education in employment

FRAMEWORK

for Progression of Craftspersons

Edited by Irene Sheridan

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This Progression Framework is intended to advise learners, employers and higher education providers on an overall progression route to allow holders of Advanced Certificates-Craft to progress to Level 7 degree programmes on the National Framework of Qualifications.

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Acknowledgements

This document is based on contributions from both individuals and organisations. The membership of the working group is set out in Appendix E and these are the principal contributors – there are, however, many other unnamed individuals within the partner organisations and elsewhere who helped to make this work possible. This document would also not have been possible without funding received under the Strategic Innovation Fund Cycle 1 from the Higher Education Authority under the National Development Plan 2006 - 2013

Foreword

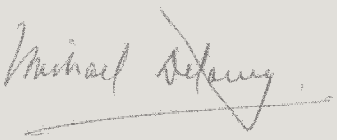
The *Education in Employment* project funded through the HEA's Strategic Innovation Fund represents a significant development for Cork Institute of Technology and its partner institutions. The project itself was a natural progression for CIT; building on its leadership in career-focused education and delivering on the lifelong learning agenda that is fundamental to economic and social progress. This framework document is the result of the dedicated efforts of the working group charged with the development of progression and diversification opportunities for craftspersons.

The national economic climate has changed somewhat since the summer of 2006 when this project was initially proposed and, consequently, this focus on progression opportunities for craft certificate holders has become even more relevant.

Throughout, the work on this project has been a cooperative effort and I would like to acknowledge the collaboration and sharing of resources and experiences that has led to this publication. All six partner institutes of technology have dedicated considerable time and effort but there has also been very valuable input from outside the project team – in particular from the NQAI, HETAC, HEA, FÁS, FETAC and the many craftspersons and employers who made important contributions and I would like to thank everyone for their efforts.

The progression framework document sets out clear mechanisms for the design of routes to qualifications at Level 7 and beyond for craftspersons. One of the most useful features, I believe, is the illustration of those routes through the successful case studies presented.

This publication highlights some excellent current practice within the partner institutes and indeed the institute of technology sector as a whole and will also encourage the development of more pathways in a flexible and accessible manner. I would like on my own behalf and on behalf of the overall project steering group to thank the members of the working group for this important piece of work and to congratulate the chair of that group on bringing this document to fruition.



Michael Delaney,
Head of Development,
Cork Institute of Technology

Executive Summary

This Progression Framework is intended to advise learners, employers and higher education providers on an overall progression route to allow holders of Advanced Certificates-Craft to progress to Level 7 degree programmes on the National Framework of Qualifications.

To illustrate and quantify the need for progression opportunities, three separate surveys were undertaken - a survey of apprentices in a number of partner institutions, a survey that polled craftspersons currently undertaking undergraduate programmes in CIT and DIT and a survey of employers of craft certificate holders. The surveys confirmed the strong desire of many apprentices to progress to higher education programmes. Detailed case studies based on learners who availed of progression opportunities specifically into electrical engineering programmes also demonstrate that apprentices who do progress do so very successfully.

In order to facilitate real engagement and to recognise the learning that is achieved through the craft certificate programmes, the focus here is on the granting of academic exemptions from modules or groups of modules on the target courses. The suggested procedure for establishing exemptions takes the form of identifying the learning outcomes of the relevant craft programme and mapping these against the relevant degree programme module learning outcomes from which exemption is sought. This mapping exercise is illustrated through a number of detailed case studies. For learners with qualifications additional to their Advanced Certificate-Craft or significant experiential learning a Recognition of Prior Learning (RPL) process should be considered for further exemptions.



The proposed framework acknowledges that to make progression available to all those who may wish to participate, irrespective of geographic location, there is a need for innovative and novel provisions on the part of the institute of technology sector. This could include collaboration between institutes, the sharing of programme delivery, franchising of programmes, the sharing of module delivery and the use of distance learning.

A number of key recommendations are included dealing with the provision of information, focused progression opportunities for craftspersons, modes of programme delivery and the provision of financial support to the learners.

This document addresses a practical framework that can be used to facilitate development of progression pathways for craft certificate holders to Level 7 and beyond on the National Framework of Qualifications and illustrates the need for progression opportunities through a number of surveys and the practical implementation through a number of case studies. In developing this document and through the engagement of the working group it became clear that there is a diverse range of programmes available in many different formats – full-time, part-time and flexible learning into which craft holders are currently progressing in many institutes of technology. It is hoped that the publication of this document will facilitate the further development of these routes.

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Contents

1 Education in Employment project

The development of this progression framework is undertaken as part of Cork Institute of Technology's participation in the Strategic Innovation Fund (SIF) Programme (under the auspices of the Higher Education Authority - Department of Education and Science). The overall SIF Cycle 1 CIT-led project is titled *Education in Employment* and this third strand of that project is focused on *Progression Routes and Diversification Opportunities for Craftspersons*. The collaborating partnership on this strand consists of representatives from Athlone Institute of Technology, Dublin Institute of Technology, Dundalk Institute of Technology, Galway-Mayo Institute of Technology and Institute of Technology, Sligo, with Cork Institute of Technology as the lead partner. The working group was formed in April 2007.

The planned outcomes under strand 3 of the Education in Employment project were:

- Investigation and recommendation of generic principles for the development of user friendly and appropriate progression routes for craftspersons up to degree-level in engineering and related courses.
- Publication of a framework for progression for craftspersons in disciplines related to their specialist craft areas.
- Progression of 40 students to degree programmes in electrical engineering in collaborating institutions by the end of year 1.
- Establishment of a bespoke business course for owner-managers of companies providing services to the building and domestic sectors.
- Establishment of a programme for craftspersons working in the construction sector to meet the needs of those wishing to move into management/supervisory roles in construction companies.

Much of the early work of the working group focused on an agreed framework for progression and this document is the outcome of that work. The specific targets in relation to progression to engineering degree programmes have been achieved and are evident through the case studies presented in Appendix D.

Background 2

The FÁS Standards-Based Apprenticeship is a structured system of skills development for craft workers across a wide range of work activities. The apprenticeship involves 7 phases, four of which are 'in career' and three on 'educational release'. Recent reports (FÁS 2000, FÁS 2006) show that the intake to apprenticeship programmes has ranged from 8,000 in 2002 to 7,900 in 2006. Most of those taking apprenticeship as an option are male and these numbers represent at least a quarter of all young males leaving school either post Junior Certificate or Leaving Certificate and half of all young males who do not go on to full-time, third-level education. The population of registered apprentices as of December 2006 was 29,800 (FÁS 2006).

Some craftspersons have undertaken further academic studies taking advantage of progression opportunities provided in a number of institutes of technology but it is recognised that this number could be increased by the provision of more diverse and accessible progression opportunities. According to a recent report from the Expert Group on Future Skills (2007) it will be necessary by 2020 that 48% of the labour force should have qualifications at NFQ Levels 6 to 10.

Research conducted in the UK (Kappia et al., 2007), focused on career development priorities and aspirations of trade and craft employees in the construction sector found that trainees aspired to develop their career beyond the confines of the specific craft specialisation. O'Connor (2004) reports that, in a survey of former apprentices in the construction sector, the majority of respondents indicated that they believed that their apprenticeship prepares them to pursue further learning at a later stage in their career. Unwin and Fuller (2004) report that the apprentice develops confidence as a learner and ability to take personal responsibility and demonstrate autonomy, and the ability to set and strive for personal learning goals, all of which contribute to a strong basis for lifelong learning.

We can conclude, therefore, that there is and will continue to be a demand for higher skills levels in the workplace, that the aspirations of craft workers extend to higher education and that the apprenticeship is seen as a good preparation for continuing education. These are important drivers for the provision of more focused progression opportunities for holders of craft certificates. In the current economic climate it is accepted that the slowdown in the construction sector will also be a factor in the engagement of greater numbers of craft workers in higher education.

This progression framework is intended to advise learners, employers and higher education providers on an overall progression structure and to illustrate through specific case studies successful mechanisms for progression. Initially, the progression framework is as generally agreed by the project partners, however, it is envisaged that following its publication and contributions from stakeholders and interested groupings, a nationally agreed strategy would emerge.

Institutes of technology will determine how best to approach the provision of progression initiatives in line with their own priorities, resources and strategic planning. However, it would afford national access to progression programmes if institutes of technology were to act in concert for the provision of such progression programmes.

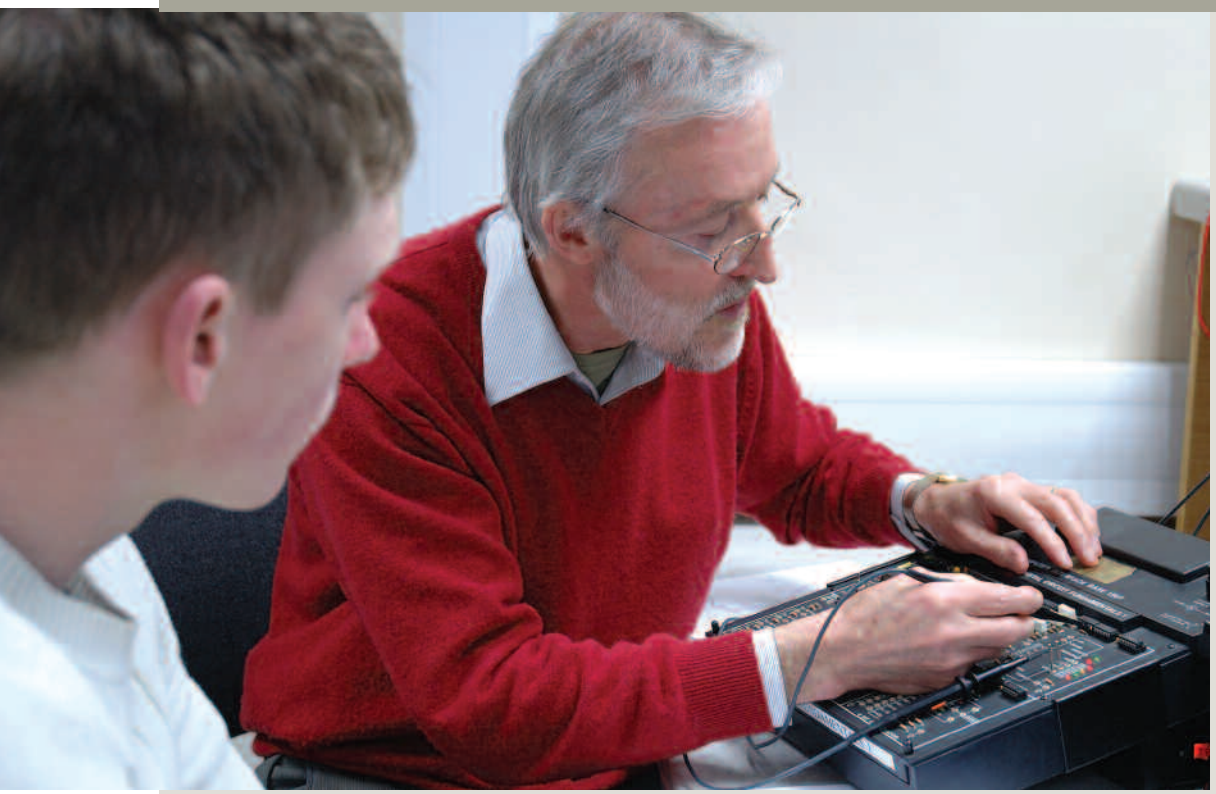
Target Survey Groups 3

In order to illustrate and quantify the need for progression opportunities three separate surveys were undertaken - a survey of apprentices in a number of partner institutions, a survey that polled craftspersons currently undertaking undergraduate programmes in CIT and DIT and a survey of employers of craft certificate holders. The aim of the survey of apprentices in the partner institutions was to gain an overall view on the demand for progression among apprentices as well as to identify the progression discipline of choice by apprentices in the various trades. The survey attempts to identify perceived barriers to further learning and preferred modes of learning. A total of 1,130 current apprentices were surveyed – of these 94.7% indicated that they would benefit from progression opportunities leading to a higher qualification. A detailed review of the survey findings is presented in Appendix A.

In addition to this group of current apprentices, figures provided by FÁS indicate that there are 35,885 Craftspersons in the workforce who have completed their Advanced Certificate-Craft (previously National Craft Certificate) and have been in full-time employment for some time. Among this cohort there is an appreciation of the need for a further qualification in their particular area in order to avail of opportunities for promotion and self development. It is also clear that this group are more likely than most to be self-employed and to employ others. O'Connor (2004) reported that of a group of apprentices in the construction industry, 18% were self employed within a year of qualifying as a craftsperson. This indicates a need for accredited diversification opportunities from their particular craft specialisation into qualifications in broader areas of management and supervision. Kappia (2007) points to this lack of suitable routes towards managerial and professional positions for craft workers.

The purpose of the second survey involving craftspersons presently pursuing undergraduate engineering programmes was to ascertain their views of the programmes they are undertaking and to identify any issues they may have encountered. The findings are presented in Appendix B.

The survey of employers found that a large percentage of employers support the need for further learning among their employees and a number of questions were raised around the financial support of such opportunities. These results are reported in Appendix C.



Academic and experiential learning through the craft certificate programmes is well defined and well understood and it is proposed here that these learners be treated as a coherent group in developing and defining progression pathways as outlined in Section 4 of this report document. Obviously, all additional formal and non-formal learning can be submitted through the Recognition of Prior Learning (RPL) process on an individual basis to apply for further exemptions against specific modules where appropriate. This will be a matter for the individual and the appropriate institution. The *Education in Employment* project includes a significant strand on alignment of RPL policies and practices in partner institutions and will result in the generation of a set of agreed guidelines for learners, mentors and assessors.

Progression Pathway 4

National Framework of Qualifications

The National Qualifications Authority of Ireland (NQAI) was established in 2001 with the principal aims of establishing and maintaining a National Framework of Qualifications (NFQ) and promoting and facilitating access, transfer and progression. The outline framework of qualifications is usually seen in the form of the 'fan' diagram shown below in Figure 1.

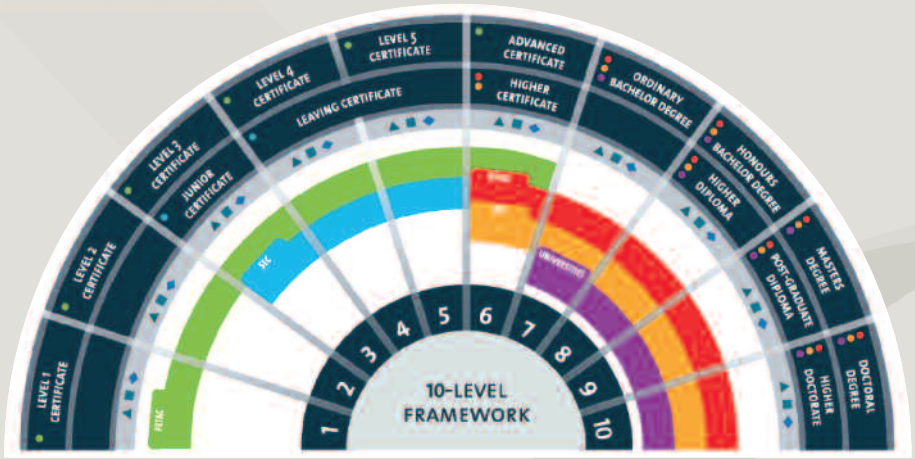
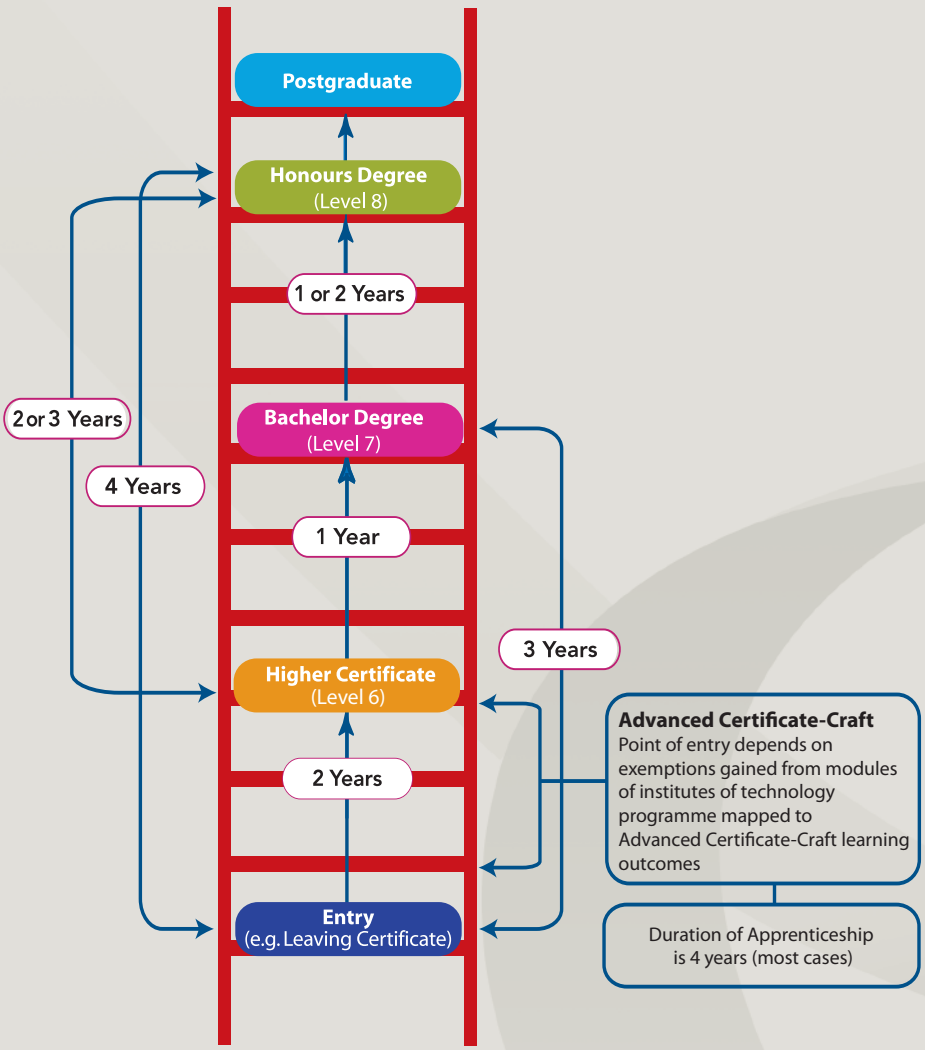


Figure 1 National Framework of Qualifications

The development of the National Framework of Qualifications was a fundamental step in achieving clarity for the learner and the provider in relating learning and learning achievements and in facilitating transfer and progression. The framework lays out clear 'levels' with one or more award types at each level. Level indicators give broad descriptions of learning outcomes in terms of knowledge, skills and competence. Awards at the same level on the framework may be different award-types because they reflect different mixes of knowledge, skills and competence. NQAI states that: *While all of the eight sub-strands of knowledge, skills and competence have been determined for the major award types, it is not the case that all of the named major awards will be as comprehensive. They may not encompass learning achievements for all of the sub-strands. Also, individual sub-strands of a named major award may be at a different level to the overall level of the major award-type.*

The basis for distinguishing between awards in the further education and higher education sectors at the same level on the framework is the comparison of the learning outcomes achieved under the knowledge, skills and competence headings. Inevitably there will be a requirement to evaluate the learning acquired by those who have obtained qualifications in the further education sector and who wish to seek exemptions on progressing on to programmes leading to a higher education award. Such evaluation is best undertaken using a *mapping exercise* involving the comparison of the learning outcomes for each programme and where an adequate match is made, exemptions will be applied subject to meeting the academic regulations associated with the programme onto which the learner wishes to progress.

The institute of technology sector has long operated on the basis of ladders of opportunity designed to facilitate the progression path described above thus ensuring that learners are given appropriate opportunities to progress their learning – from Level 6 to Level 10 on the framework. A typical 'ladder of progression' diagram from the CIT student prospectus is shown in Figure 2.


Postgraduate
Honours Degree
(Level 8)
1 or 2 Years
Bachelor Degree
(Level 7)
1 Year
Higher Certificate
(Level 6)
2 Years
Entry
(e.g. Leaving Certificate)
2 or 3 Years
4 Years
3 Years
Advanced Certificate-Craft
Point of entry depends on exemptions gained from modules of institutes of technology programme mapped to Advanced Certificate-Craft learning outcomes
Duration of Apprenticeship is 4 years (most cases)

This progression framework document will focus on the progression from a FETAC award at Level 6 on the NQAI Framework to a HETAC Level 7 award in a broadly related discipline. It is understood that further progression opportunities from Level 7 exist in all partner institutions. In general, the progression path is as shown in Figure 3 below.

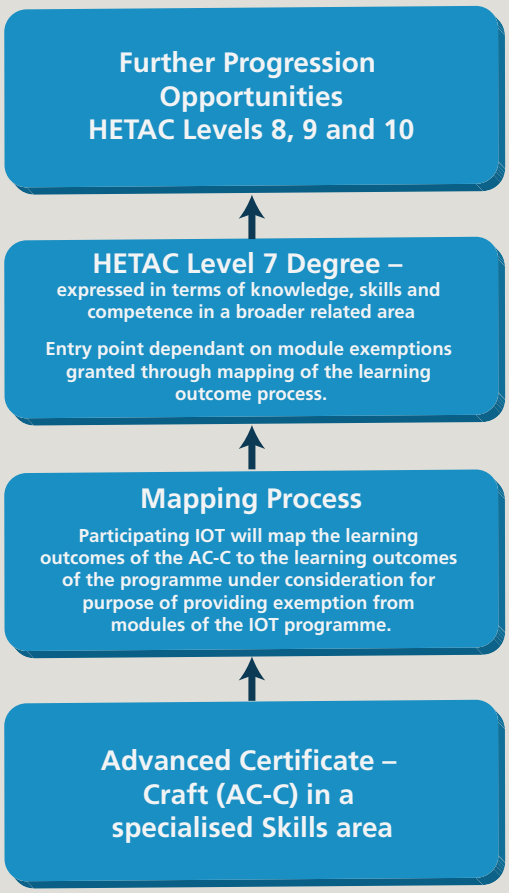


Figure 3 General outline of progression pathway

Knowledge, Skills and Competence approach

In order to plot progression pathways for craftspersons both the Advanced Certificate-Craft (AC-C) and the destination programme must be clearly articulated in terms of the National Framework of Qualifications. A detailed comparison of the knowledge, skills and competence outcomes in the AC-C apprenticeship programme and the descriptors for the destination Level 7 degree programme will indicate the learning required to 'bridge the gap'. The narrower the discipline in which the degree is sought and the more closely it is aligned with the craft specialisation, the better the match and the greater the exemptions applicable.

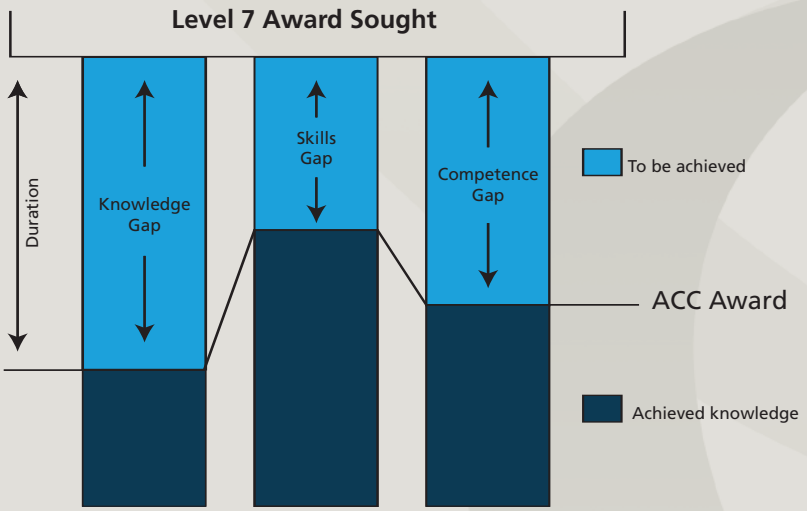


Figure 4 Advanced Certificate-Craft mapped to Level 7 Award Descriptors

5 Exemption from Modules within a Programme of Study

This progression framework is intended to outline a means by which holders of advanced craft certificates can, as a group, be afforded advanced entry to programmes that lead to awards at Level 7 on the National Framework of Qualifications. As programmes of study in the partner institutes of technology are described in terms of learning outcomes and programme outcomes in a modularised format, it is suggested that these existing approved modules act as the basis for the formal procedure.

Exemption is a key aspect of this proposed progression framework and the suggested procedure for establishing exemption should take the form of identifying the learning outcomes of the relevant craft programme and mapping these against the relevant degree programme module learning outcomes, from which exemption is sought. Furthermore, such approved modules may be utilised for the design of new programmes where such a need is identified. Detailed examples of the mapping process have been appended to this document for the purpose of demonstration in the case studies provided in Appendix D.

The award being sought will determine if additional prerequisites need to be considered. For instance, if learners seek to progress toward a Level 7 qualification in engineering, Leaving Certificate Mathematics or equivalent may be required – unless their craft certificate can be shown to have met the equivalent mathematics standard.

Institutes of technology will be encouraged to include such exemption information in their respective programme information brochures and it is desirable that a national organisation would prepare a specialist brochure embracing programmes with exemptions for distribution widely within the FÁS and institutes of technology sector principally aimed at craftspersons.

Recognition of Prior Learning (RPL)

Where a learner has gained additional formal or informal learning this can be submitted through the formal Recognition of Prior Learning (RPL) procedures to be considered for additional exemptions. In this case the applicant will submit that extra learning to the formal RPL process of the institute of technology to which they are making application. It is acknowledged that the outcome of such an RPL process is confined to each individual applicant and is not normally expected to establish further general exemptions.

6 Modes of Delivery

It is recognised that most craftspersons will be engaged in full-time employment and many of those who wish to embark on a progression route are not likely to enrol as full-time students. Interestingly, students from a craftspersons background already engaged on study programmes in DIT and CIT leading to a Level 7 Bachelor Degree indicated a significant preference (91.1%) in favour of the full-time mode. The survey of current apprentices also showed the main obstacles to progression as being financial burden 51.4% (to be interpreted as loss of future earnings if embarking on a full-time programme) and 20.4% lack of time for self-study. These two different responses can be understood in the context of the respondents' current experiences. The current apprentices are engaged in the workplace and their study programmes are considered as

necessary interruptions to their working life. The craftspersons who have progressed to third level education have, in many cases, chosen to study on a full-time basis and could therefore be expected to express a preference for this mode.

The progression framework acknowledges that to make progression available to all those who may wish to participate, irrespective of geographic location, there is a need for innovative and novel provisions on the part of the institute of technology sector. This could include collaboration between institutes of technology, the sharing of programme delivery, franchising of programmes, the sharing of module delivery and the use of distance learning. The sector is encouraged to consider all options to ensure that the provision of progression opportunities be as flexible and wide as possible. Consideration should also be given to collaboration with agencies and providers outside the institute of technology sector.

Development of shared consortium programmes and new collaborative activities could be facilitated through HETAC. Under the outcomes of the *Education in Employment* project, it is intended that a bespoke business course for craftspersons who are owner-managers will be explored. Preliminary work in this area will focus on a review of current provision and exploration of possible synergies with other agencies and providers.

It should be noted that significant funding has been received under the Strategic Innovation Fund Cycle 2 for an institute of technology sectoral project 'Addressing the Needs of the Knowledge Economy' which is aimed at supporting the further development of flexible learning within the sector. Overall, it would seem apparent that a diverse range of delivery options, including flexible and shared development and delivery will enhance the participation of craft workers in higher education.

7 Recommendations

Marketing this framework is viewed as an essential element of its implementation since its success will only be achieved on the basis of widespread dissemination to all the players expected to engage in the process. The roll out of the framework will see an intensive set of information sessions to key educational personnel across the third level sector and will also embrace the publication of appropriate literature for distribution to the potential users of this framework.

It is clear that where opportunities exist these must be effectively marketed to potential learners and that these learners should be supported in their efforts to progress. The level of support that the learner might expect will vary from organisation to organisation. A particular difficulty in encouraging SME's to take up training opportunities is reported by Holifield et al (2008) due to the 'survival mode' of operation of many smaller organisations. Larger employers and multinational organisations tend to have greater training and development budgets.

Other recommendations arising from this work are as follows:

- A central repository of information on progression pathways and opportunities for craft holders in all disciplines should be established and maintained;
- Information on further learning opportunities should be made available to apprentice learners at all appropriate levels;
- Development of further focused progression opportunities for craftspersons should be actively promoted within higher education institutions;
- Consideration should be given to flexible learning opportunities within any programmes developed;
- The issue of financial support for craftspersons progressing onto higher education on a part-time or full-time basis should be the subject of a national debate.

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Appendix A

Apprentice Survey Results

Introduction

This report presents the findings from a survey conducted by the collaborating partner institutions (AIT, CIT, DIT, DKIT, GMIT, and ITS) as part of the rationale for a national framework on progression routes for craftsperson. The main purpose of this survey was to examine the perceptions of the current apprentice students in relation to further education and progression. This was achieved by a quantitative assessment using student questionnaires. The questionnaire was developed by the project working group members. In total 1,130 apprentices participated in this survey.

Research Sample

The groups that participated in this survey were the FÁS Programme Apprentices at 'Phase 4' and 'Phase 6' level attending AIT, CIT, DIT[1], DKIT, GMIT[2], and ITS in Term 1 2007/08. The trade areas involved are Electrical, Welding & Fabrication, Fitting, Motor, Plumbing, Carpentry, Bricklaying, Plastering and Painting.

Geographical Spread

Apprentices attending an institute of technology do not necessarily attend the one nearest to them. The placement of each apprentice is actually chosen independently by FÁS. Therefore, an apprentice from Donegal could in fact attend CIT and not IT Sligo for phase 4 and 6 of their chosen apprenticeship. With this in mind the apprentices were asked to state (1) the institute they attended, (2) their home county, (3) their current trade and (4) their current phase of apprenticeship. This provides the survey with a physical and geographical breakdown on the apprentices. Figure 1 and Tables 1 and 2 give a full breakdown on this spread.

1 DIT results taken from Term 2 2007/2008
2 GMIT results taken from a pilot survey carried out on electrical apprentices during the initial registration on the 24th September Term 1 2007/2008.

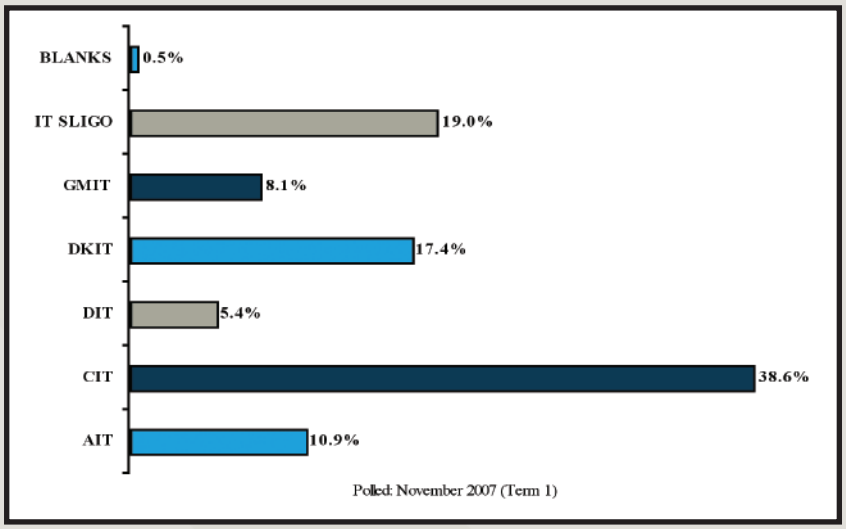


Figure 1 Number of apprentices surveyed in each institute of technology

County	%	County	%
Armagh	0.1%	Limerick	4.9%
Carlow	0.7%	Longford	0.3%
Cavan	2.9%	Louth	3.7%
Clare	3.3%	Mayo	3.2%
Cork	19.2%	Meath	5.5%
Derry	0.3%	Monaghan	3.5%
Donegal	4.3%	Offaly	1.9%
Dublin	6.2%	Roscommon	1.3%
Galway	12.7%	Sligo	3.9%
Kerry	5.0%	Tipperary	2.9%
Kildare	2.5%	Waterford	1.8%
Kilkenny	2.5%	Westmeath	1.4%
Laois	0.9%	Wexford	1.3%
Letrim	2.6%	Wicklow	0.7%

Table 1 Geographical spread

Trade Area	Number of Apprentices	% Value
Bricklaying	29	2.6%
Carpentry	296	26.2%
Electrical	412	36.5%
Metal Fabrication/Welding	27	2.4%
Heavy Motor Vehicle	48	4.2%
Motor	30	2.7%
Painting & Decorating	22	1.9%
Plumbing	219	19.4%
Plastering	31	2.7%
Tool making	16	1.4%
Total	**1130**	**100%**

Table 2 Number of apprentices surveyed in each trade area.

Of those surveyed, 52% were in phase 6 and 48% in phase 4 of their apprenticeship.

In the survey, the apprentices were asked if they could benefit from opportunities to progress to further education after completing their apprenticeship. This question is important in identifying the demand and need for such opportunities. The results from the survey shows that 94.7% of the apprentices surveyed believed that they could benefit from such opportunities while 5.2% said 'No'. The remaining 0.1% did not answer. This is illustrated in Figure 2.

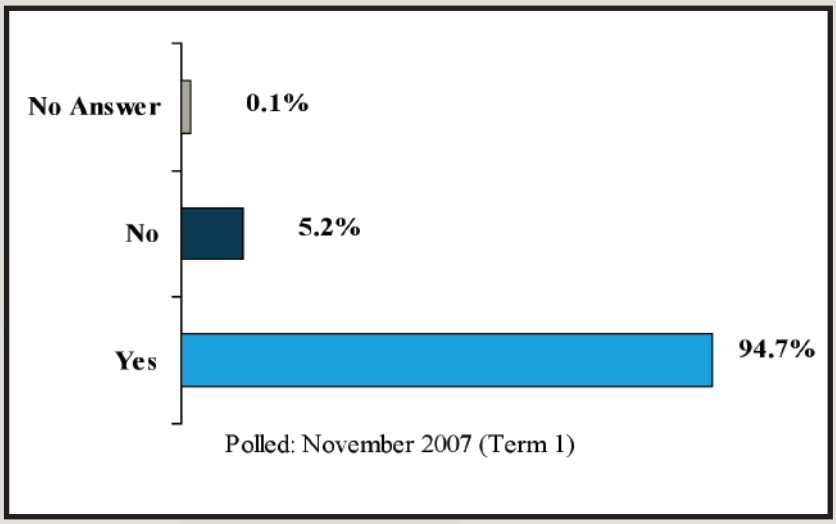


Figure 2 Do you feel you could benefit from opportunities to progress to further education, after completing your apprenticeship?

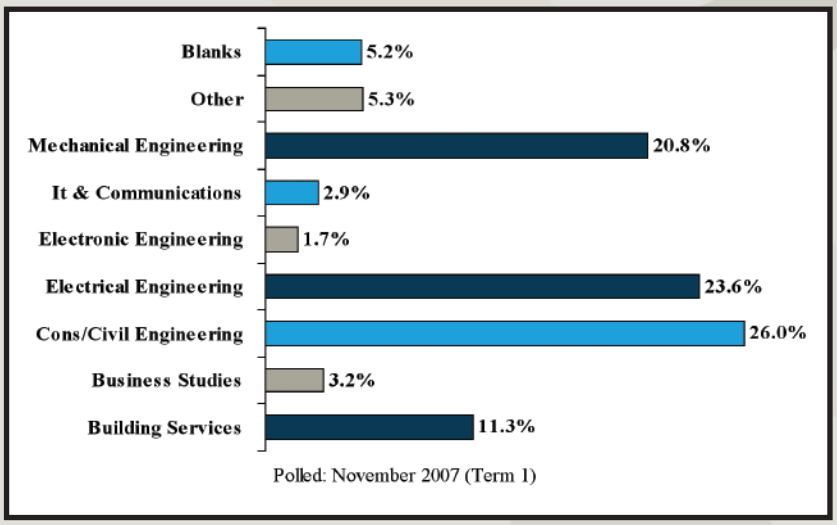


Figure 3 First preference for areas of progression

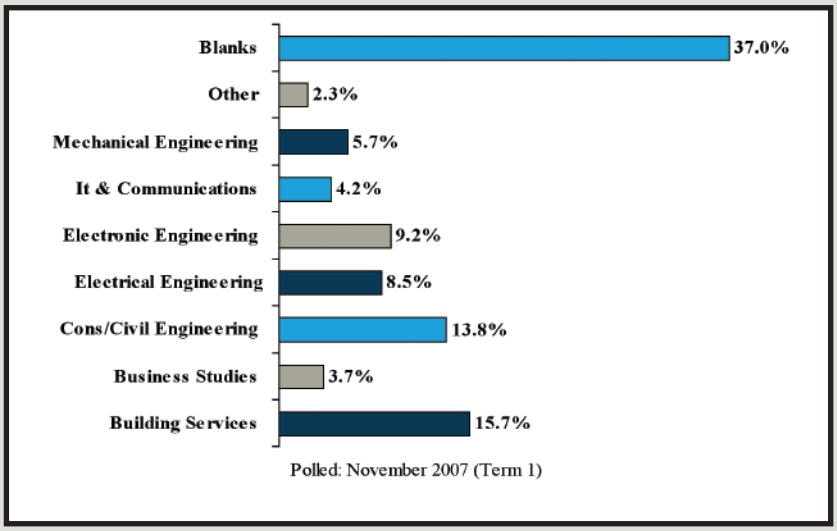


Figure 4 Second preference for areas of progression

The respondents were also asked to identify their preferences in relation to disciplines for progression. Three separate questions asked for their first, second and third preference. Seven specific progression choices were provided with an opportunity to identify another area. The findings from the survey show that areas such as Construction/Civil Engineering (20.6%), Electrical (23.6%) and Mechanical Engineering (20.8%) featured high on first preference for progression among the cohort questioned.

Building Services Engineering, Construction/Civil Engineering, Electrical/Electronic Engineering and Mechanical Engineering again featured high on their second and third preference for progression, although many respondents chose to give their first preference only as illustrated by the 'blanks'. Figures 3, 4 and 5 give a full breakdown on preferences.

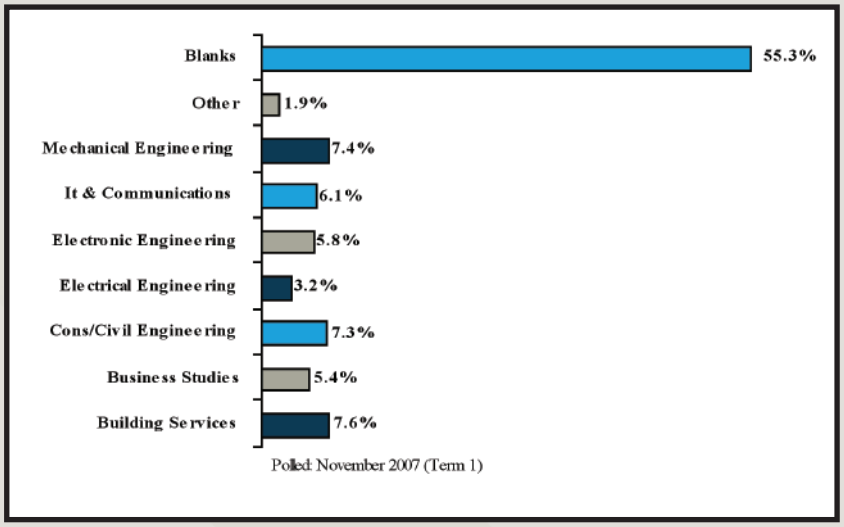


Figure 5 Third preference for areas of progression

These responses in terms of preferred discipline for further study should be considered in conjunction with the question relating to the relationship between the current trade and the preferred area for progression detailed below. It is noteworthy that in the vast majority of cases the respondents have chosen the 'expected' route. Those in the electrical trade area have indicated a preference for electrical engineering and so on. It is also interesting to note that very few participants chose a progression pathway other than the seven presented as options in the survey form.

Trade	Preferred Progression Route
Metal Fabrication	Mechanical Engineering **(74%)**
Heavy Motor Vehicle	Mechanical Engineering **(75%)**
Motor	Mechanical Engineering **(60%)**
Plumbing	Mechanical Engineering **(42.9%)**
Tool making	Mechanical Engineering **(88%)**
Electrical	Electrical Engineering **(70.7%)**
Carpentry	Construction/Civil Engineering **(64.2%)**
Cabinet Making	Construction/Civil Engineering **(64.7%)**
Bricklaying	Building Services Engineering **(55%)**
Painting	Business Studies/IT Communications **(23% each)**
Plastering	Construction/Civil Engineering **(65%)**

Table 3 Correlation between current trade and chosen progression route

Another question asked the apprentices to indicate what they perceived as the greatest barriers to continuing with their education. They were asked to choose their top 3 from 5 options provided with an opportunity to add another. In many cases, the respondents chose only to give their first reason. The findings from the survey show that 51.4% of the group stated 'financial burden' as their main difficulty. Lack of time for self-study also proved a difficulty with 20.4% of the students while distance from education centre and lack of recognition were other difficulties with 11% and 6.8% of the apprentices respectively. Again, lack of recognition, lack of time for self-study and distance from education centre proved a difficulty with the students second and third reasons. Figures 6, 7 and 8 give a full breakdown on the perceived difficulties/obstacles associated with further education among this cohort.

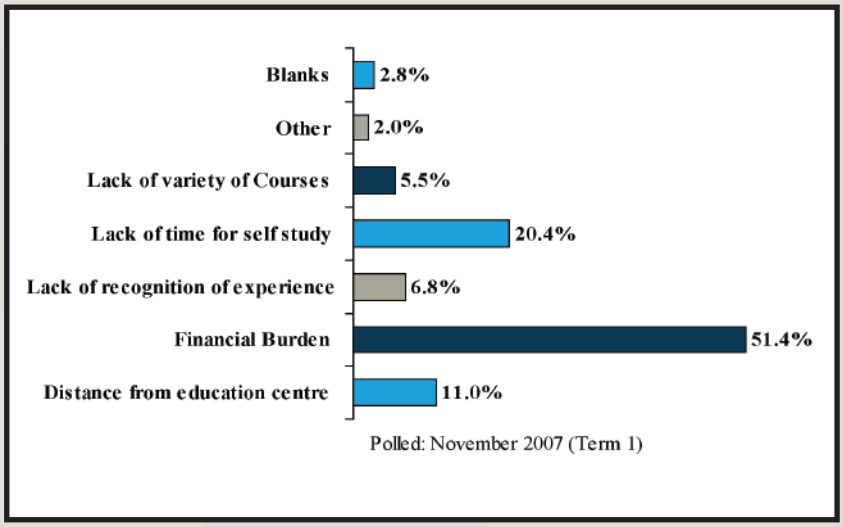


Figure 6 The largest difficulty or obstacle for further education (1st reason)
Note: The amount of 'blank answers' increased for the second and third reasons

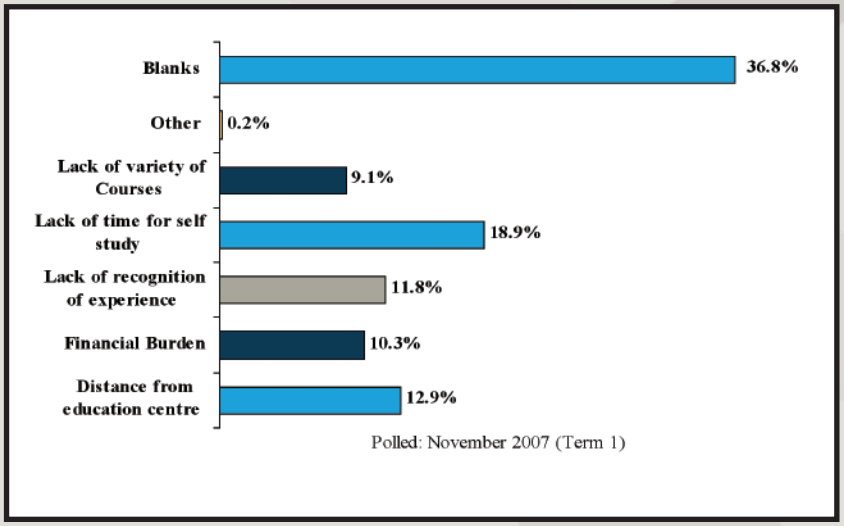


Figure 7 The largest difficulty or obstacle for further education (2nd reason)

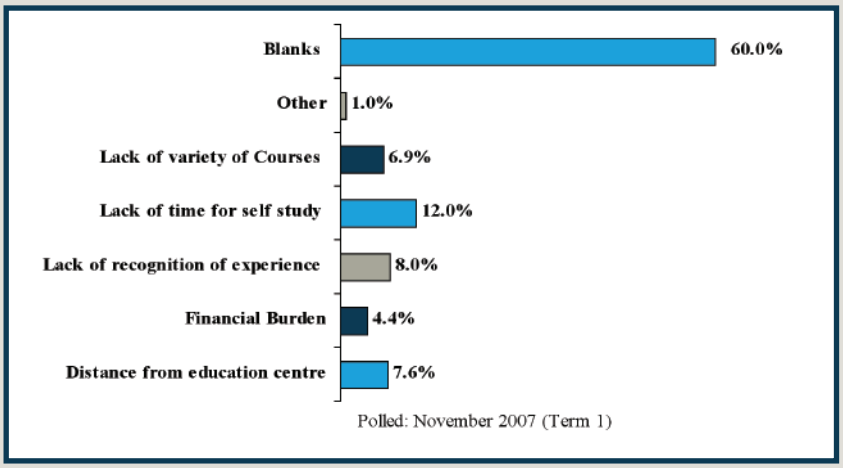


Figure 8 The largest difficulty or obstacle for further education (3rd reason)

A further question asked the apprentices to identify whether financial support or the provision of part-time versus full-time options might best benefit them. The findings show that 52% of the group would best benefit from Financial Support while 17.4% said 'Part-time study' with many choosing to indicate just their first preferred option. These responses are illustrated in figures 9, 10 and 11.

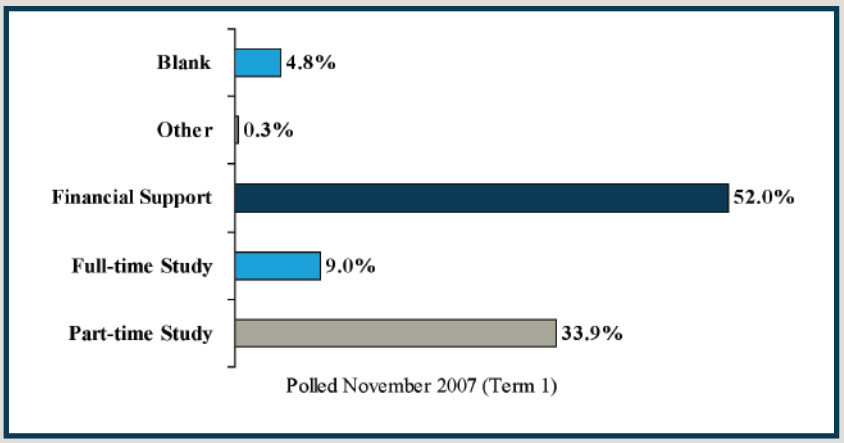


Figure 9 How could you best benefit from supports to further education courses? (1st choice)

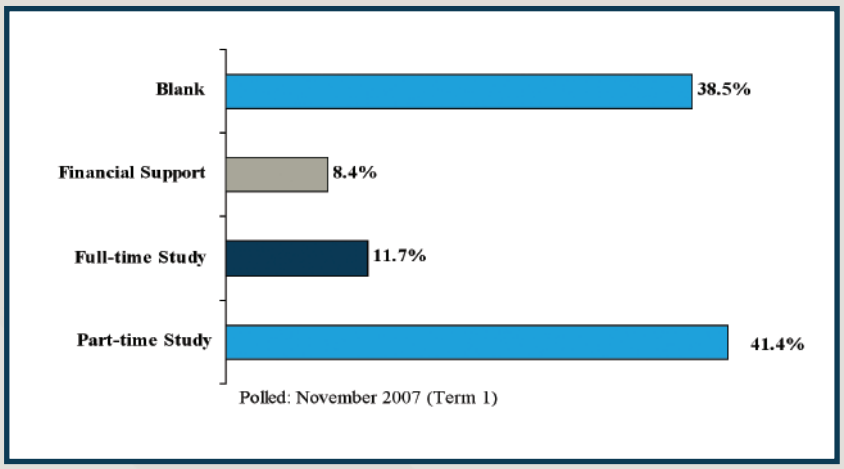


Figure 10 How could you best benefit from supports to further education courses? (2nd choice)

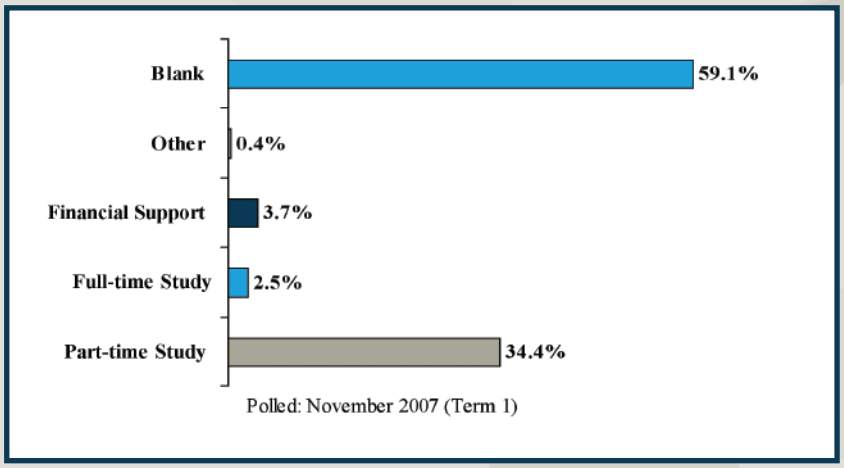


Figure 11 How could you best benefit from supports to further education courses? (3rd choice)

The final question on the questionnaire dealt with the area of prior education. Apprentices were asked to state the highest certificate that they had been awarded prior to commencing their apprenticeship programme. The findings show 79.5% of the survey achieved Leaving Certificate while 15.1% achieved Junior Certificate. Figure 12 gives a full breakdown on the findings.

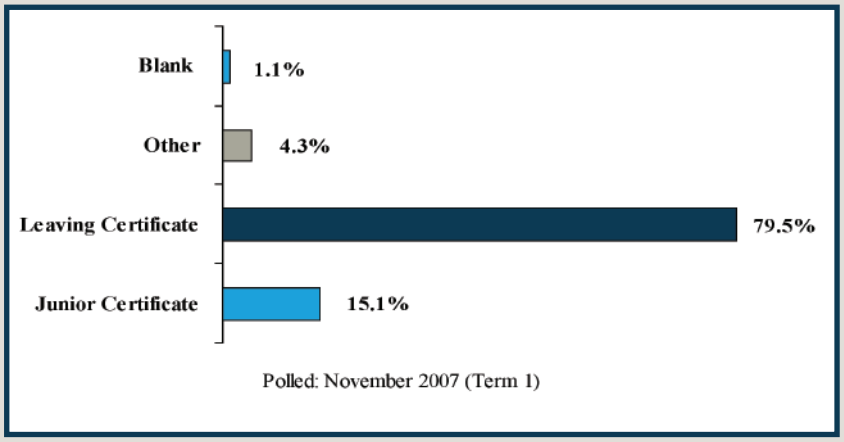


Figure 12 What is the highest education certificate you have been awarded?

Key Findings from the Survey of Apprentices

- 94.7% of the group surveyed felt that they could benefit from opportunities to progress to further education after completing their apprenticeship.
- The main areas of progression that the survey identified are Construction/Civil Engineering (26%), Electrical Engineering (23.6%) and Mechanical Engineering (20.8%)
- There is a strong relationship between progression routes and individual apprentice trade areas.
- The main obstacles or difficulties seen by the apprentices towards further education are financial support (51.4%), lack of time for self-study (20.4%), distance from education centre (11%) and lack of recognition of experience (6.8%).
- The provision of focused financial support and part-time flexible learning opportunities would best assist the apprentices in accessing higher education.
- 79.5% of the group surveyed have achieved Leaving Certificate award.



Appendix B

Current Student Survey Results

Statistics from survey of students (qualified craftspersons) currently engaged in higher education programmes

As a focus of the project is on the progression of electrical apprentices onto programmes in electrical engineering, it was decided to ascertain the views of this group on their experiences to date. The participants attended either CIT or DIT. All of the students surveyed had completed the electrical apprenticeship programme and were now enrolled on Level 7 engineering degrees in the area of electrical engineering. Table 1 gives the breakdown of the students. The craft certificate holders gained exemptions at entry into the Level 7 programme based on their apprenticeship. Figure 1 reflects the level achieved in Leaving Certificate mathematics. It is interesting to note that the average Leaving Certificate points in 310.7.

Degree Titles	No of Students
Bachelor of Engineering in Electrical Engineering (CIT)	14 (31.1%)
Bachelor of Engineering in Electrical Services Engineering (DIT)	31 (68.9%)

Table 1 Degree titles and student numbers

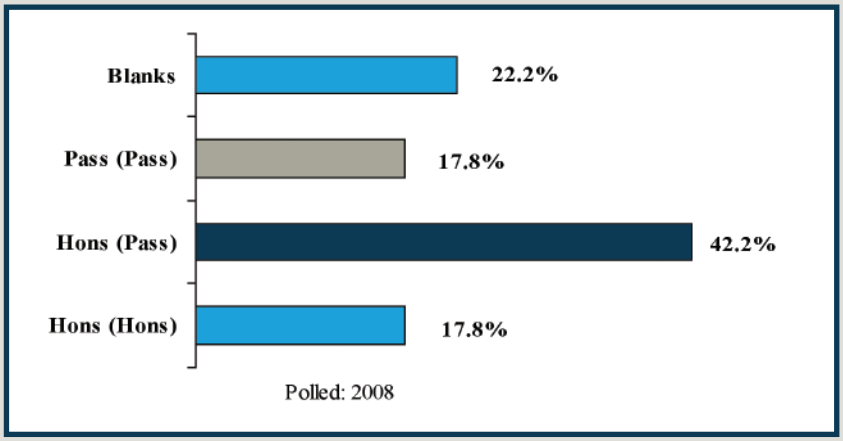


Figure 1 Respondents Leaving Certificate results in Mathematics

The survey found that 33.3% of the students had considered a full-time engineering programme before finally deciding to do an apprenticeship. Students were asked to indicate their reasons for deciding on an apprenticeship and the answers are illustrated in Figure 2 below. As these learners have completed their apprenticeship and spent some time in the workplace it may be the case that they feel at some remove from their earlier post Leaving Certificate decision and this may explain the number of students who did not indicate a reason.

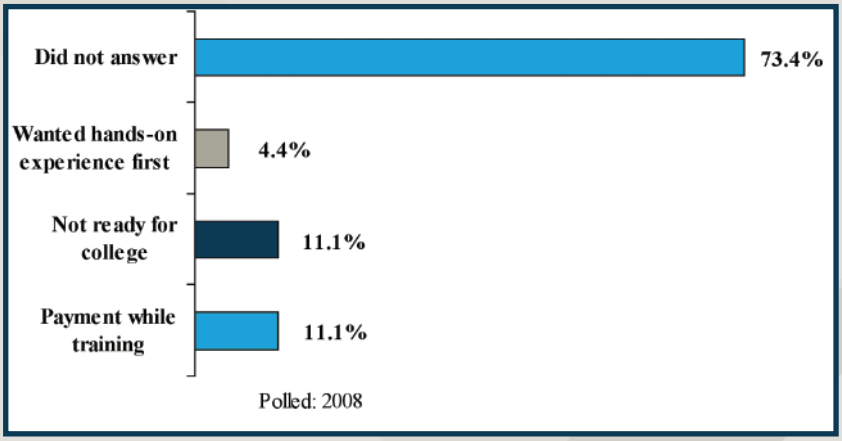


Figure 2 Reasons for choosing an apprenticeship vs full-time engineering programme

When asked if they had experienced any difficulties in their programme, 55.6% of the students did not have any problems fitting into the current degree programme and 35.6% who said "they had difficulties" only experienced them at the very beginning.

Out of the 35.6% who indicated that they had experienced early difficulties 70.6% of them stated that "bridging courses and better prior knowledge would minimise or resolve this".

When questioned about the motivation for progression to a degree programme 69.8% of the students surveyed stated the main reason they decided to apply for a place on a degree programme was "for a personal and career advancement".

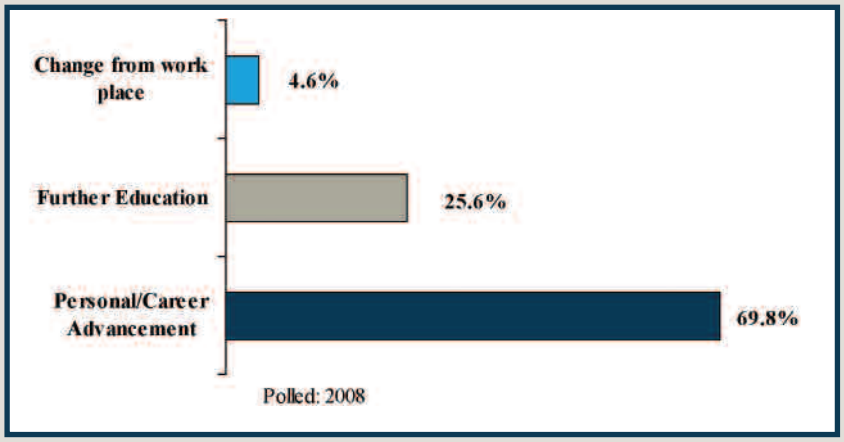


Figure 3 Why did you decide to undertake this degree programme?

Another question attempted to probe this motivation further by asking the students to indicate the role that they would expect to undertake after completing their studies. As might be expected the students responded that they expect to acquire jobs as design engineers, 41%, or electrical engineers, 31%.

When questioned about the preferred mode of study the vast majority, 91.1%, of the students surveyed said that full-time was the best mode of delivery. As mentioned earlier in this report, this must be influenced by the fact that these learners have already chosen a full-time programme in many cases and they are therefore not representative of potential learners in general.

The survey found that 45% of the students entered a degree programme within one year of completing their craft apprenticeship while 10% entered immediately on completion of their craft apprenticeship. This raises some interesting questions. As the students surveyed for this report all embarked on higher education programmes in September 2007, there may be a link between the decision to opt for higher education qualifications and the beginning of a slowdown in the construction sector at that time.

It would be interesting for further study to plot the demand for higher education programmes among recently qualified apprentices against the demand for skilled craftspersons in the workplace.

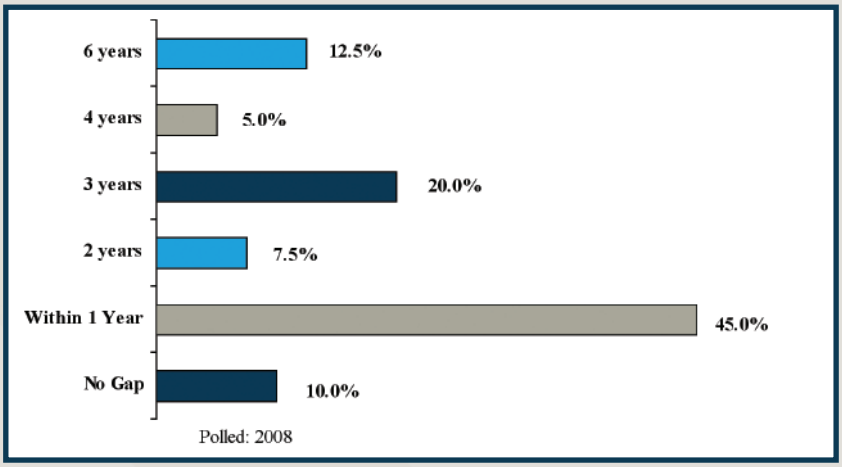


Figure 5 How long after qualifying as a craftsperson did you enter this degree programme?

82.2% of the students surveyed did give consideration to the earnings they would be foregoing while studying. As shown in Figure 6, 75.5% indicated they are satisfied or very satisfied with the programme they are undertaking.

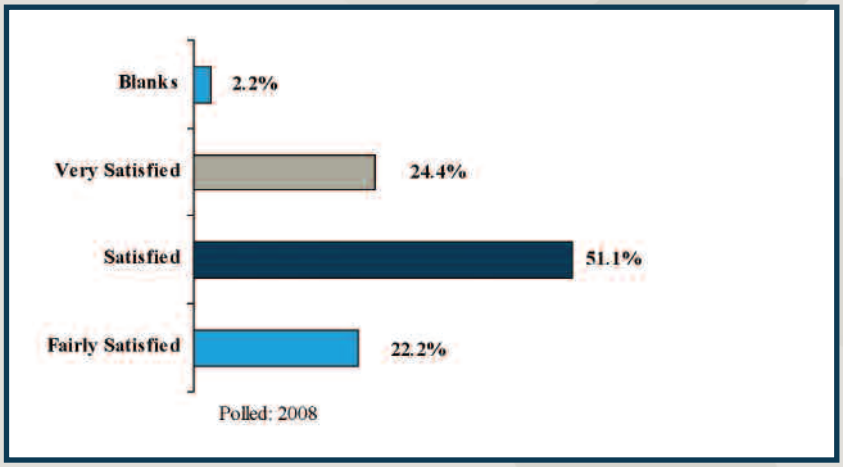


Figure 6 Are you satisfied with the course so far?

Order of difficulty	Subject
1st	Mathematics (67.5%)
2nd	Building Services Project Management Power Systems (18.5%)
3rd	Electronics Electrical Services Plant Electrical Services Design (14%)

Table 2 List the subjects in order of difficulty

The students were asked to indicate subjects that had caused them the most difficulty in returning to education. As might be expected in a Level 7 engineering programme, a majority of students indicated that mathematics was the most difficult subject. It is interesting to note that the case studies in Appendix D giving statistical analysis of the students from the trades area who have progressed into higher education show that these students overcome these difficulties and attain high standards in their award years.

Key findings from the survey of students currently engaged in progression programmes.

- 77.8% surveyed indicated they had Leaving Certificate Mathematics, 17.8% at honours level.
- Average Leaving Certificate Points are 310.7.
- 69.8% of progression students surveyed stated the main reason they decided to apply for a place on a degree programme was "for a personal & career advancement".
- 91.1% of the students surveyed said that full-time was the most suitable mode of delivery for them.
- 55% of the students entered the degree programme within one year of completing their craft apprenticeship.
- 55.6% of the students surveyed did not have any problems fitting into the current degree programme. Although 35.6% said "they had difficulties" such difficulties were only experienced at the very beginning of the course.
- 75.5% are satisfied or very satisfied with their course while 22.2% are fairly satisfied.
- Most of the progression students surveyed did give consideration to the earnings they would be foregoing.
- The positions that the students expected to acquire on completing the course are Design Engineer (41%) and Electrical Engineer (31%).

Appendix C

Employers Survey Results

Introduction

This report presents the findings from a survey conducted by the partners on a cross-section of employers from all trade areas who had apprentices attending an institute of technology in 2008 as part of their apprenticeship training programme. The main purpose of this survey was to get feedback from the employers which may help in the implementation of the framework. In total 195 employers participated in this survey. The geographical spread of the employers is shown below in Figure 1.

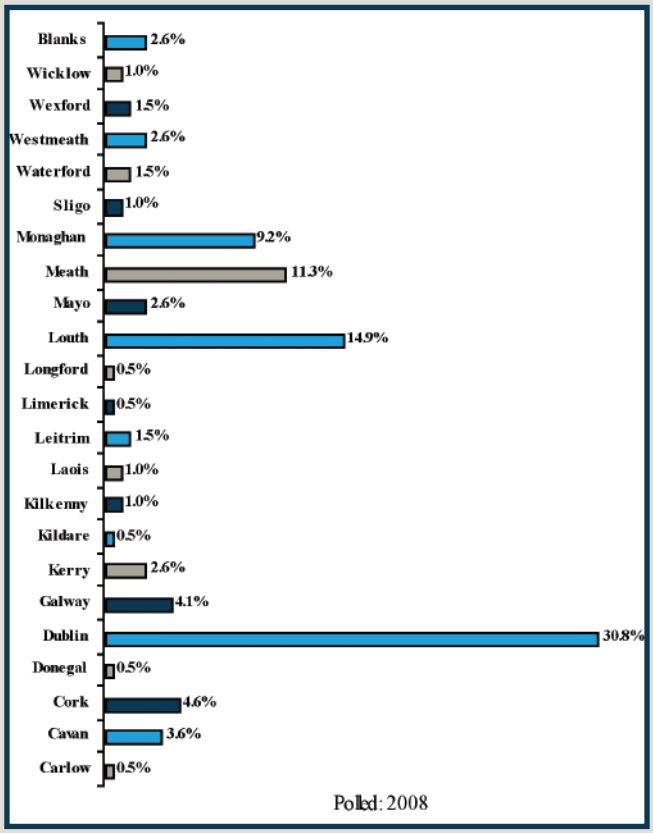


Figure 1 The Geographical Spread of the Surveyed Employers

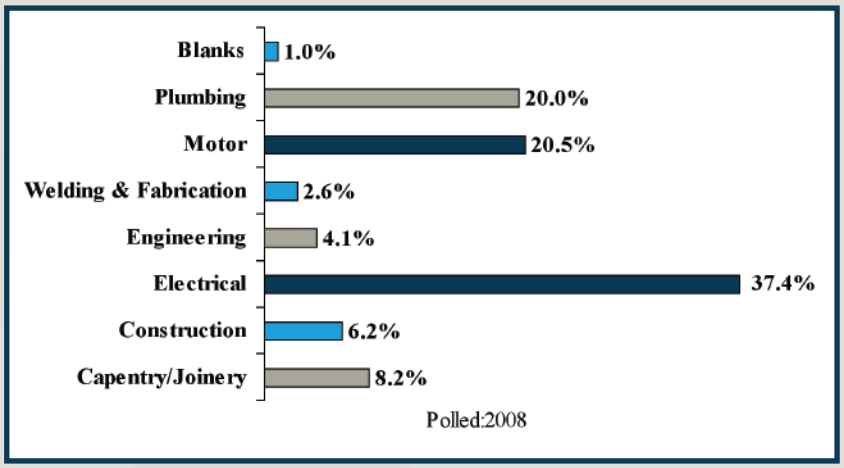


Figure 2 Area of Speciality

In the survey, the employers were asked to state their 'area of speciality'. The main area of speciality the survey found was electrical with 37.4%. Plumbing and motor were also well represented with 20% and 20.5% respectively. The areas of speciality are shown in Figure 2. The survey also found that the average number of employees for each company was 118.4. Figure 3 shows the breakdown between the public and private sectors.

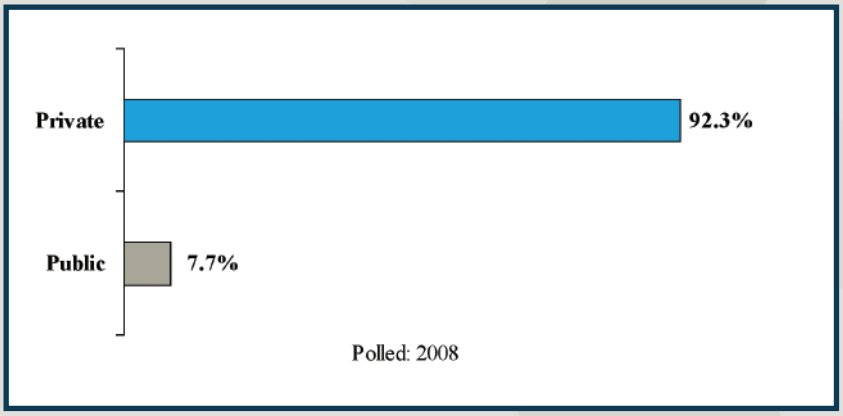


Figure 3 Public or Private Sector

In the survey the employers were asked if they believed that their employees would benefit from progressing onto further education programmes . Results from the survey show that 81% of the employers did believe their employees would benefit from this. The full breakdown is shown in Figure 4.

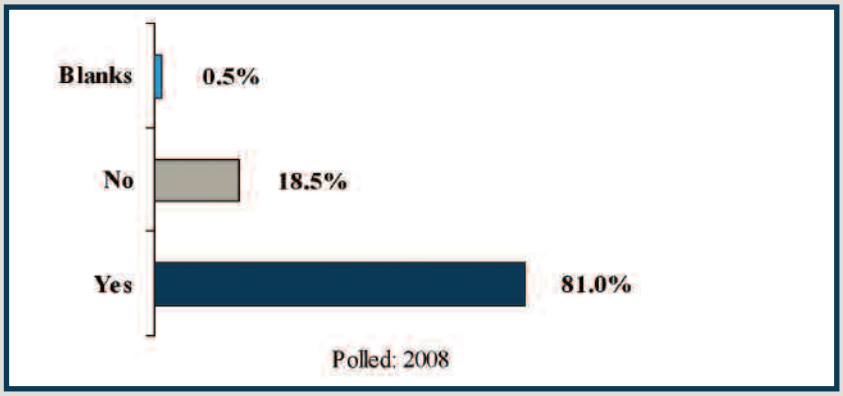


Figure 4 Do you think that your employees could benefit from progressing onto further education programmes ?

On a follow up to the previous question the employers were asked if they considered that their company would benefit from their employees progressing onto education programmes . 72.8% of the employers said 'Yes'. Figure 5 shows the full breakdown on this question.

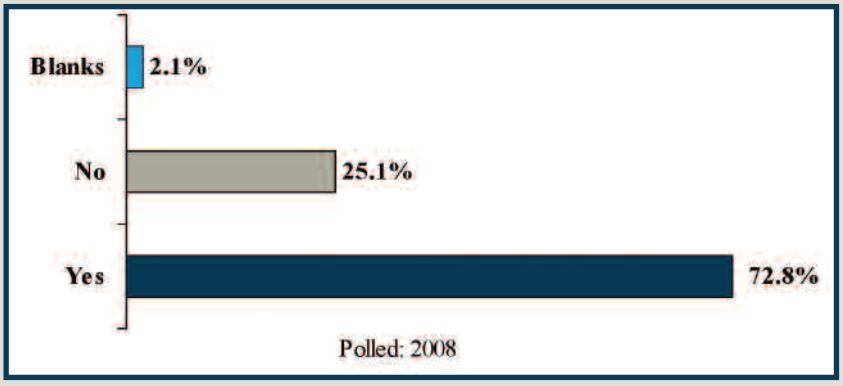


Figure 5 Do you consider that your company could benefit from employees progressing onto education programmes ?

Another important finding from the survey was that 69.7% of the employers would provide some type of time-allowance for their employees if they decided to progress onto higher education programmes. Figure 6 gives the full breakdown.

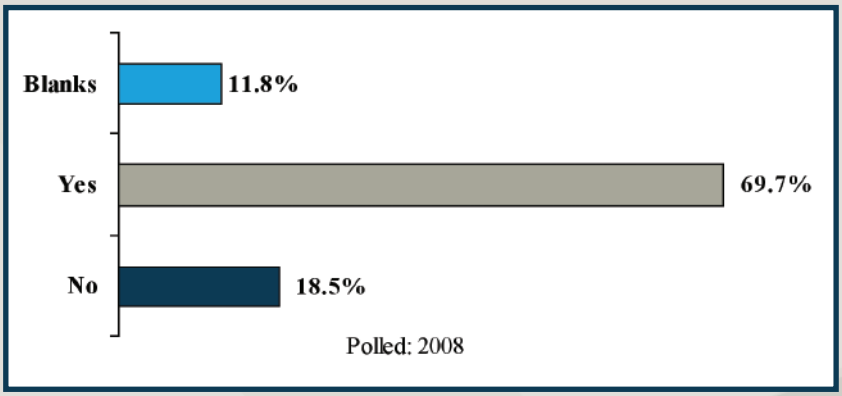


Figure 6 Would you provide time for your employees to participate in higher education programmes?

Employers were also asked to state their preference in relation to the most suitable times to deliver such education programmes. The employers were given 4 different options to choose from. Results from the survey show that 28.2% of the employers preferred 'night-time', 8.2% stated '2/3 day blocks' while 31.1% of the employers indicated a 'mixture' of delivery modes might be appropriate.

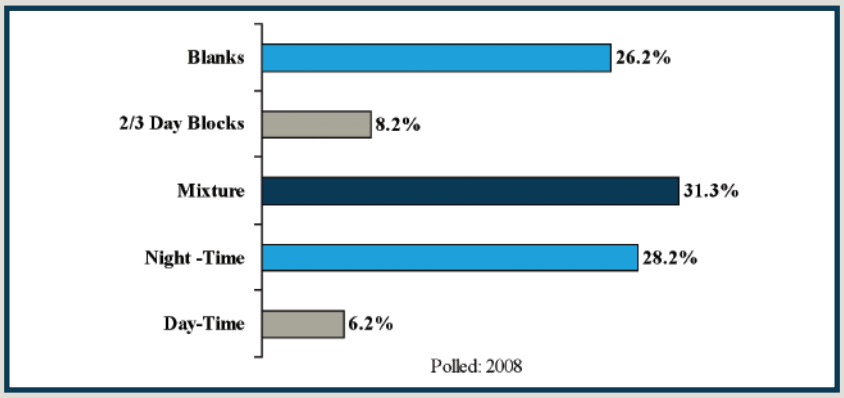


Figure 7 Which of the following times would best suit your company?

There are challenges here for higher education to ensure that programmes are designed with a view to flexibility and accessibility to meet the needs of the learners and the employers. Moreover, in the survey the employers were asked if they would be willing to help their employees financially while attending college and studying. Results from the survey show that 47.7% said 'Yes' while 35.9% said 'No'. Figure 8 gives the breakdown on this.

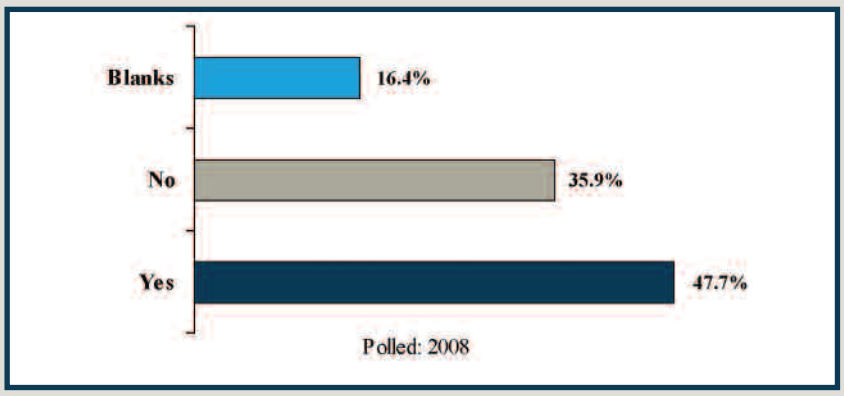


Figure 8 Would you be willing to help your employees financially while attending college/ studying etc?

In a follow up to the previous question the employers were asked to state what they considered would play an important role in gaining their support. Again, they were given 4 choices to choose from with an option to state a reason of their own. Findings from the survey show that 41.5% of the employees would like some 'state financial support'. Further employee commitment (17.9%) and achieved qualification suitable to company development (14.9%) also were high requirements for the employers. Figure 9 gives the full breakdown.

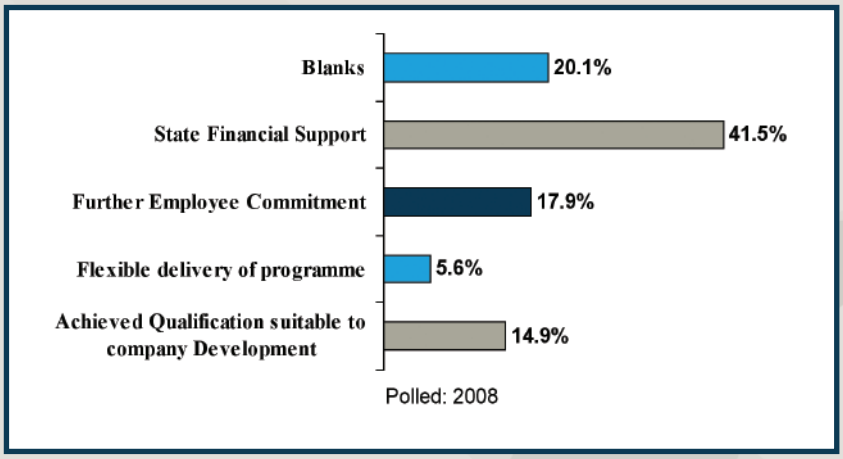


Figure 9 Which of the issues listed would you consider to play an important role in gaining your support for education for your employees?

Key findings from the survey of employers

- The main areas of speciality among the group of respondents are Electrical (37.4%), Plumbing (20%) and Motor (20.5%).
- 92.3% of the surveyed employers were in the private sector.
- 81% of the employers believed that their employees would benefit from further education programmes.
- 72.8% of the employers believed that their company would benefit from their employees progressing onto further education programmes.
- 67.9% of the employers would provide time for their employees to pursue further education programmes.
- 47.7% of the employers would financially support their employees while on further education programmes.
- A mixture of night-time, day-time and 2/3 day blocks would be the most suitable mode of delivery for further education programmes.
- 41.5% of the employers said 'state financial support' would play an important role in gaining their support in further education programmes for their employees.

Appendix D
Case Studies

Case Study D1

Progression of Craftspersons into an existing Level 7 Electrical Engineering programme

Institution:	Cork Institute of Technology
Programme:	Electrical Engineering
Programme Title:	Bachelor of Engineering in Electrical Engineering
Level:	7
Mode:	Full-time
Normal Duration:	3 years
Number of Students:	Usual intake to Semester 1 (year 1) is 40 students from CAO entry

Programme Philosophy

The programme is designed to educate and train graduates for employment as electrical associate engineers in the design, planning and maintenance of large-scale industrial and commercial complexes, or as sales/marketing executives or technical support personnel with major suppliers of electrical, control and automation equipment. The graduate will be able to calculate electrical parameters of a system/facility/component and from this be able to specify and execute all relevant drawings, lists and material procurement for the system realisation. The graduate exercises independent technical judgment and work, as an engineering technologist, with significant autonomy within his/her allocated responsibility.

The programme employs an applications-orientated industry-related approach to produce associate engineers capable of making an early contribution in the working environment across a wide range of employment positions.

Need for the Programme

The present programme has its origins in a two-year, full-time National Certificate in Electrical Engineering developed in 1975 to meet the local needs of the electrical construction firms, the consulting engineering organisations and the manufacturing industries. Responding to the demands of employers an add-on, one-year Diploma in Electrical Engineering was provided in 1997. The programme was subsequently converted to a Bachelor Degree in Electrical Engineering in 2004 in line with the Higher Education and Training Awards Council (HETAC) transformation of its award system in response to the launch of the National Framework of Qualifications in October 2003.

Graduates from the programme find ready employment in the industrial, manufacturing, contracting, utility/process, sales/marketing and electrical engineering consultancy areas, and in the public sector dealing initially with technical and engineering aspects. Having acquired suitable work experience the graduates may expect to progress quickly to positions of responsibility where independent technical judgment will be exercised and will work with a significant level of autonomy.

Programme outcomes

The programmes outcomes of the Bachelor Degree in Electrical Engineering outlined below have been aligned with the HETAC Descriptors for Engineering Programmes.

PO1	**Knowledge - Breadth**	A specialist knowledge of areas of electrical circuitry and practice, installation and equipment. A knowledge of mathematics, ICT, design, safety, business and engineering practice relevant to the electrical engineering technician.
PO2	**Knowledge - Kind**	The ability to apply analytical knowledge of electrical science, practice and design, to the solution of well-defined electrical engineering technology problems.
PO3	**Skill - Range**	The ability to use techniques, skills and modern computer-based engineering tools and packages necessary for engineering practice.
PO4	**Skill - Selectivity**	The ability to design system, component or process to meet specified needs and to contribute to the assessment of the technical performance of the design.
PO5	**Competence - Context**	The ability to implement the solution of common engineering technology problems in electrical engineering.
PO6	**Competence - Role**	The ability to work autonomously and as a member of a multidisciplinary team in well-defined work settings.
PO7	**Competence - Learning to Learn**	The ability to identify and address learning needs within a structured learning environment and an awareness of the need for continued professional development.
PO8	**Competence - Insight**	An understanding of the wider social, political, business and economic contest within which engineering operates and the need for high ethical standards in the practice of engineering, including the responsibilities of the engineering profession towards people and the environment.

Mapping exercise

In order to address the issue of the advanced craft certificate holder gaining entry to the degree programme at the appropriate level a detailed mapping exercise was undertaken to compare the learning gained in the craft certificate with the learning outcomes of the year 1 modules of the degree programme. This is illustrated in the following pages.

Table 1 illustrates the overall match between the relevant FÁS programme and the year 1 modules on the 3-year degree programme. Table 2 gives the detailed matching exercise – matching the learning outcomes of the modules on the engineering programme with those of the relevant FÁS modules.

Cork Institute of Technology – Department of Electrical Engineering

		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Semester 1 (year 1)	Exemption Sought	Electrical Science 1 ▲	Electrical Power Systems ▲	Electrical CAD★	Electrical Practicals	Technological Mathematics 1★	Creativity, Innovation & Teamwork
	Previous relevant learning	Phase 2 - Electricity 1 Phase 4 - Electricity 2 Phase 4 - Electronics 1	Phase 4 - Power Distribution 1	Phase 4 - With the exception of AutoCAD all other material is covered	Phase 4 - Electricity 2 Phase 4 - Electronics 1	Phase 4 - Electricity 2 Phase 6 - Electricity 3	Having completed 7 phases of an apprenticeship the content of this module is covered
	Learning outcomes match	95%	95%	50 - 60%	90%	50%	100%
Semester 2 (year 1)	Exemption Sought	Electrical Science 2 ▲	Electrical Installation Practice	Electrical Draughting★	Engineering Practicals	Technological Mathematics II (Electrical)★	Installation Practicals
	Previous relevant learning	Phase 2 - Electricity 1 Phase 4 - Electricity 2 Phase 4 - Electronics 1 Phase 6 - Electricity 3	Phase 4 - Power Distribution 1 Phase 6 - Power Distribution 2	Spread across the entire apprenticeship a knowledge of wiring diagrams/ circuit diagrams are continually used	Phase 4 - Electricity 2 Phase 4 - Electronics 1 Phase 6 - Electronics 2		Phase 2 - Installation Techniques 1 Installation Techniques 2 Panel Wiring and Motor Control Phase 4 - Electricity 2 Phase 6 - Automation Control
	Learning outcomes match	100%	95%	70%	80%	0%	100%

Table 1 Mapping of FÁS Programme for Electrical Apprentices to Year 1 of Bachelor of Engineering in Electrical Engineering
★ Bridging is provided to students on start of Semester 3
▲ Sample mapping for these three modules follows

Cork Institute of Technology Programme
Bachelor of Engineering in Electrical Engineering

Table 2 Detailed comparison of specific module learning outcomes (three different Year 1 modules) and relevant FÁS programme learning outcomes

Module 1 - Semester 1 Electrical Science 1 Module ID: 2751	FÁS Programme - Electrical
LEARNING OUTCOMES 1. Describe and define electrical, magnetic and physical terms and quantities and perform fundamental calculations involving these quantities. 2. Apply DC theory to the solution of practical problems involving electrical quantities. 3. Apply a knowledge of electrical and electronic components, their characteristics and how these components are utilised in basic circuits. 4. Build and construct basic series and parallel circuits in an electrically safe manner. 5. Measure parameters within basic circuits to examine circuit/component behaviour. **INDICATIVE CONTENT** **Fundamentals** SI system, prefixes, scientific & engineering notation; Introduction to current flow; electrical units. Conductors, insulators, resistivity, temperature coefficient of resistance. Ohm's Law; Kirchhoff's Laws; DC network solutions. **Electrostatics** Electric fields. Electrostatic charges; field strength; flux density; permittivity; dielectric strength. Capacitance, capacitors, energy stored. Electrostatic shielding.	**PHASE 2 - MODULE 1. ELECTRICITY 1** **Unit 4: Ohm's Law/The Basic Circuit** **Learning Outcome** - Define the quantities associated with the flow of electric current: Pico to Mega - State the units relevant to each electrical quantity: Volt, amp, ohm - Calculate circuit values using Ohm's Law **Unit 5: Resistance Network Measurement** **Learning Outcome** - Test circuit continuity and resistive component values using a multi-meter - Calculate the total resistance of series, parallel and series/parallel circuits - Calculate and measure the voltage, current and resistance aspects of circuits - Control lamp circuits using on/off, two way, and selective switching - Connect cells in series and in parallel, measure output voltage **Unit 6: Power and Energy** **Learning Outcome** - Determine the relationship between potential difference, current and power in circuits - Connect instruments to measure power in a circuit **Unit 7: Magnetism, Electromagnetism and Electromagnetic Induction** **Learning Outcome** - State Faraday's Law of electromagnetic induction - Apply the corkscrew, right hand grip rules

Module 1 - Semester 1 Electrical Science 1 Module ID: 2751	FÁS Programme - Electrical
Magnetism and Electromagnetism Magnetic fields. Ferromagnetism; hysteresis loops; saturation. Electromagnetism; fields; magnet-motive force; magnetic flux, electromagnetic devices. Electromagnetic induction; Lenz's Law transformers. Magnetic screening. Force on current-carrying conductors in magnetic field; application to motors. **Thermal Energy** Heat and energy - Heat capacity, calorific value, change of state and Latent heat Transfer of heat - conduction, convection and radiation. **Practical exploration of Basic Electrical Circuits** Electrical safety, Circuit Connections Ohm's Law, Series Resistors, Parallel Resistors, Series Parallel Resistors, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Kirchhoff's Laws with two sources.	- Discriminate between magnetic and non-magnetic materials - Construct a circuit which will demonstrate the effect of switching inductive loads - Explain how the growth of current in a coil is accompanied by a flux which produces an EMF in opposition to the applied EMF. **Unit 8: Capacitance** **Learning Outcome** - Select capacitors by type, capacitive value, tolerance and maximum working voltage - Calculate values of capacitor series and parallel networks **PHASE 4 - MODULE 1 - ELECTRICITY 2** **Unit 7: Magnetic Circuit** **Learning Outcome** - Define units of magnetic flux, magneto-motive force, magnetic flux density, magnetizing force and reluctance - Calculate values of magnetic flux density and relative and absolute permeability - Differentiate between hysteresis loss and eddy current loss and state methods to overcome both - Compare electric and magnetic circuits in relation to quantities and units **PHASE 4 - MODULE 3 - ELECTRONICS 1** **Unit 1: RC Networks** **Learning Outcome** - Calculate RC network charge and discharge rates, plot curves and confirm by measurement

Cork Institute of Technology Programme
Bachelor of Engineering in Electrical Engineering

Module 1 - Semester 1 Electrical Power Systems - Module ID: 4275	FÁS Programme - Electrical
LEARNING OUTCOMES 1. Describe the general characteristics of electrical supplies and loads. 2. Perform calculations to establish operating conditions in electrical circuits. 3. Demonstrate an understanding of the conditions arising in a faulted circuit and their solutions. 4. Explain the outline of the national supply system. 5. Understand the dangers of electrical shock and evaluate the practical protection methods available. **INDICATIVE CONTENT** **Domestic and similar installations** Types of supply, AC and DC. Earthing. Introduction to electrical circuits. Lighting, socket-outlet, fixed appliance circuits. Wiring methods. Supply intake. Consumers control unit. **Power, energy and cable ratings** Calculations to establish values of circuit power and cable current requirements. Factors of simultanity and utilisation. Factors effecting cable rating. Final circuit arrangements and calculations. Radial distribution.	**PHASE 4 - MODULE 2 -** **POWER DISTRIBUTION 1** **Unit 1: Cables** **Learning Outcome** - Select a cable for a given application - Compare copper and aluminium cables under the headings of conductivity; current density; mechanical properties; cost - State the procedures for connecting cable cores to high temperature busbars - List the methods of reducing iron losses in steel conduit/trunking and armoured cables - Select and install Category 5 and 7 Cables for a given application and state precautions necessary during installation **Unit 2: Three Phase Distribution and Protective Devices** **Learning Outcome** - Draw a line diagram for a distribution board which includes both single and three phase loads - List the ratings and sizes of protective devices, isolators, busbars and main supply cables for a given load - Assemble a distribution board from discrete components and terminate supply and load cables **Unit 3: Wiring Systems** **Learning Outcome** - List the advantages and disadvantages of the hazards involved and the segregation requirements for choosing a wiring system for a particular location and application - Given a stated load, determine the method of connection, cable sizes and material/equipment requirements for connection to the following systems; rising main and overhead busbar

Module 1 - Semester 1 Electrical Power Systems - Module ID: 4275	FÁS Programme - Electrical
Faulted circuits and protection devices Concepts of overload, short-circuit and earth fault. Effects of overcurrents. Relationship between load, protective device and cable ratings. Protective devices, fuses and MCBs. Discrimination. Max. short-circuit current and breaking capacity. **National electrical network** Introduction to generation, methods, fuels, voltages, ratings. Transmission and distribution system. Final distribution transformer. LV distribution to consumers. Earthed system. **Consumer safety** Direct and indirect contact. TT and TN systems of supply. Consumers earthing. Loop impedance. Equipotential bonding. RCD construction and operation. Alternative protection arrangements. SELV/PELV/FELV/Class II. Special locations.	- State the hazards involved and precautions to be observed when installing underground cable - List the advantages of installing power link trunking and state suitable applications for same **Unit 4: Batteries and Emergency Lighting Systems** **Learning Outcome** - Inspect, carry out instrument tests on, and charge lead acid and alkaline batteries - Inspect and test, maintained, non-maintained and sustained emergency lighting circuits and control equipment. **Unit 5: Discharge Lamps** **Learning Outcome** - Describe the construction and operation of SOX, SON, MBF and MBI discharge lamps - List the factors which affect lamp life, colour rendering, efficacy and applications **Unit 6: Domestic, Industrial and Commercial Heating** **Learning Outcome** - Select the cables, accessories and protective devices required to install storage heating circuits - Design and install a heating system incorporating a programmable timeclock **Unit 7: Earthing and Testing** **Learning Outcome** - Perform the installation completion tests set down in the ETCI Rules for domestic type installations - Record the results of domestic installation completion tests - Diagnose faults on simulated test board using appropriate test equipment.

Cork Institute of Technology Programme
Bachelor of Engineering in Electrical Engineering

Module 1 - Semester 2 Electrical Science 2 - Module ID: 2784	FÁS Programme - Electrical
LEARNING OUTCOMES: 1. Apply single phase AC theory to the solution of practical problems involving electrical AC quantities. 2. Describe and define electrical, magnetic and physical terms and quantities and perform fundamental calculations involving these quantities. 3. Design and examine circuit/component behaviour to determine parameters within circuits. 4. Make meaningful measurements on electrical circuits and interpret the information from these measurements to assess the circuit and fault find. 5. Build and construct series and parallel circuits in an electrically safe manner. **INDICATIVE CONTENT** **Sinusoidal Waveforms** R.M.S. values. Solution of AC circuits involving resistance, inductance and capacitance. involving simple series or parallel combinations of these. **Electrolysis** Primary and secondary cells; characteristics of lead acid and nickel alkaline cells.	**PHASE 2 - MODULE 1. ELECTRICITY 1** **Unit 7: Magnetism, Electromagnetism and Electromagnetic Induction** **Learning Outcome** - State Faraday's Law of electromagnetic induction - Apply the corkscrew, right hand grip rules - Discriminate between magnetic and non-magnetic materials - Construct a circuit which will demonstrate the effect of switching inductive loads - Explain how the growth of current in a coil is accompanied by a flux which produces an EMF in opposition to the applied EMF **Unit 9: Introduction to A.C.** **Learning Outcome** - State how an alternating EMF is generated by rotating a coil in a magnetic field - State the relationship between average, root mean square and maximum values of alternating current and voltage - State the effect of passing alternating current through resistive, inductive and capacitive circuits - Construct simple circuits which demonstrate the effect of connecting a resistor, a capacitor and an inductor in an a.c. circuit **PHASE 4 - MODULE 1 - ELECTRICITY 2** **Unit 1: Single Phase A.C. Circuits** **Learning Outcome** - Explain the behaviour of R.L.C. combinations in single phase a.c., series and parallel circuits. Calculate circuit conditions - Explain the conditions which cause the effects of resonance in series circuits - Measure power and power factor of series and parallel circuits

Module 1 - Semester 2 Electrical Science 2 - Module ID: 2784	FÁS Programme - Electrical
Measurements Techniques for measurement of voltage, current, resistance and power. Wheatstone Moving coil meter; moving iron meter; dynamometer; electronic voltmeter; thermocouple digital meters. Range extension: multi-meters. Errors in measurement. **Mechanics** Vectors and scalars. Dynamics - Newton's Laws of motion, conservation of linear power, friction and efficiency Linear Motion, Rotational motion, moments, couple. **Practical exploration of A.C. Electrical Circuits** AC Waveforms, AC values, Resistance in AC Circuits, Inductance in AC Circuits, Work, Capacitance in AC Circuits, Impedance in AC Circuits, Resonance in AC Circuits.	**Unit 3: Three Phase A.C. Circuits** **Learning Outcome** - State the principles and advantages of three phase systems - Measure power in balanced three phase loads using one, two and three watt meter methods - Measure the output voltage waveforms of three phase half wave and three phase full wave rectifier circuits, using an oscilloscope **Unit 7: Magnetic Circuit** **Learning Outcome** - Define units of magnetic flux, magnetomotive force, magnetic flux density, magnetising force and reluctance - Calculate values of magnetic flux density and relative and absolute Permeability - Differentiate between hysteresis loss and eddy current loss and state methods to overcome both - Compare electric and magnetic circuits in relation to quantities and units **PHASE 4 - MODULE 3 - ELECTRONICS 1** **Unit 1: RC Networks** **Learning Outcome** - Calculate RC network charge and discharge rates, plot curves and confirm by measurement **PHASE 6 - MODULE 3: ELECTRICITY 3** **Unit 1: Single and Three Phase A.C. Circuits** **Learning Outcome** - Describe the behaviour of single phase a.c. parallel circuits involving resistance/inductance and resistance/capacitance in individual branches - Determine the relationship between line and phase currents in star and delta systems for balanced and unbalanced loads - Calculate the current in the neutral of star connected balanced and unbalanced loads - Calculate the values of total power in balanced and unbalanced star and delta connected loads - Measure the power in balanced and unbalanced three phase loads using one, two and three wattmeter methods - Construct circuits which improve circuit power factor - Calculate phase currents only for unbalanced delta connected loads

Admission to Cork Institute of Technology Programme

Admission for holders of Advanced Certificate-Craft is to Year 2 of the 3-Year, Level 7 Bachelor Degree in Electrical Engineering programme following a bridging course in mathematics. The mapping exercise demonstrates that the learning outcomes of most of the Year 1 modules [semester 1 and semester 2] (with the exception of the mathematics elements) are substantially met by the FÁS Apprentice programme for Trade of Electrician. An additional bridging module in mathematics is provided prior to Semester 3 to prepare the students for the programme. The following tables giving the progression statistics for these learners over 5 years shows that retention and attainment of these learners has been above average.

Progression statistics to date

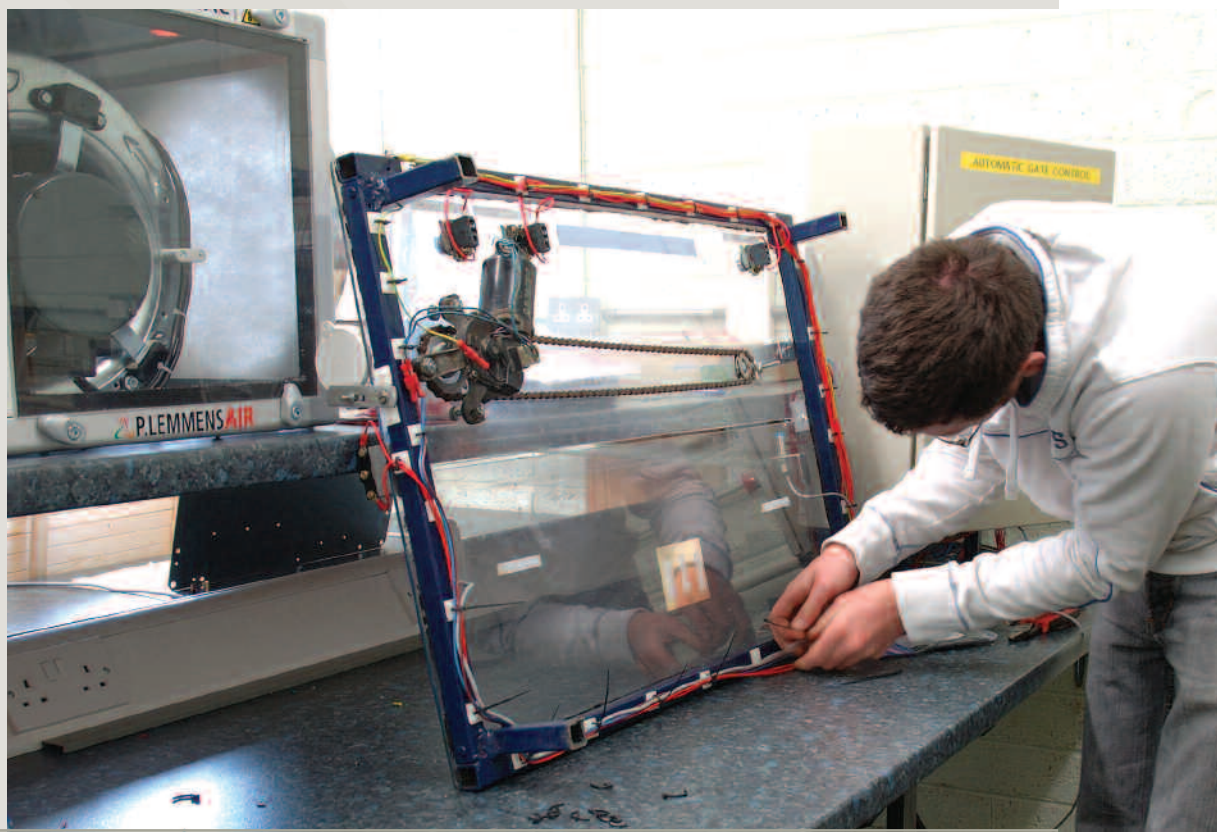
These tables provide the statistics for the craft certificate holders in each of these years only.

Year 2 Year	Total	Graduated	Retention	Pass	Merit 2	Merit 1	Dist
2003	11	11	100%	0	1	1	9
2004	5	5	100%	1	2	0	2
2005	10	10	100%	0	0	1	9
2006	10	10	100%	0	2	1	7
2007	14	14	100%	0	0	4	10
Year 3 Year	**Total**	**Graduated**	**Retention**	**Pass**	**Merit 2**	**Merit 1**	**Dist**
2004	9	9	100%	1	1	3	4
2005	5	4	80%	2	1	0	1
2006	10	10	100%	0	0	0	10
2007	9	9	100%	1	2	2	4
2008	15	15	100%	0	6	2	7

Table 3 Progression statistics for Craft Certificate holders

Comments

CIT's experience of students coming through the progression route has been a very positive one. It is acknowledged that such students are highly focused and motivated as witnessed by the large number exiting with distinction in their Level 7 degree as documented previously. Their involvement in the course provides significant positive influence within the classroom and they bring that very important ingredient of practical experience to discussion and project work.



Case Study D2

Progression of Craftspersons into programmes in Electrical Services Engineering

Institution:	Dublin Institute of Technology
Programme:	Electrical Services Engineering
Programme Titles:	Bachelor of Technology in Electrical Services Engineering (Full-time) DT010
Associated Programmes:	Bachelor of Technology in Electrical Services Engineering (Part-time) DT083 Higher Certificate in Electrical Services Engineering (Part-time) DT078
Level:	7 (6)
Mode:	Full-time and part-time options
Normal Duration:	3 years

Background

This ordinary degree programme is a development of the certificate/diploma in Electrical Services Engineering, which was validated in March 2002. This certificate/diploma programme has been redesigned as an ordinary degree. There is strong demand for this change from the current cohort of students and strong support is also given by the Chartered Institution of Building Services Engineers (CIBSE) and representatives of the Electrical Services Industry. There is presently no other institute in Ireland offering Electrical Services Engineering programmes. The increase in complexity of electrical services in recent years has been such that practitioners must now possess a wide range of skills.

Graduates from this programme will possess a wide range of personal, interpersonal, communication, and management skills as well as the traditional technical/professional skills. This will ensure a well-rounded graduate capable of lifelong learning who will be able to take up gainful employment in a diverse range of areas such as: Electrical Services Contracting, Electrical Services Design, Building Services Consultancy, Industrial Services, Engineering Systems Support for Manufacturing, Technical Sales and Environmental Control.

Programme Duration

The Bachelor of Technology programme (DT010) is a full-time *ab-initio* three-year modular programme with the option of the Higher Certificate award as an exit award after the successful completion of two years study. The exit award is ungraded and is available for students who do not complete the third year of the programme.

Programme aims

The aims of the programme are to:

- Address the current skills shortage of electrical services technicians;
- Provide a deep seated learning environment for students;
- Produce graduates who will exercise engineering skills in a scientific and reflective way, which will enable them to perform to a high level of expertise in modern industry;
- Enable graduates to be creative and to think critically;
- Enable graduates to develop communication, managerial, personal and interpersonal skills;
- Allow graduates attain skills which will allow them address the challenges of lifelong learning, thus overcoming the problems associated with the short life cycle of modern engineering information;
- Allow linkage and transfer to DIT Electrical, Building Services and other engineering post graduate programmes within the DIT and further afield.

Applicants holding the Advanced Certificate-Craft (Electrical) are required to furnish proof of having achieved an appropriate level of competence in Computer Aided Design (AutoCAD) and must also have passed the European Computer Driving Licence (ECDL) to allow advanced level entry into year two of the full-time programme.

Dublin Institute of Technology
Department of Electrical Services Engineering

Mapping of FÁS Advanced Certificate-Craft to the Programme Module Outcomes for Year 1 of the Bachelor of Technology in Electrical Services Engineering (DT010)

This section will show how the particular Advanced Certificate-Craft (Electrical) meets the learning needs for entry to this programme / progression opportunity. In cases where the craft certificate holder is being granted advanced entry into an existing 3 year Level 7 programme this section will clearly show the modules that are required to gain entry into Year 2 of the programme.

		Module 1	Module 2	Module 3	Module 4
Semester 1 & 2	Exemption sought	Electrical Science	Electrical Services Design/Safety/ Environmental Engineering	Computer Aided Design	Industrial Automation
	Previous relevant learning	Phase 2 - Electricity 1 Phase 4 - Electricity 1 Phase 4 - Electronics 1 Phase 6 - Electricity 3	Phase 2 - Unit 2 - Health & Safety Phase 2 - Electricity 1 Phase 2 - Installation techniques Phase 4 - Power Distribution 1 Phase 6 - Power Distribution	Spread across the entire apprenticeship a knowledge of wiring diagrams/circuit diagrams are continually used AutoCAD is not offered to Apprentice Electricians	Phase 6 - Automation Control Phase 4 - Electronics 1 Phase 6 - Electronics 2
	Learning outcomes match	95%	100%	0%	100%
		Module 5	**Module 6**	**Module 7**	**Module 8**
Semester 1 & 2	Exemption sought	Engineering Mathematics 1	Professional Development	Engineering Science	Engineering Computer Applications
	Previous relevant learning	Phase 2 - Electricity 2 Phase 4 - Electricity 2 Phase 6 - Electricity 3 Phase 2 – Phase 4 Phase 6 – included in integrated curriculum further studies	Having completed 7 phases of an apprenticeship the content of this module is covered.	Phase 2 - Unit 5 - Power and Energy Phase 2 - Installation Techniques 1 Phase 4 - Electricity 2 Phase 4 - Electronics 1 Phase 4 - Power Distribution	Phase 2 - Phase 4 - Phase 6 - included in integrated curriculum further studies
	Learning outcomes match	100%	100%	90%	100%

Table 1 Mapping of FÁS Programme for Electrical Apprentices to Year 1 of Bachelor of Technology in Electical Services Engineering

Allocation of marks Year 1
Examination and course work marks

Table 2 Year 1 course outline

Year 1	Written Exam %	Course Work %	Total %	Subject weighting	Exam Marks	Course Work Marks	Total Marks
MATH 1111 Engineering Mathematics	70	30	100	1	70	30	100
PROF 1102 Professional Development	0	100	100	1	0	100	100
ELSC 1103 Electrical Science	70	30	100	2	140	60	200
ESDS 1104 Electrical Services Design Safety/ Environmental Engineering	70	30	100	2	140	60	200
ENSC 1105 Engineering Science	70	30	100	1	70	30	100
INAU 1106 Industrial Automation	50	50	100	2	100	100	200
ENCA 1107 Engineering Computer Applications	0	100	100	1	0	100	100
CAD 1108 Computer Aided Design	0	100	100	2	0	200	200
Total	**N/A**	**N/A**	**N/A**		**520**	**680**	**1200**

Note: Subject weighting 1 = 5 ECTS
Subject weighting 2 = 10 ECTS

Transfer and Progression

On successful completion of the programme, graduates of DT010 will have the option of going directly into employment or continue their education to honours degree level. A part-time honours degree programme, Bachelor of Science in Electrical Services Engineering & Energy Management has been introduced in DIT.

Progression Statistics

The following table summarises the progression statistics for the craftspersons who have entered the programme to date.

Year of Entry	Total Entries	Progress to Year 3	Year Graduated	Graduated	Retention	Pass	Lower Merit	Upper Merit	Dist
2003	10	10	2005	10	100%	2	2	2	4
2004	12	11	2006	11	92%	0	3	4	4
2005	25	21	2007	21	84%	1	2	8	0
2006	45	40	2008	Results Pending	89%				

Table 3 Progression statistics for the Craft Certificate holders.

Case Study D3

Progression of Craftspersons into Level 7:
Bachelor of Science in Construction Management

Institution: Institute of Technology, Sligo

Programme: Bachelor of Science in Construction Management

Introduction

The Institute of Technology, Sligo offers a two-year Level 7 on-line Bachelor of Science in Construction Management. The course is specifically designed to facilitate qualified carpentry and joinery craft persons who wish to acquire construction management expertise as a career progression route.

The course commenced in September 2006.

Structure and organisation of Programme

The course is delivered in two years and a special preparatory module and bridging studies programme is provided at the beginning of each year. The course consists of eight subject modules and four are delivered each year by a combination of on-line lectures and in-house tutorials. Learners may take as many as or as few modules as they wish and complete the programme over a number of years to suit their own circumstances.

Learners will be required to attend the institute for one week at the beginning of September during which they will be trained in on-line learning and they will receive introductory tutorials and bridging studies in each of the four modules to be delivered in the following academic year. A course schedule summarising the programmes is given in Table 1.

Learners will also attend at the institute for a number of days in January and April to take practical and written continuous assessment examinations. The course includes a significant amount of on-line testing in each of the modules and the objective of the in-house written and practical examinations is to ensure the validity of the on-line test results. Written examinations will be held in the institute at the end of each academic year.

This course will provide qualified carpenters with a qualification and training that will allow them to progress to positions of management particularly in contracting.

Rationale for the Programme

Despite the recent sharp downturn in house completions most commentators believe that the long term outlook for the construction industry is positive. For example a recent report by A&L Goodbody Consulting[1] predicts that the population of the State will increase to 5.1 million by the year 2020 and this will of necessity be accompanied by increased capital investment in infrastructure.

In a report entitled "Ahead of the Curve", the Enterprise Strategy Group[2] identifies the need to provide upskilling opportunities for the workforce and the proposed B.Sc. in Construction Management is part of IT Sligo's response to this need.

The 2005 National Skills Bulletin published by FÁS identifies shortages of management skills in the construction sector and it is predicted that in this environment there will be increased demand for construction management personnel at all levels.

One of the core aspirations stated in the Mission of IT Sligo is that of meeting the needs of the region and of industry. Underpinning this is the value the Institute sets on its learners and on the quality of its programmes of education. In this regard, the Institute strives to attain the highest level of recognition for its graduates – both in terms of academic qualifications and professional standing.

1 Ireland's Strategic Infrastructure Investment 2020. A&L Goodbody Consulting, September 2005
2 Ahead of the Curve, Enterprise Strategy Group, Forfás Secretariat, July 2004

Programme Aims

The primary aims of the Bachelor of Science in Construction Management are:

- To produce graduates who can assume positions of management in the construction industry. It is envisaged that graduates of the course could hold any of the following positions:
  Site Manager,
  Site Agent,
  Project Manager,
  Self-Employed Contractor of Sub-Contractor.

- To provide enhanced career and educational opportunities for qualified carpenters.
- To provide graduates of the course with the management skills required, enabling them to take up positions of responsibility both on and off site.
- To provide graduates of the course with a level of skill and knowledge which will provide a basis for further education and training.

The philosophy of the course recognises the trade background of many of those in managerial positions in the construction industry and seeks to provide a route to formal qualifications for such people.

Eligibility

The requirement for entry to the Bachelor of Science in Construction Management is a minimum of a Advanced Certificate-Craft in Carpentry and Joinery with Merit, or equivalent. Applicants who hold an appropriate Level 6 award will also be eligible to apply. Applications will also be considered from individuals who do not hold any formal qualifications but who have suitable experiential learning. If the number of applicants exceeds the number of places available, selection will be on the basis of interview.

Internet Supported Distance Learning

A Virtual Learning Environment (currently Moodle) is used by each lecturer to direct and manage the learning process for their own modules. The VLE facilitates the following:

- group and individual communication (including posting messages to students, posting of queries by learners and peer discussion);
- posting of documents by lecturers for access by learners;
- posting of links to websites for access by learners;
- electronic logged submission of assignments;
- electronic feedback on assignments;
- automated objective tests (e.g. on-line multiple choice tests);
- remote collaboration on group work (discussion boards, collaborative, document editing);
- viewing of student activity and progress;
- social communication between learners (including chat);
- polls and surveys of learners;
- Learner journals.



COURSE SCHEDULE – STAGE 1

Title of Award: Bachelor of Science in Construction Management – Level 7
Area of Specialisation: Construction Management
Learning Modes Offered: On-Line
Date Effective: September 2006

Module Number	Module Title	Credits	Contact Hours		Marks Allocation			
			On-line per week	In-house per year	CONT	PROJ	EXAM	TOTAL
CM001	Construction Technology	10	2	4	30	20	50	100
CM002	Drawing & CAD	5	2	12	25	50	25	100
CM003	Measurement & Costing	10	1	4	20	30	50	100
CM004	Site Surveying	5	1	18	40	20	40	100
	Total	**30**	**6**	**38**				

COURSE SCHEDULE – STAGE 2

Module Number	Module Title	Credits	Contact Hours		Marks Allocation			
			On-line per week	In-house per year	CONT	PROJ	EXAM	TOTAL
CM005	Building Services	5	1	4	20	50	30	100
CM006	Building Surveying	5	1	2	30	20	50	100
CM007	Contract Administration	10	2	6	30		70	100
CM008	Project Planning	10	2	12	20	30	50	100
Total		**30**	**6**	**24**				

Note:
In-house contact hours do not include in-house examinations.
An additional 12 hours per week of self-directed learning will be required.
Self-directed learning: 12 hours/week (indicative).

Appendix E

Working Group Membership

Chairperson	Organisation
Mr Barry Leach	Cork Institute of Technology

Representative	
Mr Kieron Heavin	Athlone Institute of Technology
Mr J.J. Curran	Athlone Institute of Technology
Mr Adrian McAuliffe	Cork Institute of Technology
Dr Felix Raekson	Cork Institute of Technology
Mr Kevin O'Connell	Dublin Institute of Technology
Mr Thomas Nugent	Dublin Institute of Technology
Mr Richard O'Rourke	Dublin Institute of Technology
Mr Peter Carolan	Dundalk Institute of Technology
Mr Chris Ryan	Dundalk Institute of Technology
Mr Barry Finnegan	Galway-Mayo Institute of Technology
Mr Jim O'Connor	Galway-Mayo Institute of Technology
Mr Michael Casserly	Sligo Institute of Technology

Overall Project coordinator	
Ms Irene Sheridan	Cork Institute of Technology

Project administrators	
Ms Helen Flynn	Cork Institute of Technology
Ms Vera Barrett	Cork Institute of Technology


education
in employment