Current and Future Demand for Skills in the Science Based Industries

cogent

Northern Ireland

Sector Skills Assessment

2011

Chemicals
Pharmaceuticals
Bioscience
Polymers
Petroleum
Oil & Gas
Nuclear

Delivering Skills for Science Based Industries

Contents

1. Prologue

*This Sector Skills Assessment for **Northern Ireland** is part of a suite of five covering the four nations, together with a main UK wide report reviewing the sector by industry. While each report has been designed to be self-contained and comprehensive in its own right, the complete assessment is formed from the five documents and should be viewed together.*

The year 2010 marked a change in government and the political drivers of the skills system. With a lower emphasis on skills intervention and a shift in philosophy to the choices of individuals and employers on skills, comes a conversely strong emphasis on high quality research that translates to the skills solutions, information, advice and guidance required to inform decisions; decisions that will be made by employers, employees and 'stakeholders' such as qualification awarding bodies, funding bodies, providers of education and training, and (not least) policy developers in government itself.

Nationally and globally the recession continues to dominate. Working through, as it has since 2008, from Banking to Manufacturing, the latest test to the economy will be in the contraction of the public sector over the next four years and the extent to which the private sector can grow to absorb capacity shed by the public sector. Skills for growth are therefore a strategic imperative.

The UK position of skills development in an evermore connected global economy remain as before. In this context, skills contributions to energy, clean water, food, health, a low carbon economy, sustainable development and advanced manufacturing bring both a social and a technological dimension to skills development. This places high importance on the supply and demand for skills in science (physical science and bioscience) and engineering, and the translation of research and innovation into solutions.

There is not a subsector of the Cogent footprint that is either untouched by or driven by this complex set of environmental drivers in play during 2010. This is illustrated in Table 1.0.1 for each of the sectors active in Northern Ireland.

Table 1.0.1 Strategic Contribution of Skills in Cogent Sectors in Northern Ireland

Sector	Strategic Position
Bioscience	R&D, health, low carbon, sustainable development
Pharmaceuticals	R&D, health, advanced manufacturing
Chemicals	advanced manufacturing, strategic supply chain manufacturing
Polymers	strategic supply chain manufacturing, advanced manufacturing (composites)
Petroleum	energy (fuels), transport infrastructure

These sectors are diverse in both their markets and their skills drivers but they are united by the underpinning science: all deploy molecular transformations to achieve their products. The most critical occupations that define these industries are those that require knowledge and application in science, engineering, and regulatory affairs. These are manifest in the managerial, professional, technical and associated professional and craft occupations mainly. Cogent research consequently focuses on these occupations.
The following sections explore in increasing depth the sector, its industries, the evidence base and the Cogent research strategy. Where it has not been possible or appropriate to include a full account of research findings, the Appendices contain further information and a full bibliography of recent skills publications by Cogent.

The UK has the 6th largest economy in the world, and 4th in the OECD, but its recovery from the recession that began in 2008, will depend *inter alia* on strong growth in the manufacturing sector, not least the Cogent industries. This is central not only to the immediate contribution to industrial activity, employment and wealth creation, but also to the longer term goal of rebalancing the economy with respect to the financial sector. The Cogent sector in Northern Ireland is an attractive target for investment and development, and one which can maintain a competitive edge through its use of intellectual capital.

Finally, this Sector Skills Assessment is published in December 2010. The previous Sector Skills Assessment was published in February 2010. There is consequently some degree of overlap in the coverage of these two publications. While Cogent has sought to keep this to minimum and report new primary research and customized national data, the latest Skills Oracle (see later) does not become available until January 2011.

1.1 Chemicals – a strategic asset

UK Chemical firms are required to offset the lower labour and raw material costs of the emerging markets in Asia and Eastern Europe by adding value to commodities, using lean manufacturing techniques and developing supply chain efficiencies. Mergers and acquisitions are being used to reposition companies to remain competitive, although bulk transport costs limit the distance over which chemicals can be reasonably transported, and in turn the degree of consolidation possible.

Increasingly, rapidly developing economies are exploiting their growing strength to attack traditional high value markets in the UK, Europe and the USA. Nevertheless, PricewaterhouseCooper predicts firms, such as pharmaceuticals, close to world class academic institutions, will remain strong; an analysis that suggests that UK based firms should remain resilient even while they cope with the expiry of patents and the fragmentation of the industry caused by the rise of niche, targeted, therapies.

1.2 Nuclear – secure, low carbon electricity

Nuclear Electricity Generation in 2010 stands on the verge of the largest change of all of the Cogent industries. Against an on-going decommissioning programme which will see the UK capacity fall from 10 GWe to 1 GWe, three private consortia have proposed investment which would result in the construction of 16 GWe of new capacity. This amounts to a major collaborative, privately financed, infrastructure project with a huge demand for high level science and technology skills. Planning to underpin it took a specific step forward in October 2010 with the coalition government's identification of 8 potential sites in its revised draft National Policy Statement. In response to this national proposal, Cogent produced in 2009 an in-depth report, *Power People* (2009), which remains the starting point for an assessment of the industry today. Shortly afterwards it published *Next Generation* (2010), an assessment of the skills impact of a thirteen year building programme based on 6 reactor pairs. Next Generation included an initial risk register that identified where, at this point, skills shortages would pose a particular threat. These included, amongst others, project management, high integrity welding and safety case authoring.

1.3 Bioscience – a new industrial revolution

Alongside the established industries, the Cogent footprint also contains the burgeoning Biotechnology sub-sector. In August 2010 Cogent took on responsibility for the Life Sciences sector from Semta. Both SSCs will continue to work closely together to meet the need the needs of employers in their footprints, and are currently arranging a series of meetings with stakeholder groups across the UK to agree new operational arrangements in each nation, and make arrangements for the handover of existing projects, where appropriate. The new arrangements will build on Cogent's existing remit for the Pharmaceutical Industry and provides the Life Sciences sector with 'one voice' to speak clearly to Government and Academia on skills issues.

International statistics for biotechnology confirm the dominance of health. In contrast, there is a paucity of data for industry and primary production to demonstrate significant commercial penetration. Small businesses dominate the landscape of biotechnology and outsourcing of specialist services is prevalent. There is evidence of continued growth in medical biotechnology and rapid development of parts of industrial biotechnology, e.g. speciality chemicals (supply chain to the pharmaceuticals industry) and steady development on others (e.g. energy, environment, materials); and slow development in agricultural biotechnology.
The latest biotechnology data for the United Kingdom confirm that the United Kingdom has a major global profile in medical biotechnology. The data demonstrate that the bioeconomy is dominated by health. The proportion of companies in medical biotechnology that are SMEs is extremely high at 99%, while the proportion of companies in medical biotechnology with fewer than 50 employees is also high at 90%. Total employment in medical biotechnology is estimated to be of the order of 24,000. Industrial biotechnology was recorded in the National Strategic Skills Audit (UKCES 2010b) as one of six strategic advanced manufacturing sub-sectors for their importance in the supply chain of numerous established sectors, and for their potential contribution to a low-carbon economy.

1.4 The workforce today

As would be expected in a sector reliant on science and technology, the Cogent Workforce is generally highly qualified workforce. Table 1.0.1 shows the distribution of qualifications across the Cogent industries, and in comparison with the UK as a whole.

Table 1.0.1 Workforce Qualifications

	Level of highest qualification held						
	S/NVQ 4 +	S/NVQ 3	Trade Apprenticeships	S/NVQ 2	Below S/NVQ 2	No qualifications	**total**
Oil and Gas	46%	19%	12%	12%	8%	4%	100%
Petroleum	26%	19%	5%	22%	16%	13%	100%
Nuclear*	38%	33%	5%	20%	3%	1%	100%
Chemicals	47%	14%	6%	14%	12%	7%	100%
Pharmaceuticals	58%	15%	3%	11%	8%	5%	100%
Polymers	20%	17%	8%	19%	23%	13%	100%
Cogent	**38%**	**18%**	**6%**	**16%**	**13%**	**8%**	**100%**
UK	**32%**	**17%**	**5%**	**17%**	**14%**	**15%**	**100%**

The Pharmaceutical sector shows the highest fraction at NVQ level 4 and above, although this may underestimate the actual level because of the inadequacy of Standard Industry Codes in Pharmaceutical research and development. In contrast,

Polymers and Petroleum employ a large number of staff with qualifications below NVQ level 2, and have the largest fraction with no qualifications at all.

The 2006 Leitch Review set a goal for the UK to reach the OECD upper quartile for skills attainment by 2020. Targets derived from this recommendation provide the benchmark for the UK Commission for Employment and Skills annual assessment of UK skills, jobs and productivity, Ambition 2020. [1,2] Table 1.0.2 shows the 2020 target together with the current UK and current Cogent levels.

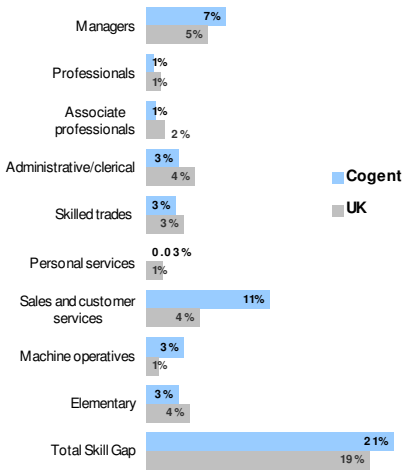
Table 1.0.2 Ambition 2020

Highest Qualification	Target 2020	UK (current)	Cogent (current)
Level 4	40%	28%	38%
Level 3	28%	17%	24%
Level 2	20%	17%	17%

The occupational distribution of the Cogent Sector workforce is given in figure 1.0.1 which reflects the expected demand for Managers, Professionals and Process Operators . In broad terms, this is repeated across the industries with some variation in for Professional and Sales depending on the nature of the industry.

Across the sector the existing integrated skills gap is slightly higher than the UK average, with particularly high levels amongst Managers and Sales and Customer services. The latter reflects the requirement for a combination of marketing skills and customer focus together with a high degree of technical knowledge.

Figure 1.0.1 Occupational Distributions



Ambition 2020 cites a link between the proportion of workers trained and the Gross Value Added such that a 5% increase in the number former results in a 4% increase in the latter. The gearing between training and productivity must be, in part, a function of the character of the industry. If taken at face value, at least, this would imply that raising the proportion of Cogent employees trained from 52% to 60% would generate an additional Gross Value Added of £4bn.
Cogent industries are well placed to support the UK economy in its recovery, and in any event form a critical part of the industrial supply chain. Driven by technology and science, high level skills have always been the life blood of the sector. This is only further emphasised by the economic necessities and technological opportunities that present themselves in 2010.

[1] Ambition 2020: World Class Skills and Jobs for the UK, July 2010
[2] Prosperity for all in the global economy - World Class Skills: The Leitch Review of Skills, December 2006

2. National Policy Overview

The Northern Ireland economy differs considerably from its nation counterparts and skill interventions reflect this.

In general, the private sector economy is based on micro enterprises which employ fewer than ten people; thus skills initiatives reflect an owner/manager culture with emphasis on tangible and rapid outputs. Readily available development agency grants over the past 35 have resulted in a reluctance by micro businesses and SMEs to invest and participate in training.

The manufacturing sector has shrunk to just over 85,000 jobs in the past 25 years. Public sector employment provides 35% of the total, with these jobs generally offering better salaries and conditions than the private sector equivalents. Northern Ireland enterprises have the second lowest level of innovation in the UK and STEM is least appreciated in Northern Ireland of all UK regions (2009 N Ireland STEM report).

The Department of Employment and Learning (DEL) estimates that 151,000 workers in Northern Ireland require up-skilling. There are overall skills deficiencies at levels 2 and 3 and a surplus at levels 1 and 4 and above. DEL has set targets to address these as follows:

- 80% of working population to have level 2 qualifications and above by 2015
- 60% of working population to have level 3 qualifications and above by 2015

The Department of Employment and Learning provides funding to address skills issues, in response to LMI backed applications, delivered almost exclusively through six regional colleges.

With respect to the Cogent sector, there is no significant Nuclear or Oil and Gas footprint in Northern Ireland. However, the sector is very important to the economy, with an overall turnover of £1.3 billion, GVA of £0.6 billion and a contribution of 18% of all Northern Ireland exports. The sector exports 60% of output, compared with a Northern Ireland manufacturing average of 35%.

There are 15,000 employees in the Cogent sector, with half of that number employed in the polymer industry. In each of the Pharmaceutical and Chemical industries there are 1,500 employees and 4,500 in the petroleum industry. The polymer sector is regarded as one of high growth potential and innovation, with specific skills needs. Invest Northern Ireland (the government body responsible for economic development and strategy) has recognised this by sponsoring the Northern Ireland Polymers Association (NIPA) which promotes and identifies training needs in the sector.

Pharmaceuticals is dominated by a very small number of world class companies who trade globally. The petroleum sector is generally distribution based with many small companies, low GVA and a strong safety regulation framework to negotiate.

The Cogent industry has a GVA of just over one third that of the UK average (£38k versus £98k). This disguises the fact that there is a world class, if small pharmaceutical industry with a very high GVA and a polymer industry with a number of companies also with a very high GVA. The petroleum industry is centred on distribution, with low value added and consequent low GVA, which distorts the overall GVA measure. Investment in training is half that of the UK average.

However, jobs in the sector are generally well paid, above the UK Cogent average, and £4,000 per annum above the overall Northern Ireland average. Despite this, the Cogent 2008 employer survey found that there were hard to fill vacancies, particularly technical posts, due to skills shortages and poor industry image. This should be addressed by promoting Cogent industry specific apprenticeships through the Department of Employment and Learning's Programme Led Apprenticeships (PLA) initiative.

The uptake of Foundation Degrees is very small compared to the UK average; Cogent is currently carrying out a scoping exercise into demand within the sector. There is also a shortage of highly qualified graduates and post doctoral workers in the pharmaceutical sector.

3.0 Research Strategy and Products

3.1 Research Strategy

The advanced manufacturing industries in the Cogent footprint cover a diverse set of sectors which, although bound by a common reliance on science and molecular transformation, differ significantly in their economic and skills drivers and the extent to which national data provides sufficient evidence to sustain skills gap analysis and future skills projections.

The research approach employs best use of national data where it exists combined with primary research to fill gaps and to penetrate more deeply than national data. Apart from the annual Sector Skills Assessment (this report), there are four main categories of output:

- **Factsheets**
  (by Industry and Region)
- **Skills Oracle**
  (annual report of primary research)
- **FutureSkills**
  (annual report of primary in-depth research and future scenarios on skills)
- **Hard-to-Reach Sectors**
  (sectors of complexity by size, location etc)

Table 3.1.1 illustrates the sectors in the first column and the Cogent perspective of segmentation of subsectors in the second column. For the most part the sectors are mutually exclusive although their supply chains may intermingle. In this way Pharmaceuticals is largely distinct from Chemicals but Chemicals is a significant supply chain to Pharmaceuticals. Bioscience is an exception. From 2010 Bioscience is a new sector to the Cogent footprint. Bioscience is cross-cutting with Medical Biotechnology sitting closely with Pharmaceuticals while Industrial Biotechnology sits closely with Chemicals.

The third column illustrates the extent of national data coverage (by Standard Industry Classification). This shows clearly the lack of national data coverage for three highly strategic sectors (politically, economically, strategically and technologically) and a number of additional specialist segments. The three strategic sector gaps left by national data are: 1 – the absence of Nuclear (Power Plant Operation; Power Plant Decommissioning; Power Plant Construction; Defence – Propulsion and Deterrence); 2 – the limited coverage of Pharmaceuticals (given the large proportion of R&D functions outside manufacturing in this sector); and 3 – the limited coverage of bioscience industries as distinct from the specific coverage of research in biotechnology.

Table 3.1.1 shows how the four research outputs have been deployed to ensure full coverage. In particular, the in-depth research of those sectors that are politically, economically, strategically and technologically of high priority is mapped out in the short term. In this way, for example, Nuclear has been covered by both Skills Oracle and FutureSkills leading to internationally recognised reports throughout 2009 and 2010; and this will continue through 2011, as the priority shifts to include skills for growth in the cross-cutting area of Bioscience.

Table 3.1.1 Sector Segmentation and Research Coverage

Sector	Segmentation	SIC fit		Fact Sheet	Skills Oracle	Future Skills	Hard-to Reach Research
Nuclear*	NPP Operation			2011			2010 intern'l project
	NPP Decommissioning						
	NPP New Build						
	Defence						
	Fuel Processing						
Bioscience	Pharmaceuticals						
	Medical Biotechnology			2010	2011		2011
	Industrial Biotechnology				2010	2010	2011
Chemicals	Industrial Chemicals						
	Consumer Chemicals						
Polymers	Processing						
	Packaging						2012
	Sign Making						2012
Petroleum	Forecourts Retail						2011
	Storage and Distribution						
	Refining (Downstream O&G)						Commercial
Oil& Gas	Extraction (Upstream O&G)						2011

*NPP = Nuclear Power Plant

Legend

Good coverage

Coverage as indicated

SIC only - not covered

3.2 Research Products

3.2.1 Factsheets[3]

These are data sheets distilling national data (e.g. ABI, LFS, NESS, ASHE), primary research by Cogent, and secondary data sources (e.g. government, trade, and international data). There are factsheets by industry (six), by region (thirteen) and by nation (four).

3.2.2 Skills Oracle[4]

Skills Oracle is a means by which employers can avoid survey fatigue yet get a useful and quick turn around in return for investing information with Cogent. At the same time the aggregated and anonymised analysis allows Cogent to generate the body of evidence and substantiate the voice of employers to policy makers and funders of qualifications. Building year on year, Skills Oracle, in conjunction with other sources of intelligence, establishes how well the sector is positioned to secure the skills it requires. But most importantly, it helps inform and shape action for the future; the evidence of demand and the evidence of progress.

Skills Oracle is a major contribution by knowledgeable employer experts – usually HR managers or equivalent with an authoritative voice on skills and training for all employees on their site. It is hosted annually by electronic means.

The survey combines regular quantitative measures with qualitative capture of opinion and future perspectives. Skills Oracle concentrates on the heart of the science-based industries – the employment and training of people with skills in science and engineering. Skills Oracle is therefore a focused survey of those sector and segments that employ such skills.

Cogent likens Skills Oracle to a skills 'ftse' of the top employers of skills, and thereby a barometer of the picture generally. The outputs from Skills Oracle are an overarching annual report. Although less robust, but still useful qualitatively, are the individual sector reports that are also published. A confidential company benchmarked version of the sector reports are provided to all respondents.

3.2.3 FutureSkills

FutureSkills is the collective output for the in-depth research projects that are prioritized for a given sector in any given year. The output is typically a detailed report arising out of major primary research in a sector, including employer and stakeholder consultation. The reports are often peer reviewed, formally launched, and followed by dissemination, evaluation and feedback. Examples of such reports included in this SSA are the Nuclear Series and the Bioscience series.

Nuclear series:

- Power People (2009)[5]
- Next Generation (2010)[6]
- SouthWest Nuclear Workforce[7]

Bioscience series:

- BioVision (2010)[8]
- Biotechnology (2010)[9]

[3] http://www.cogent-ssc.com/research/regionsindustry.php
[4] http://www.cogent-ssc.com/research/Oracle.php
[5] http://www.cogent-ssc.com/research/renaissance_i.php
[6] http://www.cogent-ssc.com/research/renaissanceII.php
[7] http://www.cogent-ssc.com/research/Publications/SouthWestNuclearWorkforce.pdf
[8] http://www.cogent-ssc.com/research/Publications/BioVision.pdf
[9] http://www.cogent-ssc.com/research/Publications/SEMTA_COGENT_report.pdf

3.2.4 Hard-to-Reach Sectors

This product is new for 2010-11 and addresses special research to cover gaps in intelligence due (usually) to hard-to-reach sectors. Hard-to-reach status may be due to the nature of the employer base (e.g.SMEs), or the complexity of the research (e.g. international collaborations). Current activities in this area include international research collaborations in Nuclear across the OECD and planned research of petroleum retail and bioscience SMEs.

3.3 Research Drivers

The research strategy considers PESTEL factors (see elsewhere in this SSA) in order to prioritise resources and workstreams in a given year. The Cogent footprint covers some of the most strategic science-based sectors in the UK economy. The industries range from the strategic (Nuclear) to the world-leading (Pharmaceuticals); many are incubators of new technologies (Chemicals – Industrial Biotechnology, Plastics - Composites) that will refresh and renew the sector in the future; others generate wealth and support our self-sufficiency in energy fuels (Oil & Gas and Petroleum). All have the deployment of higher level and technical skills at the heart of their business.

The research and intelligence reported in this SSA illustrates how the they have been driven in large part by both gaps in information and the strategic and political UK priorities, especially those sectors for which major in-depth research has been conducted and collaborations established.

3.4 Quality Assurance, Control

For major reports, a system of peer review is deployed[10] (or expert panel review drawing from Cogent Advisory Councils), and general evaluation and feedback captured.[11] These together with the Cogent Research Charter,[12] internal proofing and auditing protocols apply.

All major publications are accompanied by a web-published technical annex, giving details of the methodology and rationale.

3.5 Dissemination and Evaluation

All major publications are accompanied by an appropriate dissemination strategy. This usually entails national dissemination, often entails a launch event and can include international dissemination. The dissemination is usually accompanied by a feedback questioannaire on impact. The feedback analysis is web-published.[13]

3.6 Operationalising LMI

The various outputs inform the development of the business strategy, the action plans for the four nations and form the evidence base for development of standards (including NOS) and qualifications. Often this will require further tailored research. These and the resrecah putputs in themselves are received by the various industry Advisory Council administered by Cogent (Chemicals, Life Sciences, Pharmaceuticals, Nuclear, Polymers, Downstream Oil& Gas). The evidence is also used to support project development and the business plans of the two National Skills Academies (process Industries and Nuclear).

[10] For example http://www.cogent-ssc.com/research/Publications/Technical_Annex.pdf
[11] http://www.cogent-ssc.com/research/surveys.php
[12] http://www.cogent-ssc.com/research/Publications/Research_Charter.pdf
[13] http://www.cogent-ssc.com/research/surveys.php

4.0 The Integrated Sector

Cogent industries contributed in order of £553m into the nation's wealth in 2008. In Northern Ireland, the industries invested £44m in capital expenditure and £16m in R&D and account for 12.6% of Northern Ireland's manufacturing GVA.

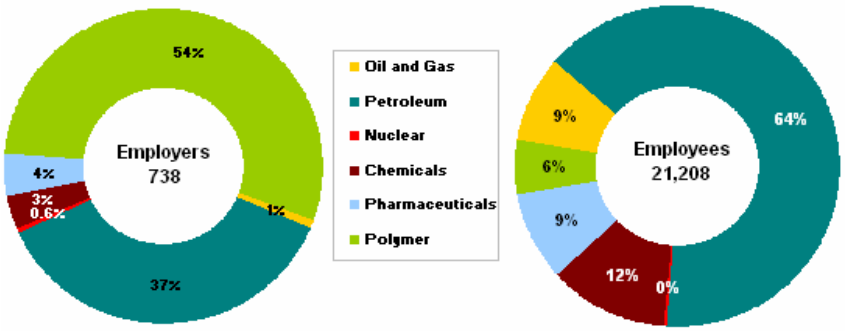
The distribution of employers in Northern Ireland is heavily loaded in and around Belfast, exploiting the transport and freight infrastructure. In the Polymer industry, 53% of the employers are located in the Co Armagh and Co Antrim areas, with a further 23% in Co Down.

This reflects not only the areas of population, but again the transport infrastructure to deliver their goods to the UK and European Markets. Petroleum products are networked across Northern Ireland to serve the population distribution.

Local retail distribution is increasingly merging with larger organisations. Chemical and Pharmaceutical industries are all located close to the main transportation links with 87% of employers located in Co Down, Co Antrim and Co Armagh.

Figure 4.0.1 shows the distribution of companies and staff across the Cogent industries in Northern Ireland. Close to two thirds of the sector's workforce is employed in Petroleum production and retail distributed across 37% of the nation's employers. The next largest employment sector is in Chemicals, although this is some way behind with 12% of the workforce and 3% of employers. The polymer industry, comprising a large number of small companies, accounts for the largest employer sector (54%), although this corresponds to only 6% of the workforce.

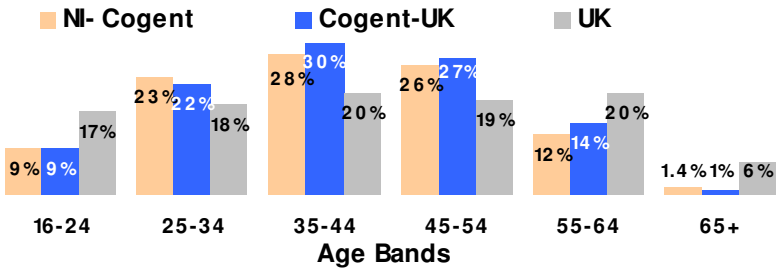
Figure 4.0.1 Employers and Employees



Source: Northern Ireland Factsheet, Cogent 2010

The age profile of the Cogent workforce in Northern Ireland is shown in figure 4.0.2. In common with the sector in the UK, the distribution is less evenly spread than the workforce generally, with a broad but clear maximum between 35 and 54 years. This is consistent with sectors that rely largely on higher (and older) levels of skill from the education supply.

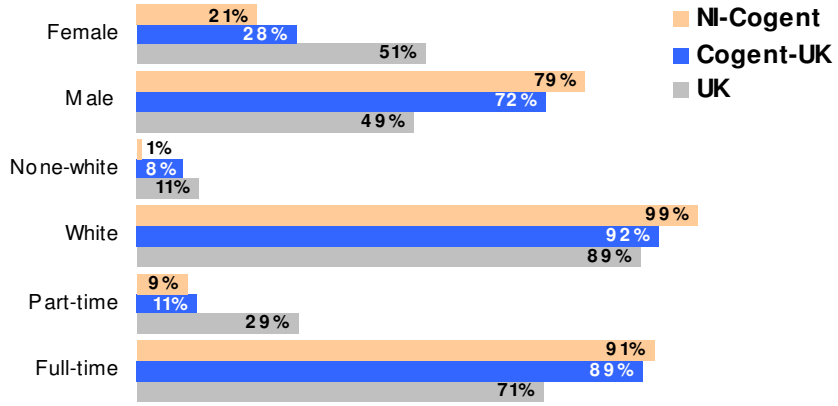
Figure 4.0.2 Age Profile



Source: Northern Ireland Factsheet, Cogent 2010

Figure 4.0.3 illustrates the workforce distribution in terms of gender, ethnicity and employment type (full time or part time). Overall the profile follows the broad characteristics of the Cogent sector; the workforce is overwhelmingly white, male and in full time employment. In fact, these characteristics are slightly stronger in the case of Northern Ireland than the sector generally. Notably the ratio of males to females is significantly different from the UK generally, showing a continuation (albeit with some weakening) of an historical trend in these industries. The workforce is 99% white, a higher figure than the sector as a whole (92%) and the UK generally (89%), but reflecting in part at least the local demographics.

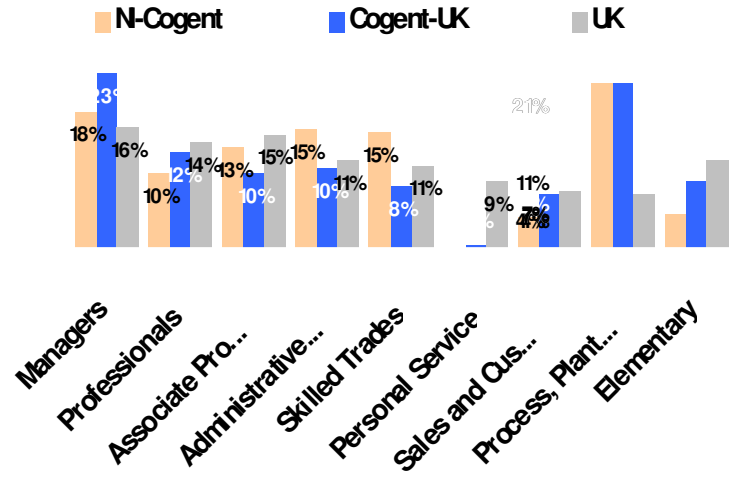
Figure 4.0.3 Workforce Distribution



Source: Northern Ireland Factsheet, Cogent 2010

Figure 4.0.4 shows the sector in Northern Ireland with higher proportions of Associate Professionals, Administrative Staff and skilled trades than Cogent-UK and the UK generally. The proportion of managers is closer to the UK average than for the sector, while that of Plant and Process Operatives matches the sector in the UK.

Figure 4.0.4 Occupational Distribution

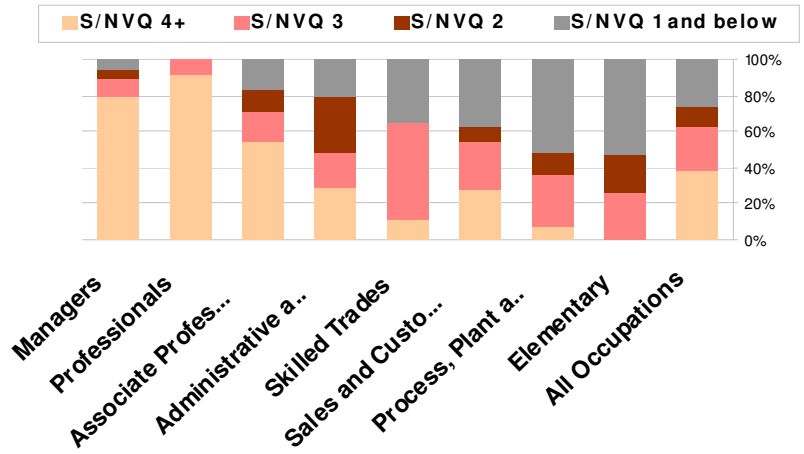


Source: Northern Ireland Factsheet, Cogent 2010

Figure 4.0.5 shows the proportion of highest level qualification by occupation. Analysis in conjunction with Skills Oracle data (Main UK report, section 5.2), suggests that the three most highly skilled occupations are also those, in a UK context, with the greatest turnover and net increase in recruitment: management,

professional and technical; these also correspond – again according to Skills Oracle – to the occupations that are hardest to fill.

Figure 4.0.5 Occupational Distribution



Source: Northern Ireland Factsheet, Cogent 2010

4.1 Skills Oracle Summary

Skills Oracle is essentially an online project surveying, over time, a significant and consistent sample of science and engineering employers. It is therefore not intended to cover all sectors or segments (retail forecourts being an example that is not in scope).

When used in conjunction with other sources of intelligence, and with national data, Skills Oracle is a powerful addition to the quantitative and qualitative evidence base on skills, training, qualifications, and the employer perspective.

The survey is not yet sufficiently large to resolve differences between nations, so the following UK integrated data is cited as a guide to the key issues for employers in Northern Ireland as elsewhere.

- Annual average company turnover in employment is approximately 15%.
- Professional scientists and engineers vacancies that are 'hard to fill' are reported by 57% of employers.
- Annual training budgets average was £930 per employee. In addition to this companies may incur additional cost such as travel, subsistence, internal training and mentoring, the maintenance cost of training facilities as well as maintaining productivity during training.
- Employers were satisfied with the coverage of qualifications across the sector. Satisfaction ratings were highest for 'Academic' qualifications, 'Competence Based' qualifications and 'Flexibility' of provision.
- Health, Safety and Environment (HSE) training was the most frequently reported training undertaken, when viewed across both internal and external training requirements. Companies tend to resource externally for specialist training, such as, 'Professional', 'Technical' and 'Health, Safety and Environment'.
- 'Private Training' providers are used by 94% of employers; 80% use 'FE' providers; and 51% use 'HE' providers.

- For private training providers, satisfaction levels tended to be extremely high (ranging between 76% and 97%) in all areas of; 'Cost', 'Relevance', 'Flexibility', 'Location' and 'Quality' of provision. This reflects the highly tailored provision offer by private training providers.

- The satisfaction ratings for FE and HE were also very high (ranging between 60% and 85%), with the lower of these ratings referring to relevance, flexibility and location of provision. This suggests that while employers value such provision, there is scope for FE and HE to innovate in flexible and accessible provision, and that there is a role for the Sector Skills Council in facilitating this.

- The majority of employers (83% and 78% respectively) place a high level of importance on the supply of Apprentices and Graduates to their workforce (8% of the skills supply recruited were Apprentices; 11% of the skills supply recruited were Graduates).

- Most employers (81% and 74% respectively) invest in 'Competence Based' and 'Technical' training of the existing workforce, with 64% of employers investing in 'Professional/Higher Level' training.

- Skills gaps and shortages were reported by 83% of employers to had some, or significant impact.

- Competence-based skills needs are reported by 65% of employers report have increased in the 12 months preceding the survey; 72% of employers expected the demand for both competence-based and management level skills to increase in the 12 months following the survey.

- Looking ahead, Cogent employers were split in concluding that the economic situation for their businesses would 'improve' (39%), 'remain static' (26%), or 'worsen' (26%) within the year (8% of employers were undecided).

- Most Cogent employers predicted 'no significant change' in employment in the short term (2 years ahead).

- Securing funding, improving access to training courses and encouraging young people into the sector, are viewed by Cogent employers as the highest priorities for a Sector Skills Council.

5.0 Sectors Selected In-depth

5.1 Life Science Industries – A Labour Market Survey

During 2009 Cogent and Semta collaborated on research covering the life science industries. The research report, based on 380 interviews from a sample base of 3,028 companies was published in February 2010. The respondent sample represented 24,000 staff across England (80% of companies), Scotland (13%), Wales (4%) and Northern Ireland (2%).

Full details of the research findings and the methodology were published during 2010.[14] The research focused primarily on:

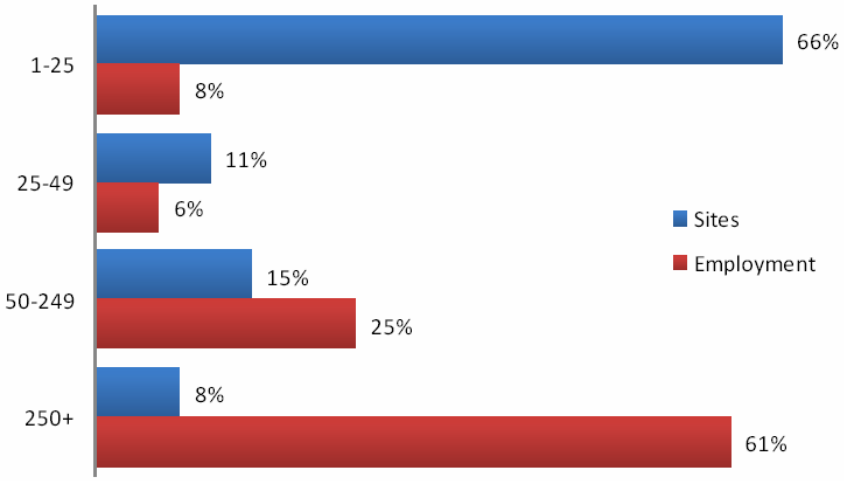
- Establishment and workforce details
- Recruitment issues
- Workforce skills
- Training and development

The research is one of the most comprehensive yet undertaken in skills in these sectors. The sample of 380 respondent organisations has given a reasonable level of confidence in the findings reported, with the usual caveats when examining sub-group samples smaller than 100. Employer skill priorities and plans for action for the sector.
This section reviews some of the findings.

5.1.1 Employers
The sample covered three types of company: pharmaceuticals (excluding R&D), medical devices and research (including biotechnology and pharmaceuticals). Cogent's interest rests across the first and the third; Semta's interest rests across the second and the third.

By employment 76% (18,384 employees) of the sample rests in the Cogent footprint; and by company/site 53% (203). The distribution by site and employment shows the normal inverse correlation between employment field and employer size (figure 5.1.1).

Figure 5.1.1 Sample by Sites and Employment



[14] http://www.cogent-ssc.com/research/Publications/SEMTA_COGENT_report.pdf

Biotechnology
Of these life science companies, 15% deployed biotechnology. This represents 18% of employment overall. In the pharmaceuticals and R&D sectors a higher incidence of biotechnology was recorded at 19% and 22% respectively.

University Spin-Outs
Overall 11% of companies had their origin as a university spin out. This proportion rose to 22% in the R&D sector.

5.1.2 Occupations
A slightly reduced sample (94% of respondents; 356 companies; 19,326 employees) were able to respond to this query.

A high proportion of senior management was recorded (22%); this is in character with national data for these sectors. When combined with professional scientists, technologists and engineers, 55% of employment was found to reside in these occupational groups (10,000 employed from the sample). A correspondingly low level of employment of elementary skills was also recorded (1%).

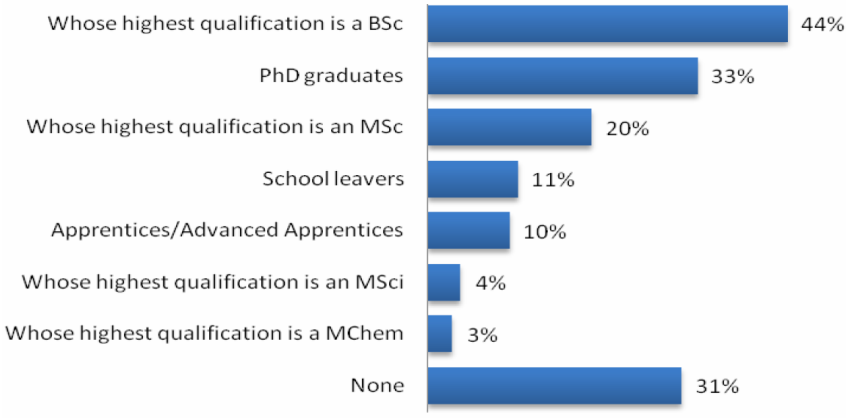
Just under two-fifths of those employed were female, with the five largest proportions, in decreasing order, being: administrative (66%), sales (53%) technical (44%), professional (35%), and management (33%) occupations.

Research and Development
Across all occupations 29% of employment is in an R&D function, with the expected highest proportion of professional occupations (59%) being deployed in this category; 38% of managerial staff were deployed in this category.

5.1.3 Recruitment
Employment appeared to be stable, with 48% of all companies having similar levels of employment to the previous year; almost a third had increased recruitment; less than a fifth had reduced employment. The smaller companies are those most likely to have the same levels of employment.

Many companies (48%) had recruited within the year. The larger companies were the most likely to have been active in this area.

Figure 5.1.2 Recruitment – Skill Levels (base: 181)



Qualifications
Recruitment tended to be at the higher end of the skills spectrum. This is in keeping with the high levels of R&D recorded by the sample.(figure 5.1.2) When analysed by R&D company, recruitment of staff with qualifications at degree, masters and doctorate levels was, naturally, much higher at 65%, 38% and 62% respectively.

Relevant Work Experience
At least two-thirds of recruits were deemed to have relevant work experience. This figure rises in proportion to the qualification level, so that 94% of those of masters level.

Overseas Recruitment
Almost one-third of recruitment is of overseas personnel or students from overseas.

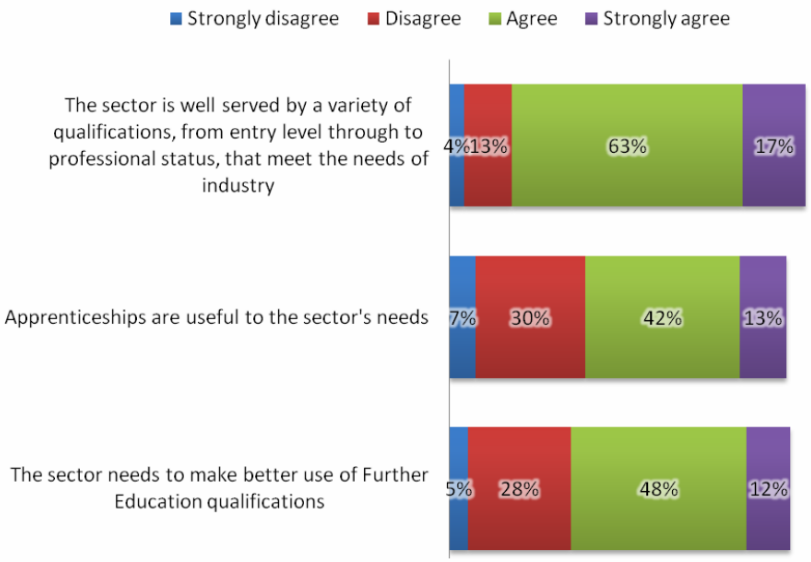
Hard-to-Fill Vacancies
Although sample size did not prove robust for this query, the data qualitatively suggests that professional and technical occupations of R&D in large companies experience this problem to the greatest degree.

5.1.4 Workforce Skills
Skills Gaps
Skills gaps required to meet business objectives were reported by one in seven of employers; down from almost a third of employers since 2006. In line with the hard-to-fill enquiries, the gaps are most evident at the higher level occupations.

On a qualitative basis the most pronounced skills gap in science is chemistry, with pharmacology/toxicology also being cited.

Qualifications Supply
The majority of employers (79%; base: 380) declared their sector well-served by qualifications from entry to professional levels, but more than half suggested that they needed to make better use of vocational pathways. Figure 5.1.3 illustrates.

Figure 5.1.3 Qualifications (base: 380)



Drivers of Change of Skills
New products, new technologies, new equipment or compliance issues are the most quoted reasons for changes in skills needs. Almost three-quarters (72%; base: 351) of employers anticipated that their existing workforces would need to acquire both new skills and new knowledge to continue to meet business objectives; less so for small employers (58%).

Training

On average 61% of employers (base: 390) have arranged or funded off-the-job training within the year; this being consistent across all three sectors. This rises to 84% for the larger companies. The pattern is similar for on-the-job training, with the corresponding statistic being 68% overall. This leaves one quarter of all companies that have undertaken no training within the year.

The average external spend on training is close to £21k (base: 94). When factored by employee, this averages to less than £645k per employee but there is a wide variation by sector and an abruptly 'stepped' variation of average spend per company by size category: from £122k for the large employers (250+ employees), to £44k for the medium-to-large employers (50-249 employees), to £9k and £8k for the small employers (5-49 and 1-4 employees, respectively).

The Pharmaceutical and R&D sectors on average spend almost four times as much than Medical Devices.

Most companies (58%; base: 294) expect levels of spend on training to remain fairly static in the coming year.

Training tends to focus more on the higher occupational levels as shown by table 5.1.1)

Table 5.1.1 Training by Occupation (%) (base: 294)

	On-the-job only	Off-the-job only	Both	Don't Know	Neither
Managers and Senior Staff	23	16	40	1	20
Professional Engineers, Scientists and Technologists Occupations	23	12	52	1	12
Associate professional and technical occupations	21	14	49	2	13
Skilled trades occupations	21	6	45	5	23
Process, plant and machine operatives	28	4	34	7	27
Sales and customer services occupations	33	12	33	2	20
Administrative and secretarial Occupations	27	8	34	5	26
Elementary occupations	27	9	23	2	39
Personal service occupations	19	4	19	19	41

In-house training is common (81% of those training), followed by commercial training providers (47%; base: 294). This tends to be due to expertise and experience. The Skills Oracle survey (section 5.2) found similar but probed more deeply to show that the job-specific training was the main focus, and that where technical and professional training with qualifications was required, that providers (FE or HE) were used.

Ratings for providers of training or qualification followed the Skills Oracle pattern also. Cost and time to train are the most quoted barriers to training. This is a pattern that is consistent across the economy generally.

Just over a quarter of the sample accessed funding for training activities, mainly for vocationally orientated courses. The incidence tended to be highest for R&D (35%; base: 83) and increases in line with company size (45% for companies of 250+ employees). Many companies had difficulty identifying access to qualification funding.

5.1.5 Skills Priorities

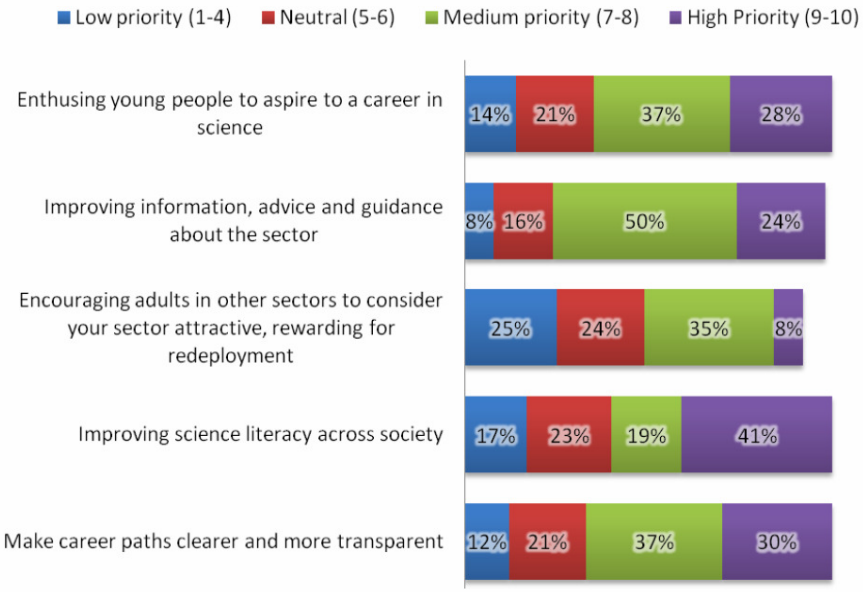
When asked to rate the objective of skills in their company from the restricted list of objectives below, employers prioritised the objectives as follows (base: 380):

- Achieve a top quality workforce (73%)
- Improve employer engagement and investment in skills (55%)
- Enhance leadership and entrepreneurship (53%)
- Improve sector image (44%)

When restricted to a single choice, 'achieving a top quality workforce' was more than twice as popular as any other at 38%. The aims feeding this priority are the development of training and qualifications that are more relevant to the employer need, and working with the education system to equip a higher number of people with the right vocational and practical skills as well as academic science.

Closing the skills gap in this context by increasing the supply of quality people and for practical skills to be championed from the education system featured prominently. Figure 5.1.4 discloses all priorities.

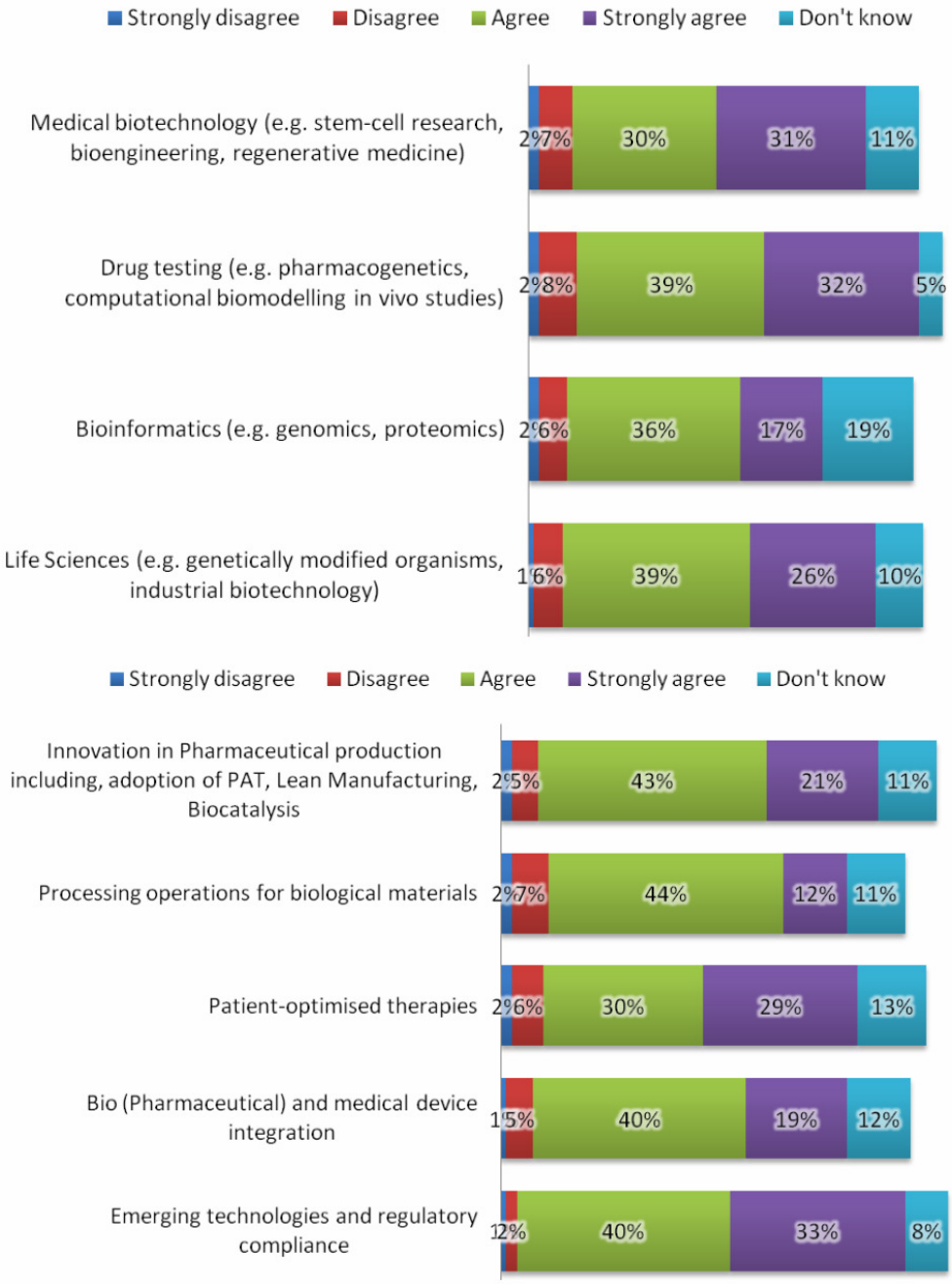
Figure 5.1.4 Priorities in Achieving a Top Quality Workforce (base: 146)



5.1.6 Science and the Future of the Pharmaceuticals Sector

Pharmaceutical companies were asked to indicate the extent to which they agreed with a number of propositions about the future of the sector. The sample base in this sub-group was 84. In all cases there was overwhelming agreement of the importance of the future developments in science and engineering. The responses are catalogued in figure 5.1.5.

Figure 5.1.5 Future Advances in Science and the Pharmaceuticals Sector



5.1.7 Skills Summary

- A high proportion of senior management and professional occupations.
- A significant element of R&D qualifications associated with professional occupations.
- Employment has been stable and largely independent of economic downturn.
- Significant overseas recruitment in R&D skills.
- Skills gaps are most evident in the higher skilled levels.
- Hard-to-fill vacancies are also mostly experienced at professional and technical level.
- Skills gaps in the supply from education include chemistry, pharmacology and toxicology.
- Education provision, in the main, serves the sector well but better use could be made of vocational pathways.
- Spend on training appears low by UK benchmarks but the measure is company dependent and fails to capture investment in training facilities.
- R&D intensive companies spend four times as much on workforce development.
- Achieving a top quality workforce is the most sought after outcome of training.

6.0 Sectors Industry by Industry

Four of the established six Cogent industries are represented in Northern Ireland; nuclear and Oil and Gas having only a small presence. The Petroleum, Polymers, Chemicals and Pharmaceuticals Industries are strategically important and collectively employ 3% of employers and 2% of employees of UK industries in their sectors.

The reader is also referred to the detailed skills analysis by industry that is provided in the UK-wide SSA. Only the summaries are reproduced here.

6.1 Chemicals

- A strategic infrastructure in manufacturing and raw materials supply supporting most other UK manufacturing.
- Strategic to UK supply of chemicals that are not readily imported due to hazards associated with storage and transport.
- Safety critical sector; highly regulated.
- A major UK industrial sector.
- An energy intensive sector.
- High levels of skills from operator through technical, professional and management.
- Technical and professional occupations are most hard-to-fill.
- Economic downturn has reduced output in short-term.
- Requires supply of science and engineering skills.
- Impact of emerging technologies could drive shift in skills needs higher more interdisciplinary, more bioscience.

6.2 Pharmaceuticals

- Strategically important sector.
- There is a large demand for Professionals, Managers and Operators in the sector.
- There is a concentration of Research Institutions in the south east which may change with fragmentation following the development of biologics, for example.
- There is demand for technical up-skilling.
- There is competition from low-wage economies.
- Rapid change transfer of new technologies will be a key driver of skills
- There is demand for science, technology, engineering and mathematics (STEM) graduates, and especially for the highest skills in chemical and biological sciences.

6.3 Polymers

- Polymers is a critical UK supply chain to manufacturing.
- The industry is dominated by SMEs.
- A high demand for process operators is evident from the workforce make up.
- Job specific training is of highest priority for employers, making training for process operatives a high compounded priority.

- Levels of external spend on training are lower than UK norms and lower than other manufacturing sectors and may be a reflection of the SME dominance of the sector and the lower level of regulation compared to other manufacturing sectors.
- The supply of Apprentices and Graduates is articulated by some employers as an important to the sector.
- Employment turnover can be high.
- There is demand for technical, leadership and management skills.
- Training provision tends to be catered for by private providers, with much specialist provision from the HE and FE having shrunk in recent decades.
- There is an important high technology role in the area of composites.
- There is a need to attract more young people to the sector
- Current provision in FE and HE is very limited.

6.4 Petroleum

- A major revenue earning industry for the UK.
- The industry provides a secure supply of fuels for the UK.
- The industry is crucial source of raw materials for large parts of the manufacturing manufacturing sector, e.g. Chemicals, Pharmaceuticals, Polymers and Petroleum industries.
- The proximity of the 'downstream' Petroleum and Petrochemicals industry is a major geographical determinant of induced skills demand.
- Production may have peaked but current levels of production continue to obviate significant import requirements.
- A safety critical sector; highly regulated.
- Public perception of the industry critical currently due to recent global incidents.
- Assuring quality and skills in the supply chain is just as important as it is in the asset-holding company.
- Large demand for technical and engineering skills.
- Future demand for skills to support new extraction technologies.
- Large proportion of workforce in professional and managerial levels.
- Many of the high level skills are in demand globally.

7.0 Projected Demand (Working Futures)

7.1 Projected Demand by Sector

Working Futures projections have been taken at the highest level SIC as an approximation for each sector. While the Working Futures[15] data preceded the onset of the recession, its projections a decade ahead normally sit outside the variations of general economic fluctuations. In the case of the current global recession the data is yet to be reassessed and is used here as the best data available to inform a conservative analysis. It is also noted that the Working Futures analysis uses LFS and ABI base data which under-represents the footprint overall (see earlier section) by as much as 100% when supply chain and sectors outside national data are accounted for.

Figure 7.1.1 shows a decline for the manufacturing sectors overall – historically this is a well established trend with a shift in employment across the UK from manufacturing to services. However, segmentation shows that the trend is not uniform.

In total, an employment requirement of an additional 2,800 personnel is projected. Allowing for uncertainty and a conservative estimate of an additional 50% for the direct supply chain and uncoded sectors, suggests of the order of 2,800 – 4,200 new personnel are required in total by 2017.

7.2 Projected Demand by Occupation and Sector

When analysed by occupation, the greatest net requirement is for occupations related to science or engineering. Figure 7.2.1 shows the details overall. Selecting the occupations that centre on skills in science and engineering, there is a net requirement for:

- managers of 400
- professionals of 140
- associated professionals of 300
- machine operatives of 400
- skilled trades of 200

These are the occupations which focus on the application of knowledge and skills in science or engineering and make up 1,400, or the majority of the total new employment requirement. Allowing for uncertainty and incomplete coverage of national data, a conservative estimate of approximately 2,200 new personnel is projected for science or engineering-related occupations by 2017.

7.3 Projected Population of Science-related Occupations

Figure 7.3.1 shows the projected population trend of occupations within the standard occupational classifications, noting that the volumes would require scaling by a conservative factor of 1.5 to represent the sector overall. Of particular note are:

- the increasing population of corporate managers
    - scaled estimate of 1,100 - 1,600 by 2017
- the stable population of science and technology professionals
    - scaled estimate of 280 - 430 by 2017
- the fairly stable population of science and technology associate professionals
    - scaled estimate of 250 - 380 by 2017

[15] *Working Futures 2007-2017,* UK Commission for employment and Skills, 2008.

- the decline in process operatives
    - scaled estimate of 900 – 1,300 by 2017

- the decline in the population of skilled trades (Mechanical/Electrical)
    - scaled estimate of 780 – 1,100 by 2017.

Although the decline is most steep for process operatives, the occupation will nonetheless remain the most populus until approximately 2014 when it will be overtaken by the slow rise of managerial occupations in the sector. The large proportion of process operatives will be related to the predominant make up of the Cogent sector in Northern Ireland by the Polymers, Chemicals and Pharmaceuticals industries. The profile for process operative is mirrored by that for skilled trades.

7.4 Skills Shortages and Skills Gaps

It should be noted that due to the small projected numbers, relative to the UK base data, the error in projection may be significant and the projections are most useful qualitatively for trends.

Gaps will continue to emerge across all occupations driven in the main by technology, regulation and compliance.

Of the 2,200 new personnel required in science and engineering-related occupations, apportionment, across the priority occupation gives requirements of:

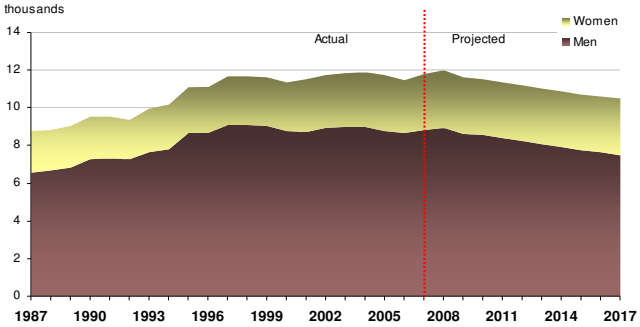
- managers - 620
- professionals - 200
- associated professionals - 450
- machine operatives – 600
- skilled trades – 330

For managers the main entry routes are either by internal progression or transfer from the economy generally. These occupations are therefore not limited by the supply from the education system.

For professionals the main entry route is either graduate recruitment or transfer from the economy generally.

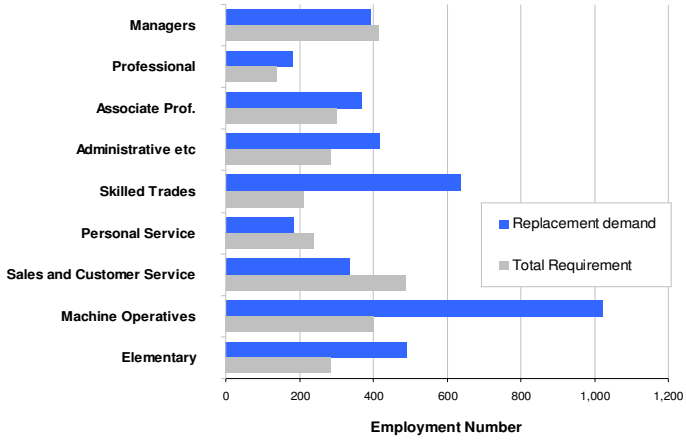
For the occupations of associated professional, process operatives and skilled trades, there is a combined requirement for 1,400 by 2017 (projected from 2007). It is in these occupations that apprenticeship and technician training are most relevant.

Figure 7.1.1 Projected Demand and Net Employment Requirement 1986-2017



(Source: Working Futures2008; excludes Nuclear, Bioscience)

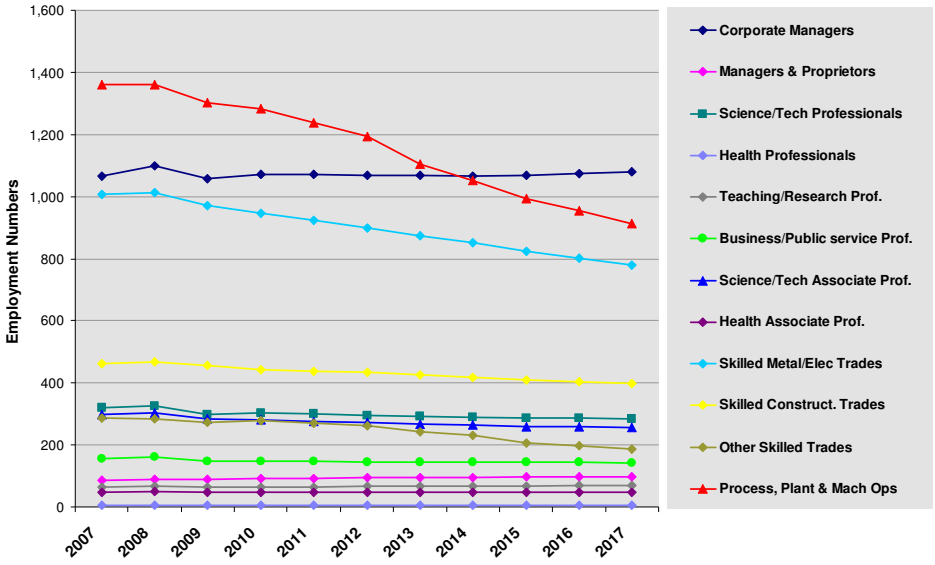
Figure 7.2.1 Projected Demand by Occupation and Sector 2007-2017



(Source: Working Futures2008; excludes Nuclear, Bioscience)

Notes
Replacement Demand = Retirements + Occupational Mobility + Migration
Net requirement = Expansion Demand + Replacement Demand

Figure 7.3.1 Projected Occupational Populations 2007- 2017



(Source: Working Futures 2008; excludes, Bioscience)

7.5 Summary

The following apply for the year 2017.

- Positive recruitments are projected for most occupations.
- Science-related occupations comprise majority of the workforce demand by 2017.
- Occupations at technical and professional levels comprise the majority of demand for science-related occupations.
- A net positive recruitment requirement of 2,800 – 4,200 is projected by 2017.
- A net positive recruitment demand of approximately 2,200 in science-related occupations is projected by 2017:
    - managers - 620
    - professionals - 200
    - associated professionals - 450
    - machine operatives – 600
    - skilled trades – 330
- For most of the science-related occupations the population projection is fairly stable, with the exception of process operatives for which a population decline is projected. For the priority occupations the following trends are projected:
    - corporate managers – slow increase
    - science professional/associated professional - stable
    - process plant and machine operatives - decline
    - skilled trades - decline
- For the priority occupations the following populations are projected**:**
    - 1,100 -1,600 corporate managers
    - 530 - 800 science professionals/associated professionals
    - 900 – 1,300 process plant and machine operatives
    - 780 -1,100 skilled trades.
- Skills gaps are most likely to be driven by technology, regulation and compliance and will require new standards as well as facilitative actions on development of suitable provision for education and training.
- For those occupations dependent on apprentice programmes for new intake, the technical, process operative and skilled trade occupations share a combined requirement of 1,400 by 2017 (projected from 2007).

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cogent Skills for Science Based Industries

The National Skills Academy NUCLEAR

The National Skills Academy PROCESS INDUSTRIES

The strategic skills alliance for the Science-based Industries