates suggest that 75% of the current workforce will still be in employment by 2014.

Table 14 below shows the regional distribution of employment levels throughout the nine government regions of England, Scotland, Wales and Northern Ireland. The table presents employment level data from Working Futures 2 for 2004 and 2014, plus provides an overview of the net change, replacement demand and total requirement of employment in the same ten year time period. The data provided from Working Futures 2 is used to provide indicative information of trend and change.

Table 14: Regional distribution of workforce based on Working Future 2 projection data

000s	Working Futures 2 Cogent Employment Levels		Net Change	Replacement Demand	Total Requirement	% of Cogent Sector Employees
	2004	2014				
England	430	394	-36	146	107	83.7
East of England	46	37	-9	16	7	5.5
East Midlands	44	41	-3	15	12	9.4
London	27	25	-2	9	7	5.5
North East	29	27	-2	10	8	6.2
North West	90	75	-15	30	16	12.5
South East	70	72	2	24	26	20.3
South West	33	29	-4	11	7	5.5
West Midlands	47	44	-3	15	11	8.3
Yorkshire and Humberside	44	44	0	16	13	10.5
Wales	26	27	1	9	10	7.8
Scotland	49	49	-7	17	9	7
Northern Ireland	10	10	0	4	2	1.5

Source: Working Futures 2005 , IER/CE

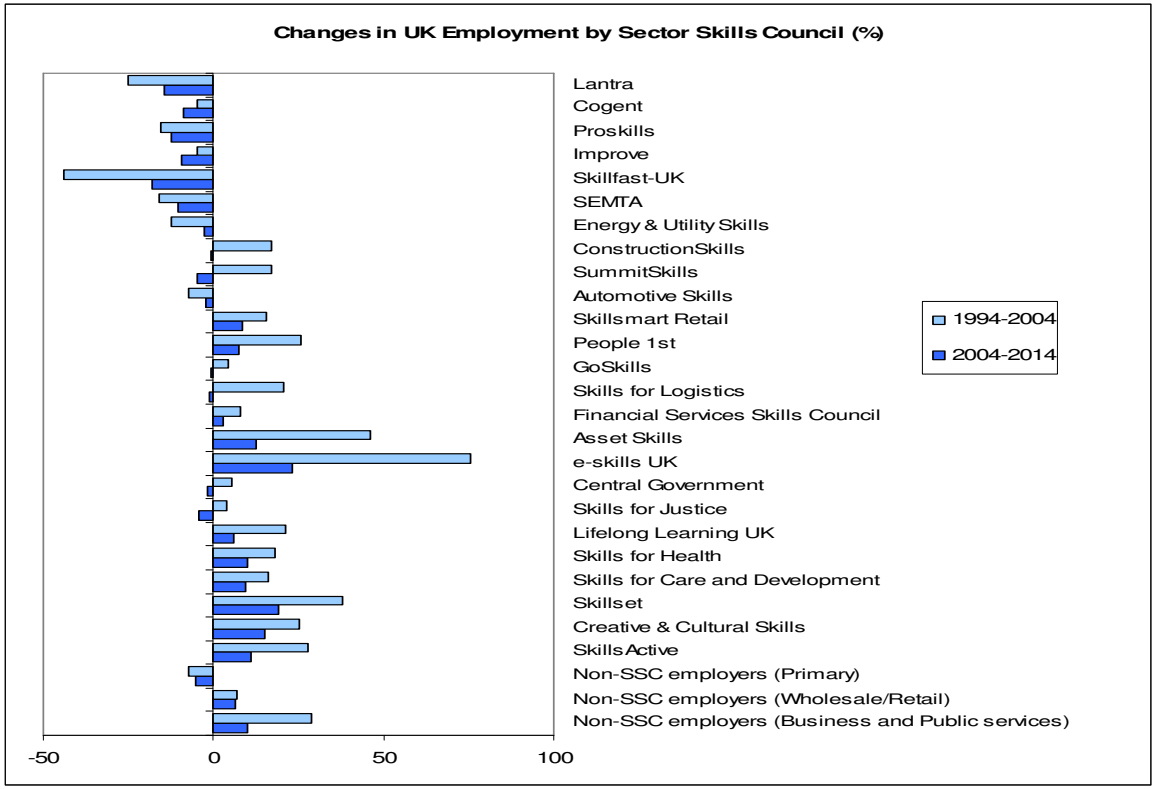
Over the next ten years the anticipated changes to the pattern of skill requirement and skills usage in the UK will depend on many aspects including, changes within the individual industries with regards to research and development and innovation amongst others. An important aspect to consider is the projected growth or decline of the Cogent sector and also to compare these changes with the entire UK economy and the other SSC's that are in operation. The UK workforce is also

subject to occupational mobility and the affects of replacement demand, which includes retirements within the workforce. The Northern Ireland workforce is however expected to remain static to 2014. This is a overall sectoral view and may disguise changes to individual industries.

Figure 29 illustrates Cogent's position compared to other sectors within the UK. The table looks at the changes in employment levels between 1994 and 2004 and also the projected change between 2004 and 2014. The table demonstrates that Cogent suffered a decline between 1994 and 2004; however the sector is predicted to decline at a faster rate between 2004 and 2014.

When compared to other sectors in the UK, Cogent is one of 14 sectors predicted to decline over the next 10 years. Comparing Cogent with other engineering sectors illustrates that Cogent is predicted to decline at a higher percentage rate than Energy and Utility Skills but a slightly lower rate than SEMTA. Within the UK economy the service sectors are predicted to sustain growth between 2004 and 2014 and the engineering and manufacturing sectors are predicted to continue declining.

Figure 30: Percentage changes of employment levels in SSCs



Source: Working Futures 2005 , IER/CE

4.1.2 Industry direction

Anticipated changes to pattern of skills requirements and skills usage
The anticipated changes across the Cogent sector are varied. Each industry has different areas of growth and decline. Below is a brief description of the industry and the main headline issues in the next ten years.

Chemicals and Pharmaceuticals – the industries are looking to increase capacity within the higher value added products and the R & D areas in the medium and long term. The largest changes are expected to be in the Process Operations, apprenticeships and professional positions.
The vast majority of companies are expecting all occupational roles, in the main, to stabilise.
Polymers – within the polymer industry those companies who prosper will be lean and efficient in both manufacturing and administration, innovative with both design and materials and will ally themselves to winning markets, customers and products. Also in the UK market locally produced products will be small quantity and higher quality with high volume to price ratio.

The UK is also forecast to develop unique products or materials and be technically superior with its production. Growing markets within the polymer industry over the next ten years include:
- Automotive industry for products with high shipping costs
- Aviation industry – low volume with high technology
- Medical
- Food and consumable packaging
- Construction
- Composite markets
- Recycling

Petroleum - The **distribution** network extends beyond the pipeline infrastructure, with purpose-built vehicles of up to 44 tonnes capable of carrying 42,000 litres delivering a variety of fuel products to the end customer. This can be at forecourts (petrol and diesel), or at larger industrial users' premises, at agricultural businesses (diesel) and private homes (domestic heating oil). The type of vehicle used is dictated by the size and location of the end customer, however all vehicles must comply with the appropriate legislation, such as The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 20041 (the Carriage Regulations) applying to the carriage of dangerous goods by road and rail. They place general duties on everyone with a role in the carriage of dangerous goods, and specific duties on those in the transport chain, ie consignors, carriers, loaders, packers, etc. The Carriage Regulations refer to the European Agreement concerning the International Carriage of Dangerous Goods by Road 20032 (ADR 2003).

One issue, not directly related to skills, but with Health and Safety implications, is the level of smuggling of fuel between the North and the South of Ireland. A group of employers (the Legitimate Oil Pressure Group) has been set up to highlight the problem. This group has emphasised the need to raise awareness of the dangers associated with "cheap" fuel. The National Audit Office has investigated the scale of the problem, revealing that 60% of retailers are selling smuggled fuel. This raises issues of both loading and offloading practices, compliance with legislation related to tachographs, etc

Finally, **retail sale at forecourts** brings petroleum to the general public. There are now less than 10,000 petrol stations, with the speed of decline accelerating over the past few years. Employment numbers are still in excess 7,000 with approximately 30% being part-time workers. The market is now changing to high volume and low margin, with new forecourts being larger, and usually attached to a retail outlet of one of the major supermarket chains. UKPIA reports that there are now 13 "significant players" in the retail fuels market.

Forecourts are not only changing in size – the product mix has also shifted towards growth in sales of diesel in preference to petrol for the first time. This trend is expected to continue into the future. The main skills issues for retail staff on forecourts relate to (other than customer service and retailing skills):

- accepting delivery of fuels
- wet stock reconciliation
- dealing with spillages and minor incidents
- emergency response.

The introduction of legislation on Phase 2 vapour recovery, and its implications for larger (over 3.5m litres) petrol stations has yet to impact, however retailers are already considering the actions required to install and operate equipment.

4.2 Changes to skills requirements and usage

4.2.1 The future workforce

Possible Future Direction of Development	Skills Implications and Needs
Service Focus: outsource core manufacturing; retain key value added components of the business e.g. R&D, design, marketing and customer service; retain capacity for making small, pre-production runs of products. Firm would be agile, knowledge-based and capable of managing manufacturing remotely.	• Strengthening skills in non-manufacturing areas of the business, such as design and innovation, project management, e-commerce, and marketing. • Abilities to work collaboratively through licensing, setting up joint ventures, and managing acquisitions
Manufacturing Focus: Build on the expertise and excellence in a manufacturing process, and improve on its current performance – raise utilisation, reduce waste and scrap, increase automation, improve process efficiency and productivity	• Skills for automation and development of manufacturing systems • adopt and perfect skills for lean manufacturing, turnaround and changeover times • adopt and sustain operations in line with international quality marks • observation, analysis and improvement skills
Local Focus: serve local markets and ensure flexibility of response, quality and convenience e.g. to the food industry	• High level of customer focus skills (service and quality) • ability to adapt capabilities to meet local customer demands
Global Focus: build on current breadth of knowledge and expertise and seek export markets	• Skills and capabilities to develop export markets • entering into collaborations and even consortia bids for large volumes of technically demanding work • marketing and networking capability and skills

The following issues have emerged from the most recent surveys[26] and analysis:

- *Recent layoffs in the industry* - most companies are taking advantage of this to create a temporary supply of well- qualified and experienced staff - and this is masking the underlying demand for skills.
- *Widespread use of Eastern European talent* - has moved from temporary to permanent solution in some firms with up to 15 percent of production staff being drawn from Northern Ireland sources- - again this is masking the underlying lack of skills and the ability to recruit people into the industry
- *Concern over the supply of technical skills, and the reducing pool of talent across the whole of Ireland*, and with the closure of the Polymer Development Centre (Athlone).
- *Greater flexibility in the business environment with growing complexity and variation in product design and manufacture* - is driving the need for a higher skilled workforce, with a higher technical skills base being required in most roles.
- *Difficult to fill vacancies* - are mainly in: tool making and machine setting; engineering; sales and marketing personnel – impacting 25% of businesses.
- *The excellent skills pools at PPRC, QUB* – This provides high quality support in higher technical skills development.

4.3 Career Pathways

4.3.1 Routes into the industry

Although achievement of a level 2 qualification e.g. 5 GCSEs at grades A to C, is broadly acknowledged as an entry requirement to the sector, employers have reported that attainment of this still leaves applicants lacking in some of the skills expected of those who enter the industries. There has been a particular decline in the number of applicants with practical or 'hands on' skills, which are highly valued by employers – this may be due to health and safety regulations. There is a need for some form of vocational element to be built into school level qualifications.

Entry from further and higher education - The range of opportunities available within some areas of education is narrow, with the decline in sector specific HNC and HND offerings (Northern Ireland having one HNC and one HND) being most noted by employers. The opposite picture has emerged for undergraduate opportunities in chemistry and related subjects (around 400 Bachelor degrees throughout the UK). A trend towards "Chemistry with…" degrees has led to confusion among employers as to graduate skills and knowledge, with relevance to industry. There is no common standard of chemistry-related content recognised across the spectrum (employers don't know what they are getting). The increase in the number of offerings has not been matched by an expansion in student numbers – fewer students (in relation to overall student numbers) are studying an expanded number of courses. These graduates are in demand outside of the chemical and pharmaceutical industries, for example in the banking sector, further reducing the recruitment pool.

There is need to establish a common understanding on employer expectations, and to reflect this in vocational elements of further and higher education provision. There is no clear vocational pathway to attract students as a valued alternative to the higher education pathway.

The decline in engineering student numbers, in relation to overall student numbers is also of concern. There are already skills shortages in this area, and any continuation of this decline will affect the ability of the industries to continue the existing levels of productivity improvement. The STEM subjects of importance to the Cogent footprint are also the building blocks of the polymer industry – there are a number of opportunities for direct entry into the workforce (process and elementary operations), which also benefit from a basic grounding in science related subjects. Northern Ireland is served by Queens University, which offers four courses - Bio Fluid Mechanics and Polymer Processign Flows (Mphil or PhD), Chemical with Polymer Engineering (MEng Hon), Polymer Engineering (PgDip or MSc) and Polymer

[26] A Competitiveness Analysis of the Polymer and Plastics Industry on the Island of Ireland, Report for Inter Trade Ireland by Segal Quince Wickstead. November 2005.

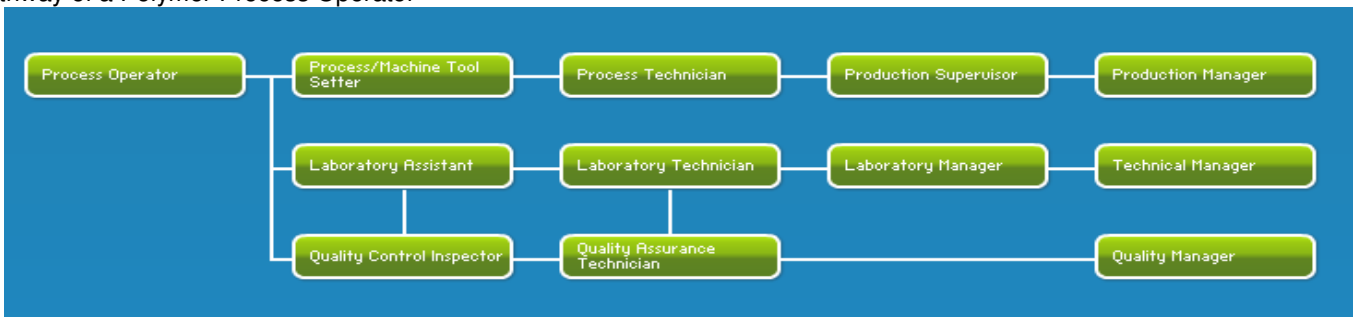
Processing (Mphil or PhD). The courses offered by Queens University are a good example of best practice as the university works closely with industry to ensure the content and delivery of the subjects are both relevant and valued by employers.

Polymer Industry Job Roles

The table below shows the variety of job roles available in the Polymer industry, working from level 1 roles on the left to level 4 and 5 job roles on the right. Within the industry there are many routes once in the industry. Figure 32. Illustrates a potential pathway from process operator through the Polymer industry.

Figure 31. Polymer Industry Job Roles

Figure 32. Career Pathway of a Polymer Process Operator



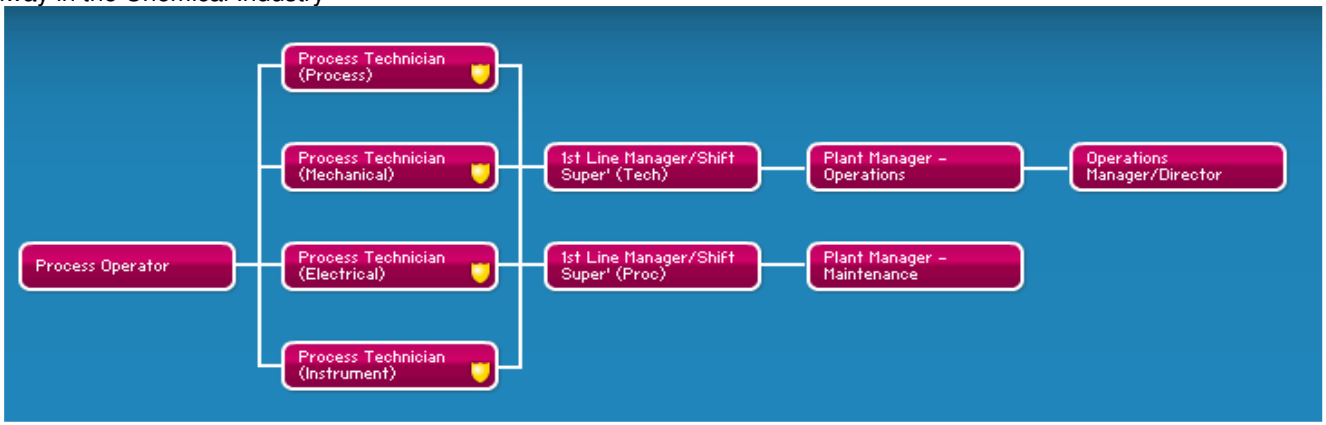
Chemical Industry Job Roles

The table below again shows examples of job roles, this time within the Chemicals industry. The table below also shows the current roles that have been developed to Gold Standard. This standard is an inspirational standard and through www.cogent-careerpathways.com the standard can be viewed.

Figure 33. Chemical Industry Job Roles

Figure 34.shows a typical career pathway for the Chemicals industry again from the entry point of Process Operator.

Figure 34. Career Pathway in the Chemical Industry



Pharmaceutical Job Roles

The table below illustrates the job roles within the Pharmaceuticals industry. The roles again show possible entry points on the left hand side and progression through different job roles in the industry.

Figure 35. Job Roles in the Pharmaceuticals Industry

The pathway shows a typical progression for a Laboratory analyst within the Cogent sector working for a Pharmaceuticals company.

Figure 36. Career Pathway in the Pharmaceutical Industry

4.4 Workforce development

Chemicals and Pharmaceuticals

A range of vocational qualifications have been designed in conjunction with industry, based on National Occupational Standards. Uptake of these in some cases has been extremely low (less than 10 candidates per year), raising questions concerning employer buy-in. In the longer term, this will affect Cogent's ability to update and refresh the related standards, and to ensure that the qualifications remain in the national frameworks. Greater employer commitment to participating in the initial design or incremental review of standards would ensure their applicability to a broader range of employees, and therefore increase the number of potential candidates for each resulting qualification.

The alternative accessible qualifications (such as HNCs) are reported to be valued by industry, however this is not reflected in uptake (for example, entry to HNCs in Chemical, Process and Energy Engineering has declined from an already low level of 15 per annum in 2002/03 to 10 in 2004/05). Foundation degrees, which can be a factor in decline of HNC and HND numbers, have not been accessed as a method of up-skilling employees – only three industry-specific Foundation degrees have been developed, with entry numbers similar to those of the HNCs and HNDs. The Foundation Degrees delivered out with industry (i.e. in colleges, with work-related element such as Fd Sc Chemistry) have higher entry rates, but have attrition levels of in the worst case, 80%.

Employer engagement in the design and delivery of foundation degrees presents an opportunity to have in place qualifications reflecting the reported need to up-skill employees to meet advances in technology. This is equally true of vocational qualifications, and the standards on which they are based.

Development and progression within industries also achieved through employers accessing private training provision. Employers value this type of provision because of the flexibility in delivery methods and their ability to tailor courses to suit their exact needs. However, there are large number of providers and courses on offer for each of the industries. This can make the selection of appropriate training difficult as there are currently no quality standards attached to this type of provision. There is also no system currently in place that standardises achievement of a private training course across the sector, in terms of the ability and competence of the employee following completion.

Polymer

The training opportunities in place for the existing workforce are a confused landscape. A number of providers have withdrawn from the market due to economic viability of courses. The NVQ/SVQ provision, (specifically Polymer Processing and Related Operations, which is available at levels 1, 2 and 3) is supported by a limited number of employers when compared to the number of employees requiring skills at these levels. Provision itself does not appear to be the issue – it is well supported In addition, the industry in NI in partnership with Cogent and Soth Eastern Regional College have developed a new Polymer apprenticeship which is due to commence delivery in September 2008.

There are also training opportunities for professional development, for example through the Institute of Polymer Technology and Materials Engineering based at Loughborough University. These include

- Plastics Processing
- Properties & Applications
- Rubber Mixing and Processing
- Materials Selection
- Automotive Materials
- Overview of Packaging Materials
- Characterisation of Polymers Science and Technology of PVC
- Adhesive Bonding
- Successful Management Practice.

4.4.1 Training

Employers in the survey were not consistently business planning, with 42% of respondents saying that a business plan setting objectives for the next 12 months did not exist. In addition 46% of employers did not have any formal training plan. Further evidence of training not being a priority is that 74% of Northern Ireland employers questioned did not have a training budget.

57% of companies were not evaluating staff skills gaps and 57% of companies did not conduct annual performance reviews.

51% of companies had not funded or arranged off-the-job training in the last 12 months. The majority of training was provided for managers 67%. The average time spent on off-the-job training was three to four days. Chemical and Pharmaceutical employers and Polymer employers were more likely to spread training provision through out occupations, whereas the petroleum was more likely to concentrate on management roles. This however, may be due to the size of organisation as Petroleum employers tend to be the smaller employers and will often have working and fully operational management staff.

62% of employers had not conducted informal or on-the-job training. Where on-the-job training was conducted the focus was on Management and Skilled Trade occupations. One third of on-the-job training was devoted to Health and Safety training.

Employers were asked about qualifications they had funded or arranged for staff over the last 12 months, 65% of employers had not funded or arranged for training relating to qualifications. 80% of employers also stated that they had no staff working towards NVQ qualifications.

4.5 Filling the Gaps

From the analysis in this document it is evident that there are key skill gaps and issues to be tackled. For phases 4 and 5 of the Sector Skills Agreement Cogent will take forward the issues and potential interventions below and gain agreement from employers and stakeholders alike to gain agreement and to formulate the Northern Ireland Action Plan

4.5.1 Potential Interventions

From the work undertaken during the Northern Ireland Sector Skills Agreement Phases 1 -3 process, Cogent has identified five key issues affecting the Chemical, Pharmaceutical, Petroleum and Polymers industries. The issues and potential interventions are listed below for consideration.

Issue	Potential Intervention
Cogent industries have poor image and understanding of the range of potential career opportunities is low. The industry fails to attract women and minorities, seriously limiting the pool from which it recruits current and future employees.	Develop a 'One Stop Shop' web-based careers information and guidance centre. This will include career pathways, individual job profiles, as well as case studies and film of role models. It will be targeted at students, teachers, careers advisors, people in other industries considering career changes and employers and it will provide clear easily accessible information to allow people to make an informed choice.
The sector reports skills gaps above the UK average and the continuous evolution of the Cogent industries challenges its employees to embark upon learning as a life long process. In addition, the Cogent industries report that their knowledge and understanding of how to access available provision is weak	Develop a clearly defined product and methodology that allows existing employees skills to be recognised and offers a simple modular approach to continuous learning and development with accreditation against national standards.
There are insufficient technicians entering the industries within the sector to meet forecast demand and the routes for existing employees to become technicians are poorly defined	Review and develop the Cogent Apprenticeship framework and develop the 'best in class' approach to the management of the scheme to increase the number of apprentices and technicians entering the industry. The schemes objectives will include easy employer access for maximum employer engagement equally applicable to large and small organisations alike.
The hazardous nature of the industries within the Cogent footprint requires excellence in management practices. Such practices exist but there is no standard to facilitate benchmarking	Develop and implement a best practice competence assurance management system. This will be realised through the involvement and commitment of companies and partners.
The sector has expressed concerns regarding the standards and qualifications of the mobile workforce in the sector supply chain. There is also a lack of clear standards for contractors in a number of the Cogent industries	Review passports for contractors to establish where gaps exist within existing provision and put appropriate passport arrangements in place.

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Technical Annex and Methodology

Data Sources Explained:

Labour Force Survey

The *Labour Force Survey* (LFS) is a unique source of articulated information using international definitions of employment and unemployment and economic inactivity, together with a wide range of related topics such as occupation, training, hours of work and personal characteristics of household members aged 16 years and over. The first LFS was conducted in 1973, under the terms of a regulation derived from the Treaty of Rome, and the provision of information for the Statistical Office of the European Communities (SOEC), now known as Eurostat, continues to be one of the reasons for carrying out the survey. Eurostat co-ordinates information from labour force surveys in the European Union (EU) member states in order to assist the EU in such matters as the allocation of the Social Fund. The LFS was carried out biennially from 1973 to 1983, and was increasingly used during this time by British government departments to obtain information which would assist in the framing of social and economic policy. By 1983, the LFS was being used by the Employment Department to obtain information which was not available from other sources or was only available for Census years. Between 1984 and 1991 the survey was carried out annually and consisted of two elements:

Labour Force Survey Northern Ireland

The Labour Force Survey (LFS) is a quarterly sample survey carried out by interviewing people about their personal circumstances and work. It is the biggest regular household survey in Northern Ireland and provides a rich and vital source of information about the labour force using internationally agreed concepts and definitions. The LFS provides information on, · labour market structure · employment · unemployment · economic activity · groups within the labour market.

Annual Business Inquiry

The Annual Business Inquiry (ABI) is conducted in two parts: one dealing with employment, the other with financial information. The financial inquiry covers about two thirds of the UK economy including: production; construction; distribution and service industries; agriculture (part), hunting, forestry and fishing. The coverage of the employment inquiry is wider.

Northern Ireland Annual Business Inquiry

The Northern Ireland Annual Business Inquiry (NIABI) is an integrated survey that provides information on the value of the economic activity that businesses generate and associated expenditure across the main industrial sectors in Northern Ireland.

The NIABI provides a number of high level indicators of economic activity such as the total value of sales and work completed by businesses (Turnover), the value of the purchase of goods, materials and services, total employment costs, the value of taxes paid and expenditure on such areas as capital investment. The contribution of different industries to the overall value of economic activity can be assessed and because estimates of employment are collected at the same time it is also possible to get a measure of value added and costs per head to allow better comparison between different sized industrial sectors.

The NIABI is designed to provide the best estimates for Northern Ireland as well as providing information that is used at a later stage to inform UK National and Regional Accounts estimates.

The Annual Business Inquiry was reviewed by ONS in 2004. This covers the period 1998-2001 when NI data was processed as part of the ONS system. Since 2002, NI ABI data has been processed independently of ONS by DETI, this system was due for review in 2007 or as part of the implementation of the findings of the Allsopp Review in Northern Ireland.

Census of Employment

The Northern Ireland Census of Employment, carried out every two years by the Northern Ireland Department of Enterprise Trade and Investment (NIDETI), concerns the labour market in Northern Ireland. Under the Statistics of Trade and Employment (NI) Order 1988, the Census is a full count of the number of employee jobs in all industries except agriculture. Data are available by sex, full or part-time working patterns, industrial activity, and by travel-to-work areas, district council areas and ward. Longitudinal analyses are available from 1971. A Census was carried out annually until 1978; however to reduce costs and the form-filling burden on businesses, it now takes place every two years.

The Skills Gap Methodology (Page 32)

To produce the skills gap diagram the Labour Force Survey (LFS) has been used. The diagram uses two variables from the survey as proxy measures for the 'Skills Level of Employee and the 'Skills Level of Job'. These measures are used to provide an illustration of the skills gap within the industry or country being analysed. The data needs to be used with caution and there are many aspects to be considered when deriving analysis. The competence of an employee will not be represented in this data. It is only formal, accredited qualifications that are recognised within the data. An employee's competence level may be higher than their formal qualifications.

The two variables used from the LFS are:

Level of Highest Qualification Held – Skills Level of Employee

LFS Variable Description	**Skills Gap Diagram Level**
NVQ Level 4 and above	Level 4 and above
NVQ Level 3	Level 3
Trade Apprenticeships	
NVQ Level 2	Level 2
Below NVQ Level 2	Level 1 and below
Other qualifications	NOT USED
No qualifications	Level 1 and below

Major Occupation Group (Main Job) – Skills Level of Job

LFS Variable Description	Skills Gap Diagram Level
Managers and Senior Officials	Level 4 and above
Professional occupations	
Associate Professional and Technical	Level 3
Administrative and Secretarial	
Skilled Trades Occupations	
Personal Service Occupations	
Sales and Customer Service Occupations	Level 2
Process, Plant and Machine Operatives	
Elementary Occupations	Level 1 and below

Appendix 1: National Vocational Qualification (NVQ) Enrolments: Science and Engineering Subjects

NVQ Level 1 (& Equivalent) Enrolments:

Subject	2005-06	2004-05	2003-04
General Engineering	103	209	66
Integrated Engineering	-	-	14
Electrical & Electronic Engineering	-	4	6
Mechanical Engineering	81	398	105
Mechanical/Electromechanical Engineering	13	7	9
Others in Mechanical Engineering	3	-	31
Electrical Engineering	57	39	47
Others in Electrical Engineering	18	22	41
Mechanical Engineering & Maintenance	32	63	32
Others in Production Engineering	16	22	9
Other Engineering	80	6	-
	403	***770***	***360***

Source: DELNI (2007

NVQ Level 2 (& Equivalent) Enrolments:

Subject	2005-06	2004-05	2003-04
Applied Science	27	-	-
General Engineering	226	271	411
Integrated Engineering	453	469	456
Mechanical Engineering	89	68	59
Mechanical/Electromechanical Engineering	84	62	59
Mechanical/Production Engineering	4	-	1
Others in Mechanical Engineering	93	173	160
Electrical Engineering	175	229	191
Electrical & Electronic Engineering	157	219	203
Others in Electrical Engineering	20	-	2
Electronic Engineering/Electronics	-	17	67
Engineering Design & Manufacture	84	-	32
Manufacture Engineering	31	57	57
Mechanical Engineering & Maintenance	135	128	36
Production Engineering	-	10	-
Other Engineering	-	7	-
	1,578	***1,710***	***1,734***

Source: DELNI (2007)

NVQ Level 3 (& Equivalent) Enrolments:

Subject	2005-06	2004-05	2003-04
Chemistry	11	-	-
Process Plant Operation	11	15	14
Others in Chemistry	394	329	290
Physical Sciences	18	-	-
Applied Science	48	-	-
Others in Other Physical Sciences	48	-	-
General Engineering	236	207	251
Integrated Engineering	158	154	233
Others in General Engineering	54	60	49
Mechanical Engineering	225	249	254
Mechanical/Electromechanical Engineering	31	50	66
Mechanical/Production Engineering	17	11	2
Others in Mechanical Engineering	12	6	27
Electrical & Electronic Engineering	153	242	338
Others in Electrical Engineering	360	327	332
Others in Electronic Engineering	58	34	35
Electronic Engineering/Electronics	29	23	5
Engineering Design & Manufacture	49	-	-
Manufacturing Engineering	57	62	55
Engineering Production	-	-	2
Mechanical Engineering & Maintenance	16	28	36
Other Engineering	33	4	-
	2,018	***1,801***	***1,989***

Source: DELNI (2007)

NVQ Level 4 (& Equivalent) Enrolments:

Subject	2005-06	2004-05	2003-04
Mathematics	1	-	-
General Engineering	1	-	-
Electrical & Electronic Engineering	6	25	24
	8	***25***	***24***

Source: DELNI (2007)

NVQ Level 5 (& Equivalent) Enrolments:

Subject	2005-06	2004-05	2003-04
Electronic Engineering/Electronics	11	-	-
Other Engineering	6	-	-
	17	***-***	***-***

Source: DELNI (2007)

Appendix 2: National Vocational Qualification (NVQ) Achievements: Science and Engineering Subjects, 2005-06

NVQ Level 1 (& Equivalent) 2005-06 Achievements:

Subject	Final Year Completers	Number of Passes
General Engineering	30	12
Integrated Engineering	-	-
Electrical & Electronic Engineering	-	-
Mechanical Engineering	23	8
Mechanical/Electromechanical Engineering	1	1
Others in Mechanical Engineering	3	3
Electrical Engineering	28	8
Others in Electrical Engineering	18	16
Mechanical Engineering & Maintenance	32	15
Others in Production Engineering	16	16
Other Engineering	79	76
	230	***155***

Source: DELNI (2007)

NVQ Level 2 (& Equivalent) 2005-06 Achievements:

Subject	Final Year Completers	Number of Passes
Applied Science	22	20
General Engineering	146	121
Integrated Engineering	347	232
Mechanical Engineering	53	34
Mechanical/Electromechanical Engineering	32	28
Mechanical/Production Engineering	-	-
Others in Mechanical Engineering	66	36
Electrical Engineering	112	67
Electrical & Electronic Engineering	95	59
Others in Electrical Engineering	19	19
Electronic Engineering/Electronics	2	1
Engineering Design & Manufacture	35	25
Manufacturing Engineering	16	13
Mechanical Engineering & Maintenance	135	129
Others in Production Engineering	5	5
Other Engineering	28	21
	1,113	***810***

Source: DELNI (2007)

NVQ Level 3 (& Equivalent) 2005-06 Achievements:

Subject	Final Year Completers	Number of Passes
Chemistry	11	-
Process Plant Operation	11	5
Others in Chemistry	394	200
Physical Sciences	18	18
Applied Science	32	9
Others in Other Physical Sciences	48	-
General Engineering	105	88
Integrated Engineering	141	72
Others in General Engineering	10	2
Mechanical Engineering	101	80
Mechanical/Electromechanical Engineering	24	8
Mechanical/Production Engineering	8	4
Others in Mechanical Engineering	12	4
Electrical & Electronic Engineering	71	47
Others in Electrical Engineering	217	161
Electronic Engineering/Electronics	29	11
Others in Electronic Engineering	36	17
Engineering Design & Manufacture	4	4
Manufacturing Engineering	30	14
Engineering Production	-	-
Mechanical Engineering & Maintenance	3	-
Other Engineering	13	-
	1,318	***744***

Source: DELNI (2007)

NVQ Level 4 (& Equivalent) 2005-06 Achievements:

Subject	Final Year Completers	Number of Passes
Mathematics	1	1
General Engineering	1	1
Electrical & Electronic Engineering	-	-
	2	***2***

Source: DELNI (2007)

NVQ Level 5 (& Equivalent) 2005-06 Achievements:

No Data provided by DELNI (2007)

Appendix 3: Higher National Certificate and Higher National Diploma Enrolments: Science and Engineering Subjects

Higher National Certificate Enrolments:

Subject	2005-06	2004-05	2003-04
Biochemistry	-	8	2
Applied Science	1	1	-
General Engineering	12	23	33
Integrated Engineering	10	-	6
Mechanical Engineering	100	123	114
Electrical & Electronic Engineering	71	76	127
Electronic Engineering/Electronics	41	34	55
Engineering Design & Manufacture	15	-	-
Manufacturing Engineering	51	48	64
Plant/Process Engineering	10	15	14
	311	***328***	***415***

Source: DELNI (2007)

Higher National Diploma Enrolments:

Subject	2005-06	2004-05	2003-04
Biochemistry	-	-	-
Applied Science	37	32	36
General Engineering	34	74	60
Integrated Engineering	-	-	-
Mechanical Engineering	37	52	40
Electrical & Electronic Engineering	97	96	94
Electronic Engineering/Electronics	-	2	2
Engineering Design & Manufacture	47	-	-
Manufacturing Engineering	76	71	61
Plant/Process Engineering	-	7	8
	328	***334***	***301***

Source: DELNI (2007)

Appendix 4: Higher National Certificate and Higher National Diploma Achievements: Science and Engineering Subjects, 2005-06

Higher National Certificate Achievements 2005-06:

Subject	2005-06			
	Final Year Completers	Retention Rates (%)	Number of Passes	Achievement Rates (%)
Biochemistry	-	-	-	-
Applied Science	-	-	-	-
General Engineering	2	67	2	100
Integrated Engineering	10	100	10	100
Mechanical Engineering	44	94	31	70
Electrical & Electronic Engineering	26	90	21	81
Electronic Engineering/Electronics	21	100	18	86
Engineering Design & Manufacture	7	88	7	100
Manufacturing Engineering	18	95	5	28
Plant/Process Engineering	9	90	4	44
	137	**-**	***98***	**-**

Source: DELNI (2007)

Higher National Diploma Achievements 2005-06:

Subject	2005-06			
	Final Year Completers	Retention Rates (%)	Number of Passes	Achievement Rates (%)
Biochemistry	-	-	-	-
Applied Science	17	100	11	65
General Engineering	15	94	15	100
Integrated Engineering	-	-	-	-
Mechanical Engineering	8	89	8	100
Electrical & Electronic Engineering	25	100	19	76
Electronic Engineering/Electronics	-	-	-	-
Engineering Design & Manufacture	28	93	27	96
Manufacturing Engineering	56	93	24	43
Plant/Process Engineering	-	-	-	-
	149	**-**	***104***	**-**

Source: DELNI (2007)

Appendix 5: GCSE and A/AS Level Enrolments in the Northern Ireland Further Education Sector

GCSE Enrolments in Cogent subject areas in the Northern Ireland Further Education sector by Qualification route 2003-04 to 2005-06:

Subject	2005-06	2004-05	2003-04
Chemistry	22	21	24
Physics	19	16	14
Applied Science	-	50	42
Mathematics	3,176	2,895	2,833
General Engineering	19	15	-
Mechanical Engineering	13	-	-
	3,249	***2,997***	***2,913***

Source: DELNI (2007)

GCE A/AS Level Enrolments in Cogent subject areas in the Northern Ireland Further Education sector by Qualification route 2003-04 to 2005-06:

Subject	2005-06	2004-05	2003-04
Chemistry	363	452	343
Physics	189	158	170
Mathematics	378	404	346
Other Engineering	-	9	-
	930	***1,023***	***859***

Source: DELNI (2007)

Appendix 6: GCSE and A/AS Level Achievements in the Northern Ireland Further Education Sector, 2005-06

GCSE Achievements in Cogent subject areas in the Northern Ireland Further Education sector by Qualification route 2005-06:

Subject	2005-06			
	Final Year Completers	Retention Rates (%)	Number of Passes	Achievement Rates (%)
Chemistry	19	86	4	21
Physics	8	42	5	63
Applied Science	-	-	-	-
Mathematics	2,378	79	815	34
General Engineering	19	100	8	42
Mechanical Engineering	13	100	2	15
	2,437	**-**	***834***	**-**

Source: DELNI (2007)

GCE A/AS Level Achievements in Cogent subject areas in the Northern Ireland Further Education sector by Qualification route 2005-06:

Subject	2005-06			
	Final Year Completers	Retention Rates (%)	Number of Passes	Achievement Rates (%)
Chemistry	283	87	135	48
Physics	130	78	54	42
Mathematics	279	84	102	37
Other Engineering	31	100	3	10
	723	**-**	***294***	**-**

Source: DELNI (2007)

Appendix 7: GNVQ Enrolments in the Northern Ireland Further Education Sector

GNVQ Intermediate Enrolments in the Northern Ireland Further Education sector:

Subject	2005-06	2004-05	2003-04
General Engineering	1	-	-
Other Engineering	-	16	11
	1	***16***	***11***

Source: DELNI (2007)

GNVQ Advanced Enrolments in the Northern Ireland Further Education sector:

Subject	2005-06	2004-05	2003-04
Chemical Technicians	-	13	-
General Engineering	22	49	53
Engineering Design & Manufacture	68	18	29
Mechanical Engineering	-	82	103
Others in Electrical Engineering	-	6	-
Other Engineering	-	10	36
Others in General Engineering	-	-	23
	90	***178***	***244***

Source: DELNI (2007)

Appendix 8: GNVQ Achievements in the Northern Ireland Further Education Sector, 2005-06

GNVQ Intermediate Achievements in the Northern Ireland Further Education sector, 2005-06:

Subject	Final Year Completers	Number of Passes
General Engineering	1	-
Other Engineering	-	-
	1	***-***

Source: DELNI (2007)

GNVQ Advanced Achievements in the Northern Ireland Further Education sector, 2005-06:

Subject	Final Year Completers	Number of Passes
Chemical Technicians	-	-
General Engineering	17	11
Engineering Design & Maintenance	56	21
Mechanical Engineering	-	-
Others in Electrical Engineering	-	-
Other Engineering	-	-
Others in General Engineering	-	-
	73	***32***

Source: DELNI (2007)

Appendix 9: Undergraduate and Postgraduate Programmes available in Northern Ireland

Undergraduate programmes

HE Institution	Programme Title	Duration of Programme
Queen's University Belfast	BSc Biochemistry	Three year full time degree
	BSc Biological Sciences	Three year full time degree
	BEng Chemical Engineering	Three year full time degree
	BEng Chemical Engineering (Sandwich)	Four year sandwich degree
	BSc Chemistry	Three year full time degree
	BSc Chemistry (Sandwich)	Four year sandwich degree
	BSc Chemistry with Extended Studies in Europe	Four year full time degree
	BSc Chemistry with Forensic Analysis	Three year full time degree
	BEng Civil Engineering	Three year full time degree
	BEng Civil Engineering (Sandwich)	Four year sandwich degree
	BEng Electrical & Electronic Engineering	Three year full time degree
	BEng Electrical & Electronic Engineering (Sandwich)	Four year sandwich degree
	BSc Environmental Biology	Three year full time degree
	BSc Genetics	Three year full time degree
	BSc Mathematics	Three year full time degree
	FdEng Mechanical Engineering	Two year full time degree
	BEng Mechanical Engineering	Three year full time degree
	BEng Mechanical Engineering (Sandwich)	Four year sandwich degree
	BSC Microbiology	Three year full time degree
	BSc Molecular Biology	Three year full time degree
	BSc Physics	Three year full time degree
University of Ulster	BSc Biology with Diploma in Industrial Studies (Sandwich)	Four year sandwich degree
	BSc Biology with Diploma in Area Studies (Sandwich)	Four year sandwich degree
	BEng Civil Engineering (Sandwich)	Four year sandwich degree
	BSc Civil Engineering	Four year sandwich degree
	BEng Engineering (Sandwich)	Four year sandwich degree
	BEng Electrical & Electronic Engineering (Sandwich)	Four year sandwich degree
	BEng Mechanical Engineering (Sandwich)	Four year sandwich degree
Stranmillis University College	BEd Mathematics & Science with Education	Four year full time degree
	BEd Science with Education	Four year full time degree
	BEd Technology and Design with Education	Four year full time degree

Postgraduate programmes

HE Institution	Programme Title	Duration of Programme
Queen's University Belfast	MEng Chemical Engineering	Four year full time degree
	MEng Chemical Engineering	Five year sandwich degree
	MSci Chemistry	Four year full time degree
	MEng Civil Engineering	Four year full time degree
	MEng Civil Engineering (Sandwich)	Five year sandwich degree
	MEng Electrical & Electronic Engineering	Four year full time degree
	MEng Electrical & Electronic Engineering (Sandwich)	Five year sandwich degree
	MEng Environmental and Civil Engineering	Four year full time degree
	MEng Environmental and Civil Engineering (Sandwich)	Five year sandwich degree
	MSci Mathematics	Four year full time degree
	MEng Mechanical and Manufacturing Engineering	Four year full time degree
	MEng Mechanical and Manufacturing Engineering (Sandwich)	Five year sandwich degree
	Postgraduate Diploma in Manufacturing Systems Engineering	9 Months
	MSci Physics	Four year full time degree
	MSc in Polymer Engineering	One year full time (2-3 year part-time)
	Postgraduate Diploma in Polymer Engineering	One year full time (2-3 year part-time)
	MSc Process Engineering	One year full time
	Postgraduate Diploma in Process Engineering	One year full time
University of Ulster	MSc Biotechnology	One year full time
	Postgraduate Diploma Biotechnology	Two years full time
	MEng Engineering (Sandwich)	Five year sandwich degree
	MEng Electrical & Electronic Engineering (Sandwich)	Five year sandwich degree
	MEng Mechanical Engineering (Sandwich)	Five year sandwich degree
	MSc Engineering: Electronics	One year full time/three years part time
	Postgraduate Diploma Engineering: Electronics	Two years part time
	MSc Manufacturing Management	One year full time/three years part time
	Postgraduate Diploma in Manufacturing Management	Two years part time
	MSc Micro and Nano Technology	One year full time/three years part time
	Postgraduate Diploma in Micro and Nano Technology	Two years part time
	MSc Polymers & Advanced Composites	One year full time/three years part time
	Postgraduate Diploma Polymers & Advanced Composites	Two years part time