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Department for Employment and Learning

Analysis of the Engineering Sector in Northern Ireland

SEPTEMBER 2012

INTRODUCTION

“If we are to enable Northern Ireland to compete globally, it is fundamental that we increase our export base and in this context, the manufacturing and engineering sectors will be pivotal. To achieve these aspirations, it will be essential that they have the skills and technical knowledge to produce innovative products and to adapt to the challenges facing the sector."

- Dr Stephen Farry, Minister for Employment and Learning

In February 2012, the Minister for Employment and Learning identified food and drink processing, advanced manufacturing and advanced engineering, as priority sectors, in light of their importance in rebalancing the economy.

On the 25th June, the Minister brought together a range of stakeholders from the engineering sector to discuss the skills issues they face. At this meeting, the Minister announced the creation of a working group to consider ways in which identified engineering skills shortages and gaps within the advanced manufacturing and engineering services sector, in particular, could be addressed. This complements the work already being taken forward in relation to the Food and Drink Manufacturing and Processing sector.

It was agreed that the new working group would bring together employers, Government departments and local colleges and universities, to develop and oversee the implementation of an action plan, which will focus specifically on addressing the medium to long-term demand for individuals with engineering skills and competences

In order to inform this work, the Minister commissioned research to examine the issue in more detail and the findings are set out in this report, which is in two parts.

Part One is a statistical analysis of the engineering sector, carried out by the Department’s Skills Policy Branch, covering such aspects as the structural profile

of the sector, entry requirements for new entrants, the supply of students in further and higher education and future employment projections.

Part Two sets out evidence gathered by the Northern Ireland Employment and Skills Adviser, Bill McGinnis and presented to the Minister for Employment and Learning. It comprises information garnered from a series of visits to individual businesses by the Adviser and from the Minister's stakeholder event held on the 25th June. It should be emphasised that the views given to the Adviser are the personal opinions of the individuals involved and may not represent the views of a particular company, nor of Mr. McGinnis, or the Department. A list of those companies visited and those which were represented at the stakeholder event is attached at Annex A. The Adviser and Department would like to thank all those who took the time to participate in these events and those who facilitated visits to their businesses.

PART ONE : A STATISTICAL ANALYSIS OF THE SECTOR

Overview of the Northern Ireland Economy

1.1 A range of economic indicators and forecasts are highlighting the continued pressures facing our economy, with downward pressures on economic growth and unemployment levels. The global recession which began in 2008, has caused a significant deterioration in world labour markets, including Northern Ireland's. Recent analysis of our economy has highlighted an unemployment rate of 8.2%, an increase of almost 20,000 since 2009.[1]

1.2 Analysis of the Northern Ireland economy suggests that we are entering 2012 facing similar headwinds to the rest of the UK and Europe. Owing to the economic problems that are affecting Northern Ireland's key trading partners in Europe, there is a high probability that our local export sector will encounter difficult trading conditions, at least until the Eurozone crisis subsides. The most likely scenario for 2012 is, at best, for a modest and very weak recovery and at worst, a return to sustained recession.

1.3 The latest monthly Labour Market Report (September 2012) from the Northern Ireland Statistics & Research Agency (NISRA) shows that the number of people in employment in Northern Ireland, during the three month period May 2012 to July 2012, was estimated to be 796,000, equal to 67.1% of people aged 16-64.

1.4 Over the last decade, the Northern Ireland manufacturing/engineering sector has experienced significant change, as the result of technological changes and the pressures from competing businesses around the world. The numbers of individuals employed within manufacturing has fallen by

[1] Monthly Labour Market Report September 2012, DFP

approximately 25,000 and is forecast to continue to fall unless action is taken to reposition the UK and Northern Ireland as a manufacturing hub.

1.5 Analysis of Northern Ireland's employment structure by broad industry group (SIC 2007) shows that there are approximately 75,000 employee jobs within the manufacturing sector. This represents approximately 11% of the total employee jobs within Northern Ireland. In terms of industry sector GVA (2008), the manufacturing industry is the largest contributor to total Northern Ireland GVA (£4,307m or 25%) and its productivity per employee (£44,500) remains significantly above the Northern Ireland industry average (£31,200).

1.6 Engineering and manufacturing play a pivotal role in determining and improving a region's economic performance and its competitiveness. These industries usually incorporate businesses which use a high level of design, or scientific skills, to produce innovative and technology complex products, or processes.

1.7 There is no exact definition or boundary as to what the sector covers. Within the 'engineering' theme, employers within the Northern Ireland economy include a diverse range of industry sub-categories and are subsequently represented by a range of Sector Skill Councils (SSCs). The SSCs, which have representation of engineering issues in some format in Northern Ireland, are:

- SEMTA,
- Cogent,
- SummitSkills,
- Energy and utility skills,
- Improve,
- Proskills, and
- ConstructionSkills.

1.8 SEMTA, however, covers the majority of the sector; its footprint encompasses advanced manufacturing and engineering, including aerospace and defence, automotive, marine (boats and shipbuilding), metals and electronics. As such, it is the source for some of the key statistics reflected in this report.

Profile of the Engineering Sector

1..9 There are no official published statistics on employee numbers within the engineering sector in Northern Ireland, however, SEMTA estimate that there are 36,800 employees and 2,800 employers. The sector accounts for 8.6% of total GVA within Northern Ireland and GVA per employee was £40,000, which is significantly above the Northern Ireland average.

1.10 Tables 1 and 2 show the breakdown of employment across the various industry sub-sectors and the occupational structure of the engineering sector. From Figure 1, it can be seen that the largest employment is in metal products (8,400) and mechanical equipment (4,800) sub-sectors. Table 2 illustrates the occupational structure of the sector and it is clear that the sector is denominated by higher skilled occupations, with 40% of the jobs deemed as higher skilled jobs.

1.11 Table 3 shows the strong skills profile of the industry, with SEMTA estimating that 25% of the industry is qualified at Level 4+ and 41% qualified at Level 3. (A table giving an explanation of the various qualification Levels can be found at Annex B.) At the other end of the skills spectrum, 11% of the sector has no qualifications, indicating that the industry has an element of lower skills issues, as well as higher skill needs.

Table 1 - Employment Structure – '*Sector Skills Assessment for Science, Engineering and Manufacturing Technologies' (2010)*

	Sector	N. Ireland
Mature engineering	Metals	8,400
	Mechanical equipment	4,800
	Electrical equipment	3,500
	Other transport	*
	Rubber tyres	*
	Total mature engineering	**17,200**
Leading-edge technology	Electronics	3,600
	Automotive	2,600
	Marine	*
	Aerospace	*
	Other engineering activities	*
	Total leading-edge technology	**17,900**
Science industries	**Science industries**	*
	Semta	**36,800**

Table 2 – Occupational Structure – '*Sector Skills Assessment for Science, Engineering and Manufacturing Technologies' (2010)*

Occupation	Mature engineering	Leading-edge technology	Science industries	Semta
Managers	17%	7%	25%	13%
Professionals	4%	16%	40%	12%
Associate professionals /technicians	5%	22%	34%	15%
Admin & secretarial	6%	5%	<1%	5%
Skilled trades/craft	32%	29%	<1%	29%
Personal service	<1%	1%	<1%	<1%
Sales & customer service	2%	<1%	<1%	1%
Operatives	26%	14%	<1%	19%
Elementary staff	8%	6%	<1%	7%
Total	100%	100%	100%	100%

Table 3 – Skills profile of the industry – '*Sector Skills Assessment for Science, Engineering and Manufacturing Technologies' (2010)*

	Highest qualification level of the workforce (NVQ or equivalent)					
Sector	No qualifications	Level 1	Level 2	Level 3	Level 4+	Total
Mature engineering	14%	3%	26%	36%	21%	100%
Leading-edge technology	9%	6%	13%	47%	25%	100%
Science industries*	<1%	<1%	19%	30%	50%	100%
Semta	11%	4%	19%	41%	25%	100%
All sectors	16%	7%	20%	25%	32%	100%

1.12 Table 4 provides a detailed analysis of the occupational profile of the workforce within SEMTA's footprint in Northern Ireland, highlighting the top 25 specific occupations. The main occupations are in technical areas,

such as metalworking and maintenance fitters (11%), electricians (5%), process operatives (4%) and welding trades (4%).

Table 4 – top 25 occupations within SEMTA – '*Sector Skills Assessment for Science, Engineering and Manufacturing Technologies' (2010)*

Standard Occupational Classification (SOC)	% of total employment
5223 Metalworking production & maintenance fitter	11%
5241 Electricians, electrical fitters	5%
8119 Process operatives n.e.c.	4%
5215 Welding trades	4%
1121 Production, works & maintenance managers	3%
8129 Plant and machine operatives n.e.c.	3%
1152 Office managers	3%
3122 Draughtspersons	3%
8133 Routine inspectors and testers	3%
5232 Vehicle body builders and repairers	3%
8125 Metalworking machine operatives	3%
9149 Other goods handling & storage occupations n.e.c	2%
2122 Mechanical engineers	2%
3131 IT operations technicians	2%
3541 Buyers and purchasing officers	2%
9139 Labourers process & plant operations n.e.c.	2%
2129 Engineering professionals n.e.c.	2%
4122 Accounts wages clerks & bookkeepers	2%
1132 Marketing and sales managers	1%
2126 Design and development engineers	1%
5213 Sheet metal workers	1%
8139 Assemblers and routine operatives n.e.c.	1%
1131 Financial managers & chartered secretaries	1%
1239 Managers and proprietors in other services n.e.c.	1%
2128 Planning and quality control engineers	1%
Total top 25 occupations	67%
All other occupations	33%

Skill Entry Requirements to Sector

1.13 In terms of securing employment, there are various routes of entry into the engineering sector. For skilled craft occupations and some assembly and operator occupations, entry is normally through apprenticeships and competence-based qualifications, such as National Vocational

Qualifications. For engineering technician and professional engineering roles, entry will tend to be through Higher National Diplomas and degrees, or progression from apprenticeships, with/through "on the job" experience. In the science sector, entry to laboratory science occupations and senior roles normally requires a degree, or a postgraduate level qualification. Some employers are beginning to explore further education and work-based learning entry for laboratory technician roles.

1.14 Across all sectors of our economy, there is a wide range of evidence[2] predicting that the proportion of those in employment with higher education qualifications will rise sharply and those with low or no qualifications will fall sharply. The implication of these forecasts is that there will be an increasing demand for higher level engineering skills over the next decade.

The Supply Equation - Student numbers in engineering

Higher Education (HE)

1.15 Table 5 shows Northern Ireland domiciled *first year* students enrolled on engineering courses at UK Higher Education institutions from 2006/07 to 2010/11. The number of students enrolled ranges from 855 in 2006/07 to a high of 1,150 in 2009/10. The latest figures show that there were 1,015 students enrolled in 2010/11. The most popular choice of study for students in 2010/11 was mechanical engineering (275), civil engineering (245), general engineering (190) and electronic and electrical engineering (150).

[2] Preparing for a lower corporation tax environment, Oxford Economics (2012); Success Through Skills, DEL (2011); and Forecasting Future Skill Needs in NI, DEL (2009).

Table 6 provides *total* students enrolled on engineering courses at UK Higher Education institutions from 2006/07 to 2010/11. The number of students enrolled ranges from 2,895 in 2006/07 to a high of 3,205 in 2010/11. The most popular choice of study for students in 2010/11 was civil engineering (935), mechanical engineering (790), general engineering (540) and electrical engineering (435).

Table 5 **-** NI Domiciled **first year** students enrolled on engineering courses at UK HEIs from 2006/07 to 2010/11

Subject	2006/07	2007/08	2008/09	2009/10	2010/11
General engineering	175	220	190	235	190
Civil engineering	225	270	270	315	245
Mechanical engineering	185	180	210	230	275
Aerospace engineering	45	45	40	50	50
Electronic & electrical	120	105	110	190	150
Production & manufacturing engineering	75	55	35	55	30
Chemical, process & energy engineering	30	35	55	70	65
Others in engineering	0	5	5	5	10
Total	855	915	915	1,150	1,015

Table 6 - NI Domiciled **total** students enrolled on engineering courses at UK HEIs from 2006/07 to 2010/11

Subject	2006/07	2007/08	2008/09	2009/10	2010/11
General engineering	535	545	455	545	540
Civil engineering	755	790	860	885	935
Mechanical engineering	695	655	670	710	790
Aerospace engineering	150	140	140	140	165
Electronic & electrical	450	390	350	410	435
Production & manufacturing engineering	190	175	140	155	115
Chemical, process & energy engineering	105	115	140	170	205
Others in engineering	15	15	20	15	20
Total	2,895	2,825	2,775	3,030	3,205

1.16 Table 7 shows there were 685 Northern Ireland domiciled first year students enrolled in engineering courses at Northern Ireland higher education institutions in 2010/11. The most popular choice of study for

first year students was mechanical engineering, civil engineering and general engineering.

Table 7 **-** NI Domiciled **first year** students enrolled on engineering courses at NI HEIs from 2006/07 to 2010/11

Subject	2006/07	2007/08	2008/09	2009/10	2010/11
General engineering	130	165	115	135	110
Civil engineering	170	200	200	240	175
Mechanical engineering	130	125	155	160	210
Aerospace engineering	30	20	30	35	30
Electronic & electrical engineering	80	65	75	120	90
Production & manufacturing engineering	65	45	30	45	25
Chemical, process & energy engineering	20	15	40	40	40
Others in engineering	0	0	0	0	5
Total	625	635	645	775	685

Table 8 shows in total there were 2,245 Northern Ireland domiciled students (all years) enrolled in engineering courses at Northern Ireland higher education institutions in 2010/11. This was an increase of 6% from the number of students enrolled in 2006/07. The most popular choice of study was civil engineering, mechanical engineering, general engineering and electronic & electrical engineering.

Table 8 **-** NI Domiciled **total** students enrolled on engineering courses at NI HEIs from 2006/07 to 2010/11

Subject	2006/07	2007/08	2008/09	2009/10	2010/11
General engineering	360	380	280	330	315
Civil engineering	570	580	625	685	710
Mechanical engineering	520	480	490	520	585
Aerospace engineering	100	85	100	100	115
Electronic & electrical engineering	330	275	250	275	300
Production & manufacturing engineering	155	140	110	125	85
Chemical, process & energy engineering	70	70	95	105	125
Others in engineering	10	10	5	5	10
Total	2,115	2,020	1,955	2,145	2,245

1.17 Table 8 shows the breakdown of engineering graduates from the University of Ulster over the period 2008/09 to 2010/11. In total, 281 students graduated from the engineering faculty in 2010/11, which was an increase of 20% from 2008/09, when 235 students graduated.

Table 8 – Engineering graduates from University of Ulster

School	Short title	Long description	2008/09	2009/10	2010/11
Faculty of Comp & Engineering	PHD Engineering	Engineering	1	3	24
School of Comp & Info Engineering	PG Dip Telecom&Internet Sys	Telecommun & Internet Systems	1		1
	MSc Telecom & Internet System	Telecommun & Internet Systems	3	3	2
School of Engineering	BEng Hons Elect Software	Electronics and Software	1	3	2
	BSc Hons Intern t& Com Eng	Internet & Communications Engin	1		
	BEng Hons Elect, Com & Sware	Electronics, Commun & Software	9	13	2
	BEng Hons Eng	Engineering Management	19	39	19
	BEng Engineering Mngt DIS FT	Engineering Management	7	8	1
	MEng Engineering FT	Engineering	2	6	1
	BEng Mechanical Engineering FT	Mechanical Engineering	3	3	3
	BEng Hons Mech. Engin FT	Mechanical Engineering	26	25	20
	MEng Engin Mechanical DIS FT	Engineering (Mechanical)	3		1
	MEng Engin Elect Electr DIS FT	Engineering (Electrical/Electronic)	3		
	MEng Engin Diploma Ingen FT	Engineering	19	19	18
	BSc Hons Biom Eng. FT	Biomedical Engineering	27	22	27
	BSc Hons Tech w Design FT	Technology with Design	25	9	15
	MSc Engineering PT	Engineering	6	17	5
	BEng Hons Engin Mech. FT	Engineering (Mechanical)		1	2
	BEng Hons Eng Elect FT	Engineering (Electrical/Electronic)		2	
	PG Dip Engineering	Engineering		8	3
	BEng Hons Electronic Eng FT	Electronic Engineering		1	5
	MEng Electronic Engin FT	Electronic Engineering			3
	MSc Biomedical Engineering FT	Biomedical Engineering			7
	MSc Adv Composites &Polymers	Advanced Composites & Polymers			2
	Cert HE Engineering FT Exit	Engineering			6
School of The Built Environment	BEng Hons Environ. Engin PT	Environmental Engineering	5		1
	MSc Infrastructure Eng	Infrastructure Engineering	6	4	6
	MSc Fire Safety Engineering	Fire Safety Engineering	18	38	20
	BEng Hons Civil Engineer	Civil Engineering	27	32	42
	BSc Civil Engineering + DIS FT	Civil Engineering	7	10	8
	PG Cert Hydro Safety Eng	Hydrogen Safety Engineering	5	6	1
	PG Dip Fire Safety Eng.	Fire Safety Engineering	1	1	1
	BEng Hons BldSer&Ene Eng	Building Services & Energy Eng		15	11
	MSc Hydrogen Safety EngDL PT	Hydrogen Safety Engineering		1	3

	MSc Infrastructure Engin FT	Infrastructure Engineering		6	4
	BSc Hons Civil Eng Tech&Ops FT	Civil Engineering			8
	PG Dip Hydrog Safety Eng DL PT	Hydrogen Safety Engineering			1
School of Comp & Intelligent Sys	BEng Hons Electrical & Com Sys	Electronics and Computer Systems	10	9	6
TOTAL			**235**	**304**	**281**

1.18 Table 9 shows that overall some 481 students have graduated from Queen's University Belfast in the academic year 2011/12. Within this, the civil engineering discipline was the most popular with 207 graduates anticipated. In terms of student intake, 504 new students enrolled in engineering courses in the 2011/12 academic year. The most popular course of study was mechanical engineering (114), civil engineering (95), electrical engineering (65) and chemical engineering (64).

Table 9 - Engineering graduates from Queen's University Belfast

School/Program/Plan	Intake	graduands
Chemistry & Chemical Engineering	**86**	**48**
Chemical Engineering undergraduate	**64**	**34**
BEng (S) Chemical Engineering	26	7
MEng (UM) Chemical Engineering	38	27
Chemical Engineering postgraduate research	**13**	**11**
MPhil Chemical Engineering	7	1
PhD Chemical Engineering	6	10
Chemical Engineering postgraduate taught	**9**	**3**
MSc (T) Process Engineering	9	3
Electrical, Electric Engineering	**105**	**90**
Electrical Engineering undergraduate	**65**	**31**
BEng (S) Electrical & Electron	35	12
BEng (S) Electronic & Software		3
BEng (S) Software & Ele - Ind	3	
BEng (S) Software & Electronic	1	
MEng (UM) Electrical & Electro	22	13
MEng (UM) Electronic & Softwar		3
MEng (UM) Softwre & Elec - Ind	4	
Electrical Engineering postgraduate research	**24**	**30**
MPhil Electrical & Electronic	2	1
PhD Electrical & Electronic	22	29
Electrical Engineering postgraduate taught	**16**	**29**

MSc (T) Adv Wireless Comms	4	
MSc (T) Electronics	7	23
MSc (T) Telecommunications	5	6
Mechanical & Aerospace Engineering	**185**	**136**
Aerospace Engineering undergraduate	**47**	**32**
BEng (S) Aerospace Eng	23	15
MEng (UM) Aerospace Eng	24	17
Aerospace Engineering postgraduate research	**1**	**9**
EngD (R) Mec and AeroSpce Eng		2
PhD Aerospace Engineering	1	7
Mechanical Engineering undergraduate	**114**	**55**
BEng (S) Manufacturing Eng	2	1
BEng (S) Mechanical Eng	43	14
BEng (S) Product Design & Dev	9	10
MEng (UM) Mech & Manuf Eng	58	19
MEng (UM) Product Design & Dev	2	11
Mechanical Engineering postgraduate research	**8**	**20**
EngD (R) Mec and AeroSpce Eng		1
MPhil Mechanical Engineering		
PhD Mechanical Engineering	8	19
Mechanical Engineering postgraduate taught	**15**	**20**
MSc (T) Adv Mech Engineering	15	7
MSc (T) Polymer Engineering		13
Civil Engineering	**128**	**207**
Civil Engineering undergraduate	**95**	**147**
BEng (S) Civil Engineering	50	72
BSc (O) Civil Engineering		4
MEng (UM) Civil Engineering	30	47
MEng (UM) Environ & Civil Eng	7	13
MEng (UM) Struct Eng with Arch	8	11
Civil Engineering postgraduate research	**13**	**19**
DSc (R) Civil Engineering	1	
MPhil Civil Engineering		
PhD Civil Engineering	12	19
Civil Engineering postgraduate taught	**20**	**41**
MSc (T) Durability of Structs		9
MSc (T) Environ Engineering	18	26
MSc (T) Water Resources Mgmt	2	6
Grand Total	**504**	**481**

Further Education (FE)

1.19 Table 10 provides statistical information in relation to professional and technical enrolments in manufacturing and engineering technologies in further education colleges, over the period 2008/09 to 2010/11. Overall, there are 10,980 students enrolled in further education and higher education courses at FE colleges in Northern Ireland. Of the 10,980 enrolments, 1,090 students are enrolled in higher education courses and 9,885 students enrolled in further education courses.

1.20 In terms of further education, the most popular choice of study for students in 2010/11 was automobile engineering (2,195), followed by general engineering (700) and electrical engineering (685). In terms of higher education in FE colleges, the most popular areas of study in terms of enrolments were mechanical engineering and maintenance (255), electrical and electronic engineering (225) and manufacturing engineering (175).

Table 10 – Enrolments in manufacturing and engineering technologies in FE Colleges (2008/09 to 2010/11)

Professional and Technical Enrolments in Manufacturing & Engineering Technologies by HE and FE

	2008/09			2009/10			2010/11		
Engineering Subject	**HE**	**FE**	**Total**	**HE**	**FE**	**Total**	**HE**	**FE**	**Total**
Food Science	0	0	0	0	0	0	0	35	35
Meat Technology	0	30	30	0	50	50	0	200	200
Food & Drink Processing	0	0	0	0	0	0	0	45	45
Others in Food Science	0	0	0	0	0	0	0	20	20
General Engineering	20	350	370	0	445	445	40	735	775
Integrated Engineering	0	210	210	0	120	120	0	140	140
Refrigeration	5	225	235	5	475	480	5	485	490
Computer Aided Engineering	0	35	35	0	15	15	0	0	0
Others in General Engineering	0	10	10	0	25	25	0	45	45
Mechanical Engineering	20	455	475	30	395	425	10	315	325
Mechanical Engineering Technicians	20	0	20	15	0	15	25	0	25
Mechanisms & Machines	0	0	0	0	10	10	0	0	0
Engineering: Automobile/Motor Vehicle	15	1,470	1,485	25	1,930	1,955	30	2,195	2,225
Automobile Assessment	40	15	60	110	0	110	95	0	95
Motor Cycle Engineering	0	15	15	0	0	0	0	0	0
Vehicle Bodywork	0	65	65	0	70	70	0	75	75
Vehicle Parts Personnel	0	0	0	0	0	0	0	15	15

Road Transport Engineering	0	25	25	0	5	5	0	0	0
Motor Vehicle Electronics	5	0	5	0	5	5	0	15	15
Turbine Technology	0	175	175	0	135	135	0	60	60
Mechanical Engineering	0	0	0	0	150	150	10	170	185
Mechanical/Electromechanical Engineering	0	45	45	0	20	20	0	20	20
Mechanical/Production Engineering	0	55	55	0	55	55	0	30	30
Others in Mechanical Engineering	0	100	100	0	75	75	0	50	50
Aeronautical Engineering	0	65	65	0	30	30	0	10	10
Aerospace Studies	20	70	90	45	60	105	65	70	135
Electrical Engineering	15	1,315	1,330	25	1,045	1,070	55	600	655
Electrical & Electronic Engineering	190	485	675	205	420	625	225	500	725
Electrical & Electronic Craft Practice	0	60	60	0	0	0	0	0	0
Power Plant Operation	0	0	0	0	0	0	0	0	0
Electrical Technicians	0	775	775	0	690	690	0	425	425
Others in Electrical Engineering	0	330	330	0	115	115	0	5	5
Electronic Engineering/Electronics	0	95	95	0	230	230	0	180	180
Electrical & Systems Engineering	0	185	185	0	130	130	0	75	75
Electronics & Computer Technology	35	100	135	30	115	145	10	80	90
Instrumentation & Control Engineering	0	20	20	0	25	25	0	30	30
Automation & control	15	0	15	15	0	15	5	0	5
Measurement & Control	0	15	15	0	20	20	0	15	15
Electronic Engineering Related Studies	0	55	55	0	35	35	0	20	20
Electronic Servicing	0	15	15	0	20	20	0	25	25
Others in Electronic Engineering	25	15	40	35	5	40	25	0	25
Production Engineering	0	15	15	0	5	5	0	5	5
Engineering Design & Manufacture	5	140	150	5	155	160	5	155	160
Engineering Design	0	465	465	0	355	355	5	320	325
Engineering Drawing	0	125	125	0	135	135	0	140	140
Manufacturing Engineering	160	225	385	155	260	415	175	360	535
Engineering Production	0	245	245	0	295	295	0	270	270
Fabrication Engineering Craft Practice	0	140	140	0	145	145	0	125	125
Mechanical Engineering & Maintenance	210	190	400	245	215	460	255	140	395
Sheet Metal Work	0	0	0	0	0	0	0	45	45
Welding	0	470	470	0	545	545	0	585	585
Chemical Engineering	0	0	0	0	20	20	0	30	30
Plant/Process Engineering	50	10	60	25	25	50	20	15	30
Gas Engineering	0	15	15	0	35	35	0	30	30
Other Engineering	10	95	105	5	85	90	0	35	35
Minerals Processing	0	45	45	0	40	40	0	160	160
Others in Minerals Technology	0	10	10	0	30	30	0	35	35
Plastics	0	10	10	0	0	0	0	0	0
Furniture Production	0	10	10	20	5	30	10	5	20
Machine Wood Working	0	60	60	0	85	85	0	35	35
Textiles - General	0	30	30	15	0	15	15	90	105
Clothing Technology & Manufacture	15	0	15	0	0	0	0	0	0
Others in Polymers & Textiles	0	0	0	0	10	10	0	0	0
Energy Studies	0	15	15	0	0	0	0	0	0
Industrial Safety	60	1,280	1,340	15	720	735	5	540	545
Road Transport	0	10	10	0	35	35	0	25	25
Others in Transport Business & Admin	0	0	0	0	0	0	0	55	55

Studies									
Total	**940**	**10,495**	**11,435**	**1,025**	**10,135**	**11,165**	**1,090**	**9,885**	**10,980**

HE = Higher Education is equivalent to NQF Level 4 and above
FE = Further Education is equivalent to NQF Level 3 and below
(1) Figures have been rounded to the nearest 5.
(2) Due to rounding, the sum of numbers in each row or column may not match the total shown

Apprenticeships

1.21 Table 11 highlights the number of engineering apprenticeships in Northern Ireland over the last three years. The latest figures from 2011 show that there are currently 1,466 apprenticeships in place. Of these, 1,310 are within the 16-24 age bracket. Given the recessionary impact and the wider challenges facing the industry, it is no surprise that the apprenticeship numbers have declined by 23% over the last three years.

Table 11 – Northern Ireland engineering apprenticeships

DATE	**Engineering Apprenticeships**		
	Age 16-24	**Age 25+**	**TOTAL**
01-Oct-09	1834	74	1908
01-Oct-10	1473	134	1607
01-Oct-11	1310	156	1466

Employment Projections

1.22 Table 12 highlights employment projections for the SEMTA footprint for 2010-2016 for the main technical occupations. SEMTA is predicting that overall there will be an annual requirement for 500 engineers, scientists and technologists. The main requirement will be for individuals within the advanced engineering sub-sector. It is important to note that these forecasts are pre-2012 and do not take into account the wider economic problems facing the UK and Europe. There is no doubt that the

challenging conditions will place further pressures on businesses and will filter through in their demand for skilled staff. However, the sector and its sub-sectors remain key to our economic recovery and there are undoubtedly huge market opportunities to exploit across the globe.

1.23 From the student enrolment information from HE institutions and HE students in FE colleges presented in section 6, the annual demand requirement of 500 jobs will appear to be satisfactorily met, given that there are:

- nearly 700 students predicted to graduate in engineering courses at Northern Ireland higher education institutions in 2011/12;
- approximately 11,000 students enrolled in HE and FE courses in our further education colleges; and
- approximately 1,500 engineering apprenticeships throughout Northern Ireland.

Table 12

Employment Projections 2010-2016	
Total net technical requirement 2010-2016: (Engineers, scientists and technologists):	**3,500** (500 per annum)
Mature engineering:	1,350 (195 per annum)
Advanced engineering:	2,100 (300 per annum)
Science Industries:	<100
Net requirement by technical occupation 2010-2016: (Engineers, scientists and technologists):	
Skilled trades/craft occupations:	1,100 (160 per annum)
Operatives:	900 (120 per annum)
Managers:	500 (70 per annum)
Professionals:	600 (90 per annum)
Associate professionals/technicians:	400 (60 per annum)

Source: Semta/IER Projections 2009 using SIC 2003 sector definitions

1.24 Even if the demand predictions in table 12 were to increase by 50%, it would appear that there would still be scope within the education system to

meet this increased demand. From the enrolment information presented earlier, it would appear that there is an adequate number of students graduating and studying engineering subjects to satisfy the current and future business requirements over the next number of years. In summary, for the academic year 2010/11, the following numbers of NI students were enrolled in manufacturing and engineering courses :

in UK HE institutions	3205
in Northern Ireland HE insitutions	2245
HE students in FE Colleges (level 4 and above)	1090
FE students (level 3 and below)	9885

PART TWO : WHAT ARE THE CHALLENGES? THE EMPLOYER VIEW

Foreword from Bill McGinnis, Adviser on Employment and Skills

Last year, in my role as Adviser on Employment and Skills, I was asked by the Minister for Employment and Skills, Dr Stephen Farry MLA, to provide strategic analysis and advice on the current and future priority skills areas in Northern Ireland. Following on from this report, the Minister announced that manufacturing (and in particular the food and drink, advanced manufacturing and advanced engineering sub sectors) would be one of the sectors on which the Department would focus its provision, with a view to helping to rebalance the economy.

Following lobbying from employers within this sector in relation to their concern about a shortage of people with engineering skills, the Minister asked me to visit a range of manufacturing/engineering companies to find out what issues employers felt were hindering progress in the sector and to present these conclusions to him. Needless to say, the issues coming through are as diverse as the sector itself, though the one consistent view is that problems can only be solved by collaboration between employers, their employees and government - the industry recognises that this isn't simply a job for government alone.

I provided an early overview of the information I had garnered at the employer stakeholder event at the Stormont Hotel on the 25th June 2012. At this event, the Minister announced the creation of an 'Advanced Manufacturing and Engineering Services' working group. My evidence, together with the analytical information provided in the earlier section of this report, will be used by this Group to inform a collaborative action plan which addresses the skills issues identified. I look forward to seeing the results of the working group's proposals.

I would like to reiterate my thanks to those employers who took the time to meet me - it is your sector and your involvement is a key part of the solution.

Bill McGinnis CBE
Northern Ireland Adviser for Employment and Skills

INTRODUCTION TO PART TWO

2.1 The first section of Part Two gives an overview of the general skill requirements, which the sector is likely to face in the medium to long term. This is based on an assessment of the labour market evidence from Sector Skills Councils, employers and research reports.

2.2 The second section summarises the views of employers on what they see as the main barriers to recruitment and to business growth and which were expressed during the meetings with Bill McGinnis and at the stakeholder event. There is general commonality in issues facing these businesses, not least being that improvements to training are not the sole preserve of Government, but require a tri-partite approach involving the employer, the employee and government.

CURRENT AND FUTURE SKILLS ISSUES

2.3 Over the last five to ten years, the sector has become increasingly engaged and focused in high value-added areas, such as innovation, design and development. This has had a fundamental impact on the industry and its various sub-sectors, with many businesses now requiring increasing numbers of individuals with higher level skills. Many sectors are predicting significant growth over the coming years, which will have

important implications in terms of the requirement for skilled labour in engineering.

2.4 It is clear from the labour market information that there is a range of skill issues across the engineering sector and industry sub-sectors. In general terms, employers consider that the main reason for recruitment difficulties is a lack of applicants with the necessary skills, work experience and qualifications, such as appropriate NVQs, or qualifications such as GCSEs, A levels or HNDs. As far as more specific skills gaps for the engineering sector are concerned, the main problem areas cited are welding, CNC machine operations, mechanical engineering, metal working, electrical engineering and computer-aided design (CAD).

2.5 Over the medium to long term, there will be a need to:

- upskill the operative and elementary section of the workforce to be qualified to a minimum of level 2 (see Part One, Table 3);

- upskill technical staff to levels 3 and 4, in broad areas such as mechanical and electrical engineering (see Part One, Table 3);

- develop the existing workforce's leadership and management skills, with a particular focus on strategic marketing and export skills (see Part One, Table 9);

- provide a continued supply of STEM graduates, in subjects such as electrical engineering, mechanical engineering, civil engineering, electronics, aerospace engineering, production and manufacturing engineering and chemical, process and energy engineering (see Part One, Table 9); and

- Evidence from SEMTA (Sector Skills Assessment for Science, Engineering and Manufacturing Technologies, 2010) suggests a need to address the issue of an ageing workforce, which is going to face a number of sectors over the next decade. This is likely to impact on SMEs in particular (see Part One, Table 3).

VIEWS FROM COMPANY BUSINESS VISITS AND THE STAKEHOLDER EVENT

Challenge One : Sector Attractiveness

2.6 There is general agreement that the sector as a whole has an image problem. It is not seen as a desirable career choice, particularly as a higher education route for the brightest students – careers in law, medicine and accountancy, for instance, are perceived by both pupils and parents as much more attractive, with better financial rewards. One view was that this is largely because the media does not understand the importance of and the varied occupations available within the sector and therefore does not promote a positive image. In the main, however, employers agreed that the sector itself, including individual companies, could do more to showcase the career opportunities it offers, particularly to schools. Some firms already have strong links with schools and colleges in their area, which helps to market the sector generally and their own company as a potential employer. A number of employers suggested that financial incentives, and in particular bursaries, should be offered to encourage young people to study economically important subjects, including engineering.

2.7 A related concern centres on the attractiveness of the sector in Northern Ireland specifically as a place to work in this industry, compared with other UK regions. In particular, there can be a large salary differential between companies in England and those in Northern Ireland and this can hinder

the recruitment and retention of qualified staff locally. Indeed, competition for the best qualified is increasing, with companies in England actively seeking students from Northern Ireland. Whilst this reflects well on the quality of the education provision in Northern Ireland, it can cause skills shortages for employers here, as qualified workers migrate to Great Britain.

2.8 Some companies report that their location can prove unattractive, as people in Northern Ireland can be unwilling to commute to a job and can view anything more than 15-20 miles as unacceptable. One company highlighted this as a real issue for them, despite their location being five minutes from the motorway.

2.9 There are particular difficulties in attracting women to the sector. Within the SEMTA footprint, only 18% of employees are women, compared with 48% across all sectors. At sub-sector level, women account for only 19% in mature engineering (metals, metal products, mechanical equipment, electrical equipment, rubber tyres and parts of other transport equipment), 17% in leading-edge technologies and 10% in science industries. [3]

Challenge Two – meeting demand

2.10 It is evident that the industry takes large numbers of apprentices each year and businesses are keen that this should be further developed. There is some variation on how companies view current skills gaps and shortages, which depends very much on a business' own experience. Some believe there is no major skill shortage presently, whilst others do, largely because they are having difficulties filling posts. All, however, agree that if we are to meet the demands of the industry in the future,

[3] SEMTA – Northern Ireland Report : Sector Skills Assessment for Science, Engineering and Manufacturing Technologies, December 2010

action must be taken to increase the supply of individuals with core engineering skills. Furthermore, many companies are diversifying in order to become less reliant on specific industries, or customers. This increasing diversification means increasing levels of skills are required.

2.11 Future demand will be affected by an aging workforce and this is a particular problem for SMEs. Another issue for smaller companies is the difficulty in portraying a clear career path, with few having a dedicated HR resource and this can also hinder recruitment. One employer noted the difficulties in promoting within the company, as they are not big enough to offer a progression route. Some firms reported a very limited response rate when using traditional media, such as newspapers, to try and recruit staff. Recruitment agencies can prove too expensive for smaller firms and there is no guarantee that suitable applicants will be sourced.

2.12 It is important that a good supply chain is established to fill future vacancies at all levels. Some employers argue, however, that the numbers graduating in electronic and electrical design are too low to meet the current and future demand from industry, though the statistical analysis does not indicate a lack of enrolments in the discipline overall. Others also report difficulty acquiring PhD graduates with relevant work experience.

2.13 Employers were asked if a short-term conversion course for graduates in other disciplines, along the lines of the IT Professional Conversion Course, would be a potential solution. The view was, however, that this would be of no real benefit, as the required foundations of maths, physics and chemistry could not be developed in a short, time-bound course. There is high regard for the Higher National Diploma (HND), which is recognised as a valuable qualification, but some felt that a Level 4 apprenticeship, if developed, would be useful for filling higher level vacancies. There was also a suggestion that companies should work with

their local college to upskill Level 3 technicians, with a view to qualifying them at HNC or HND level.

Challenge Three : Quality of Courses, Training and Qualifications

2.14 There are two main inter-related issues here, regarding courses and lecturers. A common concern was the perceived emphasis in engineering courses on the theoretical and not enough on practical application. This is linked to a view that course lecturers are largely academic, with little current, practical experience of industry. A number of employers, however, acknowledged that the sector could do more to promote closer links between industry and education, in particular, with higher education. One suggested that a preferred model for degree courses would be a condensed course, with a mandatory industrial year, which may address the theoretical/practical imbalance. Currently, it depends on which type of engineering degree course a student follows; some include a full year of industry based learning, but others require only some weeks of this.

2.15 Another employer noted that in their view, their local college does an excellent job at producing people for the lower level positions. There is a belief among some businesses, however, that the training of apprentices is ad hoc and the experience and quality of training is highly dependent on the employer. One stated that current methods for training apprentices are insufficient for the high demands of the aerospace industry.

2.16 At a general education level, almost all those consulted mentioned concern about the quality of mathematics provision in Northern Ireland's schools, which they argue is having a knock-on effect on the quality of graduates being produced from Northern Ireland's further education colleges and universities. The sector believes that a strong and robust

foundation in mathematics is absolutely essential for developing solid engineering skills.

2.17 There were a number of suggestions from employers as to how this challenge could be tackled :

- in order to widen training opportunities, there could be a value in linking SMEs to larger companies, whereby extra places could be offered with little additional cost. This could be done for SMEs within a company's supply chain, or perhaps organised within a geographical area.

- a "buddying" system between apprentices, or perhaps the allocation of a mentor to provide guidance from a more experienced worker, could help apprencticeships settle in better to the workplace; and

- an Aerospace Apprentice Academy would be a very useful training resource for this sub-sector, given its highly specialised skills needs. Such a facility would take students for 2-3 days per week for training, with the remainder of their time with their sponsor company. The funding model would have to be determined, but the preference is for the funding to be placed in the hands of the employers, who would then contribute towards the resource expenses for the centre. This model could also help address the difficulties smaller employers have in providing "world class" training.

Annex A

Engineering Stakeholder Event

Stormont Hotel

5:00pm 25 June 2012

Attendance List

ADS
AJ Power
Belfast Metropolitan College
Bombardier
CBI
Colleges NI
Coote Engineering
Denroy Plastics
Department of Education
Diageo
FG Wilson
Huddleston Engineering
Invest NI
MATRIX
Michelin/NRC
NIE
Northern Regional College
North Western Regional College
Schrader
Southern Regional College
STEM Business Group
University of Ulster/MATRIX
Ulster Unionist Party
Wrightbus

Apologies

Attrus/STEM Business Group
NIACE QUB
Semta NI
Thales Group
Whale Pumps

Meetings with Bill McGinnis

BE Aerospace
CDE Ireland
Coote Engineering
Denroy Plastics
Huddleston Engineering
JTI Gallaher
Kelvatek
Maydown Engineering
Moyola Precision Engineering
NACCO Materials Handling
Northern Ireland Electricity
Queen's University, Belfast
Ridgeway

Annex B

Qualifications: what the different levels mean[4]

How different qualifications compare

You may hear people talking about qualification 'levels'. These levels are contained in three qualification 'frameworks':

- National Qualifications Framework
- Qualifications and Credit Framework (the framework for vocational, or work-related qualifications)
- Framework for Higher Education Qualifications

The frameworks group together qualifications that place similar demands on you as a learner. However, within any one level, qualifications can cover a wide mix of subjects, and take different amounts of time to complete.
The frameworks can also help you see how one type of qualification can lead on to other, higher levels of qualifications.

National Qualifications Framework

The National Qualifications Framework (NQF) sets out the level at which a qualification can be recognised in England, Northern Ireland and Wales.

Only qualifications that have been accredited by the three regulators for England, Wales and Northern Ireland can be included in the NQF. This ensures that all qualifications within the framework are of high quality, and meet the needs of learners and employers.

Qualifications and Credit Framework

The Qualifications and Credit Framework (QCF) contains vocational (or work-related) qualifications, available in England, Wales and Northern Ireland.
These qualifications are made up of units that are worth credits. You can study units at your own pace and build these up to full qualifications of different sizes over time. Units and qualifications also range in difficulty, from entry level to level 8 (similar to the levels in the NQF).

[4] Extract from the Directgov website

Qualifications by level across the NQF and QCF

Level	Examples of NQF qualifications	Examples of QCF qualifications
Entry	- Entry level certificates - English for Speakers of Other Languages (ESOL) - Skills for Life - Functional Skills at entry level (English, maths and ICT)	- Awards, Certificates, and Diplomas at entry level - Foundation Learning at entry level - Functional Skills at entry level
1	- GCSEs grades D-G - BTEC Introductory Diplomas and Certificates - OCR Nationals - Key Skills at level 1 - Skills for Life - Functional Skills at level 1	- BTEC Awards, Certificates, and Diplomas at level 1 - Functional Skills at level 1 - Foundation Learning Tier pathways - NVQs at level 1
2	- GCSEs grades A*-C - Key Skills level 2 - Skills for Life - Functional Skills at level 2	- BTEC Awards, Certificates, and Diplomas at level 2 - Functional Skills at level 2 - OCR Nationals - NVQs at level 2
3	- A levels - GCE in applied subjects - International Baccalaureate - Key Skills level 3	- BTEC Awards, Certificates, and Diplomas at level 3 - BTEC Nationals - OCR Nationals - NVQs at level 3
4	- Certificates of Higher Education	- BTEC Professional Diplomas Certificates and Awards - HNCs - NVQs at level 4
5	- HNCs and HNDs - Other higher diplomas	- HNDs - BTEC Professional Diplomas, Certificates and Awards
6	- National Diploma in Professional Production Skills - BTEC Advanced Professional Diplomas, Certificates and Awards	- BTEC Advanced Professional Diplomas, Certificates and Awards
7	- Diploma in Translation - BTEC Advanced Professional Diplomas, Certificates and Awards	- BTEC Advanced Professional Diplomas, Certificates and Awards - NVQs at level 5 (in the QCF framework)
8	- specialist awards	- Award, Certificate and Diploma in strategic direction

Framework for Higher Education Qualifications

The Framework for Higher Education Qualifications (FHEQ) has been designed by the higher education sector, and describes all the main higher education qualifications. It applies to degrees, diplomas, certificates and other academic awards granted by a university or higher education college (apart from honorary degrees and higher doctorates).

The FHEQ broadly corresponds with levels 4 to 8 of the National Qualifications Framework, in terms of the demands the qualifications place on learners.

FHEQ level	Examples of qualifications
4	- certificates of higher education - higher national certificates
5	- diplomas of higher education - Foundation Degrees - higher national diplomas
6	- bachelors degrees - bachelors degrees with honours - graduate certificates and diplomas - Professional Graduate Certificate in Education
7	- masters degrees - integrated masters degrees - postgraduate certificates - postgraduate diplomas
8	- doctoral degrees