How can Workplace Learning Help to Reposition Ireland’s Engineering Industry Towards a High Skills Route?

Thesis submitted for the degree of Doctor of Social Sciences at the University of Leicester

by

Derek Walsh MSc Leicester Centre for Labour Market Studies University of Leicester

October 2007
Title: How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?

Abstract

This thesis set out to determine whether learning that takes place in the workplace can help significantly in the attempt to create a high skilled engineering workforce in Ireland. The rationale for the research was linked with certain stakeholder views which, suggest that the engineering industry must reposition itself higher up the value chain. Government aspirations of creating a knowledge based high skills economy and the promotion of lifelong learning were other influencing factors.

A central tenet of the analytical framework on which the study was based is that learning and working are interdependent. Moreover learning is just as much a social and participatory process as it is a form of acquisition.

Engineering companies in Ireland are classified as either traditional or modern. The expectation at the outset was to find that modern companies would provide a more conducive environment for deep learning to occur. The research was based on four case study companies representing both of these classifications in order to build a more complete of what exists in reality.

Policy debate in Ireland on high level skills, lifelong learning and knowledge creation revolves mainly around greater participation levels in third level education and acquiring formal qualifications. The author was of the opinion at the outset that this type of one sided approach ignores a critical element in the skill and knowledge formation process.

Evidence is presented which shows that engineering workers develop significant skill levels through the normal work routines and by interacting with work colleagues. The divide within the industry in relation to modern and traditional companies was shown to be insignificant as far as attitudes to learning and the need for skills are concerned. Certain skills which are regarded as being essential for high value added forms of manufacture were shown to be best acquired in the workplace.

By focusing exclusively on formal off-the-job training and education as a means of measuring skills and knowledge levels, we will never really know what skill levels and expertise exist within the industry. More importantly the research showed that engineering employees regard the workplace as a site where certain types of skills and knowledge can only be acquired. Workplace learning must be regarded as an integral part of the engineering skill formation process and should be afforded formal recognition.

The thesis is unique because it is industry specific and located in the Irish context. It is based on an analytical framework which relies on a synthesis of discrete findings from previous researchers. These interacting variables were combined as part of a mixed methodology in a way that had not been done before and resulted in some new insights on the concept of workplace learning as part of an engineering skill formation process.
Acknowledgements

This thesis could not have been completed without the assistance and support of a number of individuals and so my thanks to:-

The research participants who gave so generously of their time and the company managers/owners who also took part in the research and showed me every courtesy and facilitated their employees’ participation.

Mike Muntner, Geoff Spencer, Tom Murphy and Eoin Bell since without their assistance I would not have been able to gain access to those who participated.

The Librarian and staff of the FÁS Technical Library who processed my requests for material housed in Trinity College Library, Dublin and the British Library.

A special thanks to Dr. John Goodwin as my supervisor for his support, expertise and guidance throughout the process.
# Table of Contents

Abstract.................................................................................................................................i

Acknowledgements ..............................................................................................................ii

Table of Contents ................................................................................................................. iii

List of Appendices.................................................................................................................vi

Chapter 1 .................................................................................................................................1

High level engineering skills and workplace learning: The Irish context... 1
  Introduction.........................................................................................................................1
  Overview of workplace learning....................................................................................1
  Background to the research problem ............................................................................3
  Research problem, propositions/research issues.........................................................5
  Analytical framework for the research .........................................................................7
  Practical issues related to the research justification....................................................10
  Methodology....................................................................................................................14
  Delimitations of scope and key assumptions, with their justification .......................17
  Summary and concluding remarks.............................................................................19

Chapter 2 ..............................................................................................................................21

Workplace learning and the interdependence between working and learning ........................................................................ 21
  Introduction.......................................................................................................................21
  Overview of key debates on workplace learning.........................................................24
  The social and situated context of learning..................................................................28
  Limitations of Lave and Wenger’s theorising..............................................................35
  How learning is conceptualised.....................................................................................38
  Work organisation to facilitate workplace learning....................................................41
  The relationship between workplace learning and high performance work practices ..................................................................................45
  Workers’ perceptions about workplace learning.......................................................48
  Summary and conclusions arising from the literature reviews on workplace learning .................................................................................................52

Chapter 3 .............................................................................................................................57

Routes to competitive advantage and skill formation processes .............57
  Introduction.......................................................................................................................57
  Analytical issues related to the high/low skills routes to capital accumulation ..................................................................................58
  The decline of Fordism and the emergence of post-Fordism .................................63
  Flexibility theory............................................................................................................66
  The flexible firm ............................................................................................................71
Theories of VET and Ireland’s approach to skill formation............73
Policy implications for Ireland in becoming a high skill, knowledge-based economy..............................................................83
Summary and conclusions arising from the literature reviews on routes to competitive advantage and theories of VET...............88
Synthesis of the literature reviews ................................................90

Chapter 4 ........................................................................................................92
Research methodology ................................................................................92
Introduction..........................................................................................92
Social science research methodologies..............................................94
Rationale for a quantitative research methodology .....................95
Design of the quantitative research instrument...............................97
Quantitative data analysis .................................................................101
Justification for a qualitative methodology......................................102
Ethical issues......................................................................................107
How ethical issues were dealt with....................................................109
Pilot testing the research instrument.................................................111
Research sample and access negotiation.........................................113
Sample company details ................................................................115
Fieldwork...........................................................................................118
Data presentation and analysis.........................................................121
Summary and concluding remarks...................................................122

Chapter 5 ......................................................................................................123
Data presentation.........................................................................................123
Introduction........................................................................................123
Company A Case Study – Traditional engineering company........124
Employee interviews – Company A ..................................................127
Self-completion questionnaire results – Quantitative data ............137
Company B Case Study – Traditional engineering company........140
Employee interviews – Company B ..................................................143
Self-completion questionnaire results - Quantitative data ..........152
Company C Case Study – Modern engineering company...........155
Employee interviews – Company C ..................................................158
Self-completion questionnaire results – Quantitative data ...........167
Company D Case Study – Modern engineering company...........170
Chapter summary...............................................................................177

Chapter 6 ......................................................................................................182
Conclusions and implications .............................................................182
Introduction.........................................................................................182
Conclusions from the quantitative research.................................184
Conclusions from the qualitative research - Workplace learning......185
Workplace learning.............................................................................186
Communities of practice and the apprenticeship model of learning..187
Recognition of skills acquired in the workplace..............................190
List of Appendices

Appendix 1 Attitudinal survey on workplace learning and skill acquisition in Irish based engineering companies

Appendix 2 Employee Interview Questions

Appendix 3 Manager/Employer Interview Questions

Appendix 4 Questionnaire Cover Letter

Appendix 5 Sample Employer request to participate letter

Appendix 6 Raw Data Company A

Appendix 7 Raw data Company B

Appendix 8 Raw data Company C

Appendix 9 Raw data Company D
High level engineering skills and workplace learning: The Irish context

Introduction

This chapter commences with a brief overview of the recent interest in workplace learning among policy makers and researchers. The discussion then moves on to discuss background issues related to the research and to describe the research problem, i.e. *How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route*, and the analytical framework used to address this research question. A justification for the research is provided by referring to problems that are alleged to be facing the Irish engineering industry resulting from global competition. This justification also relates the debates in the literature on workplace learning and skill acquisition to the development of high level engineering skills in Ireland. A brief overview of the methodology that was used is included followed by an outline of the thesis structure. The scope of the research is then described followed by some concluding comments on this chapter.

Overview of workplace learning

In recent years the concept of learning at work has been gaining the attention of policy makers and researchers (see for example Ashton and Sung 2002; Billet 2001; Lawy and Bloomer 2003; Skule 2004). This interest in workplace learning is based on a recognition that learning is something that takes place as part of our everyday lives. Ó Cheallaigh (2001: 270) for example informs us that: “Learning is becoming more individualised, as jobs become more tailor-made and there is a greater recognition of work-based experience and non-formal learning in diverse settings outside education
institutions”. Research tells us that in general, workers at all levels report that significant learning occurs outside of the classroom setting and in particular from the challenge of work itself (see Ashton 1998; Eraut et al 1998; European Commission 2001). For the purposes of this research, this implies that learning also takes place during the normal work routines in engineering workshops and factories. Zuboff (1998) concurs with this, she informs us that “learning is not something that requires time out from being engaged in productivity; learning is at the heart of productive activity” (Zuboff 1998: 395). Interest in workplace learning among policy makers has arisen partially from the impact of globalisation and they are now conscious of the need to exploit any opportunities that may enhance the competitiveness of their respective national economies (CLMS M2A: 5; Boud and Garrick 1999). Malcolm, Hodkinson and Colley (2003) inform us that current EU policies on lifelong learning are placing increasing emphasis on the importance of informal learning. They assert that this type of learning is now seen as important from the point of view of increasing productivity and reducing the problem of social exclusion. However, despite this interest in the literature and at EU level there is little evidence of policy measures in Ireland to promote workplace learning.

We are also told that many organisations are increasingly turning their attention to the concept of learning at work (see Department for Education and Employment 1998). Boud and Garrick (1999:1) inform us “modern organisations ignore learning at the cost of their present and future success”. Lankshear (1997) contends that the current era of the ‘new capitalism’ has also resulted in a need to create an alliance between working and learning.
He explains new capitalism as:

Productivity that is increasingly dependent upon applied science and technology and the quality of information and management, a shift from material production to information processing activities, a shift from standardised mass production to flexible specialisation and increased innovation and adaptability (Lankshear 1997 cited in Pillay et al. 2003a: 95).

While education and working were traditionally regarded as separate entities, Pillay et al. (2003a) point out that there is now a need to strive for increased productivity combined with ongoing education and learning and this requires a shift in perception. The creation of this alliance between working and learning is based on the assumption that workers both accept and understand this concept (Pillay et al. 2003b). However, this may not be the case in the Irish engineering context and this is something that forms part of this research. While workers may be well disposed to the notion of lifelong learning as a form of personal development, their interest in it may not extend to what the workplace has to offer by way of learning. This is linked to what Ní Cheallaigh and others refer to as the monopolisation of the lifelong learning concept by labour market policies and the employability of individuals (Ní Cheallaigh 2001; Boud and Garrick: 1999).

**Background to the research problem**

Having briefly described some of the debates on workplace learning, the new capitalism and the perceived need to create an alliance between working and learning, the discussion now deals with the factors that influenced the decision to focus this

---

1 “All learning activity undertaken throughout life, with the aim of improving knowledge, skill and competences within a personal, civic and/or employment related perspective” (European Commission in McIver 2004: 9).
research on the Irish engineering context. Two factors played a part in this decision. One relates to certain competitive difficulties that are facing the Irish engineering industry and this is explained in detail in the next section. The other factor relates to certain policy issues based on the new capitalism and the so-called ‘knowledge economy’ or ‘learning society’ as outlined below. According to the Irish National Competitiveness Council, “Ireland’s long term vision is to become a high skills economy and a learning society… which will require a commitment to training and lifelong learning” (NCC 2003:12). The White Paper on Human Resource Development informs us, “For each firm the aim must be to become a ‘Learning Organisation’ that continuously develops its human resources” (Department of Enterprise, Trade and Employment, 1997:31 in McIver Consulting 2004:8). The Government appointed Enterprise Strategy Group in Ireland is also advocating that Ireland should embrace this new capitalism or knowledge economy. According to this group, “…most countries are becoming more knowledge intensive. The challenge for Ireland lies in ensuring that we are at the forefront of this transition” (Enterprise Strategy Group 2004: 26). It is acknowledged that these terms such as knowledge economy and learning society are often contested and imprecise and it is not clearly spelled out in the policy statements how these aspirations are to be realised. Lloyd and Payne (2002: 22) for example argue that “…the modern myth of the knowledge economy that emblazons text books and policy documents requires little solid evidence and has already proved markedly adept at resisting any facts it doesn’t like”. They also refer to the problem caused by policy makers in using these terms to create a vision of the future without sufficient thought as to what they actually mean and how this vision can be realised.

The Enterprise Strategy Group was appointed by the Government in 2003 to carry out a fundamental review of industrial policy and make recommendations on the future strategy required for Ireland as a developed economy going forward.
Despite this confusion, a central tenet of this knowledge economy concept is that the organisation’s wealth exists principally in the heads of its employees (see Lloyd and Payne 2003; Information Society Commission 2003; Boud and Garrick 1999; Drucker 2001). According to the Information Society Commission³ “The countries that succeed in the 21st century will be those with citizens who are creative, adaptable and skilled. Our people – their skills, talents, knowledge and creativity – are key to future success” (Information Society Commission 2002: 23). This is consistent with a definition for ‘knowledge worker’ provided by Hammer (2004: 14) “someone who knows more about his or her job than anyone else in the organisation”. Based on the discussion so far it is clear that any attempt to relate workplace learning to the creation of a high skills workforce must therefore take account of a broad range of issues as outlined in the following section.

**Research problem, propositions/research issues**

The problem addressed in this research is: *How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?*

The Irish engineering industry is said to be losing its competitive edge in recent years in the face of global competition. “As with foreign-owned companies, Irish-owned companies face increasing pressure as a result of rising costs in wages, insurance, energy and environment costs” (Engineering Sector Report 2004:9). The advice from Government agencies and policy makers is that the industry needs to reposition itself further up the value chain by producing more high value added products. The notion of continuing to compete mainly on the basis of price alone will not be sustainable in the future (see Enterprise Strategy Group 2004; Irish Engineering Enterprises

---

³ The Information Society Commission (ISC) is an independent advisory body to Government. It draws on high-level representation from the business community and the social partners.
One implication of this is that skill levels in the industry may be a limiting factor.

This research concludes that workplace learning, given the right conditions, can help significantly to create high level engineering skills. It is acknowledged by the researcher at the same time that high level skills may not be a pre-requisite for the Irish engineering industry to reposition itself further up the value chain and this was explored as part of the research. It is also argued that a number of issues such as the type of production that a firm is engaged in and the type of work organisation that applies may restrict workplace learning opportunities. Other issues that may impact on learning at work relate to perceptions held by employees about the need for lifelong learning, the institutional structures at national level that support workplace learning, labour market regulation, the VET system in general and the demand for skills. This research took account of what some commentators refer to as the rhetorical nature of the current discourse on lifelong learning. Boud and Garrick (1999:5) for example inform us “… much of the current rhetoric about lifelong learning is part of an economic agenda…” (see also Ní Cheallaigh 2001). The perspective of Irish engineering workers in the context of this economic agenda on lifelong learning was therefore examined. This provided some insights on how realistic policy makers’ ambitions are for the creation of a high skills economy in the short term. This is based on the recognition that “knowledge is embodied in people and it is the quality of the human resources that will determine the success or otherwise of firms and economies in the years ahead” (Enterprise Strategy Group 2004:26). If this is the case, then employee attitudes to learning will play a crucial role in the process. Employees, through their own individual agency, may not see a
link between working and learning or indeed, they may not see any need to engage in any form of ongoing learning at work.

Another aspect of the debate on this agency concept relates to employers. Irish employers in the engineering industry may adopt other routes to competitive advantage such as work intensification systems within a low skills environment. In this case the need to move their respective production/product range further up the value chain may not be considered necessary. On the other hand employers may not consider higher level skills to be a prerequisite for higher value added forms of production. The use of improved technology or outsourcing may be regarded as the appropriate means to facilitate higher value added forms of production while maintaining a relatively low level skill base.

**Analytical framework for the research**

The analytical framework used to explore workplace learning in the Irish Engineering context was based on a combination of the following debates within the literature: the interdependence between learning and working; the concept of learning as a form of participation as well as the acquisition of skills and knowledge; the social context of learning and the value of communities of practice; employee perceptions on workplace learning and lifelong learning and the link between high performance or high involvement work practices and high level skills. The influence of alternative routes to capital accumulation that are available to employers was also considered. The low skills equilibrium concept forms part of this debate. Existing research on these topics and debates within the literature were reviewed in Chapters 2 and 3 and the findings from this literature review were used to inform the design of the research.
instruments and to highlight any gaps in the existing literature. Some examples of key authors who are referred to and who have informed the analytical framework on which the research was based are as follows: Billet (2001), Sfard (1998), Lave and Wenger (1991), Fuller and Unwin (2003; 2004), Ashton and Sung (2002). It is the contention of the researcher that the theorising of these authors and others that are referred to in the literature reviews in Chapters 2 and 3 can be developed further. The analytical framework referred to above therefore combines discrete elements of the knowledge that has already been acquired. This analytical framework was used as a basis to develop the research instruments.

Moreover, the overall context of the research was to examine workplace learning and VET as it applies to the Irish engineering industry from the perspective of those who are working in the industry in both traditional engineering companies and modern engineering companies. This polarisation of company types is cited in the Enterprise Strategy Group (2004) *Engineering Sector Report* and the *Engineering Skills Monitoring Report 2005-2015* (FÁS 2006). Both of these reports refer to modern engineering companies as those who manufacture high value added proprietary products. The traditional segment of the industry is reported to be dominated by companies that mainly manufacture low value added products (non proprietary products) for the home market.

The research design was also informed by the notion that employees and employers in engineering companies that are involved in the manufacture of proprietary high value added products may place greater value and emphasis on workplace learning than those employed in traditional companies. This was based on the perception that these
companies may have adopted high performance or high involvement work practices where work structures facilitate greater autonomy among workers and therefore greater learning opportunities in the workplace. Despite this polarisation of company types as cited above it was anticipated by the researcher at the outset that this stark division between companies may not be evident during the research; companies may be in the process of changing strategy or they may be operating at a level that lies somewhere in between.

Based on this categorisation of companies the research established whether a sample of Irish engineering workers learn and develop their skills better through workplace learning as opposed to formal off-the-job training or full-time VET, or through alternating periods of each. This also evokes the question of how these two concepts should be reconciled (see also Hughes, Jewson and Unwin: 2007). Another related issue refers to formal recognition of this type of more informal learning. Do employers and employees consider that skills and knowledge that are acquired in this way should be formally recognised within Ireland’s National Qualifications Framework? Michael Eraut defines informal learning as:

…learning that comes closer to the informal end than the formal end of a continuum. Characteristics of the informal end of a continuum of formality include implicit, unintended, opportunistic and unstructured learning and the absence of a teacher (Eraut: 2004:250).
Practical issues related to the research justification

Apart from the theoretical issues mentioned earlier the practical grounds for the justification of this research in the Irish context are now explained in more detail. The Irish Engineering Enterprises Federation\(^4\) informs us:

… the last three years have seen a decline in output and employment in the sector. Aggregate figures for the engineering industry show that output in the sector has fallen by 25% over the past two years whilst 16000 jobs have been lost from the sector during the same period (Irish Engineering Enterprises Federation 2004:2).

The cause of the decline is partly due to a global slowdown but possibly more significantly because of intense low cost competition from the Far East, Central and Eastern European countries (Irish Engineering Enterprises Federation 2004).

Although both indigenous and foreign owned companies have been affected by the downturn indigenous companies have been affected more so (Irish Engineering Enterprises Federation 2004). Products produced by foreign-owned companies are mainly proprietary, whereas Irish-owned companies produce both proprietary and non-proprietary products. (Enterprise Strategy Group 2004).

Some 57% of Irish owned companies produce non-proprietary products or have non-proprietary process technology. These companies are more labour intensive, are very low in the value chain, and have lower sales (and lower exports) than companies producing proprietary goods. In order to survive in the long term, it is crucial that companies producing non-proprietary products shift towards proprietary products (Enterprise Strategy Group 2004: 6).

\(^4\) The Irish Engineering Enterprises Federation (IEEF) promotes and supports the competitiveness and prosperity of the engineering sector through representation of the sector’s interests to national Government and EU institutions.
The Irish Engineering Enterprises Federation (2004) has expressed similar views. They assert that “…the future of the engineering sector in Ireland can only be secured by a movement away from a focus on low cost production of low value added products” (IEEF 2004: 6).

These advisory groups (Enterprise Strategy Group and the Irish Engineering Enterprises Federation) are of the opinion that there are implications for skill formation strategies if companies are to reposition themselves higher up the value chain. This assertion is based on the notion that these more complicated manufacturing processes require more sophisticated engineering competencies (Engineering Strategy Group 2004). The Irish Engineering Enterprises Federation, for example, informs us that: “Ongoing skill development in the workplace is an issue in the engineering sector. With the deployment of new technologies and changing work practices, employees across the board have an increasing skill requirement” (IEEF 2004:33). This is linked to what was referred to earlier in relation to the new capitalism and the knowledge economy where increased employee adaptability and innovation are said to be a requirement.

Research carried out by Muntner & Associates (2006) to determine the human resource requirements of a competitive metals and machinery industry in Ireland revealed certain perceptions among employers that would point to the potential benefits of workplace learning in the Irish engineering context.

According to Muntner:

…companies who participated in the research believed that the training interventions that are currently available are poor value. In other words the
deliverables did not meet company expectations and what was achieved was at too high a cost (Muntner & Associates 2006:176-177).

They also report that the widespread view among companies is that “there is no substitute for hands on training for learning the practical skills of the trade” (Muntner & Associates 2006: 179).

Another reason why Ireland is a suitable site for this research is that, as recently as 1999, 98% of Irish companies employed less than 50 people (McIver Consulting 2004). Small and medium sized enterprises in Ireland spend less on training and education of their employees than larger companies. The reasons cited include the fear of employees being ‘poached’ by other companies after they have been trained (McIver Consulting 2004). Ní Cheallaigh (2001) makes similar claims about small and medium sized enterprises and employee learning. She refers to the difficulty experienced by these enterprises in freeing employees up for external training or of providing employees with well rounded formal in-house training. She also asserts that they are reasonably happy with on-the-job training and that they are reluctant to bear the costs of other forms of training (see also Gil et al 1994; Cedefop 1998). The inference from the research and the comments cited above is that Irish engineering employers would be well disposed to the notion of upskilling their workforces through workplace learning as opposed to formal off-the-job training. Institutional supports to assist companies to provide greater opportunities for workplace learning through changes in work organisation and job design may therefore be a worthwhile policy initiative.
Recognition of Prior Learning (RPL) as applied to the engineering sector was also examined as part of the research. The need for a national engineering skill formation strategy that takes account of learning that takes place at work was something that emerged from the findings. According to the Engineering Industry Group\(^5\) (2002), while large numbers of workers in the industry are highly qualified there is still a large percentage with no qualifications. This research therefore informs the process whereby individuals could obtain formal recognition for skills gained through experience in the workplace. According to the National Qualifications Authority of Ireland\(^6\), recognition of prior (and experiential) learning refers to recognition of learning that may have been achieved on a non-formal basis or perhaps in the workplace. The Irish National Qualifications Framework supports the further development of prior learning recognition as a broad concept that can enable entry to a training or education programme, credit towards an award, or even eligibility for a full award without participating in a formal training or education programme (NQAI 2001). The Government appointed Expert Group on Future Skills Needs\(^7\) have also alluded to this issue in their report on *The Demand and Supply of Engineers & Engineering Technicians* (McIver Consulting 2003). They inform us that people working in engineering occupations in industry acquire skills informally that are equivalent to the skills of people who are formally qualified at a higher level.

The recommendation from the group in this regard is:

---

\(^5\) The Engineering Industry Group was established to advise the board of FÁS on issues related to training requirements for the engineering sector.

\(^6\) The National Qualifications Authority of Ireland (NQAI) was established in 2001 as a result of the Qualifications (Education and Training Act 1999 with the objective of establishing and maintaining a framework of qualifications for the development, recognition and award of qualifications.

\(^7\) The Expert Group on Future Skills Needs is a body appointed by the Irish Government to advise on aspects of education and training related to the future skill requirements of the enterprise sector of the Irish economy.
…that engineering departments in third level colleges …should work with HETAC\(^8\), industry and the Irish Engineering Institute to develop more active systems of accreditation of prior experiential learning, and also to provide tailored upskilling opportunities to bridge existing learning and the requirements of higher levels of qualification (McIver Consulting 2003:113).

Despite the fact that this has been acknowledged by the Expert Group on Future Skills Needs, the main focus of the debate around skill formation relates to increasing participation in engineering courses in third level institutions and acquiring formal qualifications (see Expert Group on Future Skills Needs 2007). The potential value of raising skill levels in the engineering sector through workplace learning has largely been ignored by policy makers.

**Methodology**

This section provides a brief overview of the methodology that was used. The research was based on four company case studies using a mixed methodology covering both quantitative and qualitative data. Quantitative data was collected from employees using a survey questionnaire. The purpose of the survey was to discern attitudes on workplace learning and skill formation processes in what are alleged to be traditional and modern engineering companies. A number of concepts were identified from the existing academic debates and research on learning at work. These concepts formed the basis of the survey questionnaire. Examples of some of these concepts include, *informal learning in the workplace and communities of practice*. The other strand of the research was based on the collection of more qualitative data which complemented the quantitative data. It provided more in-depth information on

---

\(^8\) Higher Education and Training Awards Council (HETAC) is the qualifications awarding body for third-level education and training institutions outside the university sector.
employees’ and employers’ perceptions about work, learning, high level skills and how the concept of agency impacts on decisions they make on learning and business strategy. This part of the research was based on semi-structured interviews with employers and by following up on some of the employees who completed the survey questionnaire.

**Outline of the thesis**

There are 6 chapters in this thesis as follows:

- High level engineering skills and workplace learning: The Irish context
- Workplace learning and the interdependence between working and learning
- Routes to competitive advantage and skill formation processes
- Research methodology
- Data presentation
- Conclusions and implications

This first chapter outlines the aims and background to the research question and the reason why it was thought to be a worthwhile exercise. The analytical framework on which the research is based is also described as well as the scope and key assumptions that were made at the outset. Chapter 1 also provides a general overview of what is contained in the remaining chapters.

Chapters 2 and 3 are based on a review of the current state of knowledge on the academic debates and concepts that are relevant to the research. The findings of other researchers are reviewed as a means of highlighting any relevant gaps in the literature. The literature on the sub questions arising from the main research question is also
reviewed. The findings from the literature review were used to inform the design of the research instruments.

Chapter 4 deals with the methodology used to collect the data. This chapter initially examines some of the philosophical debates around different approaches to social science research. The rationale for the particular methodologies chosen is also explained. The delimitations imposed on this research are outlined such as the type of firms chosen and the categories of employees, sample size etc. The design of the research instruments is described and justified. Details of access negotiation and the fieldwork are also included.

Chapter 5 presents the findings from each of the four case studies. The data from the qualitative interviews with employers and employees is presented thematically as a narrative combined with quotations. The quantitative survey questionnaire data is presented in the form of descriptive statistics in tabular form. The chapter concludes with a summary based on patterns of results across the four case studies.

Chapter 6 presents the conclusions and implications arising from the research. The conclusions were derived from the data presented in Chapters 5 and how it relates to the literature that was reviewed in Chapters 2 and 3. In cases where the findings do not agree with the literature, an attempt is made to explain why. Chapter 6 concludes by discussing the policy and further research implications arising from the conclusions and the unique contribution the thesis makes to existing knowledge.
Delimitations of scope and key assumptions, with their justification

This section describes the key assumptions on which the research was based and sets the boundaries and scope of the research. Some issues that were referred to earlier are reiterated. Since this study relates specifically to the Irish engineering industry it is therefore necessary to explain the scope of the industry sector that was investigated.

The engineering industry is made up of both Irish owned and foreign owned companies and covers a broad range of activities such as aerospace technology, electrical, precision engineering, computers, materials handling and automotive components (FÁS\(^9\) 2006). It should be noted that this study is only concerned with engineering companies involved in manufacture as opposed to the provision of services. For the purpose of this study this sector of the industry is covered by the European Commission NACE\(^{10}\) codes 27-35. The Table below lists the codes and the type of production associated with each one.

<table>
<thead>
<tr>
<th>NACE Code</th>
<th>NACE Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Manufacture of basic metals</td>
</tr>
<tr>
<td>28</td>
<td>Manufacture of fabricated metal products</td>
</tr>
<tr>
<td>29</td>
<td>Manufacture of machinery and equipment</td>
</tr>
<tr>
<td>30</td>
<td>Manufacture of office machinery and computers</td>
</tr>
<tr>
<td>31</td>
<td>Manufacture of electrical machinery</td>
</tr>
<tr>
<td>32</td>
<td>Manufacture of radio, television and communications equipment and apparatus</td>
</tr>
<tr>
<td>33</td>
<td>Manufacture of medical, precision and optical instruments, watches and clocks</td>
</tr>
<tr>
<td>34</td>
<td>Manufacture of motor vehicles, trailers and semi-trailers</td>
</tr>
<tr>
<td>35</td>
<td>Manufacture of other transport equipment</td>
</tr>
</tbody>
</table>

Source: Census of Industrial Production, CSO

The sub-sector NACE codes, which describe the engineering sector, are classified as being traditional or modern. These classifications are based on the ERSI\(^{11}\)’s and

---

\(^9\) FÁS is Ireland’s National Training and Employment Authority.

\(^{10}\) NACE Codes represent the statistical classification of economic activities within the European Union. Persons wishing to incorporate a new company in Ireland are required to classify the principal activity of the company using the NACE classification.

\(^{11}\) Economic and Social Research Institute (ERSI) is a research institute with a core focus on Ireland’s economic and social development in order to inform policy making and societal understanding.
CSO\textsuperscript{12}’s definition of traditional and modern industries. The modern sector is dominated by multinational companies (MNCs), which manufacture sophisticated products aimed at the global market. The traditional sector is dominated by Irish owned companies, which are mainly involved in the manufacture of low value added products for the local market (FÁS 2006:18). The Table below shows which sub-sector codes represent the traditional and modern forms of production respectively.

<table>
<thead>
<tr>
<th>Traditional and modern sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NACE Sub-Sector Code</strong></td>
</tr>
<tr>
<td><strong>Traditional Engineering Sector</strong></td>
</tr>
<tr>
<td>27</td>
</tr>
<tr>
<td>28</td>
</tr>
<tr>
<td>29</td>
</tr>
<tr>
<td>34</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td><strong>Modern Engineering Sector</strong></td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>31</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td>33</td>
</tr>
</tbody>
</table>

Source: Census of Industrial Production, CSO

The research population therefore included companies that are operating in what is alleged to be the lower value added sector of the market as well as the higher end. No attempt was made to confine the research to particular engineering occupations. The research focussed on attitudes and perceptions on learning across a broad range of employees within the participating companies. Four companies participated in the research – two modern and two traditional. The research problem is predominately sector based because individual companies may devise and implement workforce development strategies that could raise skill levels within their own particular companies. However, there may also be a supply aspect to the problem and this was also considered as part of the research. These supply type issues relate to the

\textsuperscript{12} Central Statistics Office (CSO) is a Government body responsible for compiling Irish Official Statistics.
institutional structures such as the national VET system and labour market regulation because these issues may impact on employee development that takes place in the workplace. This is something that was alluded to by Streeck (1989) and is explained further in Chapter 2.

**Summary and concluding remarks**

This chapter introduced the research problem and the research issues. Background information on the human resource development requirements facing the engineering industry in Ireland was also outlined. Government aspirations of creating a high skills economy in Ireland were linked to the status of the engineering industry and questions were raised about employee attitudes to lifelong learning and workplace learning. The rhetoric on lifelong learning coming from Government and Government advisory groups and how it impacts on workers was also referred to. These issues made Ireland a suitable site for this research. Another reason cited is that Irish companies tend to be small to medium sized and according to reports they have not engaged in formal employee training to a great extent. In addition to this the recently established National Qualifications Authority of Ireland has developed a qualifications framework which requires education and training providers to provide accreditation for skills gained through experience in the workplace (RPEL). However this aspect of the framework is still largely underdeveloped and therefore this research can inform the further development of this process. The analytical framework outlined how existing knowledge on the topic was regarded as somewhat fragmented and underdeveloped and therefore there was a need to re-examine the subject by combining previous research findings in a particular way as a means of further exploration. The value of workplace learning in general as a means of skill formation
and as a means of complementing structured off-the-job training was explored within the engineering context. This is based on the notion that context is important where practical engineering skills are to be learned. Apart from the justification as outlined above the research methodology was briefly outlined together with an outline of the delimitations of the study.
Chapter 2

Workplace learning and the interdependence between working and learning

Introduction

This literature review chapter begins with some further definitional issues that are pertinent to the thesis. In this study workplace learning is regarded as learning that takes place in the workplace itself as distinct from training events that take place in an off-the-job setting. However, the relationship between on and off-the-job training is regarded as an important feature of workplace learning. Workplace learning for the purposes of this discussion is taken to mean learning that can be both incidental and informal and occurs outside of a teaching institution. Marsick and Watkins (1990) define incidental learning as, “a by-product of some other activity, such as task accomplishment, interpersonal interaction, sensing the organisational culture, or trial and error experimentation” (Marsick and Watkins 1990:6). Eraut (2004) argues that it is better to conceive workplace learning as being spread across a ‘formal-informal’ continuum. He defines informal learning as, “learning that comes closer to the informal end than the formal end of a continuum. Characteristics of the informal end of the continuum of formality include implicit, unintended, opportunistic and unstructured learning and the absence of a teacher” (Eraut: 2004:250). The literature reviews also refer to terms such as Fordism, neo-Fordism, post-Fordism and high performance work practices. Fordism is defined as “the production of standardised goods or services through a Taylorized technical division of labour, the use of dedicated machinery, and a focus on economies of scale” (Jessop 1992: 54). The term was derived from the introduction of Henry Ford’s first automated production line in Detroit. Boreham (1992) informs us of two approaches to the control of work in
advanced industrial countries. “The first is a neo-Fordist paradigm in which the intensification of work and its control are paramount…The second may be termed as a post-Fordist paradigm, which focuses on the creation of a multiskilled workforce, decentralised decision making, co-operative rather than hierarchical workplace organisation…” (Borehan 1992:15). Ashton and Sung (2002: 11) inform us that high performance work practices refers to “the concern on the part of employers with developing their labour force and making use of practices such as teamworking, job redesign, employee involvement in decision making, extensive communication and performance related pay to enhance organisational performance”. The concept of agency is referred to in the literature and this relates to the free will and capacity individuals have for doing otherwise. According to Giddens, “agency refers not to the intentions people have in doing things but to their capability in doing those things in the first place, which is why agency implies power” (Giddens 1994: 9).

Recall that the overarching research question is to determine whether workplace learning can help to reposition Ireland’s engineering industry towards a high skills route. This overarching question evokes a number of sub-questions about skill formation strategies and how people learn to do their jobs. Another important dimension to the research relates to employee attitudes to learning. Employers may also adopt different methods to remain competitive, which do not necessarily involve upskilling of their employees and this is something that is explored in Chapter 3. These are important issues that have not been fully considered in the context of the Irish Government’s aspirations of creating a high skills economy. The aim of this chapter therefore is to review the academic debates and themes that are related to workplace learning and employee attitudes to learning at work. The debates in
question are as follows: the interdependence between learning and working; the view that learning is a form of participation as well as acquisition; the social and situated context of learning and the value of communities of practice. The debates in the literature on how workplaces can be organised to facilitate learning are also considered. These debates and theories are mainly generic in the sense that they do not relate to specific industry sectors. The analytical framework for the research is based on a combination of these debates as set out in Chapter 1. The discussion that follows sets out to analyse and appraise the literature and to link the debates with learning and skill formation in the Irish engineering industry. The design of the research instruments that follow in Chapter 4 was informed by the concepts embedded within the literature and also by some issues that were identified that need further exploration.

Each section in this chapter deals with a particular theme that is related to the main research question and also to the sub-questions arising from it. One of the main propositions on which this research is based is that the work of some of the social learning theorists and authors can inform us how employee learning and skill formation can best be accommodated in to-day’s competitive environment. The work of Lave and Wenger (1991), Fuller and Unwin (2003), Vygotsky, Streeck (1989), Engeström (1991;1994) and Billet (2001) is thought to be particularly relevant in the context of the problems facing the Irish engineering industry as referred to in Chapter1. Based on what these theorists have said the social interaction that takes place in the workplace plays a very significant part in the learning process at work and this was explored in the Irish engineering context as part of this research. Before going on to look at specific pieces of research that informed the design of the research
instruments, an overview of the opinions of some key authors and researchers on workplace learning is provided. This overview links the research question with the literature debates on workplace learning.

**Overview of key debates on workplace learning**

Billet (2001) informs us that “the interdependence between work and learning is based on one hand, in what the workplace provides to assist learning and on the other hand, in how the individual engages and uses these contributions” (Billet 2001: 32). This assertion by Billet (2001) is particularly pertinent because it takes account of the type of work organisation that exists within a company and employee attitudes in relation to learning at work. Billet (2001) went on to suggest that we learn through our goal directed activities on a daily basis. The quality of what we learn depends on the kind of activities we engage in and the supports and guidance available to us combined with the way we apply ourselves (Billet 2001). Billet (2004) also argues that the affordances that individuals experience in terms of learning in the workplace may be dependent on status and standing in the firm. Billet’s assertions are regarded as central to this research because they take account of such a broad range of overarching variables that can impact on learning and skill acquisition. Many of the themes discussed by the other authors cited here are subsumed in what Billet has written.

Ashton and Sung (2002) for example build on these themes and they inform us that workplace learning must now be seen as part of the process of skill formation. The current demand for skills and abilities such as teamworking, problem solving and some forms of communication are better learned through working than through
formal education. Formal education is found to be of limited use in learning these types of skills (Ashton and Sung 2002). These skills are particularly relevant for companies engaged in high performance work practices (HPWPs), (Ashton and Sung 2002). In contemporary discourse the separation of work and learning is now seen as problematic. Other commentators have made similar claims. Streeck (1989) makes a number of points in relation to the benefits of learning in the workplace.

He argues that:

Industrial training is not just the acquisition of mental or manual skills but it is also… a process of socialisation in work related values in a culture and community of work in which … reliability, the ability to hold up under pressure and solidarity with others working at the same tasks are highly regarded and rewarded (Streeck 1989: 92-101).

Streeck (1989) also emphasises the point that learning requires doing and that work skills can ultimately only be acquired where they are used; at work. He goes on to assert that these issues have caused a rethink among policy makers on the received wisdom that places of learning and places of work should be kept apart. There is now a renewed interest in the Japanese way of skilling and the ‘German Dual System’ of apprentice training which a few years previously would have been regarded as outmoded (Streeck 1989). This links to Lave and Wenger’s (1991) theory where they conceptualised workplace learning as a process of ‘legitimate peripheral participation’ within a community of practice. Lave and Wenger perceived learning to be a social activity and therefore by virtue of being a participant in a community of practice, learning is then inevitable.
Lawy and Bloomer (2003) also advocate the importance of situated learning. Their work links with Lave and Wenger’s which is referred to above. They also refer to a general weakness in curricula for work related education because it is too far removed from the workplace for effective learning to take place. They go on to say that “knowledge is embedded in practice and transformed through practice” (Lawy and Bloomer 2003: 28) similar to what Streeck above has advocated. The views of Streeck (1989), Lawy and Bloomer (2003), Lave and Wenger (1991) are an integral part of the analytical framework for this research and were relied on to inform the design of the research instruments. It is this social and situated context of learning that they refer to which is of particular interest here. Their views appear to be ignored in the approach being advocated by the Irish Government in its attempt to create a so-called knowledge economy and in the Government’s views on how knowledge can be created. This point will be elaborated on further in the following chapter where theories of VET and Ireland’s approach to skill formation are discussed.

The views expressed by Billet (2001); Ashton and Sung (2002); Streeck (1989); Lawy and Bloomer (2003) and Lave and Wenger (1991) also contrast with the traditional view where learning and working were seen as separate activities. “In traditional discourses work and learning are usually understood as differentiated practices, each involving distinctive forms of language and sets of actions” (Boud and Solomon 2003: 327). Eraut (2004) also referred to this traditional view where learning and working were regarded as separate activities that never overlap. The emergence of the need to become a knowledge economy has contributed to a change in this perception. Terms like lifelong learning, learning organisations and work-based learning are now commonplace. Learning is now regarded as something that occurs throughout life in
all sorts of contexts and learning that occurs at work is now seen as productive and of benefit to organisations and to workers (Boud and Solomon 2003).

Another important dimension of the process of skill formation and learning that warrants investigation is the way learning is conceptualised (See Sfard 1998 and Felstead et al 2004). This again refers to the need to recognise the social and participatory aspects of learning. This implies that learning is a form of participation in work related activities as well as a process of acquisition of knowledge. It is this participatory aspect of learning, which is of particular interest for this research. It relates directly to Lave and Wenger’s (1991) concept of communities of practice and legitimate peripheral participation, which rely totally on the participatory aspect of learning within apprenticeship training in particular. The apprenticeship model of learning forms a significant part of Ireland’s engineering skill formation process and therefore the work of Lave and Wenger is considered significant. The community of practice concept also has wider application outside of the apprenticeship paradigm (see also Hughes 2007). The research that is referred to in this chapter which relates to all these issues is useful in informing the design of expansive learning environments within apprenticeship and for other categories of worker.

While the literature cited so far makes the link between learning and working, it is important to acknowledge that all workers may not recognise this. Workers who consider work and learning to be two separate entities may not take on board the type of integrated approach to learning that is expected within this emerging new capitalism (Pillay et al 2003a). This is something that is explored further in a later part of this chapter. Having briefly outlined the main themes on skill and knowledge
formation in the literature that are relevant to this research, the discussion now goes on to evaluate the relevance of specific research and the assertions of commentators on these issues.

The social and situated context of learning

Following this overview of workplace learning the discussion now moves on to explore the situated and social context of learning in the workplace in more detail. It was stated above that learning at work takes many forms such as interacting with others as part of a social process and becoming familiar with work related values. Support and guidance were also mentioned as being important in determining the quality of what we learn. This infers that learning is largely a social and situated process. This view of learning has particular relevance for training in many engineering occupations. A lot of the research that has been carried out on these issues relates to apprenticeship training. It is therefore relevant to this study. Apart from apprenticeship this existing research should have relevance for skill formation in other engineering occupations that are not designated as apprenticeships. Some examples of these occupations include, Professional Engineers, associate professionals such as Technicians as well as Tool Setters, Welders and CNC Machine Tool Operators.

The work of some important theorists and researchers on the social and situated context of learning will now be explored in more detail for its relevance to this research. Our understanding of learning as it applies to work has been advanced significantly in recent years as a result of work carried out by Lave and Wenger (1991), Rogoff (1995) and also by Fuller and Unwin (2003) among others. The
concept of situated learning involving legitimate peripheral participation in communities of practice, which was originally advanced by Lave and Wenger (1991), has helped to focus attention on learning that takes place in a social context such as, during our daily lives including the workplace. They contend that adult learning is linked with everyday life including the workplace where they engage in activities and practices as part of a community as opposed to in isolation. Learning occurs naturally where individuals participate in such communities and where relationships are established between community members, their knowledge and its application. Lave and Wenger’s (1991) view of learning is different therefore from the standard learning paradigm offered by authors such as Skinner, Watson and Piaget where the learner is perceived as being the equivalent to a receptacle for taught knowledge (CLMS M2A, U1). They questioned the inability of conventional learning theory to explain how individuals learned skills and acquired knowledge without engaging in formal education and training (Fuller et al. 2005: 4). Lave and Wenger (1991) perceived learning to be a social activity and therefore by virtue of being a participant in a ‘community of practice’, learning is then inevitable. The reference to a community of practice relates to a group of people who are engaged in a shared practice (Fox 2000).

The process of legitimate peripheral participation was originally explained by Lave and Wenger as a result of research they carried out on traditional craft apprenticeship training. They explain the development from novice to expert as a process whereby the apprentice as a newcomer is initially allocated simple tasks and gradually progresses to more complex tasks under the guidance of an expert. The apprentice participates in a community of practitioners as well as in genuine productive activity. Apprentices are given tasks that are short and simple initially where the cost of
mistakes is minimal. The apprentice has little responsibility for the overall task, yet the contribution made is useful (Lave and Wenger 1991). This differs from the conventional student/teacher relationship. Unlike students in the conventional sense the apprentice as part of a community of practice makes a legitimate contribution to the work being carried out (Fox 2000). Legitimate peripheral participation also provides opportunities for self-evaluation because the value of the novice’s contribution can be seen immediately in practice (Lave and Wenger 1991). As apprentices become more skilled, legitimacy within the group increases as they identify more with the community of practice in question and in doing so move from peripheral participation as a novice to full participation as an expert (Fox 2000).

Rogoff (1995) also wrote about the benefit of the apprentice paradigm as a model of learning. Rogoff has extended the stance taken by Lave and Wenger on learning by defining a process referred to as ‘guided participation’ (CLMS M1, U1: 56). According to Rogoff, guided participation refers to the nature of interpersonal relations required to support the apprenticeship process. It includes face to face interaction and joint participation as well as observation and hands on involvement in activities (Rogoff 1995). This notion of guided participation as referred to by Rogoff also encompasses processes such as ‘scaffolding’, whereby the individual is supported in carrying out tasks that are within his/her ‘zone of proximal development’ (CLMS M1: 56). This scaffolding process is regarded by the researcher as significant because it can be related to upskilling in the workplace as well as a support mechanism within apprenticeship.
The concept of the zone of proximal development was brought to prominence by the Russian psychologist Lev Vygotsky. Bryant (1997) informs us that while much of Vygotsky’s work was based on how children learn, his theories are also relevant to adult learners. In an edited version of Vygotsky’s writings Cole, John-Steiner, Scribner and Souberman (1978) assert that the zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. An essential feature of learning is that it creates a zone of proximal development (Cole, John-Steinner, Scribner and Souberman 1978).

Wood (1994) tells us that Vygotskian theory stresses the role of interactions between novices and experts and it is this aspect of the theory that is of interest to this study of workplace learning in an engineering context. Wood (1994) also refers to the common observation that novices can perform tasks with help when they cannot handle them alone and this is central to the theory. The gap between assisted and unassisted performance is where important learning takes place. What happens in such interactions is not simply the acquisition of new task knowledge and skills but the development of general competence in self-regulation as the process of instruction becomes internalised. The learner acquires expertise in learning how to learn by virtue of the ways in which others assist them in learning (Wood 1994). Vygotskian theory is therefore relevant to apprenticeship and adult learning because it stresses the role of interaction between novices and experts or between peers and near peers. This notion of learning how to learn is important in the context of the modern workplace where workers are often expected to assume wider roles and take on greater responsibility. CLMS support the view that Vygotskian theory does not just apply to children. They
argue that Vygotsky considered that the process of development continues throughout life as long as the individual receives appropriate support in the learning process and that learning is a social process where the outcome depends on the role of trainers who enter the process at a cultural level. They also assert that trainers play a central role in guiding individuals through the learning process, pointing out which lines of thought or action are redundant in any given set of circumstances and suggesting more appropriate strategies and facilitating the understanding of abstract cultural concepts (CLMS M1 U1).

Fuller and Unwin (2003) carried out further case study research on workplace learning, which has implications for this study. This work builds on Lave and Wenger’s (1991) conceptual framework of situated learning. Fuller and Unwin (2003) noted that Lave and Wenger made little reference to the importance of off-the-job training and education during apprenticeship and the importance of the institutional supports within apprenticeship. While Lave and Wenger’s research is very informative in so far as it highlights how technical skills can be learned in a purely on-the-job context, the work of Fuller and Unwin goes further by focusing on more contemporary apprenticeship arrangements. Their research was carried out on the Modern Apprenticeship (MA) system in the UK and reveals that the particular apprenticeship structure at company level can seriously impact on how expansive or restrictive the learning opportunities for an apprentice can be. Fuller and Unwin (2003) use the terms expansive and restrictive to describe the learning environments that characterise different apprenticeships. They see this as a continuum (Fuller and Unwin 2003). The case studies carried out by Fuller and Unwin revealed that apprentices’ experience of legitimate peripheral participation varied greatly from one
company to another. This can be partly attributed to the MA framework, which allows for situations where a person can serve an apprenticeship in one company, which can be a very expansive learning experience, while an apprentice in another company may be subjected to a very restrictive learning experience.

In some respects the apprenticeship system that operates in Ireland could also be criticised for the same reason and therefore the findings from Fuller and Unwin’s research are also relevant to the on-the-job aspects of the Irish apprenticeship system. This may be particularly relevant, given the amount of small and medium sized engineering companies that are in Ireland (see also Unwin 2007). Fuller and Unwin (2003) also concluded that apprentice learning is greatly enhanced where the apprentice is part of a number of communities of practice throughout the apprenticeship period. This would typically involve communities of practice in the off-the-job educational release periods as well as different communities of practice within the workplace i.e. where apprentices are scheduled through different departments within the company. This type of arrangement helps to create a rich and expansive learning environment (Fuller et al 2005). This type of rotation through different departments may not be possible in many smaller engineering companies in Ireland. Small companies may on the other hand have the advantage that allows more members of the workforce including apprentices to interact with company customers and clients.

Fuller and Unwin (2003) also argue that an expansive approach to apprenticeship contributes to the personal development of apprentices. They highlight the following aspects in particular of an expansive approach:
The explicit institutional recognition of and support for apprentices’ status as learners (Fuller and Unwin 2003: 411) …the provision of opportunities to reflect on practice; the ability to envisage and experience long trajectories and careers; and opportunities to develop new identities through belonging to multiple communities of practice (Fuller and Unwin 2003: 417).

Restrictive environments on the other hand are characterised by access to a narrow range of tasks and knowledge; learning opportunities limited to the organisation’s needs, participation restricted to one community of practice and little or no off-the-job training (Fuller and Unwin 2003).

While Lave and Wenger’s (1991) theory on situated learning highlights the close relationship between working and learning, the case studies carried out by Fuller and Unwin go further by identifying what could be considered to be best practice in the design of a contemporary apprenticeship framework. They draw attention to the advantages of having an on-the-job curriculum which is mapped out and where progress records are maintained. They also emphasise the importance of alternating periods of on and off-the-job training. The off-the-job periods allow the apprentice to reflect and gain a deeper understanding of the concepts that are being applied during the workplace training (Fuller and Unwin 2003) and to acquire skills not covered by their employer (Brown and Hesketh 2004 in Hughes, Jewson and Unwin 2007). In summary then, the work carried out by these researchers provides a sound basis for assisting policy makers and employers in designing working arrangements that provide employee opportunities for deep learning. Their work is particularly relevant to the design of national frameworks for apprenticeship systems and for Irish
engineering employers who are considering using the apprenticeship model as a means of recruiting and training young workers.

Apart from what has been discussed so far about the situated and social aspect of learning within apprenticeship there are other distinguishing features of apprenticeship that are relevant to this research. Smith (1992) refers to a number of intangible outcomes of apprenticeship that are relevant in an attempt to create a high skills engineering industry. Apart from the development of a broad range of manual skills, Smith asserts that apprenticeship also achieves:

- A commitment to high quality working; experience in problem solving; a capacity for individual learning; independence of thought and action; a spirit of self-reliance and paradoxically the ability to function as a member of a team. It places early responsibility for the management of learning on the shoulders of the learner. Apprenticeship seems to provide many key components of learning for the quality era which the Taylorist orientation of training cannot (Smith 1992:91; 96).

**Limitations of Lave and Wenger’s theorising**

This section now examines some possible limitations of applying Lave and Wenger’s perspective on learning, particularly the notion of communities of practice in a modern production environment. Consideration will also be given to the notion of how experienced workers who are new to a particular organisation can be accommodated within the community of practice concept. Hodkinson *et al* (2005) have raised issues about the benign nature of communities of practice and how welcoming they are to newcomers. Lave and Wenger (1991) do however
acknowledge that newcomers do pose a certain threat to old timers and this may cause a certain amount of tension within the community. Experts may be reluctant to guide and coach newcomers because of the fear that, they themselves will be displaced by those they have coached. Membership of professional institutions and unions may also pose certain restrictions on the interaction among employees and therefore restrict access to expertise. Demarcation between craft and non-craft workers may result in situations where craft workers are unwilling to share information with non-craft workers (Billet 2001).

Apart from the issue of demarcation, Billet (2001) makes the point that workplaces differ from a school environment from a learning point of view because a teacher’s role is to impart knowledge, whereas experienced workers do not necessarily see this as part of their role. The issue of unequal power relations and conflict within communities of practice is also important because it can influence the opportunities and barriers to learning that are presented to members of a community. Individuals in organisations who can exert power can therefore control the learning experiences presented to employees (Fuller, Hodkinson et al 2005). Hughes, Jewson and Unwin (2007) have cited this as an area where further research would be informative. Unintentional learning, which may not be compliant with the ideals of the organisation, is another potential problem that can arise within communities of practice (Billet 2004). This is allied to the notion that managers and workers may not always share a common interest (Lloyd and Payne 2004). Another criticism relates to the applicability of the model to contemporary organisations. Commercial pressures involved in a modern business environment may impact on the effective operation of communities of practice because of time constraints. This may impact on the expert –
novice dyad concept (see Owen-Pugh 2002). While this theorising on social and situated learning places a heavy emphasis on learning through observation and guidance from experts and more experienced peers it may have little relevance in the development of certain types of analytical skills, which are now called for, such as programming of machine tools. These programming type skills may be better learned in a more structured off-the-job type setting. These are important issues that can potentially limit the effectiveness of these theories.

Fuller, Hodkinson et al (2005) also suggest that there is a theoretical gap within Lave and Wenger’s theory because it does not really address the way experienced newcomers are integrated into a community of practice. The theory is focussed on novices. Newcomers may already be experts and therefore come into the community already formed with fixed beliefs and attitudes. The concept of legitimate peripheral participation for novices must therefore differ significantly from experienced newcomers. It could be argued that the learning process for these experienced workers when they become members of the community is not adequately addressed by the theory.

To this end Hodkinson and Hodkinson (2004) explored this further in the context of experienced workers. They concluded that Lave and Wenger’s claims that a community of practice is an intrinsic condition for learning was consistent with their findings. This conclusion was influenced by the fact that all the employees they interviewed reported that learning was a feature of their work, albeit those who belonged to the more collaborative working environments had an additional dimension to their learning (Hodkinson and Hodkinson 2004). Based on this they
argue that regardless of how we define a community of practice “we need to belong to
learn and whatever it is we belong to can be called a community of practice” (Hodkinson and Hodkinson 2004: 29).

They also found that employees may belong to several overlapping communities of
practice related to their work. They concluded that regardless of whether a community
of practice is tightly integrated or whether the community operated as a loose
integration, learning still took place among experienced workers. Where individuals
belonged to several overlapping communities of practice, learning was enhanced
(Hodkinson and Hodkinson 2004). This is consistent with Fuller and Unwin’s (2003)
conclusions, which were described, earlier in relation expansive learning
environments within the apprenticeship context.

While the work carried out by Hodkinson and Hodkinson is not directly engineering
related it has relevance to this study because it is based on experienced workers within
communities of practice. Their conclusion that communities of practice are an
intrinsic condition for learning was tested in the Irish engineering industry for craft
and non craft occupations as part of this research. The limitations of Lave and
Wenger’s theorising that were referred to in this section contributed to the theoretical
framework for this research and informed the design of the research instruments.

**How learning is conceptualised**

The discussion now examines how workforce development strategies can be
influenced by the way learning is conceptualised. This is linked to the preceding
section where the situated and social context of learning was discussed. The literature
debates on how learning may be conceptualised are important for this study because they relate specifically to informal learning and the way workplaces are organised. CLMS inform us that there are broadly two schools of thought on how learning can be conceptualised (CLMS M2A, U2: 10). Traditionally learning was conceived almost exclusively as the acquisition of knowledge and skill. The current discourse on learning however can be illustrated using two metaphors namely: ‘learning as acquisition’ and ‘learning as participation’ (Sfard 1998). Those who regard learning as acquisition perceive the mind as being equivalent to a container that can be filled with knowledge and the accumulated knowledge can be shared or applied and transferred to different contexts (Sfard 1998). Where learning is conceptualised as acquisition of knowledge the training needs of employees would typically be addressed through formal training or education and acquiring qualifications in an off-the-job training setting. Workforce development strategies are still dominated by this view of learning (CLMS M2A, U2; Felstead et al 2004).

Exponents of learning as participation on the other hand, take a different view of learning. Firstly they see the workplace as a site where significant learning and teaching takes place. Learning is seen as a social activity where context is important. The learning as participation metaphor is also central to Lave and Wenger’s situated learning theory (Fuller and Unwin 2004). Lave and Wenger argue that the conventional view of learning “suggests that knowledge is largely cerebral …” (Lave and Wenger 1991: 47). In contrast with this, Lave and Wenger’s theory provides a different concept; they regard the group as being central to the process rather than the individual. Fuller (2007: 51) explains this concept as a process where, “People learn through their co-participation in the shared practices of the ‘community’ or the ‘lived-
in’ world”. Advocates of learning as participation argue that workers’ performance is enhanced by the daily work routines, interacting with colleagues and by using the tools and materials that form part of their work (Felstead et al. 2004). The analytical framework for this research was informed by this concept of learning as a form of participation which is implicit in workplace learning. The researcher acknowledges that the learning as acquisition metaphor also plays a significant role in the learning and skill formation process. This research therefore attempted to determine how these two concepts can complement each other in the Irish engineering skill formation process. The stance adopted by the researcher was that the learning as acquisition metaphor, which is associated with a lot of formal industrial training relies heavily on behaviourist learning theories. While these forms of training are useful they are no longer sufficient on their own to satisfy the demands for employee development in modern engineering organisations (see also Mayhew 2004; Felstead et al. 2005).

The relevance and importance of the learning as participation concept can be further illustrated by referring to the results of the UK Learning at Work Survey 2004 (LAWS). The survey set out to determine what activities helped workers to learn how to do their jobs better. The survey questions were designed to solicit the views of employees on the usefulness of activities that can be aligned to the learning as acquisition as well as the learning as participation metaphor. The overall results of this survey showed that the activities associated with the learning as participation metaphor were the most useful in helping employees to improve their performance at work. Activities such as doing the job, being shown by others, self-reflection, watching and listening to others were all rated by respondents as being more useful than attending courses and acquiring qualifications (Felstead et al. 2004).
The survey also provides some insights into how the organisation of work can influence learning. The results showed that employees learn more effectively when they have a say in organising their own work, planning their work and in checking the quality of their own work. Managerial support for learning was also shown to be an important factor (Felstead *et al* 2004). These findings support the assertion that learning and working are interdependent and therefore workforce development strategies should focus on management support for workplace learning. The importance of the participatory nature of learning that emerged from the survey data suggests that work structures should be designed to capitalise on this.

While acknowledging that the notion of conceptualising learning as a form of participation may be useful in helping us structure workplaces to support learning, there are limitations to this concept. Technical skills for example that do not already exist within a firm but are necessary for the type of production a firm aspires to, cannot be initially acquired in an efficient manner through participation in existing workplace activities. This is something that was incorporated into the research instruments and explored as part of the empirical research.

**Work organisation to facilitate workplace learning**

Having reviewed the literature debates on learning as a social and participatory process it will now be informative to explore the literature and previous research on how workplaces can be organised to facilitate learning. Billet (2001) informs us that the quality of what is learned depends on the kinds of activity that individuals are engaged in and the access they have to support and guidance (Billet 2001:21). Billet’s comments seem to concur with the views of Eraut (2004) who carried out research on informal learning in the workplace among technicians, managers and professionals.
The research as it applied to technicians may be of particular relevance to the engineering industry in Ireland. Eraut (2004) identified four main types of work activity that give rise to learning as follows. Learning is enhanced by the facility to partake in group activities such as teamworking or project groups set up for a particular purpose such as devising responses to external competitive challenges. The second beneficial activity he identified was the facility to work alongside others. This allows individuals to observe other people’s expertise and to become aware of other kinds of knowledge. The observation of other people’s tacit knowledge is another advantage of working with others. These findings have similarities with Hodkinson and Hodkinson’s (2004) research on communities of practice as applied to experienced workers that were referred to earlier. The third issue identified by Eraut’s research relates to the type of tasks that individuals are engaged in. He informs us that challenging tasks not only lead to learning but also can increase motivation and confidence when they are well supported. Finally, he also reports that when individuals are afforded the opportunity to work directly with clients, learning is enhanced. This joint consultation process provides employees with enhanced problem solving skills and greater awareness of client needs (Eraut 2004).

Apart from the types of work activity that give rise to learning, Eraut identifies confidence as a major factor affecting learning in the workplace. He found that confidence levels are increased through meeting challenges successfully. The confidence to take on challenges depended on the degree to which workers felt supported in doing this. He refers to a triangular relationship between work challenges, support and confidence. If there are no challenges to respond to, or insufficient support to encourage individuals to seek out challenges, then confidence
declines and with this the motivation to learn. An important aspect of support was found to be the provision of constructive feedback. This is an important management function as far as workplace learning is concerned. Eraut argues that management development strategies within organisations usually devote little attention to supporting the development of subordinates. He argues that more attention should be paid to organising and allocating work in such a way that informal learning is encouraged or facilitated (Eraut 2004).

Ashton (2004) also carried out research that focused on barriers to learning at work. His main hypothesis was that:

The decisions taken about the structure and functioning of the organisation, and the design of work within it, are of fundamental importance in influencing the extent to which individuals can participate in the process of learning and hence the level of skill they may acquire (Ashton 2004: 45).

Some of his findings are consistent with what Eraut (2004) says about the importance of management support for learning in the workplace. The findings revealed that the attitude and behaviour of individual managers with regard to delegation of responsibility impacted on employee opportunities to learn. There was significant variability in the quality of management support for learning at work despite the fact that this particular firm took training and development seriously. Ashton asserts that this variability emerges from the belief among managers that learning is something that happens automatically and therefore does not need supporting. (Ashton 2004).

Another issue to emerge was the lack of skill and knowledge among managers about providing support for learning. This finding supports Eraut’s contention mentioned
earlier about the lack of attention paid to supporting the development of subordinates as part of management development strategies. Managers who were able to delegate effectively however, were seen to be effective in terms of providing deep learning opportunities for their subordinates (Ashton 2004). French and Bazalgette (1996) assert that, supervisors would not necessarily be aware of the need to support the learning process and to provide constructive feedback unless they had experience of training and teaching methods (French and Bazalgette 1996 in Ashton 2004: 50). If management support is an important element of workplace learning as the research by Ashton and Eraut suggests, it raised the question as to whether Irish managers are willing to structure workplaces in such a way as to facilitate learning and to provide feedback and guidance to employees. The work of Eraut (2004), Ashton (2004) and Billet (2001) related to workplace organisation to facilitate learning was influential in developing the conceptual framework for this research.

Skule (2004) also informs us of certain conditions at work which are synonymous with learning intensive jobs. These learning conditions were identified from a Norwegian based survey on differences in the organisation of work, the distribution of tasks and the human resource policies within firms. The following learning conditions were identified from the survey: a high degree of exposure to change e.g. product types and work methods; high degree of exposure to customer demands; managerial type responsibilities; extensive contacts outside the organisation; regular feedback on performance; managerial support for development and rewards for proficiency (Skule 2004).
In general Skule (2004) concluded from this research that the working conditions that are alleged to be normally found in post-Taylorist organisations are more conducive to learning at work i.e. flatter structures and high degrees of employee involvement (Skule 2004:14). This is consistent with Billet’s assertions about working and learning being interdependent with particular reference to the quality of what is learned being dependent on the activities that individuals engage in as well as managerial support and guidance (Billet 2001:21).

While the survey referred to by Skule (2004) is useful in informing us of what conditions at work help to facilitate learning and the creation of learning intensive jobs, there are practical implications to the application of some of these findings as far as many engineering firms are concerned. Firstly, all engineering occupations do not readily lend themselves to customer interaction, particularly in larger firms. Secondly the issue of constant product changes is something that is driven by market conditions rather than skill formation. Thirdly company owners will decide to adopt post Taylorist forms of production for reasons other than improved skill formation. Improvements in skill formation are more likely to be a by-product rather than a driver of change. This is something that will be referred to again and explored further in the next chapter.

The relationship between workplace learning and high performance work practices

The focus of the discussion now shifts to a consideration of the literature on how work is currently being organised in some sectors of business and industry namely high performance work practices, and how this relates to workplace learning. The type of post-Taylorist work practices referred to by Skule (2004) in the previous
section are a feature of high performance work organisations (HPWOs) and will now be considered in more detail. These new work practices have evolved in parallel with what is now referred to as the new capitalism. Within this new capitalism there is a perceived need for greater employee involvement, where the emphasis in the workplace is on teamworking, flexible work practices combined with flatter organisational structures (Fuller et al 2005). It is acknowledged that work organisation still varies widely and the type of high performance work practices referred to here is just one approach available to employers. Alternative approaches to competitive advantage will be examined in the following chapter.

Production based on what are referred to as high performance work practices (HPWPs) are now common in advanced industrial economies. These practices form the basis of high performance work organisations. HPWPs originated in Japan and contributed to the success of the Japanese economy as a high skills society and a producer of high quality products since the Second World War. The success of the Japanese economy through the use of these techniques influenced the American and European corporations to try and emulate these work practices in order to improve competitiveness (Ashton and Sung 2002: 15).

Because of the growth in HPWOs there is now a greater opportunity for all categories of workers besides professionals and highly skilled, to experience continuous workplace learning (Ashton and Sung 2002). The use of self managed teams, employee involvement in decision making combined with multi-skilling which are all characteristics of HPWOs have helped to facilitate learning as part of everyday working for all employees in these types of organisations (Ashton and Sung 2002;
Payne and Keep 2003; Felstead and Ashton 2000). Fuller et al (2005) draw attention to the use of communities of practice within HPWOs. They argue that “… the concept of communities of practice … provides another useful vehicle by which the new capitalism can further its aims” (Fuller et al 2005: 6). This assertion is based on the notion that the social context of learning which is inherent within communities of practice promotes greater employee involvement and facilitates teamworking. This suggests that the introduction of HPWPs in an organisation is facilitated where there are effective communities of practice in place.

These assertions are supported by research carried out by Green et al which suggests that work based learning is more effective than formal education in developing many of the soft skills that are required for high performance working such as problem solving and teamworking (Green et al 2001 in Ashton and Sung 2002). This ties in with the views cited by Smith (1992) earlier in relation to the intangible outcomes of apprenticeship and how these outcomes are compatible with modern post-Taylorist work structures. Survey data from the US and the UK also reveals that HPWOs make greater use of structured on-the-job training combined with coaching and mentoring of employees. Managers in these organisations are more concerned with facilitating the work of self managed teams and ensuring that knowledge and information is disseminated throughout the organisation. In HPWOs learning is an integral part of the daily work routines (Ashton and Sung 2002). This implies that organisations that have fully implemented HPWPs for all categories of workers will have already taken on board what Billet (2001; 2004) advocates by linking work practices with learning. Ashton and Sung (2002) also inform us that even though HPWOs make extensive use of formal training for employees, the emphasis is now shifting more towards work
based learning techniques. They cite some examples in German engineering companies where attempts were made to introduce higher levels of teamworking. One of these companies, namely Mercedes Benz, concluded that many of the skills required for modern work processes cannot be acquired in a classroom or in a simulated work setting (Ashton and Sung 2002).

The literature reviews on high performance work practices and these survey findings imply that high performance work practices lead to high level skills. The expectation from this research in the Irish engineering context was to find a difference in the approach to and the effectiveness of workplace learning in what was previously referred to in Chapter 1 as ‘modern engineering companies’ and the ‘traditional’ type of Irish engineering company. The literature also raised the question as to whether the success of these modern engineering companies is partly attributed to the way workplace learning is facilitated in these companies.

**Workers’ perceptions about learning and working**

The discussion so far has focussed on issues related to the way learning may be conceptualised and how workplaces can be structured to facilitate learning. Another important issue, which will now be considered, relates to how workers themselves perceive the relationship between work and learning and also their perceptions of work. Any notions of creating workforce development strategies that rely on working and learning simultaneously may be compromised by this. This part of the literature discussion is also related to individual agency and choice as it applies to workers. The conclusions from some existing research on this issue were tested in the Irish context for traditional and modern engineering companies.
Pillay et al (2003a) assert that the conceptions held by workers will influence how they approach learning in the workplace and this in turn impacts on the process of knowledge creation for themselves and for their organisations. Studies carried out by Biggs also suggest that individual’s beliefs and perceptions about knowledge and learning may impact on their approach to learning (Biggs 1999 in Pillay et al 2003a). This implies that if workers do not associate work with learning they may not be receptive to development which is centred on workplace learning. The current discourse on the integration of working and learning appears to assume that workers will automatically recognise the need for this and accept it (Pillay et al 2003b). While many commentators regard the alliance between work and learning as having the potential to increase productivity and provide a means of continuous education for employees, most of the current discourse on this could be construed as a process of imposing learning onto the work process (Pillay et al 2003b).

Pillay et al (2003b) also draw our attention to their claim that most of the debate about work based learning and lifelong learning has been driven by philosophical arguments that are put forward by experts and Government agencies. This is consistent with and reflected in the view expressed in a Forfás13 report which asserts that there is no longer such a thing as a job for life and this should therefore force individuals to take responsibility for their own lifelong learning and skill development (Forfás 1996:156). These arguments however fail to address the issue of how workers will engage with the process or whether they recognise the changing context in which they are expected to work. The question of whether Irish engineering workers recognise any need for engagement in lifelong learning and that their continued participation in

13 Forfás is Ireland’s national policy and advisory board for enterprise, trade, science, technology and innovation.
the workforce may be contingent upon this in any way must be considered. There is a need therefore to find out how Irish engineering workers perceive their work and their attitudes towards learning and working and what they perceive learning to be.

Our knowledge on older workers’ perceptions of work and attitudes to learning at work has been informed by a qualitative study that was carried out by Pillay et al (2003b). Older workers (40 plus) were selected because they were thought to belong to an era where a different work ethic existed to that which is expected within the new capitalism. This study has significance for this particular research question because we are informed that 80 percent of Ireland’s workforce will still be in the workforce in ten years time (Information Society Commission 2002).

Based on the data that was collected by Pillay et al they were able to identify four different types of conceptions, which were held about work, and five categories of conceptions on learning at work. The conceptions of work, ranged from regarding work as just a job and at the other extreme where work is regarded as a means of structuring the individuals’ life. The study revealed that few workers conceived work as empowering or as structuring their lives. However, a significant number of interviewees regarded work as just a job. The other part of the study looked at workers’ views on learning as it relates to work. In this case five conceptions were identified ranging from learning just to survive in the job and learning by observing others and at the other extreme a process of continuous lifelong learning and changing as a person as a result of learning. The findings from this part of the study were similar to the first in that most workers held more basic perceptions such as learning skills in order to survive in the job (Pillay et al 2003b).
These findings suggest that many workers may have difficulties in engaging with the opportunities that the workplace presents to assist learning. This may have implications for workforce development strategies that are intended to enhance learning in the workplace. The findings may also have broader implications for the creation of a knowledge based society and the ideals of the new capitalism where workers are expected to conceive work as empowering and as a continuous lifelong learning process. Workers who hold high-level conceptions of work and learning should be better poised to deal with the requirement for knowledge creation and innovation that is required within the emerging new capitalism (Pillay et al 2003b).

Billet (2004) made some observations about the concept of agency that are consistent with the results of the survey carried out by Pillay et al. He asserts that individual agency influences and shapes engagement with work practices and also what is learned through this engagement. He refers to how individuals’ personal histories dictate how they engage with the social world. Workers may for example resist involvement in teamworking or training if it conflicts with their cultural mores. Agency also plays a part in how individuals perceive what workplaces afford as venues for learning and whether they are worthy of participation, as far as learning is concerned (Billet 2004).
Summary and conclusions arising from the literature reviews on workplace learning

The concluding part of this chapter summarises the literature that was reviewed and relates the issues in the literature to the research problem and the research design. This final section also reiterates how the theoretical framework for this research relates to the theories that were reviewed. Theory in this context refers to debates in the literature. The lens through which the researcher examined VET and workplace learning is interwoven with these theories. The strengths and perceived weaknesses of the theories were used to focus the research design. Recall that the thesis research problem is to assess, *How can workplace learning help to reposition Ireland’s engineering towards a high skills route?* The design of the research instruments that are described fully in Chapter 4 are based on the conclusions arising from the literature reviews in this chapter and the following chapter. The specific research issues or propositions therefore emerged from a combination of the main research question, the literature and also from any gaps that existed in the literature.

A summary of the work of various authors who recognised the value of workplace learning was provided at the beginning of the chapter. There was no distinction made between different forms of workplace learning e.g. formal/informal etc. The main theme to emerge from the literature was that important learning and skill formation takes place outside the classroom setting. The literature was further analysed and the themes to emerge included the notion that learning is a social process as well as something that individuals engage with, in isolation. The assertion made by Billet (2001) that working and learning are interdependent was a central tenet in the literature that was reviewed. The social aspect of learning was further explored through an exposition of some of the literature on communities of practice and...
legitimate peripheral participation as it applies to the apprenticeship paradigm. The apprenticeship model of learning was further elaborated on by referring to research on what constitutes expansive learning environments within apprenticeships. A critique of the communities of practice concept was provided, followed by a description of how it may apply to experienced workers as opposed to the novice/expert relationship. The notion of scaffolding and the zone of proximal development that were explained by Vygotsky were referenced because they lend further support to the claimed benefits of learning within a community of practice.

Another aspect of workplace learning that was examined refers to the way learning may be conceptualised. Two metaphors were referenced to illustrate this concept namely, *learning as participation* and *learning as acquisition*. The learning as participation concept was regarded as central to this research problem, because it emphasises the social aspect of learning and the contribution the workplace can make as a site for learning. This is an area that was regarded by the researcher as being under explored in the current discourse on how to create a high skills workforce. This was supported by survey results which showed that activities associated with learning as a form of participation were more useful in helping people to learn how to do their jobs than more formal activities and training interventions. Survey results were also presented to show that workers learn more effectively when they have a say in planning and organising their work and where there is managerial support for learning at work. The type of work activities that individuals are engaged in were also shown to be important in order for deep learning to take place.
The relationship between workplace learning and high performance work practices was also examined based on the views of commentators and literature surveys. The literature suggests that skill formation differs significantly in high performance work organisations to what exists in older Fordist/Taylorist managed organisations. In HPWOs learning is reported to be an integral part of the daily work routines. This is something that was investigated in the Irish engineering context. More specifically does this distinction exist to the extent that the literature suggests and do organisations fall clearly within one category or the other? Do many of the practices such as teamworking and worker empowerment exist in traditional engineering companies in an informal way and if so are they just as effective in assisting learning?

Another important issue that was identified relates to how workers perceive the need for ongoing learning at work and how they engage with the concept of lifelong learning and the ideals of the knowledge based economy. Survey results were referred to which show that there may be a dissonance between the requirements for the creation of a knowledge based economy and how workers perceive the relationship between working and learning. Literature findings and survey data related to individuals’ agency and their ability to do otherwise are issues that emerged from the literature. This is something that was factored into the design of the research instruments for this particular study.

The conclusions to emerge from the literature are as follows. Working and learning are interdependent and the quality of what is learned depends on what the workplace has to offer by way of learning and how individuals engage with these opportunities for learning. The type of work structures that exist in companies therefore are
important from a learning perspective and likewise the attitudes of employees towards learning at work will also play a significant part in what is learned. The question arises as to whether attitudes to learning differ among workers who are employed in traditional as opposed to modern engineering companies. If traditional engineering companies are under such pressure to remain competitive as suggested by the Irish Engineering Enterprises Federation it could be argued that workers in these organisations will be under more pressure to hold on to their jobs than their counterparts who are employed in the allegedly more profitable modern organisations. These circumstances may influence these workers to maintain and upgrade their skills in order to remain in employment or to maintain their employability. On the other hand employees in modern engineering companies may be afforded better opportunities to learn at work because of the work structures that are said to be a feature of high performance work practices or world class manufacture.

Research also tells us that expansive learning environments can be created in the workplace through particular types of job design and working arrangements. Where work is structured in such a way that workers are involved in communities of practice both novices and experienced workers are often afforded the opportunities for deep learning to occur and to develop expertise and tacit knowledge that cannot be acquired in more formal settings. This also relates to the notion of regarding learning as a form of participation and as a social process, which is central to the stance taken by this researcher. There are limitations to these concepts such as the benign nature of all communities of practice and these are acknowledged. Another conclusion from the literature is that learning is enhanced where opportunities for formal learning are combined with the participatory learning referred to above.
These conclusions combined with the conclusions from the following chapter formed the basis of the analytical framework as set out in Chapter 1. The literature debates and the outcomes of the research that was reviewed throughout the chapter were linked and combined to develop research instruments. The following chapter reviews literature debates on certain other issues that can impact on workplace learning and skill formation.
Chapter 3

Routes to competitive advantage and skill formation processes

Introduction

This chapter reviews debates in the literature on the alternative methods that are available to firms in the attempt to compete successfully in the current trading conditions. These debates are relevant because they suggest that high skill, high value added forms of production are not necessarily the only routes to capital accumulation.

While the previous chapter dealt with the concept of individual worker’s agency and how it may impact on their decisions to engage in workplace learning, the same logic may apply to employers and their willingness to adopt a high skills route as a means to capital accumulation. Moreover, the traditional engineering firms that are said to be operating at the lower value added end of the market might not provide opportunities for significant learning in the workplace. If firms in this category do not see any need to move up the value chain or to utilise high-level skills as a means of producing high value added products, then the potential for workplace learning as an engineering skill formation process may be of limited value in Ireland.

The question also arises as to whether the workplace will be found to be a significant source of learning in modern engineering companies. The premise at the outset was that the workplace would be found to be a significant source for learning for employees in modern high value added production engineering plants. This chapter also examines the approach to VET in Ireland and how it links with theories of VET. The institutional structures that support workplace learning and the influence of the state in providing support to firms for workforce development may also influence employee willingness to engage in lifelong learning and for employers to provide
some form of structured training opportunities for employees (See Streeck 1989; International Labour Office 1998).

**Analytical issues related to the high/low skills routes to capital accumulation**

With regard to the issue of a firm’s competitive strategy it is worthwhile recalling what Barney (1991) had posited in relation to the resource based view of the firm. The concept of the RBV refers to the link between a firm’s resources and sustained competitive advantage. This model suggests that for sustained competitive advantage a firm’s resources must be heterogeneous and immobile. The model goes further by arguing that these resources must: be valuable, rare, imperfectly imitable and non-substitutable (Barney 1991). If these conditions hold true for a firm then this collection of resources can assist the firm in gaining and sustaining competitive advantage over time. Wright, Dunford and Snell (2001) also inform us that sustained competitive advantage is not just a function of individual components but the combination and interaction of skill sets, behaviours and people management systems.

While this model has been useful in informing human resource management strategies it has been criticised by various commentators not least because it is now so difficult to identify resources that satisfy these requirements in a sustainable way. Barney (1991) however emphasises that a major assumption of the RBV is that the link between a firm’s competitive advantage and its resource base must be opaque, particularly to its competitors.

The discussion that follows therefore is mainly focused on routes to capital accumulation that are available to firms that may only produce short term advantages and may not necessarily match the requirements for sustained competitive advantage
as specified in the resource based view of the firm. The important point to make in relation to this research question is that high level skills are not necessarily a requirement for firms to remain competitive, at least in the short term, and this will be illustrated in the following discussion. While some commentators inform us of the shift away from Fordism towards new varieties of post-Fordism, others are suspicious of these claims. On one hand recent changes in global capitalism are reported to support the need for new types of production processes, which rely on higher skill levels combined with different types of work organisation. In the UK for example, New Labour and the Confederation of British Industry refer to these changes as a natural outcome of the knowledge economy and a direct result of changes in global competition, technology changes and changes in consumer demand (Lloyd and Payne 2002). Other commentators however argue that capitalist development is not a uniform process and therefore Fordist/ Taylorist and neo-Fordist forms of production are still widespread in the advanced industrial world (see for example, Avis 2004; Boreham 1992; Cappelli et al 1997; Lloyd and Payne 2002; Keating et al 2002; Keep 1999; Keep 2000; Keep and Mayhew 2001; Vallas 1999). This implies that competitive success may be achieved through high and low skills routes (Lloyd and Payne 2002). The argument will be made and supported with reference to the literature that firms through their own agency will decide on what form of competitive advantage to pursue.

The 1998 UK Workplace Employee Relations Survey (WERS) shows that low skilled jobs offering very little opportunity for creativity and discretion are still prevalent in the UK. The low skill low trust forms of work organisation are still the norm in the US also according to Milkman (Milkman 1998 in Keep 2000). Cappelli et al (1997)
would appear to concur with this view; they inform us that the emerging US model of people management is largely based on work intensification with little job security (Cappelli et al 1997 in Keep 2000). Another view, which is espoused by Ashton et al, is that:

We are witnessing a slow drift towards high skill, high performance forms of work organisation, albeit in the context of continuing uneven development both within and between countries (Ashton et al 2001 in Lloyd and Payne 2002: 16).

These conflicting views draw attention to the problems and contradictions inherent in the belief that there is a fundamental transition taking place within capitalism. We are told on one hand for example, that global competitive pressures and technology are causing a constant upward shift in the skill levels of the workforce. At the same time the neo-liberal policies that exist in the UK and in the US have resulted in massive increases in the numbers engaged in low skill, low wage insecure work (Lloyd and Payne 2002).

Regini (1995) suggests that a high skill/high value added strategy such as exists in Germany is just one of a number of models that countries may adopt to achieve competitive advantage. A range of divergent trajectories exists that are all in evidence among nations, industry sectors and firms. The alternatives he cites include take-overs, monopolies, protected markets, cost cutting and new forms of Fordism (Regini 1995 in Keep 1999: 330). Firms will evaluate different routes to competitive advantage, the high skills route is but one of these (Avis 2004; Keep and Mayhew 2001). Arnal et al (2001) argue that firms may respond in two different ways to an increasing competitive environment. On one hand they may re-organise production
along the lines of HPWOs. This type of strategic management decision can be related in part to the resource based view of the firm which emphasises the importance of the internal resources and capabilities of the firm as sources of competitive advantage. Wright, Dunford and Snell (2001) inform us that the application of the resource based view of the firm has taken a variety of forms one of which is high performance work systems. “The underlying logic is that human resource activities are thought to lead to the development of a skilled workforce and one that engages in functional behaviour for the firm, thus forming a source of competitive advantage” (Wright, Dunford and Snell 2001:709).

Arnal et al (2001) also refer to an alternative approach for firms to respond to competition, which is to resort to numerical flexibility through non-standard types of employment, which may include work intensification and by utilising core and peripheral workers. Keating et al (2002) go on to assert that nations have choices in relation to the type of industrial policies they adopt, similar to the views of Regini (1995), Avis (2004) and Arnal et al (2001). Keating at al (2002) also argue that competitiveness can be achieved in different ways; through a high skill, high wage economy producing high quality differentiated goods or alternatively through a low wage, low skill economy producing low quality goods for the mass market. In a low skill environment such as this, a lack of supply of skilled labour is not seen as a problem by individual firms because the demand for high-level skills is low. Where the majority of jobs require low levels of skill, there is little incentive to invest in training (Keating, Medrich, Vollkoff and Perry 2002: 23).
Where these conditions exist, combined with certain institutional and societal issues, some commentators argue that a society may become locked into a low skills equilibrium (see Avis 2004; Finegold and Soskice 1998; ILO 1998; Mayhew 2004). Finegold and Soskice (1988) described a low skills equilibrium as:

A self reinforcing network of societal and state institutions which interact to stifle the demand for improvement in skill levels… resulting in the majority of enterprises staffed by poorly trained managers and workers, producing low quality goods and services (Finegold and Soskice 1988 in Finegold 1999).

A number of variables were identified by Finegold and Soskice, which help to explain the emergence of a low skills equilibrium in Britain. In the post war years there was a large scale expansion of academic education while at the same time the responsibility for training was largely delegated to employers. Education and training systems were characterised by weak central control with power decentralised within the system. Vocational education was accorded a lower status than academic education and the control of policy was dominated by individuals with no background in vocational education. British industry was characterised by an overemphasis on accounting and an under emphasis on technical skills and production. The question then arises as to whether these conditions exist in Ireland and the resultant low skills equilibrium concept. An NESC report in 1993 suggests that many of these elements exist in Ireland’s institutions and this produces a variant of the low skills equilibrium concept. (NESC 1993 in Garavan et al 1995: 48). If the suggestions of the NESC are found to be valid in the Irish engineering context, then it raises doubts about the validity of workplace learning as a skill formation process.
The decline of Fordism and the emergence of post-Fordism

Before going on to detail the way post-Fordist organisations are said to be configured it will be useful to examine some of the literature which has outlined the reasons for the alleged decline of Fordism and the corresponding driving force for flexibility in organisations. The type of Irish engineering organisations that were referred to as ‘modern’ in Chapter 1 are thought to be modelled along the lines of what will now be described under the classification of post-Fordist. Although these types of post-Fordist organisations lend themselves to the production of high value added products, they are not the only means of producing these types of goods or to remain competitive. Some alternative routes to competitive success have already been discussed and will be referred to again under the guise of neo-Fordism and the flexible firm model. While it is acknowledged that it may be possible for firms to engage in high value added production using different strategies the notion of post-Fordist types of work organisation are regarded by the researcher as a necessary condition for the development of high level engineering skills. It will therefore be informative to examine the views of some prominent authors on production strategies and skill requirements.

Piore and Sabel produced an influential text in 1984, which deals with the decline of Fordism and the rise of post-Fordism. This text is relevant to this research because it describes how some European firms dealt with competitive pressures arising from a reduction in demand for low value added goods. In their writing they point to Fordism, which was the dominant form of production in the West between the 1920s and the end of the 1960s as being the central cause of the economic stagnation that occurred after circa 1973. Mass production based on Fordism requires huge
investment in special purpose machines utilising narrowly trained workers. Mass production is highly successful where there are large enough markets to sustain demand for standardised products. By the late 1960s the demand for consumer goods that had been created at the beginning of the post war period began to reach its limits. This was more evident in the US than elsewhere initially. This is evidenced by the claim that 90% of American households had acquired all the commonly available domestic appliances by this time. This made it difficult to continue to expand domestic markets, which led to further competition among developed countries for increased market share. Competition became intense within a diminishing market (Piore and Sabel 1984). Piore and Sabel (1984) also refer to other factors that impacted on the alleged demise of Fordism such as the evolving changes in consumer tastes. More affluent consumers were becoming more discerning and began to demand products that are customised or unique in some ways.

The problem was further exacerbated by the rapid development of emerging economies particularly those of South East Asia. These emerging economies set about developing expertise through training and education in the use of technology and created marketing and financial institutions. They subsequently became very successful at producing and exporting consumer durable goods (see Castells1992; Schein 1996; Wade 1990; Chen 1979; The World Bank 1993). By 1978 South Korea, Taiwan, Hong Kong and Singapore accounted for the equivalent to 61% of the manufacturing exports of the developed world (Piore and Sabel 1984). It is this capability on the part of these Far Eastern countries and more recently Central and Eastern European countries that is said to be responsible for the difficulties now being
faced by the Irish engineering industry (Irish Engineering Enterprises Federation 2004).

In their writing, Piore and Sabel (1984) refer to two industrial divides that marked the changing forms of production over time. The first divide occurred in the late nineteenth century with the emergence of mechanisation. This early form of mechanised production became known as Fordism and it replaced the earlier manufacturing methods, which relied heavily on skilled craftsmen. The second industrial divide resulted from the inflexibility of Fordism and the inability of this mode of production to respond to the emerging demands of consumers. It is this second industrial divide that is of interest to this research.

According to Piore and Sabel (1984) this second industrial divide saw a return to a variation on the craft type of production that Fordism had previously replaced (Piore and Sabel 1984). They also referred to a particular manufacturing strategy, which they called flexible specialisation as being central to the second industrial divide. Flexible specialisation in engineering production relies on skilled labour, which is often integrated with general purpose computer controlled machine tools or other forms of programmable automation. This manufacturing strategy was observed in operation in certain industrial regions in Northern Italy, Austria and in West Germany around the time of their writing. These were mature industrial regions where companies developed quality products and had identified corresponding markets, which allowed them to avoid the problem of stagnation in mass production that had occurred elsewhere (Piore and Sabel 1984). As it evolved, flexible specialisation built on its success by narrowing the gap between the cost of customised goods and mass
produced goods, thus drawing consumers away from the formally cheap mass produced goods (Piore and Sabel 1984). Although flexible specialisation is not specifically mentioned it is this type of quality high value added production that is now advocated by the Irish Engineering Enterprises Federation and the Enterprise Strategy Group. This group argue that:

Significant steps must be taken to improve the competitiveness of the Irish engineering sector ... by a shift away from low value-added production and towards production based on skills, expertise and intellectual property that have been developed in Ireland (IEEF 2004: 5).

**Flexibility theory**

The issue of workplace and production flexibility was referred to as part of the post-Fordist paradigm will now be explored further with reference to the ways it may be achieved. There are multiple variants of what has become known as flexibility theory. Three forms of flexibility that have been adopted by firms to remain competitive will now be examined. One variant is the post-hierarchical firm, which is derived from the perceived need for firms to re-structure in order to make greater use of the skills of their employees. This need for change is driven by the newer production processes that are now available. When programmable automation became available as an alternative to dedicated machines designed for mass producing particular products or components, the need for bureaucratic structures began to disappear. The distinction between mental and manual work also became blurred as a result of the emerging technology and production methods. Issues such as learning and personal development became more important in order to maximise efficiency and to realise the potential of the new technology. New ways of designing workers’ tasks and forms
of communication were needed that are free from the constraints that are normally imposed by more traditional hierarchical structures (Vallas 1999).

Another variant of flexibility theory is referred to as flexible specialisation, which was briefly outlined earlier in Piore and Sabel’s description of the ‘second industrial divide’. This concept is similar to the post-hierarchical model but places more emphasis on the influence coming from changes in consumer tastes where the demand is increasing for differentiated high quality products. As markets for mass produced goods become saturated there is a corresponding rise in demand for customised high quality products. Changes in technology have now made it possible to produce small batches of high quality diversified products in a profitable way (Sorge and Streeck 1988 in Vallas 1999). As stated earlier, Piore and Sabel (1984) inform us that the concept of flexible specialisation is founded on the utilisation of skilled labour combined with general purpose machines and modern technology. Innovation and the ability to respond rapidly to change are also central features of this concept.

The development of computer based production technology is also central to the flexible specialisation process. Changes in product specification can be accommodated rapidly where computer numerical controlled machine tools or robots are employed. In order to make these changes the program is modified or re-written without having to make any changes to the hardware. This makes short production runs economically viable. The development of general purpose computer numerically controlled machine tools that are suitable for small and medium sized jobbing workshops played a significant part in advancing the flexible specialisation form of production and work organisation (Piore and Sabel 1984). A significant consequence
of this mode of production is that it combines the skill sets of craft workers with new technology. Employers are not forced to invest in dedicated fixed purpose machines, as was the case with mass production. General purpose computer numerically controlled machine tools, which are readily available at reasonable cost, can be programmed on the shop floor by craftsmen. The craftsman can then edit and prove the programme, thus combining craft skills with modern technology. Skilled manual workers are much more central to the production process than they had been in Fordist mass production processes (Piore and Sabel 1984).

The flexible specialisation model as described above would appear to lend itself to the Irish engineering context for the following reasons. Firstly it relies heavily on skilled labour, which can be accommodated by the highly structured apprenticeship system that exists in Ireland. Secondly it is something that is not constrained by company size. This is relevant because most Irish companies are small to medium sized (McIver Consulting 2004). The research instrument therefore explored the existence of flexible specialisation or a variant of it in the Irish context or at least the potential to move in that direction.

Vallas (1999) however singles out the post-Fordist view, that the way forward for organisations is to adopt new structures where the skill and judgement of workers are fully utilised for criticism. This post-Fordist view is based on the notion that modern production cannot be reduced to simple routines, such as what exists in a Fordist type of production set-up. The problem that Vallas (1999) has raised with regard to this view is that it ignores the various other ways in which flexibility can be achieved. In some cases the flexibility needed can be achieved with only minor adjustments to an
existing mass production set-up while at the same time maintaining the limited discretion afforded to employees. This argument however could be regarded as somewhat contrary to what Piore and Sabel (1984) have said about the inflexibility of mass production set-ups. Another approach, which can be employed, is to introduce a varied mix of product lines while maintaining the same work structures and production processes. The use of just-in-time (JIT) inventory systems and statistical process control (SPC) can also be seen as ways of improving efficiency without any major impact on skills and flexibility among workers (Vallas 1999). If the arguments made by Vallas in relation to other forms of flexibility were shown to have validity in the Irish context, some engineering workplaces would then have limited potential as sites for learning.

Another aspect of this debate, which is now considered, refers to the empirical research that has been carried out on post-Fordist work structures. Boreham (1992) points to the limited amount of empirical investigations that can be referenced on this issue, despite the fact that so much has been written about it. He does however draw attention to one particular international study of workplace organisation that was carried out in seven countries concerning workplace practices during the 1980s. The survey attempted to find out how autonomy and decision making among employees in the advanced capitalist countries compares with what is alleged to be the case in the post-Fordist literature. Boreham (1992), like other commentators acknowledges that there are two alternative approaches to the control of work in advanced industrial societies. Apart from the post-Fordism paradigm, the alternative is what he refers to as neo-Fordism, which relies on work intensification and strict hierarchical managerial control.
Boreham (1992) informs us that the results of this international study indicate that skilled workers still appear to have little autonomy and are excluded from decisions about the means and methods of production, in spite of what the post-Fordist literature says about modern forms of work organisation. The idea that skilled workers can inform the design of work practices is not very evident from the survey results. The data produced by the survey shows very clearly that participation in decision making among skilled workers, clerks, semi-skilled and unskilled workers was very limited (Boreham 1992).

Another aspect of the survey examined the autonomy available to various categories of employee in the workplace. The results again showed that autonomy was very restricted among semi-skilled and unskilled workers in all the countries surveyed with the exception of Japan. Felstead et al (2004) report similar findings from UK surveys. They found that task discretion among many categories of worker particularly those at the lower skill levels has actually declined between 1986 and 2001. This is despite the fact that training times and entry level qualifications have increased which indicates an increase in job complexity and skills. Boreham (1992) concluded that there is very little evidence of the type of participation and decision making among skilled workers which has been predicted by other commentators in the so called post-Fordist era. Boreham went on to conclude that production in advanced capitalist countries is largely organised along neo-Fordist lines. He also makes reference to a move towards a form of numerical flexibility among firms based on the growing number of people involved in part-time and other forms of non-standard working. The findings of the research carried out by Boreham and the views expressed by Vallas in relation to alternative ways of achieving flexibility both have implications for the potential of
workplace learning as an effective skill formation process. This also links back to what Billet (2001) referred to with regard to the opportunities that the workplace affords for learning and the kind of activities that employees are engaged in.

**The flexible firm**

The third variant of flexibility theory to be examined is the ‘flexible firm’. The type of numerical flexibility that was referred to by Boreham (1992) above was also cited by Vallas (1999) as a form of flexible accumulation. This process according to Vallas (1999) involves dismantling many of the resources that a firm has amassed and to rely more on outsourcing. Vallas (1999) regards this as an alternative option to flexible specialisation as a means of competing in today’s volatile trading conditions. The model of the flexible firm was originally described by Atkinson in 1985 around the same time that Piore and Sabel (1984) advanced the concept of the second industrial divide. Atkinson’s flexible firm model emphasises the division of labour between core and peripheral employees. The core employees provide the firm with functional flexibility. This core group are multi-skilled and usually form a part of multi-disciplinary project teams. They are also afforded secure conditions of employment in return for their commitment to the firm. On the outside of this core group are the peripheral workers and it is this cohort of workers who provide the firm with numerical flexibility. As the market grows the periphery expands and as growth slows the periphery contracts (Atkinson 1985; Pollert 1988). Atkinson informs us that firms utilise this core periphery form of operating in different ways to suit the prevailing trading conditions (Atkinson 1985).
The flexible firm model was considered to be relevant to this research because it has implications for training and skill formation, based on the results of some research findings. Atkinson and Meager (1986) for example carried out research in 72 large firms that were randomly selected across diverse sectors of British Industry. They found that peripheral forms of employment were on the increase and these forms of employment had built-in shortcomings for workers. Apart from lack of employment security they also report that:

…such jobs tended to require only low level skills and their peripheral status tended to inhibit investment in training from employers, workers in such jobs were unlikely to enjoy substantial opportunities for advancement on internal labour markets (Atkinson and Meager 1986: 26).

Felstead and Gaille (2002) agree with this. They refer to data that was collected for a UK skills survey (2001), which shows that those involved in non-standard types of work have less access to training, and are generally involved in lower skilled work. It is this dualism, which is an integral part of the flexible firm that is of interest in the context of workplace learning. While the core employees are part of a post-Fordism form of working arrangement, which includes high involvement work practices, the peripheral workers are consigned to a totally different fate, e.g. low skill work with little opportunity for training or advancement (see also Casey, Keep and Mayhew 1999; Arulampalam and Booth 1988).

The issues that have been described here on the rise of post-Fordism, the critique of post-Fordism and flexibility theory in general can all impact on workplace learning. While some aspects of these debates would suggest that many workplaces could now provide environments, which will enhance learning, other aspects of the debates
indicate the opposite. Flexibility theory for example acknowledges that individual firms will make strategic decisions on how they move in the direction of the flexible firm model. The research instrument therefore took account of how workplace learning is influenced by the way individual firms have decided to structure their production systems and their product strategy. The data analysis and findings from the empirical research on the Irish engineering industry that are described in Chapter 5 reflects different aspects of these debates.

**Theories of VET and Ireland’s approach to skill formation**

This chapter has so far examined different approaches available to firms to remain competitive and the impact that these choices have on product market strategy and skill requirements. There is also a need to examine the institutional structures governing the provision of vocational education and training, in other words how VET is organised within the state. Recall that Streeck (1989) informs us that these issues will have a strong influence on employer attitudes to the provision of any form of structured workplace learning. Before going on to examine these issues in more detail it is worthwhile recalling some detail on theories of VET.

A number of theories on vocational education and training have evolved over time. This section will relate Ireland’s skill formation strategies to these theories. Four theories will be described namely, Liberal Approach, Economic Governance, Societal Approach and Human Capital. The first approach to be considered is the liberal approach. This is based on the assumption that, while individuals are best left to their own devices in the market place, the state has an important role to play in ensuring that the market works. Another assumption is that equal opportunity exists for all
individuals to participate in the market and hence that there is an efficient training and education system in place (Ashton and Green 1996: 12). The liberal approach focuses on the extent and breadth of education and training experiences across the population to see how competitive the economy is likely to be. Within this theory a country’s skill acquisition system is thought to be determined by the framework of its education and training systems (CLMS M3, U1). The liberal approach outlines three different models to describe education and training provision: the dual system where preparation for work is carried out under a highly developed and regulated apprenticeship system, the schooling model, where preparation for work takes place in the formal education system and finally the mixed model which combines schooling and work based provision (CLMS M3, U1).

The difficulty with this theory is that it does not consider the relationship between the organisation of education, training and industrial organisations or economic growth. Another weakness with this approach is that it assumes that society will benefit from education and training no matter what type of industrial relations and other social and economic relations are present (CLMS M3, U1). Since this approach makes the assumption that education and training are vital for the development of a competitive economy it could be assumed that a country that puts resources into education and training should become a successful economy.

Another theory, which is associated with the work of Wolfgang Streeck, is referred to as economic governance. According to CLMS it was developed to explain the peculiar effectiveness of training practices within some European countries, with particular reference to Germany where occupational labour markets are supported by
state regulation and the social partners. The theory has particular relevance to countries where high quality diversified products are the main focus of production. In order to support this type of production there must be strong institutional arrangements in place. This type of production is regarded by Streeck (1989) as the key to economic competitiveness in a modern capitalist state (CLMS M3, U1: 18-19). The view of Streeck in this regard is similar to what was discussed earlier with regard to the work of Piore and Sabel on flexible specialisation. Streeck (1989) suggests that strong institutional supports are a necessary condition to support the flexible specialisation model. If employers are left to their own devices they would not provide the level of training required to support this type of production. The theory is important because it highlights the need to look at the wider social, economic and political arrangements within a society before the education and training system can be understood (CLMS M3, U1).

Economic governance was considered relevant to this research because it highlights the need for institutional supports that may be necessary to sustain a high skills production system. The theory however makes the assumption that high quality diversified production is the only route to competitive success. This could be seen as a weakness because other commentators such as Ashton and Green (1996: 25) point out that there is no empirical evidence to back this nor is there evidence to show that organisations cannot be equally profitable within a low skills context. The views of other authors on this were already discussed earlier in this chapter.

Another approach that complements the work of Streeck is the societal approach. This is based on research studies that attempted to explain the differences between
countries in relation to organisational configurations, work structuring, qualifications and career systems. The researchers concluded that training systems could only be understood adequately by examining their relationship with: the education system, the structure of production organisations, the system of industrial relations and the wider class structuring of society. These institutional domains interact with each other to produce a given outcome such as higher productivity, although that result cannot be attributable to any one of these elements in isolation. The theory implies that these institutional elements take on their present form because of their relationship with each other. No one system causes another and a change in one is likely to produce a change in another (CLMS 1998).

The societal approach also has its limitations. Firstly, “it assumes a degree of coherence in national systems which are not always there” (CLMS M3, U1: 22). For example Singapore uses a combination of apprenticeship and employer based training. Secondly, all the institutional elements within a national system are assumed to be of equal importance in determining the final outcome. This assumption has practical implications. It cannot for example tell whether employer practices are determined by the education and training system or vice versa (CLMS M3, U1: 22).

The final theory to be described comes from an economic perspective and is referred to as human capital. In its simplest form human capital theory proposes that all productivity differences between individuals reflect differences in the amount of human capital they possess (McNabb and Whitfield: 1994). During the 1960s economists began to stress the importance of human capital in the process of economic development. Previously this had been virtually ignored with the emphasis
firmly placed on expanding the physical capital base. Human capital theory regards education as an investment in the same way as investment in plant and machinery is regarded. Investment in the acquisition of new skills through education and training yields a financial and economic return both to the individual and to the firm. The theory states that individuals or the firm will continue investing in education and training up to the point where it ceases to yield any additional return, in the same way as a cost benefit analysis is carried out. It differs from the liberal approach in that it assumes that the beneficiary of education and training should pay the cost. When a country raises the level of skills on a national basis, this is reflected in the economic performance of the country. By raising the national skills base it allows for the introduction of advanced technology and sophisticated manufacturing techniques (Tansey 1990).

Like other theories human capital also has its weaknesses. Firstly it gives very little attention to the fact that some individuals have greater access to training than others. Why do some firms offer training while other do not? Secondly, where training is offered, what determines the type of training made available, will it be firm specific or will it be more general? The theory makes the assumption that it is perfectly rational for individuals to invest in or to engage in training because of the longer-term benefits of improved income. However, there is always uncertainty about future income and this can result in under investment in training among individuals. This under investment in training among individuals can also be related to what was mentioned earlier about individual agency and the perceptions workers hold about the need for lifelong learning. Trade unions can also impact on the attractiveness of taking on additional training by reducing the pay differential between skilled and unskilled
workers. It is assumed that workers spend part of their time learning technical skills and as a result become more productive. However the theory fails to acknowledge that many skills are merely an informal outcome that results from just doing the job (McNabb and Whitfield 1994).

These theories of VET systems may be able to tell us something about the way vocational education and training is organised in Ireland. An attempt will now be made to see how different theories have informed policy with particular reference to engineering skill formation. Where policy is informed by theory the expectation is to see the weakness in the particular theory reflected in policy. It is also anticipated that policy influences will be seen to come from a range of theories or that practice would reflect aspects of VET theory. The discussion now moves on to describe how engineering training and education is organised in Ireland and to relate these training and education policies to the theories referred to above.

It was stated earlier that apprenticeship forms a significant part of the skill formation process within Ireland’s engineering sector. A compulsory requirement to qualify as a craftsman in Ireland is the successful completion of an apprenticeship in one of the twenty-five designated trades. FÁS, the Government Training and Employment Authority has statutory responsibility for apprenticeship training in Ireland. The curriculum for each trade is designed in conjunction with the stakeholders involved namely: Employer Representatives, Trade Unions, Department of Education and Science and the Institutes of Technology. There are four trades that encompass the employment of craftsmen for the engineering sector in which this study is concerned: Fitter, Toolmaker, Sheet Metal Worker and Metal Fabricator. The apprenticeship
model governing these trades comprises seven phases of alternating on and off-the-
job training (FÁS 2006). Before an employer can take on an apprentice certain
conditions must be fulfilled. In assessing an employer’s suitability to train an
apprentice FÁS must be satisfied that the company can provide the apprentice with
access to specified learning experiences and to specific types of equipment. The
company must also have suitably qualified craftsmen to oversee the on-the-job
training of the apprentice and to carry out specific competence based assessments
during the on-the-job phases.

The current Irish apprenticeship model is referred to as a standards based system
because, in order to qualify, apprentices are required to demonstrate competence in a
range of activities which are based on agreed occupational standards. The system was
updated during the 1990s as part of a social partnership agreement between
Government and unions (Boyle 2005). The system is similar in many ways to the
German Dual Apprenticeship System, which relies on occupational labour markets,
social partnership and distributed control. Green and Sakamoto (2001) inform us that
the German Dual system of apprenticeship played a major part in developing the high
skills base of the German economy. The system is particularly suited to the
production of high quality diversified engineering products in which Germany excels.
The similarity between the Irish and German apprenticeship systems revolves around
regulation and social partnership. The type of strong institutional supports that Streeck
referred to with regard to economic governance exist within the Irish apprenticeship
model to a large extent. However there is no type of quota or agreements with
employers covering the numbers of apprentices that are trained, as is the case with the
German Dual System. Despite the similarities between the two systems there is no
guarantee that all Irish engineering apprentices will be exposed to a highly expansive learning environment in the workplace. The issues that were referred to by Fuller and Unwin (2003) earlier in relation to expansive and restrictive learning environments within apprenticeship in a workplace setting are also applicable to the Standards Based Apprenticeship system in Ireland. Even though firms must fulfil certain criteria before taking on an apprentice, significant differences exist in terms of what firms can offer by way of learning experiences.

As far as other occupations within the engineering industry are concerned the situation is somewhat different. For associate professionals and for professionals a schooling type model such as what is referred to in the liberal approach to VET applies. There is no obligation on employers to provide any sort of structured on-the-job training for these categories of employee. The route to qualification for these occupations is solely through third level institutions. With regard to semi-skilled workers and non-designated trade occupations, internal labour markets generally apply, where workers learn the relevant skills in the workplace. No mandatory qualifications are required for these occupations with the exception of specialised areas of welding, where a person must be a certified or coded welder (FÁS 2005:19).

State involvement in training outside of apprenticeship has traditionally focused on the unemployed. This training is largely provided by FÁS, the State Training and Employment Authority (McIver Consulting 2004). Leach (1993) informs us that FÁS does not see the provision of training for industry as a priority. The primary responsibility for training within industry lies with industry itself. This is in line with Government policy, which relies on a voluntarist approach (Leach 1993). As recently
as 2003, Tansey informs us that state training policy was still focussed on the unemployed and long term unemployment and that the focus must be redirected to those who are in the workforce (McIver Consulting 2004).

The policy emphasis now however has changed somewhat, with regard to training for industry. FÁS has recently launched a ‘One Step Up Programme’ aimed at upskilling those in employment who are involved in low skill occupations. The objective of this scheme is to encourage greater participation in ongoing learning by facilitating employees to continually up-skill by a further increment. This is consistent with human capital theory, which informs us that investment in education, and training yields an economic and financial return to the individual and the firm. This initiative is facilitated by the National Qualifications Framework (NQF). All training that is funded under this scheme must lead to a qualification that is recognised within the National Qualifications Framework (NQF), (Enterprise Strategy Group 2004). This type of initiative is very much in line with what was described earlier in relation to human capital theory.

The difficulty with this initiative as far as workplace learning is concerned is that it makes no reference to recognition of skills that are acquired informally in the workplace. A study by McIver Consulting for The Expert Group on Future Skills Needs recognises that it is common for people working in engineering to acquire skills informally at the workplace that are equivalent to the skills of individuals who hold higher level qualifications. They recommend that third level institutions should collaborate with industry and the qualifications awarding councils to accredit this type of prior experiential learning (McIver Consulting 2003: 113). Recognition of prior
experiential learning is listed as a policy objective by The National Qualifications Authority of Ireland. This refers to recognition of learning that may have been achieved in a non-formal or informal basis or perhaps in the workplace (National Qualifications Authority of Ireland 2001). This research attempted to find out how this concept would be regarded by Irish engineering employees and employers. Do employers and employers see any value in this recommendation? How will people who hold formal qualifications regard the notion of accreditation, which could be based on work experience alone?

Another issue that is relevant to training and development in Irish industry is company size. Irish business is mainly made up of small and medium size enterprises. Research tells us that these organisations under invest in training. One reason cited is the risk of staff being poached by competitor firms who do not engage in staff training. Organisations tend to rely on state support for training, which has already been reported as being inadequate (Muntner 2006). Difficulty with access and availability to suitable courses are other reasons cited for non-participation in training (McIver Consulting 2004; Muntner 2006). The White Paper on Adult Education (2000) meanwhile states that small and medium sized enterprises must view investment in human capital in the same way that investment in any other aspect of the business is viewed (McIver Consulting 2004). This White Paper proposal is based on the rationale that forms the basis of human capital theory; however what appears to be happening in SMEs is also consistent with what was described earlier as a weaknesses in human capital theory. The research cited above suggests that SMEs do not regard it as perfectly rational to invest or engage in employee training, particularly
in the area of transferable skills (i.e. general training). This issue was explored further as part of this research.

Policy implications for Ireland in becoming a high skill, knowledge-based economy

This section will now critique the Irish Government’s vision of creating a knowledge-based economy and how this may impact on the engineering industry. Some issues that are regarded as contentious and imprecise by this researcher in relation to the term knowledge economy have already been outlined in Chapter 1. Quotations from policy documents that outline the Government’s vision on the future shape of the economy were also cited in Chapter 1. These quotations are regarded by the researcher as macro level and aspirational and do not really inform us in any detail as to how this is to be achieved at industry or sector level. Peter Drucker also makes some comments about the uncertainty as to the shape the knowledge society will take. He draws attention to the widespread use of the term knowledge worker and goes on to say “…hardly anyone understands the implications for human values and human behaviours, for managing people and making them productive, for economics and for politics” (Drucker 2001 in Information Society Commission 2002: 24). Griffiths and Guile (2004) however, explain the concept in a more meaningful way. They inform us that the concept of the knowledge economy has now taken on a broader meaning than what was originally understood by this term. The conventional wisdom on this concept was focused on industry sectors that rely on advanced scientific and technological knowledge. Now, however the definition encompasses the general application of knowledge as it applies to the delivery of a service and the production of goods in all but the most elementary of circumstances (Griffiths and Guile 2004). This type of description provides us with a more tangible explanation of how it might
impact on workers in the engineering industry. It can also be reconciled with the
definition of a knowledge worker, which was cited in Chapter 1 by Hammer (2004:14)
“someone who knows more about his or her job than anyone else in the organisation”.
Based on these views of the knowledge economy, learning that occurs in the
workplace would have the potential to advance the aim of creating a knowledge
economy and a learning society. This raises the question of what institutional
structures are necessary to encourage employers to engage with this process.

Casey and Brugha (2005) made some observations on policy implications for Ireland
in realising the vision of becoming a knowledge based economy. They assert that state
policy has always played a critical role in the development of the Irish economy. They
contend that there appears to be a misconception at policy level about Ireland’s
potential to become a knowledge based economy and this is partially because of the
understanding of the term knowledge and how it can contribute to economic
development. Casey and Brugha (2005) argue that there has been an over reliance on
foreign direct investment (FDI) in Ireland. They also warn of the danger inherent in
trying to predict future growth by focussing on past successes. The recent success in
attracting world leading companies such as Intel, Microsoft and Dell to set up in
Ireland has created the impression that Ireland is well poised to become Europe’s
leading knowledge economy. The possibility exists that the early success in attracting
such companies created a self-reinforcing effect and became self-perpetuating. The
unprecedented growth that Ireland experienced from the mid 1990s after years of
economic recession may be attributable to geographic location and exogenous factors
just as much as policy measures such as FDI incentives (O’ Riain 1997 in Casey and
Brugha 2005:45).
Amsden and Mourshed (1997) draw attention to the contrast between Ireland’s approach to industrialisation and that of Korea and Taiwan. The Asian countries took a long-term view and decided to develop technological capabilities combined with subsidies for companies to help them to compete (see also Brinkman and Brinkman 2001; Schein 1996). Ireland on the other hand relied on attracting foreign direct investment in the form of Multinational Corporations (Trauth 2000; O’Grada 2002 in Casey and Brugha 2005). It is the development of this type of indigenous technological capability that the Asian countries focused on that is lacking in the Irish approach to the creation of a high skills knowledge economy in the opinion of the researcher. An important observation to make in relation to the Asian Tiger economies is that each of these countries worked out their own approach to moving to a high skills route based on their individual circumstances. By studying existing high skills economies such as Germany and Japan, the Singaporean Government for example, concluded that on-the-job training is a vital part of developing a high skills society. They also learned of the necessity to integrate on and off-the-job training to provide the necessary learning experiences (Ashton and Sung 1996). Irish Government policy needs to consider some sort of intervention to assist companies to restructure in ways that can promote skill and knowledge creation within the workplace for all categories of employee. Job redesign and work reorganisation have been neglected as policy issues in Ireland (see also Payne and Keep 2003). This can be linked to Griffiths and Guile’s (2004) description of a knowledge based economy as cited earlier. It also takes cognisance of what Casey and Brugha (2005) have said about Government policy and its impact on economic development in Ireland.
Another issue that warrants attention in this context relates to how lifelong learning is conceptualised by policy makers. According the OECD Ireland’s participation levels in lifelong learning is poor by comparison with the EU average. OECD figures rank Ireland 15th out of 19 countries for participation in education and training among 25-64 year olds (Information Society Commission 2002:34). Based on age profiles, the ISC inform us that 80% of the present workforce will still be in the workforce in 10 years time. Ireland therefore needs to create a culture of lifelong learning (Information Society Commission 2002: 24: 37). This however is based on a narrow definition of what constitutes lifelong learning and does not really take account of more informal learning. Lawy and Bloomer (2003) are also critical of the rhetorical nature of the current discourse on lifelong learning which is mainly focused on learning as acquisition and not participation.

If vocational education and lifelong learning are to have anything more than rhetorical value, it is clear to us that they have to be regarded as a continual striving for ‘autonomy and capability of the individual as an agent’ (Strain 2000: 294 in Lawy and Bloomer 2003:40). This claim is in stark contradiction to the compliance model of learning that figures prominently in national legislature and funding policies. The orthodoxies of the modern day – which insist on learner conformity to tightly prescribed learning opportunities and outcomes, and which demand that what has been learned is measurable by universal attainment criteria – reflect little or no understanding of the dependency of learning upon identifications and the life course. As such they are a major obstacle to the achievement of vocational education and lifelong learning (Lawy and Bloomer 2003:40).
Policy discourse on lifelong learning in Ireland is no different in the sense that it is discussed in the context of acquisition and ignores the social and participatory nature of learning which has been shown to be just as important. The observations made by Lawy and Bloomer are relevant to the Irish engineering context because identity and learning as a lifelong project will influence attitudes and perceptions about learning among the workforce.

The Irish Engineering Enterprises Federation has pointed out some other difficulties facing the engineering industry in Ireland. They assert that third level syllabi are typically out of date and do not address the new technologies now being employed in the Irish Engineering sector. The federation also claim that skill development in the workplace is an issue that needs to be addressed because of the development of new technologies and the resulting changes in work practices. They claim that engineering companies already invest heavily in skill training and development but this needs to be supported (IEEF 2004:23). Apart from what was described earlier in terms the workplace training aspects of apprenticeship there is very little else, which compels employers to provide learning opportunities for workers either in the workplace or through off-the-job training. Formal recognition of experiential learning in the view of the researcher is one policy issue which could advance the aim of creating a knowledge based economy and a learning society.
Summary and conclusions arising from the literature reviews on routes to competitive advantage and theories of VET

This chapter follows on from Chapter 2 by considering some further debates in the literature that can impact on the effectiveness of workplace learning as a means of creating a high skills engineering industry. The themes that were reviewed in this chapter combined with those in Chapter 2 represent the basis of the theoretical framework on which the research was based. This chapter highlighted the fact that there are divergent views on how companies can compete and remain profitable even in the type of market conditions that are faced by Ireland’s engineering industry. While advisory groups such as the Enterprise Strategy Group that was referred to throughout this document are advocating that companies should move their product market strategy further up the value chain they seem to ignore what other commentators have said about alternative means to competitive advantage. There are a number of alternatives approaches. One approach is to implement work intensification systems while retaining a low level of skills among the workforce. Another approach is to implement a higher value added product mix through adjustments to existing production technology. This approach would typically take the form of a neo-Fordist type of set-up. The high skills route on the other hand may involve the type of flexible specialisation model that was referred to by Piore and Sabel (1984). This approach combines high level skills with the production of high value differentiated products. This type of production may also incorporate the type of high performance work practices that were referred to in Chapter 2. It is concluded from the literature that there is a need to examine Irish employer views on these issues. The decisions made by employers on these issues will have implications for learning in the workplace because of the way workplaces are structured and the corresponding skill needs to match the type of production processes involved.
The final part of the chapter dealt with Ireland’s approach to VET and the implications of policy issues in the creation of high level skills. It is concluded that the emerging policy in Ireland relies too heavily on human capital theory to inform decisions on the means to create a high skills knowledge economy. This is evidenced by the way weaknesses in this theory are reflected in current practice. There is also evidence of current policy being influenced by the liberal approach where there is a mixture of a variant of the dual system and the schooling model in evidence. The conclusion here is that the weakness in the schooling model that was identified in the literature is reflected in the approach taken to some of the non apprenticeship occupations in the engineering industry. Other theories of VET such as economic governance inform us that institutional structures which support workplace learning are a necessary condition for the creation of high skills high value added forms of production. These institutional structures do exist in a limited way in Ireland but the question arises as to whether this is a limiting factor in the creation of effective workplace learning opportunities in the engineering industry.

It was asserted that the Government’s vision of creating a knowledge-based economy is not spelled out in sufficient detail. FDI was singled out as an issue that was relied upon heavily in the past to attract multinational companies to set up in Ireland but may not continue to produce results in the future. The approach taken in certain Asian countries was to develop technological capability and this is seen as something that is lacking in Ireland’s approach. Allied to this it was asserted that policy is needed which promotes formal recognition of workplace learning. It was also asserted that participation in lifelong learning is currently only recognized in cases where there is some form of attainment criteria associated with it and this is seen as a problem.
Synthesis of the literature reviews

Before going on to discuss the methodology that was used a synthesis of the literature reviews is provided. The discussion in Chapter 2 is largely summed up by referring to the comments make by Billet (2001) where he asserts that working and learning are interdependent. He went on to inform us that what is learned depends on what the workplace provides to support learning and how individuals engage with and use these contributions. Other commentators have made similar claims and referred to the type of work structures that support and create expansive learning environments. The work of theorists who have advocated that learning is a social and situated process was cited. These commentators also refer to the weaknesses in a lot of the curricula that applies to vocational education based on the assertion that it is too far removed from the workplace for effective learning to take place and therefore decontextualised.

Another important aspect of the literature that informed the research design refers to how individuals perceive learning. Research by Pillay et al (2003) was referenced which suggests that workers may not make the link between working and learning, or through their own agency they may not see any need to engage with the opportunities that the workplace provides for learning.

The literature reviews have been broadened out in this chapter to include other issues that impact on skill formation. Literature debates on the need for skills and routes to competitive advantage that employers may pursue were cited. The high skills route was shown to be just one option. A form of engineering manufacture which relies on high levels of engineering skills and referred to as flexible specialisation was discussed and linked to the Irish context. Theories of VET were also reviewed in order to establish a link between these theories and Ireland’s approach to VET and to
industrialisation. Finally literature was referenced which criticises the way lifelong learning is conceptualised by policy makers because of its emphasis on measurable attainment criteria and the exclusion of learning that takes place informally in the workplace.
Chapter 4
Research methodology

Introduction
The research is based on four company case studies two of which were traditional engineering companies and two modern engineering companies. The reasons for selecting four companies was to allow comparisons to be made between the traditional sector and the modern sector of the Irish engineering industry and to obtain a reasonable sample size. Yin (1994) also argues that multiple case designs provide for more robust conclusions. The design of the research instruments was informed by the debates that were reported on in the literature reviews and the findings of the various reports that were referred to in Chapters 2 and 3. The following questions arose from the literature that was reviewed in Chapters 2 and 3 and can be regarded as a sub-set of the main research question.

- Do employees learn better through normal work based activities or through formal structured training courses, or a combination of both?
- What are the attitudes of employees towards learning and working and do they see a relationship between the two?
- Do employees see any need for workplaces to be re-structured as a means of facilitating learning?
- Is there any difference between the perceptions held by workers who are employed in what are regarded as modern engineering companies as opposed to traditional engineering companies?
- What sources of learning do engineering workers find most useful in helping them to improve their skill and knowledge levels?
What impact does management attitude and level of support have on learning in the workplace?

The literature also raised another set of issues that relate to employers and how their decisions about the organisation of production are influenced. The low skills equilibrium concept that was referred to earlier could be an issue here.

- Do they see any need to move their product/market strategy further up the value chain and if not why?
- Do they see any need for upskilling and if so how should it be achieved?
- Will they invest in training and development without some sort of state intervention?
- How should any skill deficiencies that arise as a result of moving further up the value chain be addressed?
- How useful do they think formal engineering qualifications are in preparing people for work compared to workplace learning?
- What value do they place on workplace learning and do they see a need to restructure the workplace to maximise learning potential?
- Are low skill low trust jobs the norm in Ireland’s engineering industry or is there a drift towards high skill, high performance work practices?

The rest of the discussion in this chapter is structured in the following way. The first section presents a review of social science methodologies, which leads on to a justification for the methodologies that were adopted and the methods used to collect the data. A mixed methodology was used and the justification for this is explained. A description of the design of the research instruments is included along with the justification for the methodology and research methods chosen. A distinction is drawn
between methodology and method on the basis that methodology is defined as a way of thinking about social reality and method on the other hand is defined as a set of procedures or techniques for gathering and analysing data (Strauss and Corbin 1998). Details of the research sample selection process are also included. The discussion then moves on to ethical issues and how they were addressed. Pilot testing of the research instruments is also described and the process of gaining access to the participating companies. Finally the research sample is described and how the research process was carried out and the data analysis methods.

**Social science research methodologies**

This brief review of social science research methodologies is included to provide a framework for justifying the rationale for the methodologies that were chosen. Social science research methodology is often classified as being either quantitative or qualitative and this distinction is useful as a means of highlighting the inherent value and weakness of either approach (Bryman 2001:20). The philosophical position that underpins each of these paradigms is worth recalling in order to relate the potential benefits or pitfalls of each as they may apply to this research problem. The quantitative approach, which is rooted in positivism, relies on a deductive or theory testing approach. Positivists argue that social science research should concern itself with facts rather than values. Facts are considered to be value free and are regarded as objective knowledge (CLMS, M1, U2: 13). The theory testing aspect of quantitative research is intended to look at general propositions contained within theories and to apply them to specific cases. These theories may not be explicitly stated in which case the background literature related to a topic may be regarded as a proxy for theory (Bryman 2001: 7).
Qualitative research on the other hand relies on an interpretivist philosophy for trying to understand the social world. This is based on an assessment of individual’s interpretations of that world through the collection of qualitative data (Bryman 2001). Qualitative strategies tend to ask questions such as how and why, whereas quantitative methods tend to focus more on numbers and would therefore ask questions such as, how many etc (Bryman 2001:20). Qualitative researchers insist on the need to view events and the social world through the eyes of the people they study. They regard context and environment as being important influences on social behaviour (Bryman 2001: 287). They also assert that human beings act consciously through their own individual agency. In doing so what we observe in terms of behaviour is really only an outward display of internal feelings and motivations (Miller et al 2002:8). Newman and Benz (1998) argue that the two paradigms should really be considered as being at opposite ends of an epistemological continuum rather than mutually exclusive.

**Rationale for a quantitative research methodology**

Based on the literature that was reviewed for this research problem it can be seen that there is a considerable amount of theory that could be tested in the context of the Irish engineering industry. This assertion is based on the notion that theory is implicit in the literature rather than explicitly stated. A deductive reasoning or quantitative approach to some aspects of the research design was therefore appropriate. A form of quantitative research that is suited to this type of study is referred to broadly as non-experimental research. This involves making observations of social phenomena and also examining relationships between different phenomena. Descriptive surveys are one form of this type quantitative research. This is the method that was chosen for the
quantitative aspect of this research. This type of research does not involve manipulation of the variables. It falls within the quantitative paradigm because researchers normally convert the data into numerical values in order to apply statistical analysis techniques and then generalise the findings to the general population. Descriptive survey research often utilises questionnaires or interviews as a means of collecting the data (Leedy 1997).

In order to facilitate the design of the quantitative research instrument it was necessary to refer to the relevant concepts that are embedded in the literature that was reviewed. These concepts represent the points around which the research was conducted and for the organisation of observations. The first concept to be considered was learning and skill formation. This is a very broad based concept. Where a concept is very broad we may need to examine different aspects or dimensions of the concept. This will facilitate the formation of indicators of the concept (Bryman and Cramer 1990). There are a number of dimensions associated with the concept of learning that are relevant to this research and these will now be delineated. Workplace learning is one such dimension, which is central to this research and this includes all forms of informal learning that may take place in the workplace. The concept of learning is also regarded as a social process involving communities of practice and also as a form of participation as opposed to a solitary experience. Another dimension of the learning concept relates to formal learning. This refers to structured learning usually as part of a formal training or education programme. The perception held by workers on what constitutes learning is another dimension of this concept. There are two other dimensions associated with perceptions about learning that were considered. One
relates to the perceived need by employees to engage in ongoing learning and the other one relates to recognition of prior experiential learning (RPEL).

The concept of work as it applies to this research relates to the tasks normally carried out by employees as part of any of the engineering occupations. One dimension associated with the concept of work relates to the way workplaces are organised to facilitate learning and skill formation. The support for learning from a management perspective is another dimension of the work concept. The concept of high performance work practice is also relevant and this refers to the use of self-managed teams, employee empowerment and involvement in decision making combined with multi-skilling.

**Design of the quantitative research instrument**

A self-completion survey questionnaire was designed to test employee attitudes on the concepts mentioned above. Questionnaires and structured interviews are closely allied since they both rely on a series of closed form questions to collect the data. The questionnaire was chosen as a method as opposed to structured interviews or other forms of quantitative research design for the following reasons. Self-completion questionnaires are more convenient for respondents because they can complete them when they want and at the speed they want. They are also said to be cheaper and quicker to administer (Bryman 2001). The questionnaire also made it possible to obtain data from a larger sample than would have been possible with the interview method in the time available. Another advantage that the self-completion questionnaire was thought to have over the structured interview in either the face to face form or by telephone relates to the question of bias. In the conduct of interviews
there is the possibility of bias being introduced. This can happen when the interviewer has strong views on the interview topics and this is accidentally made known to the interviewee by the way the questions are posed (Bell 1999). Interviewers may inadvertently give clues as to the type of responses they would like to hear (Powney and Watts 1978). It is acknowledged that different types of bias or distortion may also exist in the use of self-completion questionnaires to some extent. For example the researcher cannot be sure that the required respondent completed the questionnaire or that it was not completed in a group setting (Wilson 1996).

The discussion now moves on to describe in detail how the questionnaire was designed (ref Appendix1). A range of indicators was used as a form of measurement for the concepts that had already been identified and are embedded in the literature that was reviewed. These indicators took the form of a set of statements in which respondents were asked to rate in terms of their own beliefs and opinions against a five-point Likert scale. The Likert scale is one of the most commonly used methods for measuring attitudes in social science research (Bryman 2001:148). Oppenheim (1966) informs us that Likert scales tend to provide reliable data partly because of the range of answers permitted to respondents. He also asserts that they provide more precision in relation to respondents’ attitudes to each item because respondents usually prefer to choose a response from a scale rather than a simple agree/disagree choice (Oppenheim 1996). The five fold categorisation was chosen as opposed to seven because it was felt that respondents would find it difficult to delineate their responses to this degree. The indicators that were used in the design of the questionnaire are now described. Attitude to workplace learning as a dimension of the learning concept was measured using six indicator statements as follows.
a) I think the best way to learn how to do a particular job is through experience.
b) I think that the best way of learning problem-solving skills related to work is through work experience and being exposed to non-routine situations.
c) My learning is enhanced through trial and error, making mistakes and rectifying them.
d) I think that off-the-job training must be re-enforced with opportunities to practice the new skills back at the workplace.
e) My work provides me with opportunities to continuously improve my technical skill and knowledge.
f) My workplace provides an opportunity to develop an understanding of engineering concepts and theory.

Attitude to formal learning and the nexus between formal and informal learning as a dimension of the learning concept was measured using five indicator statements as follows.

a) The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.
b) My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.
c) The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.
d) I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.
e) It should be possible to obtain qualifications for the skills I learned at work.

Attitude to the social and participatory dimension of the learning concept was measured using the following three indicator statements.
a) A significant source of learning in my present job is through help and advice from colleagues and from observing others working.

b) If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.

c) My work skills and knowledge were mainly acquired through guidance from experts in the workplace and by reflecting on my own performance.

Three dimensions of the concept of work were of interest in this research namely, work organisation to facilitate learning, management support for learning at work and high performance work practices.

Six indicators were used as a measure of these work dimensions.

a) I learn and develop my skills better by working as a member of a team.

b) If I am given a broader range of tasks and more control over my work my learning is enhanced.

c) My learning is improved when I receive feedback and support from my supervisor/manager.

d) When given more responsibility at work, I learn more.

e) I think that the workplace should be structured to provide a pathway for novices to become experts over time.

f) I think that tasks should be structured in the workplace so that employees gradually move from tasks of low accountability to high accountability.

The final dimensions of the learning concept that were examined refer to the perceived need to engage in ongoing learning as it applies to work and whether
working and learning are regarded as synonymous. Seven indicator statements were used to measure employee attitudes to this as follows.

a) I consider myself to be a learner as well as an employee.

b) I need to carry on learning throughout my working life.

c) I consider learning to be a part of my work.

d) I regard working to be a way of enhancing my skill and knowledge.

e) Apart from earning a living I also work to enhance my learning.

f) After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work.

g) I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge.

Quantitative data analysis

The method of coding responses and data analysis will now be explained. In survey research the number of respondents expressing a view and the rating they give to it on the attitude scale are normally taken as an index of the strength of that view (Sim 1998). Using this logic the five points on the Likert scale were used directly to measure the strength of agreement with each of the indicator questions or statements (ref Appendix 1). The intention was to word the questions in such a way that responses of 4 or 5 on the scale indicate strong to very strong agreement with each statement. Conversely, where a respondent selects option 1, it indicates that he/she strongly disagrees with the statement. In this sense the questions can be regarded as pre-coded. The frequency of responses for each option on the scale, the median and mode response values were taken as a measure of attitude towards the concepts around which the research was based. The questionnaire responses also provided a
comparison between employee attitudes on workplace learning and lifelong learning in traditional and modern engineering companies. This is explained in more detail later in the chapter during the discussion on the selection of the research sample.

**Justification for a qualitative methodology**

With reference to this particular research problem, there are certain values and attitudes that influence employees’ willingness to engage in upskilling and lifelong learning and these values must be captured as part of the research. There was a need to uncover views, feelings and attitudes by probing and following up on leads and this can only be achieved through discussion. Likewise employers and company managers through their own agency may run their businesses in a manner in which they see fit, irrespective of Government aspirations of creating a high skills economy. This suggests that a qualitative approach to the research would also have utility for this research.

It will now be instructive to refer to some literature debates and theories that will help to support the decision to use some form of mixed methodology in this research particularly in relation to the concept of agency. Many positivists concentrate exclusively on the broad structural level of society and ignore individuals’ interpretation of the world, which are often very important as a means of enhancing our understanding of social phenomena. This dichotomy is referred to in the literature as the structure- agency dilemma (CLMS MI, U2).

The theory of structuration, which was developed by Anthony Giddens, attempts to accommodate the role of individual agents and social structures in the production and
reproduction of social phenomena (CLMS M1, U2). Giddens sets out his views on what he regards as structure and what he regards as agency in his theory. The term ‘structure’ refers to social structures, which include rules and resources. Giddens sees structure as being both enabling and constraining, because on one hand rules and resources can be used to guide actions and at the same time they can act as a constraint (Arts 2000).

In structuration theory the term agents refers to individuals who are integrated into social activity. Agents are regarded as being knowledgeable and are able to make judgements intuitively and act accordingly. They have the power to make a difference. Routines and tacit knowledge are major influences on how individuals act. Agents tend to act routinely in many cases and this behaviour is influenced by the need for predictable outcomes of their actions. There is also recognition within structuration theory that agents cannot predict the outcome or the consequences of all their actions. Even though agents have choice and have the ability to act freely they are still constrained by rules, resources and structures. However it is important to note that these restraining forces alone do not dictate social action. Agents may still decide to act otherwise having considered these factors (Arts 2000). Kilminster (1991) notes that:

One of the central beliefs of Giddens theory is that the agent is to be seen not as a ‘cultural dope’, i.e. not as a mere conforming approval seeking reflex of a central value system that the actor has successfully internalised and translated into motivations (Kilminster 1991:79).

As already implied the theory holds that individuals act knowledgeably and intentionally, bound on one side by objective institutions and on the other by their
unconscious. Giddens argues that the action of human agents involves the possibility of ‘doing otherwise,’ and by doing so empowers them to make a difference in the world (Kilminster 1991: 79).

**Design of the qualitative research instrument**

As explained above the concept of agency has application to this Irish engineering research question and therefore should form part of the research. It was decided that this could best be achieved through participant observation in the form of interviews that could be regarded as being positioned more in the direction of the qualitative end of the positivist/interpretivist end of the continuum. It was not considered necessary to adopt an ethnographic approach, which can involve extended periods of on-site observation. These observations or qualitative interviews are a means of seeing the work environment through the eyes of the research subjects. There is a need to ask individuals about their own perceptions and interpretation of events through descriptive detail. The feeling was that the survey questionnaire alone would not allow the full range of human experience to emerge and that some important data would be omitted. While the survey questionnaire can provide information on how individuals feel about workplace learning and skill formation, it is limited in terms of explaining why they feel the way they do.

In order to glean this type of information consideration was initially given to setting up employee focus group interviews within companies operating in the high and low value sector of the market. This method has some advantages over one to one interviews. It would allow participants to respond to comments made by other individuals in the group and therefore allow the researcher to observe the dynamics of
the group. It also facilitates the discussion on a range of topics in the one session. In spite of these advantages there are certain disadvantages associated with the focus group method, which have been identified by other writers. Firstly, the responses are not independent of each other because a few dominant members in the group can influence the responses given by others (CLMS M1, U4). Secondly, the data may be more difficult to record accurately and therefore to interpret than individual interviews. The ethical issue of sensitive or confidential information is also more difficult to deal with. Ethical issues are discussed in more detail later in this chapter.

In relation to the dynamics of the groups, while this may be important to observe for some types of research it was decided that this was not really relevant to this particular research. A significant consideration with regard to this particular research was the perceived difficulty in organising the groups. This refers to the problem of having a group of people, typically six to twelve released from their work at the same time for a period of possibly two to two and a half hours. This would be particularly problematic in a small company. For these reasons the focus group approach was not pursued and a decision was taken to use one to one interviews with a sub-set of those who completed the questionnaire.

Based on the insights gained during the literature reviews and on the questions which the research is trying to answer it was felt that some structure would be needed in the interview format, therefore a semi-structured format was adopted. The practical consideration of estimating the duration of the interviews was also an issue here because this is something that could impact on gaining access to the research sample. In the semi-structured interview certain major questions are asked the same way each time, but the interviewer is free to alter their sequence and to probe for more
information. This provides some flexibility in the research instrument, which can take account of different comprehension levels among respondents. It also allows the interviewer to handle the fact that respondents often answer questions that were intended to be asked later in the interview (Fielding 1993).

Having decided on a semi-structured format, the next stage was to design the interview topic guide. The interview questions are set out in Appendix 2. The topic guide contains 15 questions, which were mainly derived from the questions that were used in the survey questionnaire. The interview questions were also intended to supplement the questionnaire by asking more in-depth questions. For example respondents were asked about their formal technical qualifications, if any and how useful they found these qualifications to be in the workplace. In the case of apprentice trained employees this type of question allowed for a comparison to be made between the on and off-the-job phases of apprenticeship. Respondents were also asked about the need for any skill updating that might arise as a result of their company wanting to move its product range further up the value chain. The interviews were also used to explore employees’ views on the perceived benefit of ongoing learning to themselves as advocated in human capital theory. This is also where the notion of agency and choice was explored with regard to their willingness to engage in lifelong learning. The overall objective was to obtain some descriptive detail on respondents’ perceptions on the concepts that are embedded in the literature that was reviewed. The interviews were carried out with a sub-set of volunteers of those who completed the survey questionnaire. These face-to-face interviews were also regarded as a check on the validity of the indicators that were used in the survey questionnaire.
It was also considered necessary to explore employers’ perspectives on the need to move production strategies further up the value chain in the first place. Their views on the need for high level skills and work organisation to support learning were also thought to be critical issues that needed to be explored. The concept of agency with regard to these choices applies to employers as well as employees. The interview topic guide to solicit this information from employers is shown in Appendix 3.

**Ethical issues**

This section describes the type of ethical issues that were anticipated during the design stage of the research and how these issues should be dealt with during the research process. Firstly it was anticipated that the attitudes of older un-skilled or semi-skilled workers in the industry to undertaking training and development or the formal recognition of skills acquired in the workplace, may reveal information that is sensitive to this group. These individuals may not have any formal qualifications and therefore may feel threatened during any type of discussions related to qualifications. Revealing this type of information could cause embarrassment to workers and may also compromise them if it becomes known to their employer.

At the higher skill and professional levels it was anticipated that there might also be sensitive information on an individual basis that may emerge. For example, some senior personnel may have been appointed to their positions on the basis of their experience rather than professional qualifications. This information would obviously be sensitive to the individuals concerned and they would possibly object to it being made public or known to their peers. The willingness of workers to discuss the shortcomings in the training and vocational education they underwent was also
thought to be a potential area of sensitivity. Revealing skill and knowledge gaps in their training could reflect badly on them in the eyes of their employers and jeopardise future promotional prospects. For the same reason, during this type of research, employees may be reluctant to criticise company policy on staff development and continued professional development, e.g. lack of financial support and time off to undergo training.

There are also ethical issues on an organisational level related to data collected from company managers and company owners. Certain information related to training and development could be considered sensitive and confidential by managers. Companies may have developed a competitive advantage through investment in particular types of training and development and may not be prepared to have this information known to their competitors. For companies who have invested heavily in staff development there is a risk of having these highly trained staff poached by competitors. On the other hand companies who do not support employee development either financially or by providing development during working hours may not want this stated publicly. It may be seen in a negative light when trying to recruit staff. They may see it as the role of individual employees to take responsibility for their own training and development. Alternatively they may be happy to continue to operate with a small cohort of highly qualified staff who in turn can direct and supervise the work of the majority of the staff. The researcher was of the view that company managers and employees may not be receptive to discussing these issues and therefore would need assurances about confidentiality and anonymity.
How ethical issues were dealt with

The issues raised above are peculiar to this research and had to be addressed by the researcher. The decision not to use focus groups as part of the qualitative research was influenced by these ethical issues. However, it was also envisaged that most of the ethical issues could be dealt with at the stage of gaining access and consent. It was recognised that the use to which the research data will be put would be of concern to those who took part in the research and would also influence their decision as to whether or not to take part. This raised the problem of gaining informed consent, which is also an ethical issue in itself with regard to any qualitative type research interviews. Informed consent refers to what it is that you think you are asking people to give consent to and what rights you think you have in using the information given to you (see Mason 2002). For this particular research it was firstly necessary to obtain the employer’s permission to carry out the research within the company and in doing this it was acknowledged that the employer may even nominate certain people to take part. This dilemma forms part of what was referred to as informed consent above. In this context, how much choice would employees feel they really have about participating? The researcher acknowledged the persuasive influences that may act on an employee from his/her employer or even from the researcher, all of which may influence potential interviewees into agreeing to participate.

The methods used to address these anticipated ethical issues in the design of the research instrument and in gaining access and agreement to participate is now outlined. It was important to have anticipated questions, which relate to confidentiality during the stage of trying to gain access and in convincing gatekeepers of the credibility of the researcher. The methods used to build trust are now described.
One of the most important things to communicate to prospective interviewees and company owners is that confidentiality and anonymity will be guaranteed. This was addressed by making the objectives of the researcher clear, such as explaining that the main purpose of the research is to gain a qualification. This was explained initially through a covering letter to the employer (Appendix 5) which emphasised this point and then verbally at the interview stage. A covering note was also attached to the questionnaire explaining the purpose of the research (Appendix 4). Employers were also given copies of the interview topic guides for the employee interviews and for the employer/manager interviews in advance. It was explained how the data might be disseminated when the research is complete. The offer was made to read back the transcripts of the interviews to respondents for their final approval. Finally in relation to building trust, it was made clear to the participants that they could withdraw their consent at any stage of the process. In carrying out the fieldwork the researcher ensured that the interviews were conducted in familiar surroundings where people could talk freely without the risk of being overheard. This was facilitated by management in each of the companies.

Apart from building trust, the most important thing was to assure the participants that any identifying data would be removed from the results, both for individuals and for companies. Consideration was initially given to using pseudonyms etc for replacing identifying data when writing up the results. However, on further consideration it was decided to differentiate the companies by referring to them as company A, B etc and to refer to interviewees by occupational type e.g. Welder, Metal Fabricator etc.
Pilot testing the research instrument

Pilot testing of research instruments is an important aspect of the research process and is always desirable. This is to ensure that the research instrument/s work as intended (Bryman 2001). With regard to the self-completion questionnaire it was important to ensure that the questions were clear and intelligible to respondents given that individuals may be required to complete them without the presence of the researcher. The questionnaire and the employee interview topic guide were pilot tested on two occasions with two different groups. The sample for the tests comprised workers from each of the categories that the research was intended to cover, i.e. individuals employed in both modern high value added production companies and traditional engineering companies. The pilot sample also included workers with different skills levels and different levels of qualification. On both occasions the pilot test of the questionnaire was conducted in a group setting. The groups who took part were involved in a period of off-the-job training in two different FÁS training centres when the pilot testing was carried out. The researcher is an employee of FÁS and was therefore able to gain access to the samples for pilot testing by contacting different training centres and asking for cooperation from the trainers who were carrying out the off-the-job training for these employees.

The process used to test the research instruments is now outlined. A covering note (see Appendix 4) was attached to the questionnaire, which explains the purpose of the research and some background information. Respondents were asked to read the cover note individually in order to check their understanding of what the research was trying to achieve. The level of understanding among the groups was deemed to be satisfactory and no significant adjustments to the covering letter were considered
necessary. The group members were then asked to complete the questionnaire individually without conferring. When the questionnaires were completed the respondents were asked for feedback on their understanding and clarity of the questions. They were also asked for any suggestions as to how any of the questions could have been improved based on what the research was trying to achieve. After pilot testing and consideration of subsequent data analysis it became obvious that some questions needed to be reworded to facilitate the analysis. The intention was that all questions should be structured in such a way that responses towards the high end of the Likert scale would indicate agreement with the hypothesis that was being tested and vice versa.

On examination seven questions were found to be worded in such a way that responses at the high end of the scale indicated disagreement with the hypothesis. An attempt was made to reword these questions accordingly without changing their meaning. Five of the questions were reworded and the remaining two were left in the original format. These two questions were too difficult to reword without losing some meaning and because of the nuances that were implicit in the original phrasing. On reflection it was also felt that by leaving these two questions in the original format it would act as a cross check on the integrity of the responses. This however presents a difficulty during the analysis of the scores. This was overcome by reversing the scores for these questions during analysis. The following example is provided to illustrate how some questions were reworded. Question 14 originally read: *My engineering skills and knowledge were mainly acquired through formal training and education rather than at the workplace.* This question was reworded as follows: *The engineering
skills and knowledge that I rely on most were mainly learned in the workplace rather than through formal training and education.

Secondly, there were a few questions that may not be applicable to employees who are working in areas where they have little autonomy or decision making authority. For example question 12 originally read: *By interacting with clients and customers my performance at work is enhanced.* This question was reworded as follows: *If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.*

Volunteers from the groups were also sought to pilot test the interview topic guide (Appendix 2). In general the interview topic guide did fulfil the intended purpose of obtaining more in depth qualitative information from the respondents who took part in the pilot. Minor adjustments were made to the topic guide based on some areas of clarification that were sought by some of the volunteer participants.

**Research sample and access negotiation**

The next stage of the process involved identifying suitable companies to participate and to negotiate access. The research sample was chosen from a range of companies from what was described as the modern sector and the traditional sector in Chapter 1. Recall that the modern sector was said to be dominated by larger companies who manufacture sophisticated proprietary products aimed at the global market. The traditional sector on the other hand is dominated by Irish companies, which are said to be mainly involved in the manufacture of low value added products for the home market. The aim was to split the research between the two types of organisation. The
intention was to compare perceptions about workplace learning, lifelong learning and skill formation within the two sectors of the engineering industry. Apart from the comparison between the groups the data was expected to test theory that was reviewed in the literature in Chapters 2 and 3 in the Irish engineering context.

The planned sample size for the self-administered questionnaire was 100 and the planned sample size for the face-to-face employee interviews was 20. It was also planned to interview the employer/manager from each participating company in addition to this. The companies who were asked to participate were identified through discussions with the Services to Business section of FÁS (The Irish Training and Employment Authority). The researcher is also an employee of FÁS and was able to gain access to information on the make up of the engineering industry in Ireland from data which is held in FÁS e.g. company categorisation in relation to NACE codes, size and process capability. The company identification and selection was also informed by data that was collected from a recent study commissioned by FÁS entitled, *A study of the human resource requirements for a competitive metals and machinery industry in Ireland*. The companies who participated are therefore regarded as being a representative sample rather than a convenience sample.

Initial contact was made with companies by telephone to explain the purpose of the research and to request their participation. While all companies who were contacted had no fundamental objections in principle to taking part in the research the process of gaining tentative agreement with four companies from the list took some time. This was mainly due to normal business pressures and the associated difficulty in contacting the owner or appropriate manager at a convenient time where he or she
could devote some time to consider the request to participate. The workload of companies at the time the call was made was another issue. Some managers made comments such as, “yes I would like to help you out but the timing is bad for me at the moment”. Eventually tentative agreement was obtained with four companies to participate. Further information was sent by post including, covering letter, copies of the questionnaire and the interview topic guides. This was followed up by a further telephone call to secure final participation agreement and arrangements made to visit the company.

**Sample company details**

Four companies were selected to take part in the research, two traditional and two modern engineering companies. In order to protect the identities of the companies they will be referred to as Company A, B, C and D from now on. A and B being the traditional and B and C are referred to as modern.

Company A is owner managed and was established in 1990 when it employed just four people. The company now employs 35 people. It has a capability to fabricate products and structures in mild steel, stainless steel, aluminium, brass and copper, which can be crafted to suit individual project requirements. Most of the work the company is engaged in is for architectural and construction use. The company has process capabilities which include welding, pressing and forming, CNC press braking, conventional and CNC machining and 3D CAD drawing/design. The workforce consists of Product Designers, Draughtsmen, Metal Fabricators, a Sheet Metal Worker, a Fitter/Turner, a Spray Painter and Engineering Operatives. The majority of the employees are Metal Fabricators some of whom are still undergoing training.
under the Standards Based Apprenticeship system. It was explained in Chapter 3 that Metal Fabrication, Fitting and Toolmaking are all designated trades where individuals qualify through a formal apprenticeship system. The company is regarded as a traditional engineering company because it does not manufacture any proprietary products or have any proprietary process technology and its product range falls within the NACE sub-sector codes 27-28.

Company B is also owner managed and has been in existence for 10 years. The company is mainly involved in design and fabrication of lifting and mechanical handling equipment such as hoists and overhead cranes. The company has process capability in metal fabrication, welding, mechanical assembly, hydraulics and product design. The company now employs 30 people. The workforce consists of Designers/Project Engineers, Welders, Metal Fabricators, Fitters and technical sales personnel. This company is regarded as traditional for the same reasons as Company A. The product range of this company falls within the NACE Code categories that were listed for traditional engineering companies in Chapter 1.

Company C is regarded as a modern engineering company. It manufactures electrically driven submersible pumps aimed at a global market. The company was founded in 1973 as a subsidiary of a German company. The parent company has since been bought by a Swedish company. During the 1990s the Irish plant embarked on a World Class Manufacturing strategy and took responsibility for its own research, development and marketing. The Irish plant employs 200 people. The workforce consists of Engineering Operatives, Machinists, Toolmakers, Fitters, Design Engineers and managers. The management team at the plant are all Irish. The
Company D is also regarded as a modern engineering company because it has developed its own proprietary products. This company is Irish owned and was established in 1982 as a small general engineering company. Over the years the company expanded its technical capabilities and developed expertise in particular engineering specialisms. It now regards itself as a leading manufacturer of bespoke and own design stainless steel products for the pharmaceutical, construction, healthcare and food industries. The company also has its own branded product range of stainless steel solutions covering a range of applications. The company now employs 120 people. The company has process capability in general engineering design, special purpose machine building, fabrication, machining and laser cutting. The workforce in the company consists of Production Operatives, CNC Operators, Fitters, Metal Fabricators professional and associate professional Engineers as well as technical sales personnel.
Fieldwork

The fieldwork was carried out over a period between September 2006 and November 2006. The researcher arranged to visit the companies with the owners in the case of the traditional companies and with a management representative in the case of the modern companies. In all cases the initial contact was made with the companies by telephone. As explained in the paragraph on access negotiation copies of the research questionnaire were sent to the employer/manager in advance of the visit by the researcher. The research instruments used for the field work which consisted of a self completion employee questionnaire (Appendix 1), an employee interview topic guide (Appendix 2) and an employer/manager interview topic guide (Appendix 3) were already described. In all cases the interview data was collected by note taking.

In the case of company A, at the suggestion of the employer, the covering letter and questionnaire were posted on the company notice boards in advance of the company visit. The process began with an overview of the company given by the owner/manager followed by an interview based on the interview guide as shown in Appendix 3. The interview and company overview lasted about one hour. This was followed by a tour of the premises and observation of the work in progress. Copies of the covering letter and questionnaire were handed out to employees by the owner/manager during this period and they were asked to participate. The researcher was given the use of an office and employees were asked to return the questionnaires to the researcher as soon they had completed them. As the questionnaires were returned the researcher asked respondents would they be willing to participate in the one to one interviews as a further part of the research. Twenty completed questionnaires were returned. This represented the full technical workforce who were
present. The remainder were working offsite on the day. The intention was to interview at least six employees from this company spanning the range of occupations within the company. Each individual who agreed to be interviewed was given a time slot to return to the office. Six individuals took part in the interviews. The interviews were based on the topic guide shown in Appendix 2. Each interview lasted between 20 and 30 minutes.

The date of the visit to Company B was arranged with the owner based on a telephone conversation. The production supervisor had been informed of the planned visit by the owner in advance. The fieldwork began with a meeting with the owner/manager who gave an overview on the company background, the composition of the workforce, the production capability and future plans. This was followed by the interview based on the topic guide as shown in Appendix 3. The discussion and interview with the owner manager lasted about one hour. The next stage of the research process involved the employee questionnaires and interviews. The owner introduced the researcher to a project engineer who completed the questionnaire and agreed to be interviewed. The interview lasted about 30 minutes. This was followed by an introduction to the production supervisor/foreman. The supervisor took the researcher on a tour of the premises and introduced the researcher to the employees as the tour progressed. The employees were asked to take part in the research at this stage. The questionnaires and covering letter were distributed at this time. The supervisor compiled a list of the employees who had agreed to complete the questionnaires and allocated an office for the researcher to carry out the remainder of the employee interviews. As the questionnaires were returned the researcher asked certain individuals to take part in one to one interviews. Sixteen completed questionnaires were returned. As with
company A, a number of employees were off site on the day of the research. Eight of the employees in total who completed the questionnaires took part in the interviews. This included the supervisor/foreman. Each employee interview was based on topic guide shown in Appendix 2 and lasted between 20 and 30 minutes.

The fieldwork in Company C was also carried out over a full day. The agreement for the company to participate in the research was secured with the Training and Development Manager based on a telephone conversation. The questionnaires and covering letters were sent to the Training and Development Manager in advance of the company visit. He volunteered to distribute and collect the completed questionnaires and to identify individuals who would take part in the interviews. The sample for the interviews spanned a cross-section of the workforce. When he had collected the completed questionnaires he contacted the researcher and agreed the date for the visit. The fieldwork commenced with a discussion with the training and development manager on the history of the company and details of the product range and production capability. This was followed by the employer/manager interview who in this case was the Training and Development Manager. This process took about an hour and a quarter. This was followed by a tour of the plant. The remainder of the day was devoted to the employee interviews. A room was allocated for the interviews and the individuals were scheduled for interview at intervals of 45 minutes approximately. This schedule had been arranged by the Training and Development Manager in advance. The interviews lasted between 20 and 30 minutes and were based on the topic guide shown in Appendix 2. Twenty seven completed questionnaires were returned and nine employees took part in the one to one interviews.
The company referred to as D, which was the other modern company, had initially agreed to participate fully in the research based on the outcome of a telephone conversation with the HR Manager and having received copies of the questionnaire, covering letters and interview topic guides. Subsequently, one of the company production managers did not consent to the employee interviews because of the disruption it would cause to the production schedules. The company did however agree to distribute the questionnaires and to provide an employer/manager interview. A company visit and interview was then arranged with the HR Manager. Twenty completed questionnaires were collected by the researcher on the day of the visit. The interview with the HR Manager lasted about one hour.

Data presentation and analysis

The qualitative data is presented thematically as a narrative combined with direct quotations from respondents based on the four company case studies. This is supplemented with a summary based on patterns of results across the four case studies. With reference to the interview topic guides (Appendix 2 and 3) it can be seen that the themes or issues that were investigated were already well defined by the questions that were posed. This is despite the fact that the questions were generally open ended. An example of this can be illustrated by referring to the question where employees were asked for their views on learning at work as opposed to learning in a more formal classroom type setting (Appendix 2 Q 5.) This question is focussed on two themes namely informal learning in the workplace and structured off-the-job learning. The interview format therefore eliminated the need for any significant data reduction and coding as part of the data presentation. Patterns of results and conclusions could therefore be seen as part of the data collection process. As stated
already, the quantitative data is presented in the form of descriptive statistics using tables. The expectation at the outset was that the questionnaire survey data and the interview data would complement each other as a means of building a more complete picture of the reality. The data is therefore presented in a way that shows the correlation between the data sets for each case.

**Summary and concluding remarks**

This chapter provided a brief review of social science research methodologies in order to support the decisions that were taken on the research design. The rationale for using a mixed methodology for this research was explained. The design of the research instruments was explained in detail for both qualitative and quantitative aspects. The ethical issues that were considered during the design stage were also covered and how these issues were handled. Details of how the research instruments were pilot tested were outlined. The selection process for the research sample and how access to the participating companies was negotiated was also described. The chapter concluded with details of the sample, fieldwork and how the data was subsequently presented and analysed.
Chapter 5

Data presentation

Introduction

The data is presented on the basis of four individual company case studies as explained in the last chapter. The data collection strategy was the same for each organisation. The interview questions (see Appendices 2 and 3) were framed around the themes that the research is based on. In each case the employer interview data is presented first. This is followed by the employee interview data which is also presented thematically using the following headings:

- Formal Qualifications
- The need for ongoing learning and upskilling for higher value added production
- Workplace learning and opportunities for ongoing skill development in the workplace
- Formal recognition of workplace learning
- Teamworking, learning through participation and work organisation
- In-company training provision and training supply issues
- Attitudes to work and learning at work
- Sources of learning

The interview data has been worked into a narrative which includes quotations from respondents. This is followed by the presentation of the self-completion questionnaire data. The raw data from the questionnaires was initially transferred to a spreadsheet format to facilitate analysis as shown in Appendices 6 to 9. The expectation at the outset was that the questionnaire data and the employee interview data would
complement each other by generating quantitative and qualitative findings on the same issues for each Case Study.

Company A Case Study – Traditional engineering company

The discussion begins with the data that was recorded during the employer interview.

In reply to the opening question on the need to move his production process further up the value chain, he responded by saying that he is always looking at new products and trying to move up the value chain. Until recently 99% of production was for the home market aimed at the architectural engineering market. The company has now negotiated some export orders. While he welcomes all types of work he emphasised that the company specialises in crafted products to suit individual project requirements

*We have an impressive client list. We have been involved in some high profile projects around the country* (Owner Manager Company A).

He responded to the question on how to deal with any skill deficiencies that may arise as a result of a move further up the value chain by saying that greater use might need to be made of external courses and by utilising assistance from state agencies by way of mentoring and coaching.

The question of how useful the engineering qualifications that workers bring with them to the organisation was answered with reference to those who joined the company having undergone full time VET and for those who were apprentice trained. With regard to drawing office staff that had undergone full time courses in Institutes of Technology (full-time VET), he reported that their industrial knowledge was poor. Their engineering knowledge was often lacking although their drawing skills and
knowledge of the computer aided draughting software was good. With regard to those who had undergone apprentice training as Metal Fabricators he was critical of the standard of training during the off-the-job phases of the Standards Based Apprenticeship System. He went on to say that:

*The off-the-job training is hopeless, it's too easy, the standards are set too low and the content is poor* (Owner Manager Company A).

He also referred to two of his employees who were working as Metal Fabricators that did not serve any formal apprenticeships. He regarded these two employees as being just as skilled and competent as those who had gone through formal apprenticeship training. They learned all their skills on-the-job while in this company. He used this example to illustrate the effectiveness of workplace learning.

In relation to skill transfer from one location to another, he believes that engineering skills transfer can be effective between companies. He believes that it is possible for people to join this particular company with all or most of the requisite engineering skills. In relation to the importance of the social relations aspect of the workplace and the relationship between working and learning which were referred to in the interview topic guide, he believes that teamworking is important and it is something that he tries to build into the working arrangements. The relationship between working and learning was seen by him as a very individual thing. Some people learn better at work than others. He is open to the idea of restructuring the organisation of the company to facilitate learning, although he feels such a structure already exists.

*In general I try to give people as much autonomy over their work as is reasonably possible. I know the capability of the staff; they are all highly*
motivated and highly skilled. You can see this in the quality of the work they produce (Owner Manager Company A).

In relation to formal recognition of skills that are acquired in the workplace he reflected that this may not always be fair to those employees who undertake formal study on a part-time basis. He then went on to say:

Recognition should be more than financial. RPL would be useful if standards that are applied are even (Owner Manager Company A).

He believes that Government agencies have a role to play in helping companies to raise their skill levels.

FAS already played an important role in the development of this company and raising skill levels. County Enterprise boards also play a role here (Owner Manager Company A).

He singled out the apprenticeship system for criticism again in responding to this. The design and standards that apply in apprenticeship are the responsibility of FÁS, which is a state agency.

The apprenticeship system needs to be tightened up (Owner Manager Company A).

The question of how workplace learning can help in raising skill levels among employees was answered by saying that:

I think on-the-job-training is better for skills training than off-the-job (Owner Manager Company A).

Work structures and the question of how work places should be structured to promote learning among novices and experienced workers was answered by saying that jobs should be broken down into their component parts for novices and that the more
important work assigned to experienced workers with the complexity of the work increasing over time. He also referred to teamwork and photographs of completed work pieces installed in situ as motivators particularly for novices. He did not see the comment that, small and medium sized firms are reported to spend little on training, as being relevant to him. The reason he cited for this is that most of the training is carried out through the apprenticeship system and that the off-the-job phases of apprenticeship are funded through FÁS with no direct cost to him. He also referred to training as an ongoing issue which takes place on and off-the-job in this company.

Training is encouraged and rewarded here (Owner Manager Company A).

Employee interviews – Company A

The information that was collected during the employee interviews is now presented. Six employees were interviewed as part of this case study. The topic guide for these interviews is shown in Appendix 2. The employees who were interviewed spanned across all of the technical occupations within the firm. The findings are now presented using the theme heading referred to earlier.

Formal qualifications

Respondents were asked initially what formal engineering qualification they had and how useful these qualifications were in helping them in performing their jobs. Within this cohort, two of the respondents had no formal qualifications such as an apprenticeship or a third level engineering qualification but did not see this as a disadvantage. They both learned all of their skills in the workplace. One had completed the senior cycle in second level schooling and attained what he described as high level grades in his Leaving Certificate. The remainder had formal technical
qualifications, such as apprenticeships and some additional post apprenticeship qualifications that were acquired on a part-time basis. One of the respondents was qualified to degree level in an engineering discipline, which was acquired through full-time VET. One of the respondents had qualifications that are regarded as associate professional level which he had acquired on a part-time basis after he had completed his apprenticeship. The main issue to emerge from the question of formal qualifications and how useful they are, was that these individuals learned more in the workplace than at college or in an off-the-job context. For example a Sheet Metal Worker who had served his apprenticeship in the UK where he spent one day a week in college said:

\[I\] learned more in the workshop than at college during my apprenticeship.

\[I\] learned a lot of short cuts in the workshop. Most of the time this was a good thing (Sheet Metal Worker).

One respondent who was working as a Technician and had studied computer aided design on a part-time basis in college remarked:

The course was good but you needed to be working as well. The course on its own wasn’t enough (Technician).

A design engineer said that he had used the same design programme in college as he now uses at work. While he was fairly proficient in using the programme when he started work, as a result of his college training and education, he learned most of his skills as a designer in the workplace.

A lot of stuff we learned in college on ‘Solidworks’ just weren’t sufficient for what’s needed at work (Design Engineer).

A Metal Fabricator said he learned a lot of theory during the off-the-job phases of his apprenticeship.
He then went on to say:

…the off-the-job training was poor for practical training because the standards required to pass the practical exams were not high enough

(Metal Fabricator)

The questions on formal qualifications were not relevant to the two individuals who had no formal qualifications. However they did not see this as a disadvantage because they already felt very competent to do their jobs.

The need for ongoing learning and up skilling for higher value added production

The question of how individuals perceive the need to go on learning and upgrading their skills throughout their working lives was answered in a consistent manner by all respondents. The workplace itself was seen as the main vehicle through which this can best be achieved. This is evidenced by the following quotations:

Everyday is a learning day - I’ll always be learning – you never have enough knowledge - learning is something I enjoy (Metal Fabricator).

You never know it all (Spray Painter).

I am constantly upgrading my skills at work (Metal Fabricator).

All my engineering production knowledge was acquired since I started working and this knowledge was acquired in the workplace (Design Draughtsman).

Yes definitely. It’s got to be worth a wage rise though. If I’m learning I’m worth more to the company than someone whose not up skilling (Sheet Metal Worker).
There were consistent views on how this company may need to up-skill the workforce in an attempt to move production further up the value chain. Some respondents felt that the skill levels that already existed in the company were very high and that skill would not be a limiting factor in taking on more complex work.

There is a big variety of work done here already, 50 percent of the staff here already have the skills to do more complex work. The best way would be to train here on-the-job. You would pick up more skill and knowledge here (Metal Fabricator formally trained).

We can tackle most jobs here (Metal Fabricator without formal qualifications).

One respondent remarked that the best way to address any skill deficiency would be to bring in experts to train people on site.

You would then be learning in your own environment (Design Draughtsman).

Another respondent held a similar view; he felt that more skill and knowledge would be picked by employees through some form of on-the-job training.

**Workplace learning and opportunities for ongoing skill development in the workplace**

There were some divergent views on the value of learning in the workplace as opposed to learning in a more formal classroom type setting. One respondent made the comment that there are some things that cannot be learned in the classroom, for example what tolerances to apply when designing certain fabricated structures. Another view was that a balance between the two is ideal:

They really go hand in hand. The emphasis is on qualifications these days and the need to hold formal qualifications (Sheet Metal Worker).

This led him to believe that formal learning has become more important. Another view expressed by a Metal Fabricator is as follows:
You learn a lot more on the job. You make something, you fit it in place and you see the finished product (Metal Fabricator).

Respondents were also asked about their jobs and whether they had the opportunity to acquire higher-level engineering skills and knowledge in their workplace and if not why. If the answer was yes they were asked – in what ways. This question was framed to gain some insights into the difference between traditional and modern companies on skill levels and skill formation processes. In general the respondents in this company did feel that the work is challenging and therefore it provides constant opportunities to acquire higher-level skills. The most common type of response to this question was that every day is different and that there are different issues to be dealt with every day such as different problems to be solved and dealing with different customer requirements. One respondent asserted that more elaborate work is coming in all the time. A Metal Fabricator also pointed out that even though he was qualified when he started with the firm he is still constantly learning. On the other hand another respondent remarked that:

Metal fabrication is metal fabrication (Metal Fabricator).

He went on to say that he was already working at a high skill level anyway.

There were a number of similar unequivocal views on the question of what type of learning can only be carried out in the workplace. These responses included faultfinding, quality control, man-management skills, production methods, knowledge of specific pieces of plant and machinery, people skills and problem solving. There were negative comments about learning in a college environment such as:

...in college there are no consequences if you mess up ... you learn a lot by rectifying mistakes in the workplace (Design Draughtsman).
Sending people away to a college to learn doesn’t always work – the courses are not specific enough (Design Draughtsman).

Reference was also made to the value of practical experience and hands on learning, which occurs in the workplace.

Specific pieces of plant and machines can only be learned in the workplace (Sheet Metal Worker).

Nothing beats the practical knowledge you get on-the-job (Metal Fabricator).

**Formal recognition of workplace learning**

The formal recognition of learning that occurs in the workplace was not something that respondents had given any thought to in general. One respondent commented that it was not relevant to him because he had served an apprenticeship and therefore the skills he learned at work were already recognised. In general though, when prompted, all respondents felt that the idea was good if some method could be devised for measuring it and applying accreditation to it. The predominant view when probed on this issue was that individuals could submit workpieces which are vouched for by an employer or could be given a test, which would lead to a certificate.

**Teamworking, learning through participation and work organisation**

Teamworking does exist in this firm and in general it is seen as good method of learning. There was however some reservations about teamworking. Some respondents remarked that it depends on who is in the team with you. It was also pointed out that some aspects of the work do not lend themselves to teamworking. Some positive aspects of teamworking were identified such as, observing and learning from more experienced workers. Monthly team meetings had been initiated by the
company owner and these were seen as a good form of communication and had helped greatly to improve quality. Workers who are the only ones in the firm doing a particular job, such as spray painting, or sheet metal work did not see how teamworking could be relevant to them. The notion that they still needed to interact with others was not considered to be an issue for them and therefore they did not really consider this as an aspect of teamworking.

*It’s a good way of learning, you learn from older more experienced guys* (Metal Fabricator).

*You can confer and get advice from colleagues – this really helps me to learn* (Design Engineer).

On the question of regarding learning as a form of participation through social interaction and communities of practice such as the apprentice/craftsman relationship the general consensus was that this is the ideal way to learn and that it is an essential part of the learning process. The prevalent view was that working with experienced peers in a protected environment provides a rich and expansive learning environment and newcomers need to start at the bottom to really learn how things work.

*I’m big into this concept there’s no substitute for this* (Metal Fabricator).

*Its essential – only way young lads learn – it also keeps you learning as well – forces you to think. The lads reckon (apprentices) they learn more here than they do when they are in college* (Sheet Metal Worker).

*Even though I was never an apprentice I can see that the apprenticeship model is good. I learned in this way myself when I started work here after college. I found it was a good way of learning* (Design Engineer).
There was only one negative comment on the concept of Communities of Practice. While the respondent felt that it is a very good way of learning he went on to say that it can be restrictive in some instances because:

You can only learn what they know; therefore off-the-job training is also important (Spray Painter).

The question of how workplaces should ideally be structured to facilitate learning produced fairly similar answers. Mentoring and coaching from specialists was seen as worthwhile. One respondent remarked on the fact that he progressed within the company from general operative to apprentice, he then became a craftsman and is now a technician and this was a very positive reflection on the way the firm is structured. A work structure where individuals are gradually given more responsibility and more complicated work over time and working with more experienced colleagues seemed to be the general consensus on the ideal form of work organisation. One respondent remarked that time is always an issue and this impinges on people’s ability to learn. This response related to the pressure to meet production deadlines and therefore learning was really a secondary issue for workers and employers. Some respondents regarded structure as something that is dictated by the type of work being carried out. Overall, in relation to structure respondents regarded themselves as having a good deal of autonomy and control over their own work and quality assurance. One respondent referred to his own experience in this firm, which he regarded as the ideal structure. The example he cited is similar to the apprenticeship model.
I started here as a complete novice, got lots of help originally. Gradually I was given more responsible work to do. I wasn’t thrown in at the deep end – was helped along (Design Engineer).

Another respondent commented on his own experiences in the firm as being particularly useful in maximising learning.

I get the chance to interact with outside clients, this is good (Design Draughtsman).

In-company training provision and training supply issues.

Respondents were asked did they think employers would provide structured training for employees without Government intervention. One respondent remarked:

Probably not, why should they, its all about making money (Metal Fabricator, not formally trained).

Other respondents felt that many employers are only interested in obtaining training grants or that they may send one or two employees for training for a new product and expect them to pass on the knowledge to others. The issue of how existing engineering courses that are available could be improved to facilitate people who are already in employment did not provoke many wide ranging responses. Generally it was felt that it is an individual choice to attend part time courses. The idea of alternative delivery methods such as on-line learning and availability of relevant part time courses did not arise with the exception of one respondent. He asserted that there is often a mismatch between the courses that are available and what is required by engineering employees.
Attitudes to work and learning at work

When respondents were asked did they regard work as simply a means of making a living or did they regard it as something more than that, the responses were quite varied. Initially many of the respondents said that it was just a means of making a living or a means to an end. However, when probed on these responses it emerged that work really meant something more. Some respondents went on to say that it is a form of identity. One respondent referred to it as a means of character forming and a means of facilitating social well being and a means of moulding the person. One respondent who saw work as just a means of making a living went on to emphasise that he saw no conflict between this view and the fact that he is constantly learning at work. A trend to emerge in these responses was that job satisfaction means a lot. The following comments were typical of the responses.

- *It’s something more than that…has an impact on your life, you’ve got to enjoy the work… it gives you self esteem* (Metal Fabricator/Coded Welder).
- *I have a good interest in work. I regard work as a way of learning and I value what I learn at work* (Apprentice Fitter).
- *It’s a bit more… I had a chance to retire… took two months out and got bored. Job satisfaction means a lot to me* (Working Charge hand).

Sources of learning

The final question that was posed asked respondents to rate eight different learning sources in terms of their usefulness, one being the optimum. The range of options included learning sources that can be regarded as forms of acquisition and learning sources that can be regarded as forms of participation. The participatory sources of learning are closely aligned with workplace learning. The results of this question are
shown in the table below. With reference to the table which is based on 6 interview responses it can be seen that participatory sources of learning, i.e. working with more experienced colleagues, observing others and practice in doing the job were all rated highly. Working with more experienced colleagues was regarded as the best and second best way to improve job performance by one and three respondents respectively, while practice acquired by doing the job was regarded as best by four respondents. Observing others was regarded second best by three respondents.

<table>
<thead>
<tr>
<th>Rating 1-8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training courses organised by your employer</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Observing others</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Working with more experienced colleagues</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Machine Manuals</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Trial and Error</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Reflecting on performance</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Drawing on skills/knowledge you learned during your formal training</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Practice acquired by just doing the job</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Zero indicates that there were no responses against this particular rating.

**Self-completion questionnaire results – Quantitative data**

The questionnaire results are presented in tabular form based on the frequency of responses for each response score option. With reference to Table 1, the indicator statement responses are aggregated for each of the five dimensions of the concepts of learning and working that were identified in the design of the research instrument as explained in the Methodology Chapter.
The results of the self-completion questionnaire are presented in Table 1 below.

### Table 1. Company A - Results of Self-Completion Questionnaire based on 20 respondents

<table>
<thead>
<tr>
<th>Workplace Learning</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. I think the best way to learn how to do a particular job is through experience.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>10% (2)</td>
</tr>
<tr>
<td>5. I think that the best way of learning problem-solving skills related to work is through work experience and being exposed to non-routine situations.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>6. My learning is enhanced through trial and error, making mistakes and rectifying them.</td>
<td>0% (0)</td>
<td>15% (3)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>8. I think that off-the-job training must be re-enforced with opportunities to practice the new skills back at the workplace.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>10. My work provides me with opportunities to continuously improve my technical skill and knowledge.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>11. My workplace provides an opportunity to develop an understanding of engineering concepts and theory.</td>
<td>5% (1)</td>
<td>20% (4)</td>
<td>10% (2)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>0.83%</td>
<td>7.50%</td>
<td>18.33%</td>
</tr>
</tbody>
</table>

### Learning as participation versus learning as acquisition

<table>
<thead>
<tr>
<th></th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.</td>
<td>20% (4)</td>
<td>15% (3)</td>
<td>40% (8)</td>
</tr>
<tr>
<td>14. My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.</td>
<td>5% (1)</td>
<td>5% (1)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>20. The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
<td>5% (1)</td>
<td>10% (2)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>24. I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>25. It should be possible to obtain qualifications for the skills I learned at work.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>6%</td>
<td>6%</td>
<td>22%</td>
</tr>
</tbody>
</table>

### The social and participatory dimensions of the learning concept

<table>
<thead>
<tr>
<th></th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. A significant source of learning in my present job is through help and advice from colleagues and from observing others working.</td>
<td>10% (2)</td>
<td>15% (3)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>12. If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.</td>
<td>0% (0)</td>
<td>20% (4)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>17. My work skills and knowledge were mainly acquired through guidance from experts in the workplace and by reflecting on my own performance.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>3.33%</td>
<td>13.33%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Table 1. Company A - Results of Self-Completion Questionnaire based on 20 respondents (Cont.)

<table>
<thead>
<tr>
<th>Work organisation to facilitate learning, management support for learning at work and HPWPs</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I learn and develop my skills better by working as a member of a team.</td>
<td>5% (1)</td>
<td>5% (1)</td>
<td>35% (7)</td>
</tr>
<tr>
<td>9. If I am given a broader range of tasks and more control over my work my learning is enhanced.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>2. My learning is improved when I receive feedback and support from my supervisor/ manager.</td>
<td>0% (0)</td>
<td>15% (3)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>3. When given more responsibility at work, I learn more.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>50% (10)</td>
</tr>
<tr>
<td>15. I think that the workplace should be structured to provide a pathway for novices to become experts over time.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>16. I think that tasks should be structured in the workplace so that employees gradually move from tasks of low accountability to high accountability.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td><strong>Cumulative percentage for each score</strong></td>
<td><strong>0.83%</strong></td>
<td><strong>4.16%</strong></td>
<td><strong>27.5%</strong></td>
</tr>
</tbody>
</table>

Perceived need to engage in ongoing learning as it applies to work

| 18. I consider myself to be a learner as well as an employee. | 0% (0) | 0% (0) | 10% (2) | 15% (3) | 75% (15) |
| 19. I need to carry on learning throughout my working life. | 0% (0) | 0% (0) | 5% (1) | 25% (5) | 70% (14) |
| 21. I consider learning to be a part of my work. | 0% (0) | 5% (1) | 5% (1) | 15% (3) | **75%** (15) |
| 22. I regard working to be a way of enhancing my skill and knowledge. | 5% (1) | 0% (0) | 20% (4) | 25% (5) | **50%** (10) |
| 23. Apart from earning a living I also work to enhance my learning. | 10% (2) | 10% (2) | 15% (3) | 30% (6) | **35%** (7) |
| 26. After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work. | 0% (0) | 5% (1) | 10% (2) | 25% (5) | **60%** (12) |
| 27. I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge. | 0% (0) | 0% (0) | 35% (7) | 10% (2) | **55%** (11) |
| **Cumulative percentage for each score** | **2.14%** | **2.85%** | **14.28%** | **20.71%** | **60%** |

For each category in Table 1 the responses are concentrated within the 4 to 5 range on the Likert Scale which indicates agreement with the indicator statements. With reference to Appendix 6 which represents the raw data from the questionnaires, it can also be seen that the overall Median and Mode response values are 4 and 5 respectively. The inferences from the questionnaire results can be summarised as follows. The workers in this company regard the workplace as an important source of
learning engineering skills and knowledge. Work organisation and structure play an important part in skill formation. Learning is regarded largely as a social and participatory process and that skills acquired at work should be formally recognised. Finally these workers see a need to go on learning and developing their skills throughout their working lives and they regard working and learning to be interdependent. These results are consistent with the interview findings and therefore both sets of results are regarded as mutually reinforcing.

Company B Case Study – Traditional engineering company

The discussion now moves on to present the data that was collected during the Company B Case Study beginning with the owner/manager interview. This is a family owned and run business and the second traditional engineering company that formed part of the research. When asked did she see any need to move the production process further up the value chain the owner responded by saying that the company had already started to do this. They had designed an award-winning product, which is used for transporting concrete slabs which are used in many new prefabricated modular buildings. They have also started to manufacture and market a crane, which is based on a French design. The company is also beginning to export these specialised products. In relation to skill deficiencies that may arise or that have arisen as a result of a move towards more sophisticated products the response was that the skill sets of the workers were already high and that there were no particular craft type skill deficiencies. However, managerial skills such as team leading and project management skills were regarded as lacking and these skill gaps were exposed by this move towards the manufacture of more sophisticated products. These skills shortages will be addressed through structured training, which will be arranged in consultation with a regional engineering association, which the company is a member of.
The questions of how useful the engineering qualifications that workers bring with them to the company are and how transferable skills are from one location to another was answered as follows:

*Qualifications are useful but new recruits always need on-the-job training which is company specific. Where niche markets are concerned specific training is always required* (Owner Manager Company B).

In relation to the social relations aspect of work and the relationship between working and learning she believes that employees learn mainly from their more experienced peers. She also believes that:

*Practical work allows people to visualise what is required ... practical work makes more sense to the person* (Owner Manager Company B).

On the question of re-structuring the company as a means of promoting greater learning among employees she remarked that some restructuring had already taken place since the company acquired ISO 9000 status.

*Each individual has been given greater responsibility as a result. Employees now have a responsibility for their own quality control* (Owner Manager Company B).

She believes that work structures and working arrangements can make an important contribution to job satisfaction. However she did acknowledge that the restructuring she had referred to had resulted from the ISO quality assurance requirements rather than the desire to promote greater learning opportunities for employees.

When asked about the way Irish engineering companies can compete against the intense competition coming from abroad, she said that products would have to be more sophisticated. More innovation is required and higher quality products were also mentioned as potential solutions to this problem. The suggestion was made by the interviewer that companies could also respond through different types of work.
intensification systems. This was not seen as a realistic option for this company because of the higher cost of overtime and non-standard working times. Another solution to the problem that she referred to was to make greater use of new technology and try to increase efficiency in production.

On the question of recognition of skills that people acquire in the workplace, she asserted that these skills should definitely be formally recognised through the award of a certificate. Certificates may need to be tailored to suit particular skills. She was not sure how this might be accomplished but felt that the design of such a system should be left to training and education professionals. She is happy with the assistance that is available from state agencies in helping companies to raise skill levels at the moment.

*We already get assistance from state agencies – this works out quite well.*

*Maybe they could publicise what is available to companies more than they do* (Owner Manager Company B).

The view of this employer on the role of workplace learning in raising skill levels among employees is as follows:

*While the workplace is a very important source of learning, there is really a need for a combination of on and off-the-job training* (Owner Manager Company B).

In relation to work structures to promote learning for novices and experienced employees this employer went on to explain how the work was structured in this particular firm and how she feels that the structure that exists promotes learning among all employees. The structure she referred to involves work schedules that improve organisational skill and that these structures involve teamworking. The work
is organised in such a way that many of the employees get the opportunity to interact with clients where they gain a greater awareness of quality requirements.

The view of this employer on the statement that, *many small and medium sized firms in Ireland spend little on training* was that it is not true of this particular firm.

*This Company is well disposed to providing training and development opportunities for all staff* (Owner Manager Company B).

She went on to explain that in her experience staff often don’t avail of training when it is made available to them.

**Employee interviews – Company B**

Eight employees were interviewed using the topic guide shown in Appendix 2. As with Company A the interviewees spanned all the technical occupations within the company. The data is presented thematically in the same way the previous case study.

**Formal qualifications**

Respondents were asked initially what formal engineering qualifications they had and how useful these qualifications were in helping them in performing their jobs. Two of these respondents initially said that they had no formal qualifications such as an apprenticeship or a third level engineering qualification. They said they learned most of their skills in the workplace and that these questions were not really relevant to them because they did not have engineering qualifications. However, they both revealed subsequently that they had undertaken a welding training course in one of the state agency run training centres prior to their employment in this company and that this training led to their current employment. While they were awarded certification which is internationally recognised as part of this training programme, they did not
regard it as a formal engineering qualification. The remainder of the interviewees had formal qualifications, which consisted of apprenticeships and some additional qualifications that were acquired on a part-time basis. Two of the interviewees had qualifications that are regarded as associate professional level. While they all regarded their qualifications as very useful, the main issue to emerge on the question of formal qualifications and how useful they were, was that these individuals learned more in the workplace than at college. For example the designer held a HNC in metal fabrication, which was acquired on a part-time basis. He remarked that while the course was interesting he was ahead of the rest of the class because of what he had learned at work. Another respondent made the comment:

*I prefer to learn at work, it’s easier to understand when you see someone else doing it* (Metal Fabricator).

One respondent who had served an apprenticeship as a Metal Fabricator said:

*You learn best in the workplace, especially by moving around jobs* (Metal Fabricator).

**The need for ongoing learning and up skilling for higher value added production**

All respondents acknowledged the need for ongoing learning and skill development throughout their working lives. This is evidenced by the following quotations:

*You never know it all. Anyone who thinks otherwise is a fool* (Metal Fabricator).

*You always need to carry on learning, there’s always something new to be learned* (Apprentice Fitter – almost qualified).

*You can never learn enough* (Working Chargehand).

In relation to skills needed for higher value added production the consensus was that this company had already moved its production further up the value chain and that the
skill sets are already high. One respondent remarked that in-house training might be useful if further new products were introduced. All respondents remarked that the skills that exist in the company would not be a limiting factor in preventing a move in production further up the value chain. The following comments made by the Designer Engineer and an apprentice were typical:

*My skills are already adequate. Most of my work is around solving design problems* (Design Engineer).

*We can handle sophisticated stuff here at the moment* (Apprentice Fitter, almost qualified).

**The value of workplace learning and opportunities for skill development in the workplace**

The responses to the question on learning at work as opposed to learning in a more formal classroom setting resulted in a mixed set of views. Most respondents saw a need for both.

...*some jobs you need to go away and get the theory first. But when a product is being developed you learn more here* (Foreman).

*You might need formal training as well to learn properly. You might be doing the wrong thing unknown to yourself* (Welder).

*Real life experience is great, but you need the college bit as well – makes you understand the job better when you get the underlying theory. Off-the-job training complements the on-the-training* (Metal Fabricator).

*At work is best – that’s where I learned everything* (Working Chargehand).

*I prefer to learn at work. It’s easier to understand when you see other people doing it* (Welder).

*You pay more attention to it at work – It’s too laid back in college. The same urgency to learn is just not there* (Apprentice Fitter, almost qualified).
It’s easier to learn at work. For example, in school I never saw the use of Trigonometry. Now I use it all the time in work (Design Engineer).

A related question was posed which dealt with opinions on what type of learning can only be carried out in the workplace. Problem solving was cited by all respondents as an example of something that can really only be learned in the workplace. The value of experiential learning was also cited and the link between experience and problem solving skills. The following sample quotations illustrate this:

Some things can only be learned through experience. There’s only so much you can learn in college. You need to experience all aspects of the job to better yourself, like going out on-site and measuring up and so on (Metal Fabricator).

Experience – the more you work the more you learn, problem solving ability is linked to experience (Working Chargehand).

Practical stuff mainly and people skills like communication and problem solving possibly (Welder).

All respondents acknowledged that working in this company does provide them with ongoing opportunities to learn and to acquire higher level skills. The fact that there are different challenges every day provided these learning opportunities.

Yes – different things every day – different problems to be solved (Design Engineer).

Yes – We’re always faced with different things; all customers want something different like different features in the products (Foreman).

I learn every day; every day is different (Welder).
I learned a lot since I came here – even though I was already qualified when I came (Metal Fabricator).

I’m always learning – there’s big challenges in this job
(Working Chargehand).

I go out on-site a lot, in different places most days so I’m always improving
(Welder).

This question was framed to gain some insights into the difference between traditional and modern companies on skill levels and skill formation processes.

**Formal recognition of workplace learning**

The formal recognition of learning that occurs in the workplace was not something that respondents had previously given any thought to in general. This was similar to Company A. The Design Engineer remarked on the difficulty of quantifying it and went on to say that while the concept was probably good it would only amount to a piece of paper. The Working Chargehand who had served an apprenticeship as a Metal Fabricator did not see the relevance of it because it already forms part of apprenticeship training and therefore it is already recognised. In general though, when prompted, all the other respondents felt that the idea was good if some method could be devised for measuring it and applying accreditation to it. The predominant view when probed on this issue was that individuals could submit workpieces or could be given a test, which would lead to a certificate. A welder who had learned fabrication skills in the company went on to say:

* I should get recognition for it – maybe be allowed to do a test or someone could assess you over a period – to get a cert (Welder).
Teamworking, learning through participation and work organisation

Teamworking does exist in this firm and in general it is seen as good method of learning. While some individuals work alone a lot of the time they still feel that they are part of an overall team. This applied to the Design Engineer and one of the Welders. There was however some reservations about teamworking. Some respondents remarked that it depends on who is in the team with you. Some positive aspects of teamworking were identified such as, observing and learning from more experienced workers. The Working Chargehand went on to say:

Yes there’s five of us in the team, I’m in charge. You learn from people. …pick up different things – you don’t learn these things working on your own (Working Chargehand).

On the question of regarding learning as a form of participation through social interaction and communities of practice such as the apprentice/craftsman relationship the general consensus was that this is the ideal way to learn and that it is an essential part of the learning process. The prevalent view was that working with experienced peers in a protected environment provides a rich and expansive learning environment.

You pick up an awful lot from this, that you wouldn’t get otherwise. It comes more naturally. You need to be put in at the bottom to really learn how things work (Metal Fabricator).

The social aspect is important – interacting with others (Welder).

It’s a very good way to learn, if someone is interested, it’s very good (Working Chargehand).

There was only one negative comment about this concept.

You can pick up bad habits and possibly the wrong way to do certain things in a technical sense (Apprentice Fitter).
On the question of how workplaces should ideally be structured to facilitate learning the overall view was that this company is already structured in a way that facilitates learning. Individuals already have a good deal of autonomy. This is evidenced by the following comments:

*I have a lot of autonomy over my own work – I project manage it and this helps me to learn* (Design Engineer).

*I always try to give feedback, good or bad and I get them to work in teams where appropriate* (Foreman).

*Job rotation and teamwork, we are largely responsible for our own work here – the Foreman does the final checks* (Welder).

*It doesn’t really matter to us, you have a particular job to do and you get on with it, in this sense the work dictates the structure* (Metal Fabricator).

*Not being stuck on the one thing, Job rotation, that’s the way it is here. Work structures really depend on the situation and people, some people can handle responsibility, some cant* (Welder).

*They work in teams here, they have control over their own work, and this helps them to learn* (Working Chargehand).

*We get a chance to talk to the clients. People bring in jobs and we get a chance to talk to them- helps you to learn – you make the part to the customers spec* (Apprentice Fitter).
In-company training provision and training supply issues

Respondents were asked did they think employers would provide structured training for employees without Government intervention. All of the respondents from this Company pointed out that this particular company was very pro-active with regard to training. However the consensus was that this company would probably not be representative of the norm. This was backed up by comments such as:

*Why should they bother without Government intervention… particularly when the cost of training is coming out of their own pocket* (Workshop Foreman).

On the issue of how existing engineering courses that are available could be improved to facilitate people who are already in employment it was generally felt that it is an individual choice to attend part time courses. The idea of alternative delivery methods such as on-line learning and availability of relevant part time courses did not arise with the exception of two respondents. One cited an example of hydraulic training not being available on a part-time basis locally. The other one mentioned that there is often a mismatch between the courses that are available and what is required by engineering employees.

Attitudes to work and learning at work

When respondents were asked did they regard work as simply a means of making a living or did they regard it as something more than that, the responses were quite similar. They all saw work as being important for reasons other than just making a living. A trend to emerge in these responses was that job satisfaction means a lot. The following comments were typical:

*I have a good interest in work. I regard work as a way of learning and I value what I learn at work* (Apprentice Fitter).
It’s a bit more… I had a chance to retire… took two months out and got bored.

Job satisfaction means a lot to me (Working Charge hand).

I like work – it’s not just a job - get satisfaction from seeing things completed (Design Engineer).

It’s more than that, I’d go mad if I was at home all day (Foreman).

Sources of learning

The final question that was posed asked respondents to rate eight different learning sources in terms of their usefulness, one being the optimum. The range of options included learning sources that can be regarded as forms of acquisition and learning sources that can be regarded as forms of participation. Based on the literature that was reviewed, the participatory sources of learning are more closely aligned with workplace learning. The results of this question are shown below. Working with more experienced colleagues was regarded as the best way to improve job performance by six respondents. This is the most significant piece of data to emerge from this question. While eight employees took part in the interviews from this company, the data related to this particular question only includes six employee responses. Two respondents misinterpreted the question and gave responses that were contradictory; therefore this data was not included in the table.
<table>
<thead>
<tr>
<th>Rating 1-8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training courses organised by your employer</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Observing others</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Working with more experienced colleagues</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Machine Manuals</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Trial and Error</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Reflecting on performance</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Drawing on skills/knowledge you learned during</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Practice acquired by just doing the job</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Zero indicates that there were no responses against this particular rating.

**Self-completion questionnaire results - Quantitative data**

The results of the employee attitude survey based on the self-completion questionnaire are presented in Table 2. The results are categorised under five different headings, each one represents different dimensions of the concepts of work and learning. In each category most of the responses are within the 4 to 5 range which indicates agreement with the Likert Scale indicator statements. With reference to Appendix 7 it can also be seen that the overall Median and Mode response values are 4 and 5 respectively. The inferences that can be drawn from these results are therefore the same as for the Company A Case Study. These survey results also corroborate the evidence that was collected during the employee interviews for this company.
Table 2. Company B - Results of Self-Completion Questionnaire based on 16 respondents

<table>
<thead>
<tr>
<th>Workplace Learning</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. I think the best way to learn how to do a particular job is through experience.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I think that the best way of learning problem-solving skills related to work is through work experience and being exposed to non-routine situations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. My learning is enhanced through trial and error, making mistakes and rectifying them.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I think that off-the-job training must be re-enforced with opportunities to practice the new skills back at the workplace.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. My work provides me with opportunities to continuously improve my technical skill and knowledge.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. My workplace provides an opportunity to develop an understanding of engineering concepts and theory.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. It should be possible to obtain qualifications for the skills I learned at work.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cumulative percentage for each score

<table>
<thead>
<tr>
<th>Learning as participation versus learning as acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.</td>
</tr>
<tr>
<td>14. My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.</td>
</tr>
<tr>
<td>20. The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
</tr>
<tr>
<td>24. I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
</tr>
<tr>
<td>25. It should be possible to obtain qualifications for the skills I learned at work.</td>
</tr>
</tbody>
</table>

Cumulative percentage for each score

<table>
<thead>
<tr>
<th>The social and participatory dimensions of the learning concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. A significant source of learning in my present job is through help and advice from colleagues and from observing others working.</td>
</tr>
<tr>
<td>12. If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.</td>
</tr>
<tr>
<td>17. My work skills and knowledge were mainly acquired through guidance from experts in the workplace and by reflecting on my own performance.</td>
</tr>
</tbody>
</table>

Cumulative percentage for each score

153
<table>
<thead>
<tr>
<th>Work organisation to facilitate learning, management support for learning at work and HPWPs</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I learn and develop my skills better by working as a member of a team.</td>
<td>0% (0)</td>
<td>6.25% (1) 31.25% (5) 12.5% (2)</td>
<td>50% (8)</td>
</tr>
<tr>
<td>9. If I am given a broader range of tasks and more control over my work my learning is enhanced.</td>
<td>0% (0)</td>
<td>0% (0) 18.75% (3) 37.5% (6)</td>
<td>43.75% (7)</td>
</tr>
<tr>
<td>2. My learning is improved when I receive feedback and support from my supervisor/manager.</td>
<td>0% (0)</td>
<td>6.25% (1) 12.5% (2) 18.75% (3)</td>
<td>62.5% (10)</td>
</tr>
<tr>
<td>3. When given more responsibility at work, I learn more.</td>
<td>0% (0)</td>
<td>0% (0) 31.25% (5) 6.25% (1)</td>
<td>62.5% (10)</td>
</tr>
<tr>
<td>15. I think that the workplace should be structured to provide a pathway for novices to become experts over time.</td>
<td>0% (0)</td>
<td>0% (0) 12.5% (2) 50% (8)</td>
<td>37.5% (6)</td>
</tr>
<tr>
<td>16. I think that tasks should be structured in the workplace so that employees gradually move from tasks of low accountability to high accountability.</td>
<td>0% (0)</td>
<td>6.25% (1) 12.5% (2) 56.25% (9)</td>
<td>25% (4)</td>
</tr>
</tbody>
</table>

| Cumulative percentage for each score | 0% | 3.12% | 19.79% | 30.2% | 46.87% |

| Perceived need to engage in ongoing learning as it applies to work |
|---|---|---|---|---|
| 18. I consider myself to be a learner as well as an employee. | 0% (0) | 0% (0) 18.75% (3) 31.25% (5) | 50% (8) |
| 19. I need to carry on learning throughout my working life. | 0% (0) | 0% (0) 6.25% (1) 31.25% (5) | 62.5% (10) |
| 21. I consider learning to be a part of my work. | 0% (0) | 0% (0) 18.75% (3) 43.75% (7) | 37.5% (6) |
| 22. I regard working to be a way of enhancing my skill and knowledge. | 0% (0) | 0% (0) 18.75% (3) 43.75% (7) | 37.5% (6) |
| 23. Apart from earning a living I also work to enhance my learning. | 6.25% (1) 6.25% (1) 18.75% (3) | 50% (8) | 18.75% (3) |
| 26. After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work. | 12.5% (2) 18.75% (3) 18.75% (3) | 6.25% (1) | 43.75% (7) |
| 27. I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge. | 0% (0) 12.5% (2) 6.25% (1) | 43.75% (7) | 37.5% (6) |

| Cumulative percentage for each score | 2.67% | 5.35% | 15.15% | 35.71% | 41% |
Company C Case Study – Modern engineering company

This section begins with the data that was collected during the employer interview. Recall that this company was regarded as a modern engineering company that manufactures high quality submersible pumps for the global market. The interview was carried out with the Training and Development Manager. The background information on the company strategy that was provided in the Methodology Chapter was obtained as part of the employer/manager interview. The initial part of the interview dealt with these issues such as, where the company sees itself in the value chain and any skill deficiencies that would impact on a move towards higher value added production. While this company is already operating at high value added end of the market, the company is trying to move further in this direction. The intention is to provide a service which involved the design of overall pumping solutions. This goes beyond the production and marketing of pumps. The recruitment of more employees with PhD qualifications was cited as a means of addressing skill/knowledge deficits in this regard. Expertise in mechatronics and hydraulics were also seen as possible skill/knowledge shortages in relation to this strategy.

On the question of how useful the engineering qualifications are to the company that employees bring with them when recruited he said that these basic skills need to be built on further in the company. He went on to describe an initiative, which was taken by the company to provide formal training in advanced manufacturing techniques to shop floor employees. A two-year part-time on site course was delivered by Dublin City University. The course of study involved on-site lectures, assignments and projects and led to formal certification. Twenty employees started the course and 16 completed it and were awarded certification. The programme was initiated following
a restructuring process that included the introduction of world class manufacturing

techniques (WCM), which relies on self-managing teams, and cellular manufacturing

processes.

He feels that some skills are transferable from one workplace to another and
generally that experienced people can settle in fast because of the technical skills they
already possess.

> However, there is always a need for company specific training as well and this
can really only be carried out on site

(Training and Development Manager Company C).

On the question of social relations that exist in the workplace, he sees this as quite
important because it can impact on confidence levels. He asserted that the notion of
teamworking is an important mechanism for sharing knowledge among employees.
For this reason this company relies heavily on a ‘buddy system’ of working
arrangement among employees. The relationship between working and learning is
seen as an integrated process by this company manager.

> While some people may not see the connection between learning and working,
learning still takes place unbeknown to them - for example people learn
through reflection and by making mistakes and rectifying them

(Training and Development Manager).

In terms of re-structuring the working arrangements to promote greater learning he
outlined what had already happened in this company in relation to restructuring. As
part of the change to WCM and the introduction of manufacturing cells a conscious
decision was made to make shop floor workers more autonomous. This had the impact of creating a flatter organisation structure, which relied on self managed teams. The success rate of this initiative was mixed. He feels that the concept was probably oversold initially by management and therefore it met with some resistance.

*It was often seen as just another management fad by employees. Some employees saw it as just another way of making them take on more responsibility without any extra remuneration* (Training and Development Manager).

From the management perspective the change was implemented as a way of responding to competition and securing the future of the plant in Ireland. The company is now planning to adopt a lean manufacturing strategy. A continuous improvement process has been put in place and this has been facilitated by developing staff in Six Sigma processes as a means of identifying inefficiencies.

The recognition of skills that are acquired at work is something that he feels is a worthwhile concept. He is familiar with the RPEL concept and thinks it needs to be promoted more and made user friendly. The state agencies are seen as being quite effective in helping companies to raise skill levels. It is really up to individual companies to make greater use of the state assistance that is available.

The record of this company on spending on training does not tie in with the research that was cited earlier which suggests that small and medium sized Irish companies spend little on training (see McIver Consulting 2004; Ní Cheallaigh 2001).

*We spent two hundred thousand Euros on training last year. We sponsor employee training wherever they can. The staff turnover in this company is*
very low; it is regarded locally as a good place to work (Training and Development Manager).

He also remarked that the company had also received an Excellence through People Award. The risk of investing in training and the possibility of employees being poached subsequently by other employers is regarded by him as a chance you must take as an employer.

**Employee interviews – Company C**

Nine employees were interviewed from this Company. The same topic guide that that was used for the traditional companies was used for these interviews (ref Appendix 3). The employees who took part in the interviews spanned most of the technical occupations in the company similar to what occurred in the traditional companies. The data is presented in the same format as the other two case studies. The focus is on patterns and trends that emerged based on the interview topics.

**Formal qualifications**

Four of these respondents had no formal engineering qualifications when they joined the company. However, three of them had since acquired formal engineering qualifications through part-time study which was sponsored by the company. The remainder of the interviewees joined the company with various types of engineering qualifications such as degrees or apprenticeships. Four individuals from this cohort had participated in a company sponsored training programme which led to a certificate in advanced manufacturing techniques. This was referred to earlier as part of the interview with the Training and Development Manager. The programme was organised by the company through a Dublin based university and delivered on a part-
time basis on site. This initiative was taken by the company to coincide with a move by the company towards WCM. There were no consistent views from the group on the usefulness of their formal engineering qualifications. On one hand an employee who started in the company with no qualifications and is now doing an ordinary level engineering degree on a part-time basis said:

*Formal qualifications are very useful… before I had the ideas in my head but didn’t know how to put them down on paper. The theory did really help, I now know about hardness of metals and calibration… be lost without it* (Team Leader).

On the other hand another respondent who took part in the Advanced Manufacturing Techniques course which was run by Dublin City University said:

*It was not very useful – for everyday work* (Toolmaker)

However this respondent was a qualified Toolmaker which is a formal qualification. At a later stage in the interview he revealed that he held his qualification as a Toolmaker in high regard. Another respondent made a similar comment about the Advanced Manufacturing Techniques course.

*What we learned on the course is not fully utilised – so in that sense it was not that useful* (Team Leader).

**The need for ongoing learning and upskilling for higher value added production**

There was unanimous agreement on the need for individuals to go on learning throughout their working lives. All respondents held similar views on this issue; they were all well disposed to the idea of ongoing learning and skill upgrading. They were all either currently involved in some form of ongoing learning or had participated in training and development in the past. The questions of how the company should deal
with skills that may be needed in any attempt to move production even further up the value chain revealed some inconsistent views. Some respondents expressed the view that there high levels of knowledge and skill within the company already particularly in relation to machining of metals and that there is a lot of upskilling taking place on an ongoing basis. The most common view was that any skill updating that may be needed would be best carried out in an on-the-job setting.

Another view which was expresses by an employee who was only two and a half years in the company was as follows:

*A lot of people are working here years and they are very set in their ways, so they would need training. It would be best bring in someone to train them.*

*People won’t remember theory, so practical training would be more valuable*  
(CAD Technician)

**Formal recognition of workplace learning**

In relation to the issue of formal recognition for skills that workers acquire in the workplace all the respondents felt that the idea is good and should be implemented. Two of the respondents who were employed as motor winders felt particularly strongly about this. They both pointed out that they had acquired considerable skills but the occupation is not a recognised trade and there are no formal qualifications associated with it. A team leader remarked that he lost out on promotion in the past because of his lack of formal qualifications even though he regarded himself as having considerable engineering skill and knowledge. He subsequently went on to study for an engineering degree on a part-time basis. One respondent commented on a form of RPEL that he and others in the plant were accredited with. This referred to the Advanced Manufacturing Techniques course that the company initiated for employees
in consultation with one of the universities. The course participants were interviewed by the lecturers before beginning the course with a view to gaining exemptions from some of the learning inputs. On the subject of recognition a Manufacturing Manager reflected:

This type of learning should definitely be recognised, because it encourages people to go on learning (Manufacturing Manager).

The value of workplace learning and opportunities for skill development in the workplace

There was a bias towards learning in the workplace as a favoured method of learning even if this involved alternating it with off the job training.

There is a need for both, on and off-the-job training (Team Leader).

I am more comfortable learning in work, in my own environment (Team leader).

People seem to be more interested in learning on the job, particularly older people (Manufacturing Manager).

What you learn in work from experienced people is invaluable (Machine Tool Operator).

I have had a shift in perception. I used to think that work based learning is better, now I think there should be a balance between the two. One is not better than the other (Process Improvement Manager).

Another respondent remarked:

It’s hard to go into a classroom situation when you’re 30 years out of school. I would absorb information better in a practical sense – hands on (Machine Setter).
A commonly expressed view was that people seem to be more interested in learning on the job, particularly older people.

All the respondents except two expressed the view that their jobs give them the opportunities to acquire higher level engineering skills and knowledge. This was attributed to job rotation and the way their jobs had been broadened to include extra responsibilities. Reference was also made to the way the company supports learning:

*I am glad I work here. This company really supports learning* (Team Leader).

*The opportunity exists to move around. The job has been broadened, I now do a motor from start to finish, this includes some testing and re-working, when it's needed* (Motor Winding Machine Setter).

*Yes I'm still learning in an informal way even though I've been here for 28 years* (Team Leader).

*Yes would be learning here all the time. I learned all my CNC machining knowledge on the job* (Toolmaker).

Of the two employees who did not share the same views as the rest one of them said:

*I have been here for fifteen years doing the same job, I know it inside out... they show you what to do but not why... we never see a pump in use* (Assembly Worker).

The other negative view on this issue came from a skilled Toolmaker. He said for him personally, the job did not give him the opportunity to go on learning. Some specific types of skill and knowledge were identified as being best suited to workplace learning. These included certain types of soft skills such as, problem solving, people skills and how to deal with personality types. Practical skills and product knowledge were also cited in response to this question.
Teamworking, learning through participation and work organisation

Teamworking is now a major feature of the working arrangements in this company. The introduction of WCM techniques involves self managed teams working in cells. This is generally seen in a positive way by those involved in the production process, both as a means of facilitating learning and empowering workers. One proviso is that:

*Everyone must pull their weight* (Machine Setter).

A consequence of these working arrangements is that there are now fewer layers of supervision and management. On the negative side one respondent remarked that these working arrangements now mean that no one takes ownership of a problem. The Process Improvement Manager who is not involved in the self managing teams that are referred to above also held a different view on teamworking:

*I am not big on teamwork. Teams should be a means not an end – call on people as you need them* (Process Improvement Manager).

The main themes to emerge from the question on the value of learning by observing others and interacting with peers etc are illustrated by the following quotes:

*Yes I did learn that way – it’s the only way to learn certain things* (Machine Setter).

*Yes - they can show you all the videos they like, but you have to get in and do something in a hands on way* (Assembly Worker).

A manufacturing manager who served an apprenticeship as a Fitter said:

*It’s a very good way to learn. It’s like being a member of a family. It should be broadened out to include other categories of employee besides apprentices* (Manufacturing Manager).
If you are coached you will not be so afraid to take risks – helps you to reach your full potential (CAD Technician).

The policies and structures that exist in this company with regard to working arrangements were generally regarded by the respondents as being well suited to providing learning opportunities for employees. The following quotes illustrate these perceptions:

It’s Beneficial to have a structure where all skills can be learned by all employees, such as job rotation (Process Improvement Manager).

We now have a WCM structure in operation, this relies on trust. You must pull your weight – better now. We now have more control over our work. You don’t work harder you work smarter. This company are big into training (Machine Setter).

WCM is now in operation which involves manufacturing cells; it’s very good for employee learning (Machine Setter).

WCM has broadened people’s horizons (Manufacturing Manager).

In-company training provision and training supply issues

To facilitate people who are in the workforce the existing provision of engineering courses was not seen as a particular problem for these workers. A number of the respondents pointed out that the company allows people to leave early if they are taking evening courses that are related to their work. Comments were also made about how the company has been organising different training interventions regularly most of which are carried out on site and that this offsets any shortcomings in the VET
provision. However, the respondents considered this company to be somewhat unique in this regard.

The notion that Irish companies would not provide a structured means of upgrading employee skills without state intervention was not seen as an issue by the respondents in relation to this company. All the respondents agreed that this company is very proactive in relation to staff training. One respondent remarked that this can be evidenced by the fact that:

*This company pay up front plus expenses. A lot of the management here have come from the shop floor* (Team Leader).

**Attitudes to work and learning at work**

Respondents were asked did they regard work as simply a means of making a living or did they see it as something more than that. While most respondents initially said that they regarded work as simply a means of making a living they went on to elaborate on this. Pride in the work, learning opportunities, identity and the social aspect were all regarded as important. This illustrated by the following comments:

*The bottom line is making a living. For me there is a pride thing as well. I have pride in my work* (CNC Setter and Programmer).

*I have a sense of pride in my work. Get a buzz out of it. For me work and learning are integrated* (CAD Technician).

*There is a social aspect to it. Your occupation can give you an identity within a local area* (Team Leader).
For me number one is to get paid. Learning is a reason why I would be happy in a job (Process Improvement manager).

For me its more – I enjoy work. I relate work to learning

(Manufacturing Manager).

Sources of learning

The final question that was posed asked respondents to rate different learning sources in terms of their usefulness. The participatory sources of learning are closely aligned with workplace learning. The results of this question based on nine employee responses are shown in the table below. With reference to the table below it can be seen that three sources of learning that are closely associated with the workplace, i.e. working with more experienced colleagues, observing others and practice in doing the job were all rated highly. These learning sources are synonymous with workplace learning.

<table>
<thead>
<tr>
<th>Rating 1-8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training courses organised by your employer</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Observing others</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Working with more</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Experienced colleagues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine Manuals</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Trial and Error</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Reflecting on performance</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Drawing on skills/knowledge you learned during your formal training</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Practice acquired by just doing the job</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Zero indicates that there were no responses against this particular rating.
Self-completion questionnaire results – Quantitative data

The questionnaire results for 27 respondents are presented below in Table 3. With reference to the Table, for each category the responses are concentrated within the 4 to 5 response option range which indicates agreement with the Likert Scale indicator statements. By referring to Appendix 8 which represents the raw data that was collected from this company it can also be seen that the overall Median and Mode response values are 4 and 5 respectively. The survey results are consistent with the employee interview data for this company. The interview findings are therefore further supported by the survey results.
<table>
<thead>
<tr>
<th>Workplace Learning</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. I think the best way to learn how to do a particular job is through experience.</td>
<td>0% (0)</td>
<td>18.50% (5)</td>
<td>74.0% (20)</td>
</tr>
<tr>
<td>5. I think that the best way of learning problem-solving skills related to work is through work experience and being exposed to non-routine situations.</td>
<td>0% (0)</td>
<td>22.20% (6)</td>
<td>11.11% (3)</td>
</tr>
<tr>
<td>6. My learning is enhanced through trial and error, making mistakes and rectifying them.</td>
<td>0% (0)</td>
<td>29.60% (8)</td>
<td>14.80% (4)</td>
</tr>
<tr>
<td>8. I think that off-the-job training must be re-enforced with opportunities to practice the new skills back at the workplace.</td>
<td>0% (0)</td>
<td>33.33% (9)</td>
<td>14.80% (4)</td>
</tr>
<tr>
<td>10. My work provides me with opportunities to continuously improve my technical skill and knowledge.</td>
<td>7.4% (2)</td>
<td>37.00% (4)</td>
<td>48.1% (13)</td>
</tr>
<tr>
<td>11. My workplace provides an opportunity to develop an understanding of engineering concepts and theory.</td>
<td>14.8% (4)</td>
<td>29.60% (8)</td>
<td>11.11% (3)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>3.70%</td>
<td>6.79%</td>
<td>23.45%</td>
</tr>
<tr>
<td>Learning as participation versus learning as acquisition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.</td>
<td>22.22% (6)</td>
<td>29.60% (8)</td>
<td>3.70% (1)</td>
</tr>
<tr>
<td>14. My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.</td>
<td>7.4% (2)</td>
<td>37.00% (10)</td>
<td>29.60% (8)</td>
</tr>
<tr>
<td>20. The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
<td>14.8% (4)</td>
<td>48.1% (13)</td>
<td>14.80% (4)</td>
</tr>
<tr>
<td>24. I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
<td>11.11% (3)</td>
<td>7.40% (2)</td>
<td>55.5% (15)</td>
</tr>
<tr>
<td>25. It should be possible to obtain qualifications for the skills I learned at work.</td>
<td>0% (0)</td>
<td>7.40% (2)</td>
<td>48.1% (13)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>11.11%</td>
<td>8.14%</td>
<td>28.14%</td>
</tr>
<tr>
<td>The social and participatory dimensions of the learning concept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. A significant source of learning in my present job is through help and advice from colleagues and from observing others working.</td>
<td>3.7% (1)</td>
<td>22.20% (6)</td>
<td>22.20% (6)</td>
</tr>
<tr>
<td>12. If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.</td>
<td>0% (0)</td>
<td>18.50% (5)</td>
<td>33.33% (9)</td>
</tr>
<tr>
<td>17. My work skills and knowledge were mainly acquired through guidance from experts in the workplace and by reflecting on my own performance.</td>
<td>11.11% (3)</td>
<td>29.60% (8)</td>
<td>22.20% (6)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>4.93%</td>
<td>8.64%</td>
<td>23.45%</td>
</tr>
</tbody>
</table>
### Table 3. Company C - Results of Self-Completion Questionnaire based on 27 respondents (Cont.)

#### Work organisation to facilitate learning, management support for learning at work and HPWPs

<table>
<thead>
<tr>
<th>1. I learn and develop my skills better by working as a member of a team.</th>
<th>2. My learning is improved when I receive feedback and support from my supervisor/manager.</th>
<th>3. When given more responsibility at work, I learn more.</th>
<th>15. I think that the workplace should be structured to provide a pathway for novices to become experts over time.</th>
<th>16. I think that tasks should be structured in the workplace so that employees gradually move from tasks of low accountability to high accountability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers in brackets represent frequency of responses</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Not at all true of me</td>
<td>0% (0)</td>
<td>11.11% (3)</td>
<td>33.33% (9)</td>
<td>37% (10)</td>
</tr>
<tr>
<td>Very true of me</td>
<td>3.7% (1)</td>
<td>0% (0)</td>
<td>18.50% (5)</td>
<td>48.1% (13)</td>
</tr>
<tr>
<td></td>
<td>3.7% (1)</td>
<td>0% (0)</td>
<td>18.50% (5)</td>
<td>25.90% (7)</td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>1.23%</td>
<td>2.64%</td>
<td>22.22%</td>
<td>32.71%</td>
</tr>
</tbody>
</table>

#### Perceived need to engage in ongoing learning as it applies to work

<table>
<thead>
<tr>
<th>18. I consider myself to be a learner as well as an employee.</th>
<th>19. I need to carry on learning throughout my working life.</th>
<th>21. I consider learning to be a part of my work.</th>
<th>22. I regard working to be a way of enhancing my skill and knowledge.</th>
<th>23. Apart from earning a living I also work to enhance my learning.</th>
<th>26. After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work.</th>
<th>27. I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers in brackets represent frequency of responses</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Not at all true of me</td>
<td>3.7% (1)</td>
<td>3.70% (1)</td>
<td>0% (0)</td>
<td>29.6% (8)</td>
<td>62.9% (17)</td>
<td></td>
</tr>
<tr>
<td>Very true of me</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>7.40% (2)</td>
<td>25.90% (7)</td>
<td>66.66% (18)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.11% (3)</td>
<td>0% (0)</td>
<td>7.40% (2)</td>
<td>29.60% (8)</td>
<td>51.8% (14)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.7% (1)</td>
<td>7.40% (2)</td>
<td>14.80% (4)</td>
<td>22.20% (6)</td>
<td>51.8% (14)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.11% (3)</td>
<td>11.11% (3)</td>
<td>29.60% (8)</td>
<td>29.60% (8)</td>
<td>18.50% (5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.7% (1)</td>
<td>0% (0)</td>
<td>3.70% (1)</td>
<td>25.90% (7)</td>
<td>66.66% (18)</td>
<td></td>
</tr>
<tr>
<td>Cumulative percentage for each score</td>
<td>4.76%</td>
<td>4.23%</td>
<td>11.11%</td>
<td>28.04%</td>
<td>51.85%</td>
<td></td>
</tr>
</tbody>
</table>
Company D Case Study – Modern engineering company

The manager who gave the interview on behalf of Company D, which was the second modern engineering company to participate in the research, was responsible for the HR function. She explained how the company had already gone through the process of moving its product market strategy further up the value chain. This company had originally been involved in what she described as, ‘metal bashing’. This reference related to producing simple fabricated products. Over the years the company began to develop and manufacture more sophisticated products for the export market. It now considers itself as a solution provider. The company now regards itself as Ireland’s leading designer and manufacturer of stainless steel bespoke components for architectural use and special purpose machines. She cited an example of an award winning building in London. The external cladding on this building was manufactured in the plant. She also referred to contracts, which have been negotiated to construct stainless steel structures for the forthcoming Olympic Games.

The move towards higher value added forms of production in this firm has mainly been facilitated through increasing use of technology rather than upskilling. The training that was required for the operation and setting of the newer machinery was mainly carried out by the equipment vendors on-site. There is very little out sourcing carried out and very little use is made of non-standard working arrangements. The vast majority of the employees are employed on a permanent full-time basis.

In relation to how useful the engineering qualifications are that workers bring with them when recruited she said that mechanical engineers are not ready for work immediately after qualifying. This is addressed by placing newly qualified engineers
on the shop floor for a period of six months when they are recruited. In relation to skilled craft workers the situation is somewhat different. These workers are trained through a formal apprenticeship system, which relies on periods of on and off-the-job training. She asserted that this system works quite well. Machine operators on the other hand are mainly trained on-the-job and do not generally have any formal engineering qualifications. Given that many processes are company specific there is always a need for company specific training.

*This type of learning is not therefore transferable from one workplace to another* (HR Manager Company D).

The social relationships that exist in the workplace were regarded as an important influence on learning. She referred to the apprenticeship model as being particularly effective in this regard. She pointed out that a team-oriented approach was used for all categories of employee and that periodic reviews were used to identify training and development needs. Working and learning were seen as being inter-related.

*Working and learning go hand in hand* (HR Manager Company D).

One of the goals for the company for 2007 is to move more in the direction of adopting high performance work practices with greater employee involvement. The expectation is that this will eventually lead to a flatter organisational structure. Some moves in this direction have already been made. She cited the example of machine operators who are now trained to carry out some basic first line maintenance on their machines. She went on to explain how this company has adopted different approaches to deal with competition coming from Eastern Europe and the Ear East. They can still manage to compete in the lower value added sector of the market and continue to
produce low value added products as well as the higher value added products and solutions as mentioned earlier. At the lower value added end they have concentrated on designing costs out of the products through innovative designs and use of new technology. They can therefore offer high quality expensive products or low spec cheap products, depending on customer requirements.

When asked about recognition of skills that employees acquire in the workplace she said that this company favours the notion of formal recognition for learning, which occurs in the workplace. They had also implemented measures to gain recognition for skills that some employees had acquired in the work place.

_There are some employees who had been working here for 15 years and had no formal engineering qualifications. We organised to have a form of RPL put in place through one of the third level Institutes of Technology. These workers were offered the opportunity to sit exams, which, were assessed by the Institute of Technology, and successful candidates were then awarded a City & Guilds qualification_ (HR Manager Company D).

The role of Government in helping companies to raise skill levels was seen as something that does exist and is fairly effective. The fact that off-the-job training of apprentices is funded by FÁS - Training and Employment Authority and this was seen by her as a major benefit. Government support in providing mentoring and networking opportunities for young managers was cited as another area with potential benefits to companies.
In relation to the role of workplace learning in helping to raise skill levels, she said that the workplace was probably more beneficial to people who have been away from the classroom for a long time:

_Some people just don’t like classroom learning_ (HR Manager Company D).

The type of work structures that exist in the company that she cited as being beneficial for learning at work included a ‘buddy system’, which operates in a fairly informal way. The company have also implemented a form of job rotation for operatives that involves cross over training, which is carried out in-house. There is also interaction between skilled craft workers and clients during the production of specialised products such as metal sculptures.

The research that was cited in the literature about Irish companies spending relatively little on training does not apply to this company either based on this interview:

_This company does provide upskilling and education without Government intervention. Employee fees for night classes are also subsidised._

_There is a fear of employees being poached, but overall the positives outweigh the negatives – it’s all about people_ (HR Manager Company D).

An example was also cited of an initiative taken by the company during the year 2000. At this time it was very difficult to recruit engineers. The company brought in third year under graduates for work experience during the summer months. When the student engineers returned to college for their final year the company sponsored them on the basis of a 100 Euro per week. The students were asked to sign a contract to work for the company for two years after qualifying in return. As stated earlier in the Methodology Chapter this Company did not agree to participate in the employee interviews because of the disruption to production that it would entail.
Self-completion questionnaire results - Quantitative data

The results of the self-completion questionnaire are presented in Table 4 based on twenty respondents. The results are categorised under five different headings, each one represents different dimensions of the concepts of work and learning. In each category most of the responses are within the 4 to 5 range which indicates agreement with the Likert Scale indicator statements. With reference to Appendix 9 it can also be seen that the overall Median and Mode response values are 4 and 4 respectively.
### Table 4. Company D - Results of Self-Completion Questionnaire based on 20 respondents

<table>
<thead>
<tr>
<th>Workplace Learning</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. I think the best way to learn how to do a particular job is through experience.</td>
<td>0% (0)</td>
<td>10% (2)</td>
<td>35% (7)</td>
</tr>
<tr>
<td>5. I think that the best way of learning problem-solving skills related to work is through work experience and being exposed to non-routine situations.</td>
<td>0% (0)</td>
<td>30% (6)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>6. My learning is enhanced through trial and error, making mistakes and rectifying them.</td>
<td>0% (0)</td>
<td>20% (4)</td>
<td>35% (7)</td>
</tr>
<tr>
<td>8. I think that off-the-job training must be re-enforced with opportunities to practice the new skills back at the workplace.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>10. My work provides me with opportunities to continuously improve my technical skill and knowledge.</td>
<td>0% (0)</td>
<td>20% (4)</td>
<td>40% (8)</td>
</tr>
<tr>
<td>11. My workplace provides an opportunity to develop an understanding of engineering concepts and theory.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>65% (13)</td>
</tr>
<tr>
<td><strong>Cumulative percentage for each score</strong></td>
<td><strong>0%</strong></td>
<td><strong>1.66%</strong></td>
<td><strong>17.50%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning as participation versus learning as acquisition</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13. The best way to improve my skill and knowledge is through off-the-job training arranged by my employer.</td>
<td>35% (7)</td>
<td>25% (5)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>14. My engineering skills and knowledge were mainly acquired in the workplace rather than through formal training and education.</td>
<td>0% (0)</td>
<td>20% (4)</td>
<td>30% (6)</td>
</tr>
<tr>
<td>20. The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
<td>0% (0)</td>
<td>25% (5)</td>
<td>45% (9)</td>
</tr>
<tr>
<td>24. I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
<td>0% (0)</td>
<td>15% (3)</td>
<td>50% (10)</td>
</tr>
<tr>
<td>25. It should be possible to obtain qualifications for the skills I learned at work.</td>
<td>0% (0)</td>
<td>20% (4)</td>
<td>30% (6)</td>
</tr>
<tr>
<td><strong>Cumulative percentage for each score</strong></td>
<td><strong>7%</strong></td>
<td><strong>8%</strong></td>
<td><strong>21%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The social and participatory dimensions of the learning concept</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. A significant source of learning in my present job is through help and advice from colleagues and from observing others working.</td>
<td>0% (0)</td>
<td>25% (5)</td>
<td>40% (8)</td>
</tr>
<tr>
<td>12. If I were given the opportunity to interact with clients and customers my performance at work would be enhanced.</td>
<td>0% (0)</td>
<td>25% (5)</td>
<td>45% (9)</td>
</tr>
<tr>
<td>17. My work skills and knowledge were mainly acquired through guidance from experts in the workplace and by reflecting on my own performance.</td>
<td>0% (0)</td>
<td>25% (5)</td>
<td>40% (8)</td>
</tr>
<tr>
<td><strong>Cumulative percentage for each score</strong></td>
<td><strong>0.00%</strong></td>
<td><strong>25%</strong></td>
<td><strong>41.66%</strong></td>
</tr>
<tr>
<td>Work organisation to facilitate learning, management support for learning at work and HPWP's</td>
<td>Not at all true of me</td>
<td>Numbers in brackets represent frequency of responses</td>
<td>Very true of me</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1. I learn and develop my skills better by working as a member of a team.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>40% (8)</td>
</tr>
<tr>
<td>2. My learning is improved when I receive feedback and support from my supervisor/manager.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>3. When given more responsibility at work, I learn more.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>9. If I am given a broader range of tasks and more control over my work my learning is enhanced.</td>
<td>5% (1)</td>
<td>5% (1)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>15. I think that the workplace should be structured to provide a pathway for novices to become experts over time.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>16. I think that tasks should be structured in the workplace so that employees gradually move from tasks of low accountability to high accountability.</td>
<td>0% (0)</td>
<td>5% (1)</td>
<td>30% (6)</td>
</tr>
</tbody>
</table>

**Cumulative percentage for each score**

- 0.83%
- 2.5%
- 25.83%
- 38.33%
- 32.5%

<table>
<thead>
<tr>
<th>Perceived need to engage in ongoing learning as it applies to work</th>
<th>Not at all true of me</th>
<th>Numbers in brackets represent frequency of responses</th>
<th>Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. I consider myself to be a learner as well as an employee.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>15% (3)</td>
</tr>
<tr>
<td>19. I need to carry on learning throughout my working life.</td>
<td>5% (1)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>21. I consider learning to be a part of my work.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>22. I regard working to be a way of enhancing my skill and knowledge.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>20% (4)</td>
</tr>
<tr>
<td>23. Apart from earning a living I also work to enhance my learning.</td>
<td>0% (0)</td>
<td>10% (2)</td>
<td>10% (2)</td>
</tr>
<tr>
<td>26. After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work.</td>
<td>20% (4)</td>
<td>30% (6)</td>
<td>30% (6)</td>
</tr>
<tr>
<td>27. I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge.</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>0% (0)</td>
</tr>
</tbody>
</table>

**Cumulative percentage for each score**

- 3.50%
- 5.71%
- 17.14%
- 37.14%
- 36.42%
**Chapter summary**

This section commences with a summary of the interview data based on patterns of results across the four case studies. The summary is structured thematically similar to the individual case study data presentations. The quantitative data is also summarised by providing a comparison of results across the four case studies. The conclusions and policy implications that can be drawn from the findings of this research are presented in the following chapter.

**Formal qualifications**

Most respondents who took part in the interviews had some sort of formal engineering qualifications some of which were based on combinations of on and off-the-job training such as apprenticeships on one hand and full time VET on the other. The main issue to emerge in relation to the value of formal qualifications was that learning that occurs in an off-the-job context must be supplemented with further experiential learning at work. This was a common view between the employers and employees. Employers emphasised the need for company specific training for all categories of engineering employees.

**The need for ongoing learning and upskilling for higher value added production**

The need for ongoing learning and skill development was widely recognised by all respondents in all the participating companies. In general, though it was seen as something that takes place through the normal work practices, particularly in the traditional companies. The employees in the two traditional companies regarded themselves to be better poised to take on higher value added production than those in the modern company. In-house training was seen as the best means to acquire any
higher level skills that may be needed. One of the modern engineering company employers referred to other means besides skills as an option for higher value added production.

**Workplace learning and opportunities for ongoing skill development in the workplace**

There were mixed views on the value of learning in the workplace as opposed to learning in a more formal classroom setting. This was the case within each of the companies. The consensus was that there is a need for both. In the modern company there was a preference among respondents for learning in the workplace. The respondents in the traditional companies expressed more positive views on the opportunities they have within the workplace for learning and skill development. There were some negative comments from engineering operatives in the modern company on the opportunities for ongoing learning. There was general agreement across the case studies that certain skills are best learned in the workplace.

**Formal recognition of workplace learning**

This was something that many of the employees had not given much thought to, however during the discussion it was almost universally accepted as something that should be implemented. The employers/managers on the other hand already held strong views on the need for this, particularly those from the modern companies. They were familiar with the concept of Recognition of Prior Experiential Learning (RPEL) and had already implemented a form of RPEL for some employees in consultation with certain education providers.
Teamworking, learning through participation and work organisation

There were some divergent views on the value of teamworking across the case studies. However the concept communities of practice and the benefits of learning by being a member of such a community in a workplace context were widely recognised as an ideal way to learn. The type of work structures in the traditional companies were largely regarded as being compatible with learning. In the modern company the work procedures that form part World Class Manufacturing procedures was regarded as a good method to promote learning. All the employers felt that their current work structures do promote learning and were well disposed to the idea of work arrangements to facilitate further learning. Both of the modern company managers referred to work structures they had in place which relied on teamworking. This was seen as a means of employee development.

In-company training provision and training supply issues

The main pattern to emerge based on employee opinions was that companies in general would not be willing to provide structured training for employees without Government intervention. However, it was generally recognised by all respondents that the companies who took part did support employee learning. The same view was expressed by all the company managers. What is available from a supply side by way of engineering training and education was regarded as being adequate and it was a matter of personal choice as to whether to avail of it.

Attitudes to work and learning at work

Almost all employee respondents expressed the view that working meant more to them than just a means of making a living and that learning was an integral part of
working in all of the engineering occupations that the research participants were involved.

Sources of learning

The pattern of results in relation to the issue of preferred sources of employee learning showed that participatory forms of learning, such as working with more experienced colleagues were highly regarded in each of the case studies.

Quantitative summary data across the four Case Studies

The pattern of results from the self-completion questionnaires that were returned from each of the companies is similar. In all cases the majority of responses were clustered around the 4 to 5 response options while the response options in the 1 to 2 range were extremely low. This is illustrated graphically in Table 5 below where it can be seen that the results for each response option under each category are closely replicated across the four case studies. Finally the questionnaire results complement the data that was collected from the interviews. It is noteworthy that there is no divergence of results between what were regarded as traditional and modern engineering companies.
Table 5. Cross case comparison of questionnaire responses

Workplace Learning

Learning as acquisition versus learning as participation

The social and participatory dimensions of the learning concept

Work Org. to facilitate learning

Perceived need to engage in on-going learning as it applies to work
Chapter 6

Conclusions and implications

Introduction

This concluding chapter begins by restating the research question followed by a brief review of the preceding discussion.

*How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?*

In Chapter 1 the research problem was described including the reasons why it was felt to be a worthwhile exercise. The reasons cited included the recent interest in workplace learning on one hand and on the other hand the reports that the Irish engineering industry has been suffering losses in recent years. This was linked with the aspirations of the Irish Government to create a high skills economy and in doing so to promote the notion of lifelong learning among workers. The analytical framework for the research was based on a synthesis of the work of previous researchers and authors. The framework took account of certain other issues that may not be regarded as having a direct impact on workplace learning but nevertheless, in the opinion of the researcher, can impact on the effectiveness of workplace learning. These issues included employee attitudes to ongoing learning and employers’ freedom to choose the type of production strategy they engage in and the corresponding skill sets required to match this. It was this particular type of synthesis or interpretation that was not made before that can advance our knowledge of the phenomenon under investigation.

Chapters 2 and 3 reviewed the literature that was used to inform the analytical framework. This literature review focused on the themes related to the research
question and the sub questions arising from it. Chapter 2 dealt with issues directly related to workplace learning such as the social and situated context of learning. This was followed by a review of the impact of work practices and work organisation on workplace learning. The chapter then went on to examine the debates in the literature on employee attitudes to ongoing learning. Chapter 3 examined other aspects of the literature and influences that informed the analytical framework that was referred to in Chapter 1. Routes to competitive advantage, theories of VET and Ireland’s approach to VET were the central issues discussed in Chapter 3.

Chapter 4 described the research methodology and the design of the research instruments. A mixed methodology was used in order to get a more complete picture of the issues under investigation. Apart from the requirement to obtain a more complete picture of attitudes to workplace learning the qualitative part of the research also addressed the concept of individual agency. This can impact on the views and decisions of employees and employers on the requirement to go on learning and the need for high level skills from the employer perspective. Chapter 4 also detailed how it was proposed to deal with any ethical issues associated with the research, the research sample and fieldwork.

Chapter 5 presented the qualitative and quantitative data that was collected for each case. The quantitative data was presented in tabular form using descriptive statistics and in bar chart format for each company that took part. The qualitative data was presented thematically as a narrative based on the responses to the interview questions combined with some direct quotations. Having completed all the stages of the research process as outlined above it now remains to derive some conclusions and to discuss further research and policy implications related to the findings.
Conclusions from the quantitative research

The conclusions that follow in this section are based on the findings of the attitude survey questionnaires that were presented in Tables 1 to 5 in the last chapter. Given that the results across the four Case Studies are broadly similar the following statements are regarded as representative of the attitudes of the 83 respondents.

- Individuals learn how to do their jobs best by experience gained through work based activities such as problem solving, trial and error, making mistakes and rectifying them.
- Off-the-job training must be supported with opportunities to practice the newly acquired skills back at the workplace.
- Engineering workplaces provide workers with opportunities to continuously improve their technical skills and knowledge.
- The best way to improve skills and knowledge is not necessarily through formal training outside of the workplace.
- The engineering skills and knowledge that individuals rely on mostly are mainly learned in the workplace and the best way to learn new engineering skills is in the workplace rather than through formal courses that lead to qualifications.
- It should be possible to obtain qualifications for the skills learned in the workplace.
- Significant learning occurs through interaction with colleagues, observing others working, guidance from experts and reflecting on performance.
- Teamworking is an effective means of skill development.
- Management support and feedback are important in helping people to learn at work.
• Learning is improved through job enlargement, extra responsibility, broader range of tasks and more control over one’s work.

• Tasks should be structured in such a way that individuals are gradually given more responsibility over a phased period of time.

• Engineering workers across a broad range of occupations regard themselves to be learners as well as employees and they recognise the need to carry on learning throughout their working lives.

• Learning is regarded as part of the normal work activity.

• Work means more to individuals than merely a means of making a living.

• There is a need for employees to go on learning following the completion of initial occupational qualifications.

• Individuals welcome the opportunity to take on more responsibility and a wider variety of tasks as a means of improving skills and knowledge.

Finally these conclusions are further supported by the interview data which was presented in the last chapter and will now be discussed further.

Conclusions from the qualitative research

At the outset it was anticipated that certain information would emerge from the interviews that could not be discerned from the questionnaires and this proved to be the case. The interviews provided data on respondents’ motives for acting and explanations about their perceptions on learning and working. The conclusions will be related to the topics in literature reviews in Chapters 2 and 3, beginning with workplace learning in general.
Workplace learning

The views of authors such as Ashton and Sung (2002), Billet (2001) and Streeck (1989) on workplace learning were referenced. Ashton (2002) for example asserted that certain types of skills can only be learned in the workplace or at least can be learned better in the workplace than through formal qualifications. This was borne out in the employee interviews. Comments from the traditional company employees made reference to faultfinding, people skills, man management and problem solving as skills that can only be learned in the workplace. The responses from employees in the modern engineering company on this topic were almost identical. These are also the type of skills that are regarded as being essential for companies to compete in the era of the new capitalism that was referred to in Chapters 1 and 2. On the question of teamworking there were some differences in opinion in relation to its effectiveness. While it was generally regarded as something that can really only be learned in the workplace, some respondents did not see teamworking as particularly relevant to them. Others regarded it as something that was necessary on certain occasions. However, the means to acquire any skills that may be necessary for effective teamworking were generally regarded as being best acquired at work. This ties in with the views of Ashton and Sung (2002) as cited in Chapter 2. The observations made by Lawy and Bloomer (2003) and Streeck (1989) about the weakness of a lot of the curricula for work related education was also supported in many of the interview responses.

In relation to engineering skill development in general it was significant that employees learned certain skills in the workplace that are often regarded as being more suited to off-the-job training. For example, it was assumed in Chapter 2 that over reliance on the community of practice concept might have limitations in
relation to the development of some of the skills required in modern production environments. The example was cited of computer numerical controlled machine tool (CNC) programming and setting. However, the research found that Company C relies heavily on CNC machine tools for its production processes and both the manager and some of the employees referred to these skills as having being learned in the workplace.

Communities of practice and the apprenticeship model of learning

The value of communities of practice and working with more experienced peers such as the apprenticeship paradigm was seen as a very effective method of skill and knowledge formation in both categories of company. Most respondents could identify with this concept by referring to their own experiences as apprentices. Apprentice trained employees also pointed out that this model of learning should possibly be broadened out to include other categories of employee. Those who did not serve an apprenticeship could also see the value in this model of learning. This ties in with the literature that was reviewed on legitimate peripheral participation (Lave and Wenger 1991) and guided participation (Rogoff 1995). The aspects of Vygotskian theory that were referred to in the literature debates can also be related to the research findings. The notion of scaffolding whereby individuals were supported in carrying out tasks which they could not complete by themselves was referred to by some respondents.

Chapter 2 referred to some weaknesses in Lave and Wenger’s theorising on communities of practice. The benign nature of communities of practice and how effective they are for workers who are already experienced was questioned. However, the research findings did not reflect these particular issues with regard to
communities of practice. There were reservations expressed by a minority of respondents on the usefulness of certain aspects of communities of practice. These reservations related to the view that, as a novice within a community, learning may be restricted to what the experienced members know. Furthermore, novices may pick up bad habits and possibly even the wrong way of doing things from a technical perspective. Billet (2004) also referred to this as unintentional learning, which often takes place in the workplace. In spite of some negative issues related to communities of practice the overall conclusion is that they are a necessary condition for deep learning in many engineering occupations. It is also concluded that alternating periods of on and off-the-job training as in the apprenticeship model can compensate for certain deficiencies in on-the-job training. This conclusion was informed by the research findings where respondents pointed to the need for both types of training and learning experiences.

The issue of restrictive learning environments within apprenticeship training that was referred to by Fuller and Unwin (2003) did not present itself as an issue during this research. It was anticipated in Chapter 2 that because of the predominance of small and medium sized companies in Ireland restrictive learning environments might have been an issue particularly in the traditional companies. The interviewees in the traditional companies who had served apprenticeships all regarded their workplaces as sources of deep learning. It is acknowledged that some of the interviewees who were apprentice trained did not serve their apprenticeships in the companies where they are now employed. Nevertheless, they all regarded the apprenticeship model as a very effective method of skill formation. The comments therefore made by Smith (1992) on the benefits of apprenticeship as referred to in Chapter 2 were supported by this research. In general any criticisms of the
apprenticeship system tended to revolve around the off-the-job training aspects. The only forceful criticism of the Irish Standards Based Apprenticeship system came from the Company A employer. His criticisms were based on the standards being applied during the practical examinations during the off-the-job training phases. This employer was himself a former apprentice metal fabricator who represented Ireland in the Skills Olympics. In light of his own achievement it may be the case that his expectations of standards that can be achieved by the average apprentice may be unrealistic.

It has also been established in this research that qualified workers benefit from being members of communities of practice as part of the ongoing learning process in the workplace. This is consistent with the conclusions of Hodkinson and Hodkinson (2004) on communities of practice and experienced workers. Qualified workers particularly in the traditional companies reported instances of significant learning through collaborative working. A related issue that was raised by Billet (2004) on workplace learning affordances being influenced by issues such as the individuals’ standing in the workplace (occupational category) may also be relevant. The example cited in this research whereby some operative level employees felt restricted in their learning potential in one of the modern engineering companies illustrates this point. Not withstanding these possible limitations the overall conclusion is that engineering workplaces are very important sites for learning and skill development. These limitations can be minimised by combining workplace learning with periods of off-the-job training.
Recognition of skills acquired in the workplace

Formal recognition for skills that employees acquired in the workplace was not something that many of the respondents in the traditional engineering companies had given much thought to. Those that had formal engineering qualifications such as apprenticeships or qualifications acquired through full-time VET did not see it as something particularly relevant to them, although when prompted they all said that it was a worthwhile concept. The employees in the modern engineering companies held stronger views on this. They all said it is something that should be put in place. The four employers who took part in the research also expressed the view that learning that takes place in the workplace should be afforded appropriate recognition. The managers from the two modern companies described initiatives they had put in place which allowed employees to acquire formal qualifications through a tailor made recognition of prior experiential learning (RPEL) system. The interview findings combined with the questionnaire data indicates that there is a strongly held view on the need to formally recognise learning that occurs in this way.

Work organisation to facilitate learning

This aspect of the research was explored with regard to the way jobs are designed, management support for learning and the benefits of teamworking. For the traditional companies it is concluded that the technical nature of the jobs that the respondents were engaged in provides ongoing learning opportunities. For these companies the variety of work they engage in is the main source of this learning. Each type of job brings a new set of challenges. This was reflected in the interview responses and also in the additional comments that some respondents provided on the questionnaires. The work structures in the traditional companies were not tightly specified, the emphasis was on getting the job done and individuals were given as
much autonomy and responsibility as they were capable of handling. Neither the managers nor the employees referred to terms like, ‘high performance work practices’ in the sense that they are used in the literature or in the HRM discourse. However it was evident that there were many elements of what are regarded as high performance work practices in operation in both of these companies albeit in an informal way. The structure in these organisations was very flat and this is related to company size and the fact that they were owner managed. All of the employees in these companies had a one to one working relationship with the owner/manager. It was evident from the interviews that the owners knew the capabilities, qualifications, strengths and weaknesses of all the employees. The owner/managers regarded themselves as very supportive of employee learning both in the workplace and by assisting employees in taking on certain types of off-the-job training and part-time study.

In the modern engineering companies there were more highly structured types of work organisation in place. One company had implemented WCM about ten years ago. This involved major restructuring involving cellular manufacture which relies on self-managed teams and less layers of authority. This was generally seen in a positive way as far as learning is concerned. The move towards WCM was implemented to secure the future of the company rather than the explicit desire to implement greater employee involvement or to facilitate learning. The fact that greater workplace learning occurred for many of the employees was merely a by-product of the overall process. In essence all of the respondents both employers and employees did recognise that the way jobs are structured does have a big impact on opportunities for learning at work.
Many of the issues in the literature that was reviewed on work organisation to facilitate workplace learning are supported in the research findings for both categories of company. The type of structures and affordances to support learning that was referred to by Billet’s (2001), Ashton (2004), Eraut (2004) and Felstead et al (2004) were observed in the participating companies. Allied to this the conditions that Skule (2004) identified as conducive to learning at work were also mirrored in this research. It emerged that the type of post-Taylorist forms of work organisation that Skule referred to were very evident in all the companies that were investigated. The reasons for this are probably company specific and related to production volume and strategy, company size and the required employee skill sets.

It is acknowledged from the literature reviews that Taylorist/Fordist types of work organisation are best suited to firms involved in mass production set-ups. The traditional engineering companies that were investigated were not involved in mass production. A lot of the products that these companies produce are one-off or small batches or even specifically tailored to customer needs. They also rely heavily on skilled labour in the sense that most of the employees were apprentice trained. In the case of the modern companies the picture is somewhat mixed and this is linked to the fact that the products are made in larger volumes. Even though these firms exhibit many of the characteristics of post-Taylorist forms of work organisation there was some evidence of what could be described neo-Fordism in operation in one of them. This is based on the information coming from some of the lower skill level employees.
Workers’ perceptions about learning and working

The perceptions on learning and working held by the research participants did not really tally with some of the issues that were referred to in the literature. Pillay et al’s (2003) contention that workers may not recognise the changing context in which they are expected to work was not really evident. All of the interviewees saw a strong correlation between working and learning. While some of them held very high level conceptions about working and learning in the sense that it gave them an identity and they derived a lot of personal fulfilment from work, others held the view that work was not much more than a means to an end. Nevertheless, they all regarded the workplace as a source of ongoing learning. They also saw this in a positive light. There was no real evidence of individuals regarding ongoing learning as something associated with the purely economic agenda that was referred to in the literature. Neither was there any evidence of any employees having a difficulty in engaging with the learning opportunities that the workplace may present as suggested by Pillay et al (2003) and Billet (2004). Learning in general was regarded as an integral part of working. Billet’s (2004) assertion that employees may resist involvement in teamworking or training because of cultural mores or personal life histories was not evident in the research. The individual’s agency with regard to the choice to refuse to engage with workplace learning was not evident either. However, in relation to private part-time further education and training, individuals did indicate that they made value judgements on the need for or the usefulness of investing their own time in such activities.

Skill formation and routes to competitive advantage

Chapter 3 examined some of the literature debates on methods of skill formation and the choices that employers may make in relation to the means to competitive
advantage. The literature referred to alternative routes to competitive advantage that are available to organisations such as work intensification systems and other forms of neo-Fordism. The high skills route was reported to be just one option. The existence of a low skills equilibrium was also discussed because it can act as a restraining factor on learning in the workplace. There was very little evidence of the characteristics of a low skills equilibrium in the firms that were researched. The employers in both categories of company regarded high level employee skills as being important. The manager who was interviewed from company D (modern engineering company) did make reference to using technology to offset any skill deficiencies that existed in certain instances. However this company already operates in the high value added end of the market and relies on high level skills to a large extent.

In the discussion in Chapter 3 on the decline of Fordism and the emergence of post-Fordism, some parallels can be seen between the companies that were investigated and what was referenced in the literature. Since Ireland was late to industrialise a lot of what was said about the decline of Fordism would already have taken place before the companies that were researched were established. Sweeney (1998) sees no disadvantages in the fact that Ireland failed to industrialise in the nineteenth century and later after independence in the 1920s. He goes on to argue that the ability to compete in the modern era is not governed by economies of scale in the manner that applies in Fordist type mass production environments (Sweeney 1989). This is consistent with what was discussed in Chapter 3 on flexible specialisation. The traditional Irish engineering companies are small and rely heavily on skilled labour because of the need to be able to produce a variety of fabricated structures and to tailor products for individual needs. In this regard there are some aspects of what
Piore and Sabel (1984) had described as flexible specialisation in operation in these companies. While these companies produce products of a high quality they may not fully comply with the way propriety goods are described in Chapter 1, *i.e. high quality, not easily copied and where the patent is held by the company*. However, on reflection, the way propriety goods are characterised in these reports does not really stand up to scrutiny in the opinion of the researcher. Given that technology is available at reasonable costs as explained in Chapter 3, the combination of technology and skilled workers should allow most engineering products to be copied directly or modified versions to be produced. Notwithstanding this observation on the notion of propriety products and based on what the company owners had said, it appears that they are trying to move further in the direction of the flexible specialisation model. This is significant because this model relies on craft type skills, general purpose machine tools combined with new technology (Piore and Sabel 1984). The reference by Ashton *et al* (2001) therefore to a slow drift towards high skills, high performance forms of work organisation appears to have relevance in the Irish context.

The research findings show that flexible specialisation is a realistic option as a production strategy for both categories of company. There was evidence of aspects of flexible specialisation in operation in each of the companies that were researched. It is also apparent that the companies are well poised to consolidate this and move further in this direction. The owner managers of traditional companies cited examples of products that they are now beginning to export such as a gantry crane and a handling device for concrete products. The modern companies had already taken on board this approach at an earlier stage and now regard themselves as solution providers. The criticism made by Vallas (1999) in relation to the logic of
flexibility theory is not really relevant to the Irish context at this time based on the findings of this research. Vallas makes the point as outlined in the literature review earlier that it may be possible to make minor adjustments to existing mass production processes as a means of remaining competitive. However, the type of engineering mass production that exists in many large industrialised countries does not exist to any great extent in Ireland.

While some aspects of the study that Boreham (1992) referred to (see Chapter 2) on post-Fordist work structures were not specifically researched in this study i.e. worker decisions about product types and work organisation, the findings do not support what Boreham had advocated about decision making and worker autonomy. The interviewees reported a significant amount of autonomy and decision making capability in relation to their work. The third variant of flexibility theory referred to as the flexible firm did not feature in the companies that were researched. All of the companies maintained a fairly stable full time workforce. The limited potential for learning among certain categories of worker, such as the peripheral group that are reported to be a feature of the flexible firm model, did not therefore manifest itself in this research.

**The impact of VET policy on workplace learning**

The research took account of how VET policy may impact on workplace learning and how engineering workers engage with learning opportunities. Certain influencing elements of the VET theories that were reviewed can be seen in some of the Government policy aspirations that were referred to in Chapter 1. Comments such as, “Knowledge is embodied in people and it is the quality of the human resources that will determine the success or otherwise of firms and economies in the
years ahead” (Enterprise Strategy Group 2004: 26), can be linked with the underlying principles within human capital theory. In the review of economic governance in Chapter 3 it was stated that this theory of VET has particular relevance to countries that manufacture high quality diversified products such as Germany. This is linked to what was described earlier as part of the flexible specialisation concept. Streeck (1989) regards this as the key to economic competitiveness in a modern capitalist country. The strong institutional supports that Streeck regards as a necessary condition for this type of production do exist within the Irish apprenticeship system. Employers are compelled to comply with the structures and procedures that are part of the apprenticeship process. However, this is not generally seen as an imposition because all of the stakeholders were involved in the design of the system at the outset.

It is also concluded that cognisance should be taken of the comments made by Green and Sakamoto (2001) and Streeck (1989), (see Chapter 3) on the link between Germany’s ability to produce high quality diversified engineering products and the dual apprenticeship system. The Irish apprenticeship system is similar in many ways to the German dual system of apprenticeship training. Despite these similarities there is a significant difference between them that could influence skill levels nationally. Streeck (1989) informs us that the decision on the number of apprentices a firm takes in is something that is not at the sole discretion of management. The Government, the chambers of commerce and trade unions also have a say in this. In Ireland this is solely at the discretion of individual employers. This is seen as a weakness in the Irish system. An increase in the number of apprentices trained in the engineering trades would produce a corresponding increase in the supply of intermediate to high level skill in the industry.
All the companies that took part in this research had a high concentration of apprentice trained workers in the designated engineering trades. However the structures that exist for training other categories of engineering employees are not regulated to this extent, particularly with regard to the type of training that is carried out in the workplace. This type of scenario was referred to in the review of theories of VET. For example it was reported that the societal approach recognises that there is not necessarily coherence in VET systems. This is the case in Ireland where there is a combination of employer based systems and apprenticeship in operation albeit for different occupations. Elements of a schooling model can also be seen for engineering professionals and associate professionals whereby they qualify through a fulltime college based VET process.

Irish Government policy in relation to VET appears to be strongly influenced by human capital theory. The research findings highlighted some of the weaknesses in human capital theory that are consistent with the literature reviews. Government policy for example advocates that the national skill base should be raised based on the premise that, “Ireland’s long term vision is to become a high skills economy and a learning society” (NCC 2003:12). One of the weaknesses in human capital theory that was highlighted in the literature is the assumption that it is perfectly rational for individuals to invest in training and education because of the longer term benefits of improved income. The research findings revealed that individuals did not necessarily regard it to be perfectly rational to partake in private time study because of the longer term benefits. It was also reported in the literature that Ireland’s participation rates in lifelong learning are poor by comparison with the EU average. While many of the research participants did take part in either private time study or training organised through their employer the majority felt that significant learning occurred
as a result of normal workplace activity. This is ignored as far as human capital theory is concerned. Lawy and Bloomer (2003) also recognised this as an issue of concern. They commented on the rhetorical nature of the current discourse on lifelong learning, which is mainly focused on learning as acquisition and not as participation. This is reflected in the requirement to demonstrate that what has been learned is measurable through some form of attainment criteria (Lawy and Bloomer 2003). Workplace learning is largely ignored in the formal sense and the feeling among the employees and employers who participated in this research was that there should be a means of accreditation for this type of learning.

In relation to VET provision from the supply side, there were no strongly held views on how the system should be improved for people who are already working. The decision to take on part-time study was generally regarded as a personal choice. The companies that took part in this research were very supportive of employees who were prepared to engage in any type of part-time engineering development. The employees in all cases acknowledged this and pointed out that their employers were probably not typical in this regard. From an employer perspective there was no great deal of dissatisfaction with the assistance that is available through state agencies for employee training. The funding of the off-the-job training phases for apprentices was seen as an important state intervention. The underinvestment in training and the fear of employees being poached that was reported in the findings of previous research by McIver Consulting (2004) and Muntner and Associates (2005) was not evident in this research.
Categorisation of company types

The discussion now moves on to report on some conclusions arising from the decision to segregate the companies into two types for the purposes of the research. It was assumed at the outset that the notion of workplace learning would have better currency among employees in the modern engineering companies. This thinking was based on the assumption that these companies would have adopted a lot of the elements of what are regarded as high performance work practices. These high performance work practices are closely aligned with what we are told exist in the post-Fordist type of companies referred to by Fuller et al (2005) and Ashton and Sung (2002). More worker autonomy, greater variety of tasks and greater decision-making capability are features of this type of work organisation. These are also the type of activities that were subsequently reported in the literature as factors that lead to expansive learning environments for employees.

The findings from the research did not reveal any significant differences in the attitudes of workers in each category of company on what the workplace can provide by way of learning. If anything the employees in the traditional companies regarded the workplace as a greater source of learning than the employees in the modern companies. This was evidenced in both the quantitative and qualitative strands of the research. By referring to Table 5 in Chapter 5 for example there is a greater percentage of very true of me (5) responses among the traditional companies than the modern companies. Another significant finding in this regard relates to product market strategy. The HR manager in Company D (modern company) said that they could still compete in the low value added sector of the market as well as the high value added end. They can offer designs to suit customer requirements at either end of market. As far as cheaper products at the more competitive end of the market are
concerned, she said they concentrated on designing costs out of the production process and also on the use of technology to produce cheaper products where price is a more important criterion than the sophistication of the product. Another reason to conclude that the segregation of company types as cited in the reports is overstated relates to the emerging type of product strategy that was observed in the traditional companies.

Another expectation at the outset was to find lower skill levels in the traditional companies or at least the perceptions among employees that their skills were fairly low level. This did not emerge during the research. The employees in the traditional companies regarded themselves and their work colleagues as being highly skilled and quite capable of producing any type of fabricated metal structure or product. There was no discernable difference in the management’s perception in the two categories of company on the need for higher value added forms of production. The main difference was that the modern companies were further along the road in the development of export markets and higher value production.

Returning to the question of differences between workers’ perceptions on the need for ongoing learning within the two categories of company, the expectation was to find that workers in modern engineering companies hold higher level perceptions, or more positive views on the need for ongoing learning. The findings did not corroborate this view. There were no significant differences across the four cases on employee perceptions on the need for ongoing learning or the meaning they attach to the part work plays in their lives. If anything the employees in the traditional companies held higher level perceptions on these issues.
In drawing some conclusions about attitudes to workplace learning among employees in the two categories of company the following issues may provide some explanations. In the smaller traditional companies it was apparent that employees had more contact with the clients. They were therefore more conscious of the need for quality and could see the consequences of poor quality workmanship. This ties in with what was reported in the literature on what conditions at work promote learning (see Skule 2004). In the larger companies this was not the case; all employees did not get this opportunity to the same extent. Another issue to emerge from the research was the higher concentration of skilled employees in the traditional companies. This finding is consistent with what is reported in the Engineering Skills Monitoring Report 2005 (FÁS 2006). Skilled in this context refers to employees who had served formal apprenticeships as opposed to employees who are operating as operatives or what is referred to as semiskilled work. The apprentice trained employees appeared to be very well disposed to the notion of ongoing learning. This may be influenced by the fact that they had spent a long period of time in training as apprentices. The strong links that are formed with peers as communities of practice seems to have a long-term impact after they qualify. This was evidenced in the way they regard their co-workers as sources of learning and information and the way that information was shared among them. They referred to the way they collaborate on certain projects and on other occasions they work alone. In general though, there was evidence of an overall sense of teamworking within these smaller firms. These findings are consistent with what was reported in Chapter 2 in relation to the intangible outcomes of apprenticeship (see Smith 1992).
**Key conclusions**

Having discussed specific conclusions on the various themes that were reviewed in the literature, this section presents the key conclusions that relate to the overall research question. Workplace learning was shown to play a very significant part in the skill formation process in the four case study companies. It also emerged that formal engineering qualifications are not a true reflection or indicator of skill levels even though they are usually used as a proxy for skill levels. Engineering employees go on learning and developing their skills in the workplace having gone through an initial period of training such as apprenticeship or fulltime VET. In general the social, situated and participatory aspects of learning played the biggest part in the skill development of the individuals who took part in this research. Apprenticeship training as a model of learning was shown to be very effective and has a number of spin off benefits that are derived from the situated, social and participatory elements of the process. The capacity to go on learning, collaborative working and the other intangible outcomes of apprenticeship that were referred to by Smith (1992) are some examples. It is concluded from this research that the workplace training aspect of apprenticeship is largely responsible for the development of these attributes. The confidence levels with regard to taking on more complex work and the acceptance of the need for ongoing learning among apprentice trained employees was significant. These attributes are beneficial in any attempt to move further in the direction of high quality customised production. It is notable that all the other categories of employee who took part in the research recognised the potential benefits of the apprenticeship model as a form of skill formation.

The main conclusion on routes to competitive advantage is that Ireland’s engineering industry is well poised to adopt the type of flexible specialisation or a variant of it
that was referred to by Piore and Sabel (1984). This conclusion is informed by the attitudes among workers to ongoing learning and the skills sets that already exist. This is consistent with the type of production strategy that is advocated by the Irish Engineering Enterprises Federation (2004). However, it must be emphasised that the type of research and development capability required for this production strategy is a separate issue, which was not considered as part of this research. It is also concluded that the strong institutional supports that exist for apprenticeship in Ireland puts this country in a strong position to develop further along the road to higher value added production including propriety products. This conclusion is derived from what was observed in the traditional companies in particular that took part in this research. These companies had a high concentration of apprentice trained employees and they showed that they were able to develop and manufacture diversified products of a high quality. Many of the skill sets that were necessary for this were largely acquired in the workplace.

It is acknowledged that engineering industries that rely on high volume production utilising low level skills may continue to decline in Ireland in the face of global competition. However, the companies that are currently referred to as traditional but nevertheless employ mainly craftsmen should be able to continue to compete by adopting strategies similar to those of the companies that took part in this research. By moving further in the direction of propriety products and services the requirement for skills will also increase. It has been established from this research that the workplace is a significant site for skill development and should not be ignored as part of the skill formation process. Ashton (1998), Eraut et al (1998), European Commission (2001) and Billet (1994) also concur with this.
The question then remains as to how to raise the profile of this type of learning. The conclusion on this issue is that individuals should be afforded the opportunity to have their skills assessed through some sort of accreditation process. This would have the benefit of encouraging employees to engage with and avail of learning opportunities in the workplace on an ongoing basis.

In relation to employers and their attitudes towards high level skills it was found that they value skills and they recognise skills as an important component in their ability to compete and to develop more sophisticated products. The reliance on outsourcing and work intensification, or any of the approaches referred to in the flexible firm model were not evidenced in this research. Had this been the case it would have signalled a possible limitation on the usefulness of Irish engineering workplaces as sites for learning.

It is also concluded that certain underpinning variables that were used in the analytical framework for this research are interrelated. The way these variables combine determines how expansive the learning environment will be in the workplace. The need for skills, enlarged job design, management support for learning, effective communities of practice, and employee autonomy are necessary conditions for effective workplace learning. Issues that are external to the firm such as VET policy on how qualifications can be acquired will also influence how employees engage with learning opportunities at work.

Finally it also brings into sharp focus the fact that certain skills and knowledge that are acquired in the workplace are not recognised and therefore the ability of engineering workers to respond to the demands of the new capitalism are
underestimated. Given this information deficit on skills we do not know the real level of skill and expertise that already exists in the engineering industry.

**Implications of the findings for policy and research**

The current discourse among policy makers, educationalists and other commentators on the approach to the creation of a high skills economy is mainly focused on increased participation in third level education and forms of lifelong learning that are linked to some sort of attainment criteria. It has been shown conclusively in this research that this could only form part of the solution. As referred to earlier employees in the Case Study companies regarded the workplace as a greater source of learning and skill development than formal training and education. A strong correlation between working and learning was shown to exist in engineering occupations and this should be recognised by policy makers.

The findings of this research indicate that a policy decision to make workplace learning a feature of all engineering qualifications similar to what exists in apprenticeship would be worthwhile. Workplace learning is not a compulsory element in the training and education of associate and professional engineers and this is seen as a major weakness based on the findings of this research. It is acknowledged however that this may not work as effectively for non-apprenticeship occupations. The culture and tradition based on communities of practice that exists in engineering apprenticeship training may not translate effectively to non apprenticeship occupations during the initial stages of skill formation. This assertion is linked to Fuller and Unwin’s (2003) point that the institutional recognition and support for the status of apprentices as learners is a contributory factor in the creation of an expansive learning environment in the workplace. This status as
learners may not apply to other categories of employee even though they may be novices. The creation of an expansive learning environment in the workplace for non-apprentice categories may therefore pose a problem in certain organisations. This is something that warrants further research.

A further policy implication in relation to engineering apprenticeships is as follows. The benefits that accrue to apprentice trained employees as a result of their workplace learning experiences could be utilised to greater effect by industry if there were more equitable progression routes to professional and associate professional status available to craftsmen. These progression routes would need to take account of and build on the skills and knowledge that these craftsmen have already acquired. The engineering industry would benefit by having more apprentice trained employees in positions of authority and responsibility by capitalising on the tacit knowledge and hands on experience that these workers have acquired during their training. Although craftsmen can progress through part time study, the current progression routes can be very circuitous and often involve having to repeat learning outcomes that have been achieved as part of the apprenticeship.

While the need to recognise learning that occurs in the workplace is acknowledged by policy makers it is still a long way from being embedded in the formal VET system. A contributory factor here is the fact that workplace learning is rendered invisible because it is inseparable from the normal work carried out on the shop floor. The details of a process for formal recognition of workplace informal learning and how it should link in with Ireland’s National Qualifications Framework is something that warrants further research. A practical question that also arises relates to whether the accreditation and assessment methods for learning that occurs in the
workplace can be the same as that which occurs in a formal setting. Another related policy issue for consideration is whether employers should be allowed to award qualifications. This would have the advantage of providing closer alignment between qualifications and industry needs.

Lifelong learning is also an ongoing process in the industry and yet it is largely unrecognised because of its informal nature. If Ireland is to develop a higher skills engineering workforce, policy makers will have to question the narrow pre-occupation with third level qualifications and formal training as the sole means to achieve this. A different conception of the breadth and depth of skills and knowledge that are required to create the type of skilled employee that is now being advocated is required.

**Unique contributions of this research to existing knowledge**

This research on workplace learning is distinctive for a number of reasons. Firstly it challenges the traditional view of how skill levels are measured. It also shows that formal engineering qualifications do not necessarily reflect the skills and knowledge that are needed in the workplace. Because it is industry specific and located in an Irish context the findings are focussed and can be applied or further developed by policy makers to inform engineering skill formation strategies. Apart from being industry specific it examined workplace learning in both traditional and modern engineering companies. These companies differed significantly in size, structure and product mix. This enables us to be more confident in how the findings can be generalised across the industry sector. The research design relied on a synthesis of certain findings from previous research covering a broad range of interacting variables that impact on skill and knowledge formation in a way that had not been done before.
The mixed methodology provided in-depth insights on the perceptions of employers and employees on a cross section of issues related to workplace learning, the need for ongoing learning and engineering skill formation processes in general. It provides further insights into employee and employer perceptions on the need to formally recognise learning that takes place informally and how the concepts of learning as acquisition and participation can be reconciled as part of a national skill formation strategy. Finally, it highlights the importance of a particular type of relationship that exists between employers and employees, whereby employers can enable learning to take place based on the type of working arrangements that apply, as opposed to providing training in the traditional context. Employees on the other hand through their own agency can decide how they avail of these learning opportunities. This type of relationship appears to be more important for employee performance and development than formal training interventions that employers may implement. The focus is therefore shifted away from training towards learning.
Appendix 1

Attitudinal survey on workplace learning and skill acquisition in Irish based engineering companies.

The questions below ask about your preferred learning methods and your attitude to learning and working. The form is divided into two parts. Part A deals with workplace learning and skill acquisition. Part B deals with attitudes towards learning and how learning is perceived.

Before going on to answer the questions please state your job title and give a brief outline of your duties and responsibilities in the spaces provided.

Job Title: __________________________ Company name: __________________________

Duties and Responsibilities:

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

There are no right or wrong answers to the following questions, just answer as accurately as you can to describe your own opinions. Use the scale below to answer the questions. If you think the statement is very true of you, tick 5. If the statement is not at all true of you, tick 1; otherwise find the number between 1 and 5 that best describes you.

<table>
<thead>
<tr>
<th>Part A – Workplace learning and skill acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I learn and develop my skills better by working as a member of a team.</td>
</tr>
<tr>
<td>2. My learning is improved when I receive feedback and support from my supervisor/manager.</td>
</tr>
<tr>
<td>3. When given more responsibility at work, I learn more.</td>
</tr>
<tr>
<td>4. I think the best way to learn how to do a particular job is through experience.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
</tr>
<tr>
<td>9.</td>
</tr>
<tr>
<td>10.</td>
</tr>
<tr>
<td>11.</td>
</tr>
<tr>
<td>12.</td>
</tr>
<tr>
<td>13.</td>
</tr>
<tr>
<td>14.</td>
</tr>
<tr>
<td>15.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>16.</td>
</tr>
<tr>
<td>17.</td>
</tr>
</tbody>
</table>

**Part B – Perceptions about learning**

<table>
<thead>
<tr>
<th></th>
<th>1 Not at all true of me</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 Very true of me</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>I consider myself to be a learner as well as an employee.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>19.</td>
<td>I need to carry on learning throughout my working life.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>20.</td>
<td>The best way to learn new engineering skills and knowledge is in the workplace rather than through formal courses that lead to qualifications.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>21.</td>
<td>I consider learning to be a part of my work.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>22.</td>
<td>I regard working to be a way of enhancing my skill and knowledge.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>23.</td>
<td>Apart from earning a living I also work to enhance my learning.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>24.</td>
<td>I believe that real learning occurs as a result of everyday working as well through formal courses that lead to certification.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>25.</td>
<td>It should be possible to obtain qualifications for the skills I learned at work.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
26. After having acquired my initial qualification or training, there should be no need for me to engage in any further learning related to work.

27. I would welcome the opportunity to take on more responsibility and a wider variety of tasks as a means improving my skills and knowledge.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all true of me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional comments**

The above questions will reveal the attitudes that exist among employees but not the reasons why such attitudes exist. Could you please therefore include any additional comments that would explain the rationale for your answers. You may reference your comments to specific questions.
Appendix 2

How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?

Research Instrument

Employee interview questions

The following interview questions are intended to obtain qualitative information related to perceptions of learning and skill acquisition. These interviews will be carried out with a sub-set of those employees who completed the questionnaire as a means of allowing them to elaborate on some of the relevant themes and issues.

1. What engineering qualifications do you hold and how did you acquire them?

2. How useful were the formal engineering qualifications you obtained through full-time VET as a means of providing you with the skill and knowledge required in the workplace?

3. Do you see any need to continue learning and upgrading your skills through out your working life?

4. If your company was to consider moving its production processes further up the value chain, how should the workforce skills be upgraded to facilitate this?

5. What are your views on learning at work as opposed to learning in a more formal classroom type setting?

6. How do you think that the engineering skills and knowledge that you acquired at work should be recognised?

7. Does your present employment provide you with the potential to acquire higher level engineering skills and knowledge? If not- Why? If yes- in what ways?

8. Do you work as a member of a team and if so, how has it impacted on your learning at work?

9. How could the existing engineering courses that are available be improved or re-structured to facilitate people who are already in employment?

10. What way do you think that workplaces should ideally be structured in order to maximise learning opportunities for employees?

11. Do you think that employers would provide a structured means of facilitating employee skill upgrading without state intervention?
12. In your opinion, what type of learning can only be carried out in the workplace?

13. Do you regard work as simply a means of making a living, or do you regard it to be something more than that?

14. What are your views on the value of learning by observing others, interacting with peers and working under the guidance of an expert, such as the apprentice/craftsman relationship.

15. Rate the following learning sources in order of their usefulness in helping you to improve your job performance:

| __________ | Training courses organised by your employer |
| __________ | Observing others |
| __________ | Working with a more experienced colleague/s |
| __________ | Machine manuals |
| __________ | Trial and error |
| __________ | Reflecting on performance |
| __________ | Drawing on the skill/knowledge you learned during your formal training |
| __________ | Practice acquired by just doing the job |
Appendix 3

How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?

Research Instrument

Manager/employer interview questions

1. Do you see any need for your organisation to move its product market strategy further up the value chain- if not why?

2. If your company was to engage in the production of higher value added products aimed at specialist markets, what do you think that the implications for staff training would be?

3. How do you think that any skill deficiencies arising from a move towards higher value added production should be addressed?

4. How useful do you think the engineering qualifications are that workers bring with them to your organisation when recruited?

5. To what extent can learning be transferred from one workplace to another?

6. Do you think that the type of social relations that exist in the workplace have any impact on learning at work e.g. communities of practice/teammaking?

7. What do you think the relationship is between working and learning as it may apply in an engineering manufacturing business?

8. Would you be prepared to re-structure the working arrangements in your organisation as a means of promoting greater learning among employees? If not why?

9. What do you think the relationship is between working and learning?

10. Do you think that the skills people acquire at work should be formally recognised and if so how do you think this could be achieved?

11. Do you think that Government or Government agencies have role to play in assisting companies to raise the skill levels of employees?

12. What role do you think workplace learning has in raising skill levels among employees?
13. What type of work structures do you think would promote greater learning at work for novices and experienced workers?

14. Research tells us that Irish Small and medium sized enterprises spend little on training – why do you think this may be?
Sept, 2006

**Attitudinal survey on workplace learning and skill acquisition**

As a doctorate student at the Centre for Labour Market Studies, University of Leicester, I am carrying out research for a thesis, which is titled:

**How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?**

Workplace learning has attracted a good deal of academic interest in recent years and is regarded by some academics as an essential part of the skill formation process. As part of my thesis, I am collecting data using the attached questionnaire on the perceptions of employees on the usefulness of workplace learning as a means of helping to create a high skills engineering industry in Ireland. The way workplaces are organised and the perceptions held by employees on learning at work will be a central part of the research as well as perceptions on the need for lifelong learning.

I would be grateful if you would consent to taking part in this research by completing the attached questionnaire

I also hope to carry out interviews with a sub-set of those who completed the questionnaire in order to collect more in-depth information. I envisage that the interviews will take about 30 minutes to complete and would appreciate your cooperation by agreeing to participate.

I assure you that the information will not be used for any purpose other than this piece of academic research. I propose to visit your company on XX XX 2006, where I can collect the completed questionnaires and conduct interviews.

Derek Walsh
Doctorate Student
University of Leicester
Tel: 086 3005983 or 01 6070878
Email: derek.walsh@fas.ie
Dear

Attitude survey on workplace learning and skill acquisition in Irish based engineering companies

Following my recent telephone call regarding my Doctorate research, this letter provides additional background information on the purpose of the research and my request for your support by participating in a survey.

As a doctorate student at the Centre for Labour Market Studies, University of Leicester I am carrying out research for a thesis, which is titled:

How can workplace learning help to reposition Ireland’s engineering industry towards a high skills route?

Workplace learning has attracted a good deal of academic interest in recent years and is regarded by some academics as an essential part of the skill formation process. As part of my thesis I am collecting data on the perceptions of employees on the usefulness of workplace learning as a means of helping to create a high skills engineering industry in Ireland. The way workplaces are organised and the perceptions held by employees on learning at work will be a central part of the research.

Another aspect of the research is to collect data from employers/company managers on skill formation processes within the industry and to solicit their views on the need to create a high skills engineering industry in the first place. The advice coming from the Irish Engineering Enterprises Federation and from Government advisory groups is that the industry should reposition itself higher up the value chain in order to remain competitive. This has implications for skill/knowledge levels within the workforce.

My intention is to survey traditional engineering companies as well as companies that manufacture high value added sophisticated products. This will provide a comparison
between the perceptions of employees in both types of organisation on the need for lifelong learning and how the organisation of workplaces can impact on learning.

There are three aspects to the research. Firstly I intend to collect quantitative data from employees using the enclosed self-completion questionnaire. Secondly I hope to interview a sub-set of those who completed the questionnaire in order to collect more qualitative data. Finally I propose to interview company managers/owners, depending on company size, to solicit their views on these issues.

I assure you that the information will not be used for any purpose other than this piece of academic research and will not be passed on to a third party. Company names or participant names will not appear in the thesis.

In summary then, I would be grateful if you would distribute the attached questionnaires to your employees for completion. As you will see I have also attached a covering letter to the questionnaires, which explains the purpose of the survey and requests employee participation. I hope to gather 25 responses from your company and ideally to interview about six of those who completed the questionnaire. The interview topic guide for employees is enclosed for your information. I envisage that these interviews will take about 30 minutes.

Finally I would also hope to carry out an interview with you based on the enclosed Employer interview topic guide. The interview would take about 40 minutes. I will ring you again shortly and hopefully you will have had a chance to look over this material by then.

Yours sincerely

Derek Walsh
Doctorate Student
University of Leicester
Tel: 086 3005983

Email: derek.walsh@fas.ie
## Appendix 6

### Raw Data Company A - Individual Responses Based on 20 Questionnaires

Numbers represent each respondent's rating per question

<table>
<thead>
<tr>
<th>Question</th>
<th>Ratings</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>4 3 2 5 3 5 1 3 4 3 3 3 4 5 4 5 5 3 5</td>
<td>4</td>
<td>5,3</td>
</tr>
<tr>
<td>Q2</td>
<td>5 5 4 5 4 2 3 4 3 3 3 2 5 5 4 5 4 2 5</td>
<td>4</td>
<td>5,4</td>
</tr>
<tr>
<td>Q3</td>
<td>5 3 3 2 5 3 5 3 4 3 3 3 5 3 4 5 3 4 5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Q4</td>
<td>4 5 5 5 5 3 3 5 5 4 5 4 5 3 5 4 4 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q5</td>
<td>4 4 3 5 4 4 3 5 4 5 3 5 4 5 5 4 5 5 4 4 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q6</td>
<td>5 5 4 3 5 2 3 3 2 5 5 5 2 4 4 5 5 5 5 5 5</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q7</td>
<td>5 4 4 2 5 4 1 1 4 5 3 2 2 3 5 5 5 4 3 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q8</td>
<td>4 4 3 4 5 4 3 5 4 4 3 3 5 5 3 4 5 4 2 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q9</td>
<td>4 3 3 3 4 3 5 4 5 4 5 5 3 4 5 4 5 4 5 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q10</td>
<td>5 4 3 3 5 4 4 5 4 4 2 4 3 5 5 5 3 5 5 5 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q11</td>
<td>4 5 3 2 5 4 2 1 5 4 2 3 2 5 5 4 5 4 4 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q12</td>
<td>5 3 3 2 5 2 5 2 5 4 5 4 5 4 2 4 5 3 3 2 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q13</td>
<td>3 3 2 2 3 4 5 3 3 5 5 4 1 3 3 1 1 2 3 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Q14</td>
<td>3 4 4 2 3 4 5 1 4 5 5 4 3 4 5 3 4 5 4 4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q15</td>
<td>5 4 4 3 5 3 4 5 5 5 5 3 4 4 5 4 5 4 4 5 5 5</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q16</td>
<td>5 3 5 3 5 4 3 5 4 5 5 3 4 5 4 5 4 5 4 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q17</td>
<td>5 3 5 4 3 4 5 3 4 5 5 3 4 4 5 5 5 4 2 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q18</td>
<td>5 5 3 5 5 5 5 5 4 5 5 4 3 5 5 4 5 5 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q19</td>
<td>5 5 4 3 5 5 5 5 4 5 5 4 4 5 5 5 5 5 4 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q20</td>
<td>5 4 3 2 5 3 1 3 4 5 3 4 2 4 5 5 5 3 5 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q21</td>
<td>5 5 4 2 5 5 5 5 4 5 5 3 5 4 5 5 5 5 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q22</td>
<td>5 5 4 3 5 5 5 5 1 4 5 3 3 3 4 5 4 5 4 5 5</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q23</td>
<td>5 5 3 2 5 4 5 1 4 5 5 3 4 5 4 5 4 3 4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q24</td>
<td>5 5 4 4 5 4 3 4 5 5 3 4 3 4 5 4 5 5 4 5 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q25</td>
<td>5 5 5 4 4 5 5 5 5 3 3 4 5 5 5 4 4 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q26</td>
<td>5 5 4 3 5 5 4 5 2 4 5 3 5 5 5 4 5 5 5 4 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q27</td>
<td>5 3 3 3 5 3 5 5 4 5 3 3 5 5 5 4 5 5 3 5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Overall: Median - Mode**

4 5

Note: High numbers represent agreement with questionnaire statements
## Appendix 7

### Raw Data Company B - Individual Responses based on 16 questionnaires

Numbers represent each respondent’s rating per question

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>5 3 3 3 5 3 5 5 5 4 5 3 2 5 5 4</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q2</td>
<td>5 3 4 3 5 4 5 5 5 5 5 4 2 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q3</td>
<td>5 3 4 3 3 3 5 5 5 5 5 5 3 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q4</td>
<td>5 4 5 5 5 4 5 5 5 5 5 3 5 4 5 4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q5</td>
<td>5 3 5 5 4 5 5 4 5 4 4 4 4 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q6</td>
<td>5 4 4 4 5 5 3 5 4 5 4 5 4 5 5 4</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q7</td>
<td>5 3 1 5 4 5 5 4 4 4 5 2 3 3 4 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q8</td>
<td>5 3 4 5 5 5 5 4 4 5 5 4 3 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q9</td>
<td>5 3 4 4 4 5 5 3 4 4 5 5 3 4 5 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q10</td>
<td>4 3 5 2 4 4 5 3 4 5 5 4 3 4 5 5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Q11</td>
<td>3 3 5 2 2 2 5 4 4 4 5 5 4 4 4 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q12</td>
<td>5 3 3 5 2 3 3 5 4 2 5 1 4 5 5 5</td>
<td>3.5</td>
<td>5</td>
</tr>
<tr>
<td>Q13</td>
<td>1 2 4 3 1 3 3 2 2 4 2 4 1 2 2 5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Q14</td>
<td>5 3 1 3 3 2 5 5 4 5 4 5 3 5 5</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q15</td>
<td>5 4 3 5 4 4 5 4 4 5 4 4 5 4 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q16</td>
<td>5 3 2 4 5 4 3 4 4 4 4 4 4 5 4 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q17</td>
<td>5 3 5 1 3 3 4 3 4 3 4 4 5 4 3 5 2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Q18</td>
<td>4 4 5 5 5 3 5 5 3 4 5 4 3 5 5 5</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>Q19</td>
<td>5 4 5 4 5 5 3 4 4 5 4 5 5 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q20</td>
<td>5 3 2 3 1 3 5 4 4 3 4 3 4 3 5 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Q21</td>
<td>5 3 5 4 4 4 5 4 4 3 4 4 3 5 5 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q22</td>
<td>4 4 5 3 4 3 5 4 4 5 4 4 3 5 5 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q23</td>
<td>4 3 5 4 3 2 4 4 4 4 3 4 1 5 4 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Q24</td>
<td>5 3 5 3 4 5 5 4 4 5 5 4 3 5 5 5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q25</td>
<td>5 3 5 4 2 5 4 5 5 4 4 5 5 4 5 4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Q26</td>
<td>5 5 5 3 1 5 1 2 2 4 5 2 3 5 3 5</td>
<td>3.5</td>
<td>5</td>
</tr>
<tr>
<td>Q27</td>
<td>5 3 4 4 4 2 2 5 4 4 5 4 4 5 5 5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Overall</strong>: Median - Mode</td>
<td></td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: High numbers represent agreement with questionnaire statements
| Q1 | 4 3 2 3 4 2 3 3 4 4 3 2 3 4 4 5 5 4 4 5 5 4 3 3 3 4 4 |
| Q2 | 5 4 5 4 5 4 4 4 5 4 3 4 3 4 5 4 4 5 3 4 3 5 3 1 4 5 |
| Q3 | 5 5 5 4 4 4 5 1 5 5 4 4 5 3 4 5 3 5 4 4 3 4 5 3 5 4 5 |
| Q4 | 5 5 5 5 5 5 3 5 5 5 3 5 3 3 3 5 4 5 5 5 5 4 5 5 4 5 5 |
| Q5 | 5 3 5 3 3 5 3 3 2 5 3 5 2 5 5 5 5 5 4 5 5 5 4 5 5 4 5 |
| Q6 | 5 5 3 3 4 5 5 5 4 5 2 3 5 3 3 4 5 3 5 4 5 5 5 3 2 5 3 |
| Q7 | 5 4 5 2 5 4 4 3 2 3 4 2 4 3 2 5 3 5 2 4 5 4 3 1 3 4 |
| Q8 | 5 5 3 5 4 5 4 4 4 5 4 5 5 5 4 4 4 3 5 5 4 3 5 4 5 4 5 |
| Q9 | 5 5 5 4 3 5 3 5 5 5 5 5 4 5 3 4 5 4 3 5 3 5 3 5 5 5 |
| Q10 | 5 3 3 2 4 4 3 4 1 1 4 4 3 5 5 2 3 3 5 4 3 4 3 3 4 4 |
| Q11 | 3 1 1 2 5 3 2 3 1 1 4 4 2 5 5 2 3 4 3 4 3 2 4 4 4 4 3 |
| Q12 | 4 4 5 3 5 4 4 3 4 3 4 5 4 4 4 5 4 5 5 5 5 5 3 5 3 4 |
| Q13 | 3 1 1 3 1 4 3 2 1 1 2 3 2 2 3 3 1 3 4 4 5 4 3 2 2 4 4 |
| Q14 | 5 3 5 4 4 3 5 1 5 5 4 3 4 3 3 4 4 4 5 4 5 1 3 2 2 5 4 |
| Q15 | 5 5 5 4 3 3 5 4 4 4 5 3 4 5 5 3 5 5 5 3 5 5 4 4 5 5 5 |
| Q16 | 3 5 5 3 4 4 4 5 2 4 5 4 3 4 5 4 3 5 5 5 4 3 3 4 3 5 5 |
| Q17 | 5 5 3 3 4 2 4 3 1 1 4 3 3 3 5 4 5 4 5 4 3 3 4 3 1 2 5 4 |
| Q18 | 5 5 5 4 5 4 5 5 2 1 5 4 4 5 4 5 5 4 5 5 5 5 4 5 5 5 5 |
| Q19 | 5 1 3 4 3 2 1 3 4 3 3 1 5 3 3 4 3 5 1 3 4 3 3 4 3 4 |
| Q20 | 5 1 3 4 3 2 1 3 4 3 3 1 5 3 3 4 3 5 1 3 4 3 3 4 3 4 |
| Q21 | 5 3 5 4 5 5 4 4 4 5 4 5 5 3 5 5 5 5 5 5 5 5 5 5 5 4 |
| Q22 | 5 1 3 4 3 2 1 3 4 3 3 1 5 3 3 4 3 5 1 3 4 3 3 4 3 4 |
| Q23 | 5 3 5 4 5 5 4 4 5 1 1 1 5 4 5 5 4 4 5 5 5 3 5 5 5 4 4 |
| Q24 | 5 5 5 4 5 4 5 5 2 3 2 2 1 5 4 3 4 5 5 3 4 4 5 4 4 4 4 |
| Q25 | 4 4 5 4 5 4 5 5 3 3 4 4 5 5 5 4 2 5 4 5 5 5 4 4 4 4 5 |
| Q26 | 5 5 5 4 5 5 5 5 4 4 4 4 5 5 5 5 5 5 4 5 5 5 3 5 5 5 4 |
| Q27 | 5 5 5 4 3 4 4 4 4 5 3 4 4 4 4 5 5 2 4 5 3 3 5 5 5 2 5 5 4 |

Overall: Median - Mode 4 5

Note: High numbers represent agreement with questionnaire statements
<table>
<thead>
<tr>
<th>Appendix 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Data Company D - Individual Responses based 20 questionnaires</td>
</tr>
<tr>
<td>Numbers represent each respondent’s rating per question</td>
</tr>
<tr>
<td>Q1</td>
</tr>
<tr>
<td>Q2</td>
</tr>
<tr>
<td>Q3</td>
</tr>
<tr>
<td>Q4</td>
</tr>
<tr>
<td>Q5</td>
</tr>
<tr>
<td>Q6</td>
</tr>
<tr>
<td>Q7</td>
</tr>
<tr>
<td>Q8</td>
</tr>
<tr>
<td>Q9</td>
</tr>
<tr>
<td>Q10</td>
</tr>
<tr>
<td>Q11</td>
</tr>
<tr>
<td>Q12</td>
</tr>
<tr>
<td>Q13</td>
</tr>
<tr>
<td>Q14</td>
</tr>
<tr>
<td>Q15</td>
</tr>
<tr>
<td>Q16</td>
</tr>
<tr>
<td>Q17</td>
</tr>
<tr>
<td>Q18</td>
</tr>
<tr>
<td>Q19</td>
</tr>
<tr>
<td>Q20</td>
</tr>
<tr>
<td>Q21</td>
</tr>
<tr>
<td>Q22</td>
</tr>
<tr>
<td>Q23</td>
</tr>
<tr>
<td>Q24</td>
</tr>
<tr>
<td>Q25</td>
</tr>
<tr>
<td>Q26</td>
</tr>
<tr>
<td>Q27</td>
</tr>
</tbody>
</table>

Overall: Total - Mean - Mode | 4 | 4 |

Note: High numbers represent agreement with questionnaire statements
Bibliography


CLMS (1) Doctorate in Social Science (HRD) Module 1.

CLMS (1) Doctorate in Social Science (HRD) Module 2 A.

CLMS (1) Doctorate in Social Science (HRD) Module 2D.

CLMS (1) Doctorate in Social Science (HRD) Module2 J.

CLMS (1) Doctorate of Social Science (HRD) Module 2 G.

CLMS (7.1) *MSc in Training*, Module 3


National Competitiveness Council (2003), The Competitiveness Challenge, Dublin: Forfás.


