Forecasting the supply of construction labour

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FORECASTING THE SUPPLY OF CONSTRUCTION LABOUR

by

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A Doctoral Thesis Submitted in Partial Fulfilment of the requirements for the award of Doctor of Philosophy of the Loughborough University

May 1996

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Abstract

Construction is a labour-intensive industry that places heavy reliance upon the skills of its workforce. Construction companies need to understand and realise the importance of long-term labour resource planning requirements. The overall aim of this thesis is to develop a systematic planning process that offers the opportunity for gathering information for construction labour markets throughout Europe. Such a process would benefit the construction industry by identifying imbalances between the demand and supply of specific construction skills. In order to plan, the construction industry must: appreciate the complexity of labour resource requirements; understand the long-term planning implications; have reliable information; and be aware of any restrictions or limitations on the planning exercise. These have been reflected in the main objectives of this research which were to: identify and collate useful and reliable sources of data on construction labour resources throughout Europe; construct a model to predict labour resource trends; and assess the acceptability of movement between various European regions.

Key sources of construction industry labour statistics were identified in several European countries. Descriptions of the information held by each source were obtained through a questionnaire survey that illustrated the extent to which data in individual countries were broken down. Due to the differences in the classification of data, meaningful comparisons of labour statistics from one country to another were difficult to achieve.

The future supply of construction skills depends on the recruitment of young people, together with some upgrading of semi-skilled operatives to skilled operatives. The potential for modelling labour supply was identified and could provide an insight into influences on this supply of trainees. A human capital approach to analysing labour supply was used as a theoretical basis for developing such a model. It was found that real craft wage and output have a strong influence on the supply of new entrants, along with demographic factors and young people's image of the construction industry.

The movement of labour within Europe is more common place in the construction industry than other industries owing to the transient nature of the workforce. Factors governing labour mobility between various regions of Europe were identified through literature review. This research demonstrated that the movement of construction labour depends on several push-pull factors: push factors encourage movement from a particular region; and pull-factors direct movement into a particular region. Mutual recognition of qualification and common labour regulations were found to be less significant factors.
Acknowledgements

I would like to express my gratitude to Dr. Andrew Price for the comments and advice that he has given me, and the time and attention he has invested in my thesis.

I am grateful to my family, friends and work colleagues for their support and understanding, both at Loughborough and Reading. In particular, I wish to thank Mike Wright for proof reading the thesis during the final stages and for his cheerful efficiency and considerable patience.

This research has been supported by a grant from the EPSRC and the European Construction Institute, to whom the author is most grateful. Thanks are also due to Sara Buzby (NJCBI), Pat Bowen (CITB) and Steve Wellington (New Earnings Survey) for providing the relevant data, and particularly to members of the European Construction Institutes Construction Manpower Taskforce for their continued support.
Declaration

No portion of the research referred to in this thesis has been submitted in support of an application for another degree or qualification at this or any other university or other institution of learning.
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CHAPTER ONE

INTRODUCTION

1.1 Introduction To The Subject

During the 1990’s, more higher-level skills will be needed to cope with the increasing use of new technologies in both manufacturing and construction. Changes in consumer demand and changing market opportunities, such as those arising from the single European market, will also intensify the economy’s need for a more highly skilled, flexible and adaptable workforce. These changes are taking place against a background of important shifts in the composition of the labour force which employers need to take into account if they are to avoid future skill shortages. In general, the construction industry has responded to shortages of any type of skilled labour by adopting one or more of the following policies:

- the short-term option of increasing remuneration is often the most common, however, this results in companies poaching labour from each other and leads to inflationary rises in the cost of construction, which in turn reduces demand and temporarily solves the problem of labour shortage;

- the medium to long-term option of redesigning construction methods, taking into account forecasts or known shortages which is an under-utilised practice; and

- the long-term option of establishing training programmes which is infrequently applied.
The preference for short-term solutions comes about because labour resource issues are not fully understood by the employers and their subsequent failure to influence national governments to invest in the most appropriate form of skilled labour provision. The situation is compounded by the free movement of labour within Europe. This aspect is not well documented (Briscoe and Wilson, 1993).

1.2 Background

The construction industry is both diffuse and inadequately defined, as a result there is an absence in almost every country in Europe of a single reliable source of employment data (Agapiou et al, 1995b). Such information is vital in a footloose industry such as construction and is essential to investors exploring new regions. The availability of labour is a major consideration in most investment decisions. There is indeed a plethora of data available from many sources on the subject of labour resources, but much of these data are unintelligible to companies and instances abound of large projects being located in areas where there are insufficient labour to satisfy the demand generated.

The level of demand for construction skills is affected by the cyclical nature of the industry’s workload. Previous fluctuations in output have had serious adverse effects on the construction industry’s ability to sustain a skilled workforce. The problem of predicting skill needs is made more difficult by shifts in level of demand from different market sectors and new opportunities.

Construction is still very much a local business, however, inter-company links in Europe have become more important in recent times. Many companies now recognise the huge potential of Single European Market. There is, for example, a great demand for new housing in some countries. While in other countries, international competition for large-scale projects is bound to intensify, especially for infrastructure projects.
A report to the European Commission on 'Strategies for the Construction Sector' by W.S. Atkins presented three scenarios for future construction and economic growth in countries of the European Union (Commission of the European Communities, 1993).

- Scenario A, the most optimistic, envisages high growth and high productivity improvements; construction output will double by 2005; and improvements in housing, cities and infrastructure will create 5 million new construction jobs.

- Scenario B, predicts historic growth and moderate improvements in productivity; growth in the construction industry's share of GDP to the 1990/91 level followed after 4 years by steady growth of around 3 per cent a year; and this will create two million new construction jobs.

- Scenario C, the most pessimistic, envisages low growth and no improvements in productivity; construction output is forecast to fall for a number of years and then grow slowly, but remain below levels achieved in 1992; and a further two million construction jobs will be lost.

If high levels of construction output are achieved, as predicted by Scenarios A and B, then questions arise concerning how skill needs can be met. Regions where highly skilled construction workers are available will benefit at the expense of regions that do not possess the necessary skill levels.

During the UK construction boom of the late 1980's, successive construction industry surveys reported how an increasing number of respondents had experienced difficulties in recruiting bricklayers, carpenters and plasterers (see Table 1.1). These shortages were particularly acute in London and the south-east, where extensive building projects, for example, the London Docklands and Broadgate developments, put pressure on an already short supply of skilled craft workers.
The number of jobs lost during the recession has left the industry with a shortage of construction skills. A recent report by the Engineering Construction Industry Training Board on future training needs suggests that the Engineering Construction sector will face acute skill shortages in a number of trades (ECITB, 1996).

Table 1.1: Percentage of firms nationally reporting difficulties in securing labour skills

<table>
<thead>
<tr>
<th>Date</th>
<th>Bricklayers</th>
<th>Carpenters</th>
<th>Plasterers</th>
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<tr>
<td>Feb. 1984</td>
<td>40 %</td>
<td>38 %</td>
<td>24 %</td>
</tr>
<tr>
<td>Feb. 1986</td>
<td>48 %</td>
<td>35 %</td>
<td>25 %</td>
</tr>
<tr>
<td>Feb. 1988</td>
<td>87 %</td>
<td>87 %</td>
<td>60 %</td>
</tr>
<tr>
<td>Nov. 1989</td>
<td>51 %</td>
<td>51 %</td>
<td>40 %</td>
</tr>
</tbody>
</table>

Source: Building Employers Confederation

The pace of technological change in the construction industry, combined with increased specialisation especially on large-scale projects, will focus more attention on the pattern of future skill requirements. In particular, the use of prefabricated components eliminates the need for traditional craft skills. The increased use of specialist trades, working in close proximity, has led to a rise in new interfacing problems. Future skill requirements of craft workers will be determined by changes in management practice and technology. However, this assumes that the construction industry will be able attract and retain people in sufficient numbers to be trained in these skills.

The pool of young people leaving full-time education has traditionally been the main source of supply for employers in the construction industry. Employers need to be made aware of the impending changes in the structure of the work force, including the declining number of young people entering the employment market. This may encourage more active competition amongst employers for this type of employee. Thus, employers offering competitive pay packages and good career structures should be able to satisfy their labour requirements.
The construction industry is well known for offering attractive pay, but the lack of a career structure, particular for craft operatives, and poor image of the industry often deters some young people from even considering the industry as a future employer. It may be that construction firms should consider alternative sources of labour.

A large proportion of the initial demand for labour can be satisfied from the pool of unemployed construction workers, notwithstanding the losses caused by retirements and movements to other industries. However, it is unlikely that the construction industry’s labour needs can be satisfied from the ranks of the unemployed alone, many of whom no longer possess the necessary skills. The situation is compounded by the cyclical nature of the construction industry, that has resulted in many skills being lost during recessionary periods. High numbers of skilled operatives leave the industry and fail to return when work becomes available. These skill losses create serious problems and have a direct impact on the rate of the construction industry’s expansion.

1.3 Research Justification

The foregoing evidence indicates that skills shortages and recruitment difficulties often come about because labour resource issues are not fully understood at industry level. Construction employers may be able to increase pressure on national governments to invest in the most appropriate form of skilled labour provision once they have a complete understanding of the labour resource issues affecting the construction industry.

The importance of good quality data in decision making and planning cannot be over-emphasised. The provision of reliable labour resource data is also a prerequisite for planning future skill requirements. Reliable data on the demand for, and the supply of construction skills is essential for effective employment planning and forecasting in the industry. Though neither the availability of information nor the availability of employment planning per se will guarantee the avoidance of future shortages, both are an essential first step towards the adoption of the appropriate policies.
1.4 Aims and Objectives of the Research

Organisations concerned with construction labour market issues have traditionally worked independently, often taking decisions on the basis of incomplete information. The aim of this thesis is to develop a systematic employment planning process that offers the opportunity for gathering comprehensive information for construction labour markets throughout Europe. Such a process would benefit the construction industry by identifying imbalances between the demand and supply of specific skills. In order to achieve an adequate supply of labour skills, the construction industry must: appreciate the complexity of labour resource requirements; understand the long-term planning implications; have reliable data; and be aware of any restrictions or limitations on the planning exercise. Accordingly, the main objectives of the research were as follows:

- Identify and collate important and reliable sources of data on labour resources relevant to the construction industry in Europe. This would involve interpretation of the various definitions used and eliminating double, or treble counting. If the key reliable sources of data were identified, explained and made available to industry, this would, in itself, be a significant contribution.

- Construct a model to predict labour resource trends. This would facilitate clearer planning by construction companies and could well be a major factor in stimulating investment in devising new construction.

- Assess the acceptability of movement between various regions of Europe, and measure what is likely to be the effect of the ‘free movement of labour’ on the supply of construction skills

1.5 Research Methodology

To achieve the objectives, this research was undertaken in two phases as presented in Figure 1.1.
Literature review

Aims & Objectives

---

Phase 1

Define parameters of the proposed planning process

Evaluate available labour resource data

---

Phase 2

Develop information tools for planning purposes

Evaluate international dimensions of planning labour resource requirements

Recommendations

Figure 1.1 Research methodology
Phase one involved a literature review to highlight the important labour resource issues affecting the construction industry, in so far as this defined the limitations and restrictions on proposed planning process. Phase two focused on the development of information tools to plan future labour skill requirements using questionnaire analysis, and econometric techniques to build and test the proposed employment model. Further details of research methodology have been presented in Chapter Four.

1.6 Organisation of the Thesis

This thesis contains eight sections which are summarised below.

Chapter Two clarifies the important labour resources issues affecting the construction industry. These include: the implications of the fall in the number of young people for training in the British construction industry; the factors that determine the levels of training provision; and predicting the future pattern of skill requirements within the context of changes in construction methods and technology. This chapter also highlights the need for long-term planning of labour resource requirements in Britain. The UK construction industry can only exert pressure on the national government to increase investment in the appropriate forms of skilled labour provision once they identify the issues affecting construction.

Chapter Three examines the ways in which construction operatives acquire their skills. First, recent developments in government policy for youth training in Britain in general is reviewed. Second, formalised training procedures and the roles of the different training organisations in the construction industry are then examined. This forms an important backdrop for understanding issues affecting the introduction of competence-based qualifications. Finally, the aims, objectives and key characteristics of new construction qualifications are presented. Factors that have constrained the implementation and delivery of these new qualifications are also identified.
Chapter Four discusses the research methodology adopted in this research, including the development of the tools to collect labour resource data and the construction of a labour supply model for forecasting purposes.

Chapter Five reviews the general approach to employment planning and forecasting as practised in the UK and elsewhere. Both the expected gains from comprehensive forecasting and the possible limitations from such an exercise are identified. This chapter also reviews the general methodological approaches to employment supply-side forecasting. The current state of employment planning and forecasting in the construction industry is appraised and the case is made for developing a more sophisticated labour supply model of the kind presented here.

Chapter Six provides an overall assessment of the data sources which are available to serve a labour supply model. The chapter also reviews statistical series on aggregate employment, numbers employed by main skill occupations, and data on the supply of new trainees to the construction. Other series detailing construction output and wages are briefly investigated. The nature and sources of construction industry labour statistics within Europe are also assessed.

Chapter Seven presents an aggregate supply model for craft trainee entrants to the UK construction sector. The theoretical framework used to formulate the labour supply model is based on the human capital approach to analysing labour supply, as applied to new entrants to the engineering sector. In particular, testing the hypothesis that the proportion of school-leavers choosing to train as construction operatives depends upon the real craft wage and the long-term prospects of the construction industry. Co-integration is used to produce a long-term relationship between intakes, real wages, output and other variables. The supply equation is then reduced to a more parsimonious representation. The final restricted form of the model is tested against various diagnostic statistical criteria. A sensitivity analysis is undertaken to highlight which of the key variables have a critical effect on the responses in the model system. A sensitivity analysis was performed in order to highlight which of the key variables had a critical effect on the responses in the model system. Limitations of the proposed supply model are then discussed.
Chapter Eight assesses the acceptability of movement of construction labour between various European regions. Employment practices and patterns of labour mobility are examined. This includes an analysis of the benefits and risks of such movement. Measures to create a regulatory framework at bilateral and multilateral levels are discussed. Initiatives to promote labour mobility are also reviewed.

Chapter Nine presents the findings from the research, recommendations and further research related to the subject matter.

1.7 Summary of Main Findings

Systematic employment planning can be used to co-ordinate the activities of the various agencies concerned with training and other labour market issues in the construction industry. In the past, many of these organisations have operated independently, often making decisions on the basis of partial information.

The identification of imbalances between the demand and supply of specific skills is perhaps the most important benefit to be gained from employment planning. The aim of this thesis is to develop a systematic planning process that offers the opportunity of gathering comprehensive information on the availability of labour skills by region. The essence of this research is to develop information tools that would be useful for the proposed purpose. The main findings of this study are presented below.

- **Training and recruitment strategies**
  The construction industry will face recruitment problems if changes are not made to current recruitment practices. In the 1990's, employers will have to adopt long-term recruitment strategies. These strategies will need to be tailored for different regions of the UK, taking account of the demand for labour, brought about by: growth in construction output; and availability of alternative sources of labour, including the long-term unemployed, women and ethnic minorities.
In the first instance, construction employers should consider upgrading the skills of their present workforce. However, this depends on availability of local training centres and financial incentives.

- **Training levels**
The decline in construction training in Britain is associated with the dramatic rise in self-employment. The organisation of training has shifted away from the firm and workplace into training establishments. This research has demonstrated that training levels are governed by the real craft wage and construction output. This is consistent with the human capital view of labour supply. Demographic trends and socio-environmental factors, such as young people's perception of construction, also have a strong influence on the supply of new entrants.

- **Training standards**
There is a clear need for the establishment of specific minimum standards for each stage of training in all occupations, with certification of recognised levels of competence and attainment.

- **The requirement for technological skills**
Changes in technology have a dramatic effect on the construction industry's future skill requirements. The use of new technologies, such as curtain walling and prefabricated modular components, has eliminated the need for particular construction skills, including bricklaying, and scaffolding where curtain walling is installed as a bespoke cladding system.

The repackaging of work into smaller portions has lead to an increase in specialisation in the construction industry. Two distinct types of operative have emerged particularly on large projects: a semi-skilled operative responsible for clipping components together; and a highly skilled operative responsible for installing sophisticated systems.
Database on the availability of labour skills

Appropriate training can only be developed if training needs are carefully identified. This requires that interested parties in the construction industry understand and anticipate the future skill needs of their workforce. This can only be achieved if they are in possession of detailed information on the availability of labour resources on a regional basis and appropriate analytical tools.

The compilation of a database of construction workers, based on the registration and certification of tradesmen can provide a mechanism for gathering information on the availability of skills on a regional basis.

This research has highlighted many deficiencies with current methods used to collect, store and disseminate labour resource data. The main problem is one of variability across European Union member countries starting with job definitions and training methodologies.

Regional mobility and labour supply

The construction industry requires a high degree of mobility from its employees. Contracts of employment tend to be short-term, people work for many different employers, and there is poor job security with alternating periods of high and low employment.

Labour mobility within Europe depends on several push-pull factors. Push factors encourage movement from a particular region (e.g. higher levels of unemployment). Pull factors direct movement into a particular region (e.g. higher earnings). Though important, formal recognition of qualifications and common labour regulations are less significant, given the itinerant nature of the construction workforce and the way in which operatives are employed in the industry.
The free movement of labour can have a detrimental effect on both the indigenous construction workforce and the industry itself. Because irregular and low-wage employment can delay the substitution of labour with capital-intensive techniques, the growth of labour productivity and the adoption of efficient construction methods can be restricted. The employment of foreign workers can also erode training and the development of an indigenous skilled workforce.
2.1 Introduction

In order to ensure an adequate supply of labour skills the construction industry must appreciate the complexity of the labour resource requirements. This chapter clarifies the important labour resources issues affecting the construction industry. These include: the implications of the fall in the number of young people for training in the British construction industry; the factors that determine the levels of training provision; and the future pattern of skill requirements within the context of changes in construction markets and technology.

Construction is a labour-intensive industry, that places heavy reliance upon the skills of its workforce. These skills need continually updating as many construction trades become increasingly specialised. During the 1980’s, there was a rapid rise in construction activity within the UK, followed by a sudden but short-lived boom accompanied by skill shortages. The construction industry is now experiencing a deeper and longer lasting recession than originally predicted, resulting in valuable employees in all sections of the industry being lost - a high proportion of whom will never return to the construction industry. The construction industry is predicted to grow by five per cent in 1997 (Department of Environment, 1995). With this growth the industry is expected to experience considerable skill shortages in both traditional and new skill areas.

Construction is in a period of rapid cultural change accompanied by the introduction of new technologies and new ways of organising construction activities.
Powerful national and multinational clients will continue to influence the choice of these technologies through their demands for faster construction times. The construction industry will continue to face increased competition in search of eligible recruits to train to these skills. Employment within the construction industry will continue to move away from large and medium sized companies to small firms and working proprietors. In the 1980's, self-employment and the use of specialist labour-only subcontractors increased as training levels declined. If allowed to continue, this trend will hamper the industry’s ability to train people for future skill needs.

There is a need to assist interested parties in the construction industry to understand and realise the importance of labour resource issues and the need for long-term planning of labour resource requirements, so allowing them to train and retrain workers to address the predicted skill shortages.

2.2 The Implications of the Changing Shape of the Construction Labour Force

2.2.1 Demographic and Educational Trends.

There were periods when the British labour market has had to absorb increasing numbers of people of working age due to demographic trends, but the situation in the future will be rather different. In particular, during the period 1976 to 1986, the population of working age (men aged between 16 and 64, and women between 16 and 59) grew by two million (NEDO, 1989). However, between 1986 and 1996, the labour force grew by less than a quarter of this rate.

The number of young people in the population has been declining for several years. In 1993, there were one million fewer 16-19 year olds in the population than there were in 1983, a decline of 28 per cent. People of working age will be concentrated in the middle age bands. By the year 2006, the labour force is forecast to be older than in 1994. The number of people aged between 35 and 54 is projected to rise by 2.2 million. Whereas, the number of people aged under 35 years old is projected to fall by 1.5 million in the same period (Ellison et al, 1995).
By the year 2000, the labour force is projected to increase to 27.8 million (Ellison et al., 1995), a rise of 0.8 million from the 1994 level. Women returning to work will account for 75 per cent of the net increase. As a result, women are projected to make up 44 per cent of the total in the year 2000 compared with 43 per cent in 1994 (see Table 2.1).

Table 2.1: Estimates and projections of the labour force in Great Britain

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<th></th>
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<tr>
<td><strong>Men (millions)</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>All ages 16 and over</td>
<td>15.6</td>
<td>15.6</td>
<td>15.8</td>
<td>16.0</td>
</tr>
<tr>
<td>Working age(^a)</td>
<td>15.3</td>
<td>15.3</td>
<td>15.6</td>
<td>15.7</td>
</tr>
<tr>
<td><strong>Women (millions)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ages 16 and over</td>
<td>12.1</td>
<td>12.2</td>
<td>12.8</td>
<td>13.4</td>
</tr>
<tr>
<td>Working age(^a)</td>
<td>11.6</td>
<td>11.7</td>
<td>12.2</td>
<td>12.7</td>
</tr>
<tr>
<td><strong>All persons(^b) (millions)</strong></td>
<td>27.7</td>
<td>27.8</td>
<td>28.6</td>
<td>29.4</td>
</tr>
<tr>
<td>All ages 16 and over</td>
<td>27.0</td>
<td>27.0</td>
<td>27.8</td>
<td>28.4</td>
</tr>
<tr>
<td>Working age(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Women as a percentage of all (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ages 16 and over</td>
<td>43.7</td>
<td>43.9</td>
<td>44.6</td>
<td>45.6</td>
</tr>
<tr>
<td>Working age(^a)</td>
<td>43.1</td>
<td>43.3</td>
<td>44.0</td>
<td>44.8</td>
</tr>
</tbody>
</table>

\(^a\) Men aged 16 to 64 years; women aged 16 to 59 years
\(^b\) Figures for men and women do not always add up to form the figure for all persons owing to rounding errors

An increase in the number of young people staying-on in full-time education is also an important factor in determining the composition of the labour force. In 1985/86, 527,000 young people, aged sixteen and over, stayed-on at school or were enrolled on full-time and part-time courses in further educational establishments in the UK (Department of Employment, 1988). Recent figures, published by the Central Statistical Office (CSO) in its regional trends report show that 300,100 sixteen year olds stayed on at school in 1992/93, while 216,300 entered further education establishments (166,700 on full-time courses and 49,600 on part-time courses). These figures indicate an existence of regional variations in the pattern of staying-on. While 80 per cent of 16 year olds stayed on at school or entered further education in the South East, only 70 per cent stayed on in the North. In Northern Ireland, the figure is 88 per cent (see Table 2.2).
Table 2.2: The number of sixteen year olds staying on at school or going on to further education in the UK, 1992/93

<table>
<thead>
<tr>
<th></th>
<th>Numbers staying on at School (000’s)</th>
<th>Numbers entering further education (000’s)</th>
<th>Participation in education (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Full-time</td>
<td>Part-time</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>300.1</td>
<td>166.7</td>
<td>49.6</td>
</tr>
<tr>
<td>North</td>
<td>13.9</td>
<td>8.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Yorkshire &amp; Humberside</td>
<td>22.6</td>
<td>13.9</td>
<td>4.8</td>
</tr>
<tr>
<td>East Midlands</td>
<td>19.6</td>
<td>12.5</td>
<td>3.1</td>
</tr>
<tr>
<td>East Anglia</td>
<td>10.9</td>
<td>6.1</td>
<td>1.4</td>
</tr>
<tr>
<td>South East</td>
<td>98.9</td>
<td>49.5</td>
<td>9.3</td>
</tr>
<tr>
<td>South West</td>
<td>23.3</td>
<td>17.1</td>
<td>3.4</td>
</tr>
<tr>
<td>West Midlands</td>
<td>25.9</td>
<td>15.9</td>
<td>5.0</td>
</tr>
<tr>
<td>North West</td>
<td>28.8</td>
<td>20.3</td>
<td>6.0</td>
</tr>
<tr>
<td>England</td>
<td>243.0</td>
<td>144.1</td>
<td>36.2</td>
</tr>
<tr>
<td>Wales</td>
<td>14.6</td>
<td>9.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Scotland</td>
<td>31.4</td>
<td>5.9</td>
<td>8.0</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>11.2</td>
<td>7.1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Source: Department of Education: Scottish Office Education Department: Welsh Office: Northern Ireland Office

2.2.2 Implications for Training

The number of young people entering the labour market will continue to fall until 1996 due to the decline in the birth rate. The 16-19 year old labour force is forecast to rise slowly, between 1997 and 2000 but remain below 1980’s levels (see Figure 2.1) as increasing numbers of young people opt to stay in full-time education (Ellison et al, 1995).
Figure 2.1: Estimates and projections of the number of school leavers available to enter the labour market, 1984-2000
(Source: Ellison et al, 1995)

The construction industry is still very labour-intensive and competition between firms in the industry depends on the quality of the labour force that it trains. In a FMB (Federation of Master Builders) survey of member firms reporting shortages during the last construction boom, 50 per cent of respondents identified lack of quality training as the cause of shortages (Guest and Steadman, 1987). In the future, construction employers will no longer be able to rely heavily on recruiting young people, but will need to consider alternative sources of labour, such as the unemployed, women returners, ethnic minorities and their current workforce. These groups, taken together with young entrants, will need to be trained to meet the construction industry’s future skill requirements.

Employers’ recruitment policies vary from region to region. Forecasts by the Construction Forecasting & Research (CFR) and the Department of the Environment (DoE) shows that there will be some regional differences in the growth of construction output in the UK (see Table 2.3).
Table 2.3: UK regional construction output and growth rates

<table>
<thead>
<tr>
<th>Region</th>
<th>Construction output (£m)</th>
<th>Output growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>8,642</td>
<td>9,046</td>
</tr>
<tr>
<td>Central</td>
<td>6,625</td>
<td>6,812</td>
</tr>
<tr>
<td>Southern</td>
<td>10,750</td>
<td>11,085</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26,017</strong></td>
<td><strong>26,943</strong></td>
</tr>
</tbody>
</table>

Source: DoE & CFR.

Employers tend to recruit their workforce from the locality, but need to be aware of regional differences in the availability of trainee labour when considering alternative recruitment strategies. The availability of certain labour groups in any region depends on different regional factors, including staying-on rates, unemployment rates and the concentration of ethnic minorities as a percentage of all employment (Table 2.4). These factors, taken together with forecast of output levels, provide an indication of what would be an appropriate training strategy.

Table 2.4: Regional employment of ethnic minorities, 1993/94

<table>
<thead>
<tr>
<th>Region</th>
<th>Ethnic minorities as a percentage of persons in employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater London</td>
<td>over 15</td>
</tr>
<tr>
<td>Rest of South-East</td>
<td>2-4.9</td>
</tr>
<tr>
<td>East Anglia</td>
<td>under 2</td>
</tr>
<tr>
<td>East Midlands</td>
<td>2-4.9</td>
</tr>
<tr>
<td>West Midlands</td>
<td>5-14.9</td>
</tr>
<tr>
<td>Yorkshire and Humberside</td>
<td>2-4.9</td>
</tr>
<tr>
<td>North-West</td>
<td>under 2</td>
</tr>
<tr>
<td>North</td>
<td>under 2</td>
</tr>
<tr>
<td>Wales</td>
<td>under 2</td>
</tr>
<tr>
<td>South-West</td>
<td>under 2</td>
</tr>
</tbody>
</table>

Source: Labour Force Survey
Findings by the Sheffield Training Enterprise Council (1992), on the state of the local construction industry showed that the majority of Sheffield construction firms responding to the survey drew their workforce from the city. In particular, 70 per cent of respondents employed tradesmen only from Sheffield. Thus, appropriate recruitment strategies depend on local labour supply factors.

2.2.3 Training and Recruitment Strategies

Construction employers will need to adopt alternative training and recruitment strategies if they are to avoid future skill shortages. These strategies will need to be tailored for a particular region, taking account of the demand for labour, brought about by growth in construction output and the availability of alternative sources of labour (Agapiou et al, 1995a). The options available to employers are discussed below. These are:

- upgrading skills of the existing workforce;
- young people;
- women and ethnic minorities;
- adult workers;
- long-term unemployed; and
- foreign migrants

- **Upgrading skills of existing workforce**

Construction employers' interest in upgrading the skills of their employees, in order to counter persistent skill shortages varies from region to region. In a survey of construction employers in Sheffield, there was little evidence of any interest in the ongoing development of workers (Sheffield TEC, 1992). In a similar survey undertaken in the Moray, Badenoch and Strathspey region, employers showed a strong interest in developing their workforce through training (MBS, 1992). However, where interest was shown, a number of difficulties were identified.
These included the lack of suitable training courses for adult workers. The Construction Industry Training Board (CITB) was identified as the only training organisation offering an adult apprentice scheme. The available training was found to be the same as that for younger apprentices, and took no account of skills already acquired. The lack of financial incentive was also identified as a barrier to upgrading semi-skilled workers.

- **Young people**

As a direct result of the increased number of young people staying-on at school past the age of sixteen, some employers are finding it difficult to recruit apprentices (MBS, 1992). The availability of funds for training apprentices is geared to 16 year old school leavers. Employers now have to choose their apprentices from a smaller pool of often less able young people. Over one-fifth (22 per cent) of young men, for example, aged 16 to 18 years old who were not in full-time education work in the construction industry (Hibbett and Beaston, 1995). Future recruitment difficulties are likely to occur where a high proportion of young people are staying-on in full-time education and growth prospects are good, including: the South-West; East Anglia; and the East Midlands. CITB (1988) survey findings revealed that young people have negative images of construction work. The work is perceived as being dirty, dangerous, having a low social status and poor career prospects. Positive images of the construction industry centred on pay and the possibilities of learning a trade. Employers need to attract young people to the industry, especially where local competition for apprentices is intense, by creating strong links with the local community, in particular local secondary schools; offering work experience to school pupils; and enhancing the image of construction industry by improving employment conditions, including pay, conditions of employment and career prospects. However, these improvements can only be achieved if there is steady growth in construction demand.
Women and ethnic minorities

The traditional sources of construction labour have been predominantly young, white and male. Women and ethnic minorities are under-represented in the industry. In 1989, 1.6 per cent of the CITB apprentice intake were female, and only 1.3 per cent were from ethnic minority backgrounds (Innovation Policy Research Association (IPRA), 1991). Possible reasons for these low intakes were highlighted in a CITB (1988) study of the factors affecting recruitment for the construction industry. A sample of women, Asian and Afro-Caribbean men, aged between 18 and 24, were asked about their opinion of the construction industry as a prospective employer. Most women respondents felt that they would not be treated as equals and would face harassment from their prospective employers and work colleagues. Whereas, the Asian and Afro-Caribbean respondents had a negative image of the industry. The work was described as being ‘dirty’, ‘dangerous’ and not seen as ‘respected’.

As with most attitudes to the construction industry, those of young women and young people from ethnic minority backgrounds are generally the same, so the recruitment strategies for young people, as a whole, are equally valid. In order, to maximise the recruitment of women and ethnic minorities, employers working together with training bodies need to convey more positive images of the construction industry to school pupils, below the age of 16, and also to their parents. Clarke (1980) cited research that showed that parents had a strong influence on their children’s choice of occupation. This could be achieved by making effective use of the local and national media and links with local schools, particularly in regions where the proportion of people from ethnic minority backgrounds are significant, i.e. Greater London, and the West Midlands to a lesser extent. Some construction employers have already recognised that they must tailor the industry’s message for different audiences. The East Lancashire Training and Enterprise Council’s construction specialist group, for example, are aiming their message at Asian school-leavers.
**Adult workers**

An alternative to young recruits is adult recruits. In general, employers found them more enthusiastic and committed than most young people (MBS, 1992). Particularly, if they were already fully trained or apprenticed. Craft workers who moved out of the construction industry to take more stable employment and better working conditions represent a potential pool of labour. However, attracting these workers back to the industry may be difficult. Workers will be influenced by relative job opportunities in their locality. In Scotland, for example, the availability of trades people depends on oil-related activity. The suitability of this source also depends on the degree to which their skills are ‘transferable’ to other industries. Briscoe and Wilson (1993) produced an analysis of construction occupations according to skill transferability (see Table 2.5).

Table 2.5: Analysis of construction occupations according to skill transferability

<table>
<thead>
<tr>
<th>Low transferability</th>
<th>Medium transferability</th>
<th>High transferability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricklayers</td>
<td>Painters</td>
<td>Carpenters</td>
</tr>
<tr>
<td>Plasterers</td>
<td>Scaffolders</td>
<td>Plumbers &amp; H/V engineers</td>
</tr>
<tr>
<td>Roofers</td>
<td>Floorers</td>
<td>Electricians</td>
</tr>
<tr>
<td>Paviours</td>
<td>Crane drivers</td>
<td>Labourers</td>
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<tr>
<td>Glaziers</td>
<td>Plant operators</td>
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<tr>
<td>Other Build skills</td>
<td>Plant mechanics</td>
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<tr>
<td></td>
<td>Bar benders</td>
<td></td>
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<tr>
<td></td>
<td>Steel erectors</td>
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The above analysis shows that electricians and plumbers could easily find employment outside the construction industry, whereas, bricklayers and plasterers are not so fortunate. Furthermore, even if some construction workers were enticed back, employers would have to judge whether the skills of these workers were still adequate, and would have to be prepared to retrain them where necessary.
The multi-million pound redevelopment of the Cardiff bay area prompted the local
development corporation to set up a skills training centre, in conjunction with
Mowlem training, to give local people a chance to learn new skills (Construction
News, 1995). The centre offered CITB-approved training courses in most
construction skills for both new recruits to the industry and those already employed
by firms in the Cardiff bay area.

- Long-term unemployed
Skill demands in the construction industry can usually be met from the pool of
unemployed workers. However, the available skills amongst the unemployed change
over a period of time. Estimating the potential supply of construction workers from
the pool of unemployed workers is difficult. Available data, such as that published by
the DoE, no longer indicate the main occupations of those registered as unemployed.
Detailed total figures and overall regional data do exist, but without an indication of
the numbers of construction skills. Regional unemployment figures for different
occupations can be estimated from local information provided by employers. Figure
2.2 shows the number of unemployed people in Ayrshire for 1992 who recorded their
usual occupation as one of the construction trades (Enterprise Ayrshire, 1992).

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Figure 2.2: Number of unemployed people in Ayrshire who recorded
their usual occupation as one of the construction trades in 1992
Foreign migrants

In Belgium, Germany, France and the Netherlands significant numbers of migrant workers are employed in construction. In the French construction industry, for example, 25 per cent of the employees in 1989 were foreigners (Gross, 1992). In the UK, foreign migrants represent an insignificant proportion of the construction labour force. Large numbers of workers have traditionally been recruited from Eire. In 1993, an estimated 35,000 Irish Nationals worked in the UK construction industry (Woolford, 1994).

A recent European Court ruling might well facilitate higher levels of migration between the UK and the rest of Europe. The judgement made under the provisions of the Treaty of Rome to encourage the free movement of services between European Union (EU) member countries, could allow more foreign workers holding domestic work permits for other EU countries to take up jobs on British construction sites (Construction News, 1994).

2.3 Factors Determining the Levels of Training Activity in the Construction Industry

2.3.1 Levels of Training Activity

Since the 1960's, the number of craft trainees entering construction has declined sharply. Indicative of this trend is the reduction in the number of operative trainees registered with the CITB between 1968 and 1989, as illustrated in Figure 2.3. This decline was spread over all the traditional construction trades. There were notable falls in the number of carpenters, bricklayers and plasterers. Between 1968 and 1989, the numbers of trainee carpenters fell from 28,879 to 11,300, and the number of trainee bricklayers dropped from 10,970 to 5,400 (see Figure 2.4).
DAMAGED TEXT IN ORIGINAL
Figure 2.3: Total number of operative trainees, 1968-89
(Source: Housing and Construction Industry Statistics)

Figure 2.4: Number of trainee carpenters, bricklayers and plasterers, 1968-89
(Source: Housing and Construction Industry Statistics)
2.3.2 Reasons for the Decline in Training

Opinions are sharply divided as to the reasons for the decline in training levels. Some employers suggest that the recession is the main cause. With current uncertain workloads, companies are reluctant to enter into long-term training commitments. In 1991, the CITB, the construction industry's main industry training organisation, had to make provisions to find alternative firms, who were willing to train for 1,000 apprentices, who had lost their work placements as a result of company failures (IPRA, 1991).

Construction industry trade unions contend that cuts in government spending on construction work have had an adverse affect on the industry's workload and subsequent levels of training. Both parties agreed that the growth of labour-only subcontracting has also led to a decline in training. Large construction companies, through sub-contracting have shed most of their responsibilities for training and direct employment.

Training is being increasingly left to very small firms and sole traders, who are often least able to do so. Clarke (1992a) suggested that there is a direct correlation between the fall in trainee numbers and the numbers of self-employed, both in absolute terms and as a proportion of total employment. Between 1979 and 1989, the number of self-employed operatives grew from 343,000 to 722,000. During the same period, the number of operatives directly employed by contractors fell from 763,000 to 552,000 (CITB, 1991). A recent report by Consultative Committee for Construction Industry Statistics on the state of the construction industry also stated that 44 per cent of the construction workforce were self-employed in 1994 (Consultative Committee for Construction Industry Statistics, 1995).
In the 1990's, self-employment will continue to grow and reach an estimated 865,000 by the year 2000 (Institute for Employment Research, 1988). National trends towards construction self-employment are also reflected in the regions. The latest available figures from Sheffield and Birmingham also illustrate this trend (see Figure 2.5).

![Area covered by Sheffield TEC, 1989](a) Area covered by Sheffield TEC, 1989

![Area covered by Birmingham TEC, 1989](b) Area covered by Birmingham TEC, 1989

Figure 2.5: Construction firms: number of employees in Sheffield and Birmingham

A report on the policies that effected employers' decisions to train listed six determinants of employers' policies on the trainee intakes; state of the order book; wastage; labour shortages; technological change; existing supply of skilled labour; and the internal supply of apprentices (Institute of Manpower Studies, 1982). The move to increased off-the-job training had a great influence on training provision. Whereas, funding was only a secondary consideration for employers considering training.

In construction employer surveys (Birmingham TEC, 1992; MBS 1992), a number of factors were identified, by sole trader and small firms, as disincentives to employing apprentices and training through an Industry Training Organisation. The reasons stated included:
• college block release arrangement not suitable for small businesses;
• sole traders could not afford the time to train;
• lack of committed young people;
• no suitable courses available;
• loss of trained apprentices to more lucrative jobs;
• training too expensive/lack of financial incentives to train apprentices; and
• content of NVQ modules assessed at college as part of the Vocational Qualifications irrelevant or out of date.

The main factors that recur in these surveys relate to the inappropriateness of the construction industry's training provision to current conditions. This has occurred as the influence of construction industry trade unions and the importance of the traditional construction trades have declined. The CITB has the main responsibility for defining the industry sectors' training needs. It has a tripartite structure of employer, trade union and government representatives.

Clarke (1992a) suggested that the conditions prevalent when the CITB was first set up no longer apply: trade unions responsible for monitoring and encouraging training have been excluded from the decision-making process; traditional craft trades, the main target of the training effort under the system, have declined in importance; and training policies have been developed that are inappropriate for the needs of the whole industry. It is concluded that the CITB system has become ineffective.

The training requirements of the UK construction industry often vary with the interests of individual firms who provide training places. Larger firms are usually involved in work on large new-build sites. This work is often repetitive and specialised, and trainees are unlikely to gain experience across the range of tasks required of their trade. Whereas, small firms are often engaged in repair and maintenance work or small projects. Economic pressures and their small size, however, limits the number of trainees recruited.
2.4 Changing Markets, New Technology and Future Skill Requirements

Against the background of falling training levels is also the issue of the type construction skills required in the future. This section describes the future pattern of skill requirements within the context of changes in construction markets and technology.

2.4.1 Construction Markets

All construction operatives need to possess a number of basic skills. In recent times, skills have become dependent on the market sector in which operatives are employed. Table 2.6 demonstrates that the number of traditional trades have declined.

Table 2.6: Trends in construction trades, 1968-1989

<table>
<thead>
<tr>
<th>Trade</th>
<th>Numbers employed in 1968 (000's)</th>
<th>Percentage of total, 1968 (%)</th>
<th>Numbers employed in 1989 (000's)</th>
<th>Percentage of total, 1989 (%)</th>
<th>Difference in numbers employed between 1968 &amp; 1989 (000's)</th>
<th>Change 1968-1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricklayers</td>
<td>75.152</td>
<td>8.00</td>
<td>27.30</td>
<td>6.30</td>
<td>-57.852</td>
<td>-1.70</td>
</tr>
<tr>
<td>Carpenters</td>
<td>157.739</td>
<td>17.40</td>
<td>64.60</td>
<td>14.84</td>
<td>-93.139</td>
<td>-2.56</td>
</tr>
<tr>
<td>Painters</td>
<td>77.604</td>
<td>8.60</td>
<td>27.40</td>
<td>6.30</td>
<td>-50.204</td>
<td>-2.30</td>
</tr>
<tr>
<td>Plasterers</td>
<td>16.114</td>
<td>1.80</td>
<td>6.10</td>
<td>1.40</td>
<td>-10.014</td>
<td>-0.40</td>
</tr>
<tr>
<td>Roofers</td>
<td>6.529</td>
<td>0.72</td>
<td>7.50</td>
<td>1.72</td>
<td>+0.981</td>
<td>-1.00</td>
</tr>
<tr>
<td>Paviours</td>
<td>3.017</td>
<td>0.32</td>
<td>0.40</td>
<td>0.09</td>
<td>-2.617</td>
<td>-0.23</td>
</tr>
<tr>
<td>Scaffolders</td>
<td>9.851</td>
<td>1.09</td>
<td>8.40</td>
<td>1.93</td>
<td>-1.451</td>
<td>+0.84</td>
</tr>
<tr>
<td>Floorers</td>
<td>5.461</td>
<td>0.60</td>
<td>3.90</td>
<td>0.90</td>
<td>-1.561</td>
<td>+0.30</td>
</tr>
<tr>
<td>Glaziers</td>
<td>2.634</td>
<td>0.30</td>
<td>2.40</td>
<td>0.55</td>
<td>-0.234</td>
<td>+0.25</td>
</tr>
<tr>
<td>Plumbers</td>
<td>47.183</td>
<td>5.20</td>
<td>20.87</td>
<td>4.80</td>
<td>-26.313</td>
<td>-0.40</td>
</tr>
<tr>
<td>LV engineers</td>
<td>21.190</td>
<td>2.30</td>
<td>13.90</td>
<td>3.19</td>
<td>-7.290</td>
<td>+0.89</td>
</tr>
<tr>
<td>Electricians</td>
<td>66.119</td>
<td>7.30</td>
<td>49.80</td>
<td>11.44</td>
<td>-16.319</td>
<td>+4.14</td>
</tr>
<tr>
<td>Crane operators</td>
<td>5.250</td>
<td>0.58</td>
<td>4.30</td>
<td>0.98</td>
<td>-0.250</td>
<td>+0.40</td>
</tr>
<tr>
<td>Plant operators</td>
<td>33.761</td>
<td>3.70</td>
<td>18.70</td>
<td>4.30</td>
<td>-15.061</td>
<td>+0.60</td>
</tr>
<tr>
<td>Plant</td>
<td></td>
<td></td>
<td>11.90</td>
<td>2.73</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Bar Benders</td>
<td>4.746</td>
<td>0.52</td>
<td>1.100</td>
<td>0.25</td>
<td>-3.646</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

Between 1968 and 1989, Employment of carpenters and painters has declined, (detailed figures are unavailable after 1989), by 93,139 and 50, 204 respectively; about two per cent as a proportion of all trades. Whereas, the number of electricians in employment declined by 16, 319 but increased by four per cent as a proportion of all trades.
These changes have occurred as a result of the trend from traditional craft skills towards skills required in small specialist firms, and stricter health and safety legislation. In most cases, occupational trends are related to the type of project and the volume of work within a particular market sector. Some traditional craft skills are concentrated in only a few market sectors. Employment in these skills is, therefore, more sensitive to changes in the volume of work. In a study that examined the availability of operatives, and their requirements for different types and amounts of construction works, assessments were made of the sensitivity of various trades to broad changes in the pattern of demand in three sectors: new housing; general building; and civil engineering (Building and Civil Engineering EDCs, 1978). Table 2.7 shows those trades that were found to be sensitive to broad change in the pattern of demand. If new work changed by one per cent, solely as a result of change in the amount of either new housing, general building or civil engineering work, the requirements for operatives changed as indicated. A one per cent increase in new work, for example, solely as a result of an increase in civil engineering work will increase the total requirement for tarmac asphalters and plant operators by between 2.0 and 2.9 per cent, and 3.0 and 3.9 per cent respectively.

Table 2.7: Trades sensitive to changes in the pattern of new work

<table>
<thead>
<tr>
<th>Groups of market</th>
<th>% change in requirement for trade</th>
<th>1.5 - 1.9</th>
<th>2.0 - 2.9</th>
<th>3.0 - 3.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Painters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bricklayers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plumbers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plasterers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Building</td>
<td>Glazier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heating and Ventilating engineer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Steel erectors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Tarmac/asphalters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plant operators</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage change in total requirement for each trade as a result of 1 per cent change in new work owing to change in either new housing, general building or civil engineering work.
Traditional craft skills, such as, painting, plastering and bricklaying are dependent on the quantity of work in the housing sector. Whereas, electricians are more active in the new non-housing work. The majority of roofers, floor, wall and ceiling tilers are employed mainly in new-build work. The remainder are employed in the repair and maintenance sector.

Table 2.8 shows forecasts produced by the Centre for Strategic Studies in Construction (1990) of the total volume of construction output by market sector. New private housing and housing repair and maintenance work are forecast to increase by 39 per cent and 34 per cent respectively. Whereas, new public non-housing and private commercial work are projected to increase by only 0.5 per cent and 2.8 per cent respectively. Output within the private industrial work is forecast to increase by 24 per cent, and by 68 per cent if adjustments are made for privatisation's of the water and electricity industries.

Table 2.8: Forecast growth in construction output, 1989-2001

<table>
<thead>
<tr>
<th>TYPE OF WORK</th>
<th>TOTAL PERCENTAGE CHANGE</th>
<th>Ignoring privatisations</th>
<th>Amending for privatisation (where adjustment significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>+10.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>+38.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New non-housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>+0.5</td>
<td></td>
<td>-43.2</td>
</tr>
<tr>
<td>Private</td>
<td>+24.8</td>
<td></td>
<td>+68.1</td>
</tr>
<tr>
<td>Commercial</td>
<td>+2.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL NEW WORK</td>
<td>+14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repair and maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>+31.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>+28.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>+48.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Repair and maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>+31.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>+28.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>+48.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL TOTAL</td>
<td>+23.5</td>
<td></td>
<td>+9.3</td>
</tr>
</tbody>
</table>
These above forecasts indicate that the prospects for traditional craft skills are good. However, this will depend on the extent to which new technologies are used on construction sites. In new-build work, the use of prefabricated components is becoming more common. This has resulted in the decline of a number of construction skills, including bricklaying, plastering and carpentry.

2.4.2 New Technologies

Technological change in the construction industry has mainly been restricted to small improvements in material specification, product ranges, fixings and sealants, or in hand tools and equipment (IPRA, 1991). Operatives, therefore, need only to update their knowledge of new products and processes. However, some new technologies have given rise to the need for a combination of skills from traditional separate construction trades. This includes the development of prefabricated systems.

- Prefabrication

A report to the CITB on technological change and construction skills in the 1990's identified and examined the principal technological changes likely to affect the building trades (CITB, 1991). Case studies were presented of technological change and the implications for skills. Problems were identified in the installation of systems where traditional carpentry, joinery and glazing skills were used. Carpenters and joiners, for example, were found to cut joints too tight for gasket materials to be installed correctly. Whereas, glaziers did not understand that water penetration could not be overcome by squeezing silicone into linking joints.

The refitting of existing buildings with services, fixtures and fittings may increase the demand for curtain walling systems, particularly if the residential tower blocks, built in the 1960's and 1970's, are upgraded. This work could take the form of re-cladding. This includes: stripping away the existing cladding system and replacing it with a new facade or overcladding; covering the existing system to overcome the problem of water seepage; and improving thermal insulation of buildings.
Examples of prefabricated modular units used in construction projects include toilet, bathroom and lift modules. Skills shortages and the pressure to reduce construction times during the UK 1980's construction boom relied on the use of off-site production of building components. In the 1990's, prefabricated units may become more common in the housing sector, including components such as kitchens and bathroom units.

Three types of skills are required where prefabricated units are used, these include:

- off-site production skills;
- installation skills; and
- maintenance skills.

Traditional crafts are often employed in factories to produce modules. However, in the fabrication of toilet modules more specialist skills are required.

On-site installation is undertaken either by the manufacturers’ own team or by a subcontractor. The units are craned into position, usually through the side of the building and rolled on a trolley into their final position. Therefore, in addition to a crane driver, installation teams require people with rigging and lifting skills and an understanding of the construction process.

Where fast-track techniques are used the ability to negotiate, resolve problems and work to tight schedules is required. Communication skills are also important particularly at the interface between different services and liaising with other contractors.

Repair and maintenance of prefabricated modules is difficult once they are installed and the building is in use. Maintenance operatives need to be highly skilled, therefore, in different areas to overcome complex problems, including diagnostic, building, mechanical and electrical skills.
The introduction of new products and processes, such as prefabricated components, has meant that contractors increasingly need the skills of specialist subcontractors, particularly for new-build and maintenance work.

- **Types of sub-contractor**

Three distinct types of subcontracting organisation have emerged from the shift towards specialisation. These include:

- trade contractors;
- specialist technical contractors; and
- specialist installer contractors.

Each of the above organisations has different roles and particular skill requirements. Trade contractors employ craft workers from one particular trade, such as plastering or bricklaying. Work carried out would, therefore, be associated with that particular trade, whether it be in new-build or maintenance work. Whereas, specialist technical contractors operate in only one specialist area, for example, cladding installation.

Highly skilled specialist operatives are required with a good technical background together with some competence in detailed technical drawing and design work. Specialist installer contractors operate in a similar way to specialist technical contractors, however, they would not get involved in design work, so the emphasis on technical knowledge required by operatives is less.

Where specialist subcontractors are operating in different markets the skills required by operatives varies from one market to another. In the new-build and maintenance markets work is organised so that only a small proportion of skills practised in a particular trade are required by an individual operative.
The size of project, within a particular market, is another factor that dictates the extent to which specialised skills are practised in the construction industry. On large projects, for example, subcontractors require operatives that have a high degree of technical knowledge and organisational skills, particularly where the work involves the installation of complex technical equipment in a small work area, in which different trades need to co-operate. On small projects, however, operatives require skills to perform a wide range of activities.

2.5 Summary

This chapter has clarified the important labour resource issues affecting the construction industry. These include the implications of the changing shape of the construction labour force; the factors that determine the levels of training provision; and the future pattern of skill requirements within the context of changes in construction markets and technology.

The demographic and educational changes taking place in the labour market have a number of implications for training in the UK construction industry. In particular the changes taking place in the shape and structure of the workforce provide a challenge to construction employers. Although the number of young people entering the employment market is projected to decline in the 1990’s, the number of adults in the workforce, particularly women, will continue to rise and will provide real opportunities for employers if they are to avoid persistent skills shortages.

Levels of training activity in the construction industry declined in the 1970’s and 1980’s. There were dramatic falls in the number of trainee plasterers, carpenters and bricklayers. The number of traditional craft apprenticeships have decreased and have been replaced by youth training schemes and short specialist courses to train semi-skilled workers. Large firms have shed their responsibility for training and direct employment, through the use of self-employment and labour-only subcontracting.
Training has been left to small firms or sole traders who are often least able to finance or supervise apprentices. In addition, there is a reluctance for some small firms to formally train apprentices because of the inappropriateness of training programmes.

The trend towards specialisation in the construction industry, including the increased use of sophisticated systems in buildings and the repackaging of work into smaller portions to off-load risk, has a number of implications for future skill needs. In particular, operatives will not only require strong technical skills to cope with complex systems but also co-ordination skills and an understanding of the construction process. This is particularly important when different trades work in close proximity to one another.

Changing technology, including the increased use of prefabricated modular components will reduce the need for traditional construction skills and create new more sophisticated needs, particular on large projects in the new-build market. However the large volume of maintenance and refurbishment forecast for the 1990's will continue to require traditional skills, such as plastering, carpentry and bricklaying. Generally, technical expertise is growing in importance relative to traditional manual skills. Operatives working on complex projects will need to be trained in a broad range of technical skills and have an understanding of the characteristics of the prefabrication and in modern construction methods.

Appropriate training programmes can only be developed if training needs are carefully identified. The next chapter reviews the different training methodologies in the construction industry.
CHAPTER THREE

TRENDS IN CONSTRUCTION OPERATIVE TRAINING

3.1 Introduction

This chapter traces the changes taking place in the construction training provision and reviews general developments in training and the impact these changes have had on training arrangements in construction. The role of construction training institutions and formal training procedures are examined. This includes the aims, objectives and key characteristics of newly established vocational qualifications. The factors that constrain the implementation and delivery of new approaches to construction training are also identified.

The rise of self-employment and labour-only subcontracting in the 1980's coincided with low levels of formal training (see Section 2.3). Only a few of these organisations engage in any form of training; to do so could jeopardise current profits. Training organisations have found it very difficult to involve such firms in formal training mechanisms, but there is a clear need to do so in the future. This will require not only financial incentives, but training programmes designed to meet future skill requirements. Construction companies need to identify their training needs clearly in the context of their markets and technology. Technical knowledge is growing in importance relative to manual skills. All workers in complex projects need to be trained to have a broad overview of the characteristics of new machinery and prefabrication and in modern construction methods.
In contrast to manufacturing, construction still largely remains a labour intensive, low skill and low technology industry. The trend towards specialisation in the construction industry, including the increased use of sophisticated systems in building and the repackaging of work into smaller portions to off-load risks, has a number of implications for future skill needs. The construction industry can be regarded as an assembly industry, in the same way as the manufacturing process. One of the challenges for the future will be to establish how to transfer the culture and technologies prevalent in manufacturing into the construction industry (Fisher, 1993). If implemented, these changes could have far reaching consequences on the way the construction processes are organised and the skills required. Current management practices will also have a considerable impact on the training needs of construction operatives. There has been a general trend throughout most industries to: push the decision making process down to the work front; introduce multi-skilled operatives; and create flatter management structures. The construction industry is beginning to introduce many of these concepts, thus creating the need for better trained operatives.

The overwhelming majority of construction workers have, to date, received little new technology training (Agapiou et al, 1995b). New approaches to training are urgently required in order to reflect rapidly changing markets, technology and work procedures. To some extent, it is only in the Engineering Construction sector where this issue has been tackled (Delo, 1990). This sector requires a wide range of skilled workers during its construction programmes, and brings together large and complex equipment and materials in plant form, much of which function at extremely high temperatures and pressures. The skills required to work within engineering construction are the most demanding within construction due to the exacting standards of quality and safety.

It is significant that it is not only Engineering Contractors who are represented on the sector’s Training Committee, but also their clients, in particular from the oil and power generation industries (IPRA, 1991). These clients let contracts which specify that contractors must operate approved Engineering Construction training schemes, and this greatly increases the sector’s commitment to training.
Clients in the building and civil engineering sectors have recently recognised the need for a well-qualified workforce and a long commitment to training to maintain quality. A recent report on construction training by the Construction Round Table (a client dominated forum) concluded (Construction Round Table, 1996):

‘Clients may be the best placed to provide the needed catalyst for developing the next (and current) generation of industry competencies, through the selection of suppliers, on the basis of insisting on: minimum competency levels; long-term commitment to training and participation; and adequate qualification of all staff involved in the construction process’. (p12)

3.2 General Changes in Construction Training

The development of craft skills has been perceived as a direct means of increasing the productivity of labour intensive industries, such as construction (Hatchett, 1981). There have been three broad avenues down which craft skills have developed within the construction industry: the classical formal route through apprenticeship; government sponsored training schemes; and the traditional accumulation of skills through trial and error. Acquisition of skills and training has changed with time and not remained fixed and unchanging. Thus the different forms of construction training over a period of time have been reviewed.

3.2.1 An Historical Understanding of the Training Provision

Construction craft apprenticeships have had a long tradition going as far back as the Middle-Ages. Historically, apprenticeships have been linked with initial entry of young people to a small number of manual trades (Ryrie and Weir, 1978). Under the capitalist system, apprenticeship can be divided into three main stages (Clarke, 1992a).

From the early years of capitalism until 1813, apprenticeships were regulated by the Elizabethan Statute of Artificers, introduced in 1562, in which a trainee was apprenticed to a master.
At the beginning of the nineteenth century this Statute was repealed. This was an attempt by the new general contractors to undermine the power of workshop-based craftsmen. This had far-reaching consequences, particularly for the authority of the Master craftsman: any controls exercised by the Master over the entry to a trade and over the mobility of individual workers were relinquished. The effect was dramatic, and contrasts with the situation that existed in many mainland European countries where Master craftsmen retained their authority. These changes led to the introduction of an unregulated, voluntary system of apprenticeship; apprentices were either considered improvers - substitutes for cheap labour with no one responsible for their training or a potential member of a craft elite often retained by general contractors. The poor development of skills was chronicled at various times throughout the nineteenth century and early twentieth century. In the early 1880's, the Samuelson Commission on Technical Instruction (1882-84) concluded that the introduction of new technology and the transfer of production to factories provided a structural change in industry, which had failed to adapt to the new circumstances. The lack of state involvement in education and training was identified as the main problem. This was certainly the case in the building industry, as discovered by Booth (1985) in the 1890's:

'at the present time a formal training apprenticeship is the exception rather than the rule in London.........large builders won’t be bothered about training, and that there was no systematic training in a single shop'. (p21)

Booth’s overall conclusion for the building industry was that instead of apprentices, improvers were used where learning was based on casual experience in the workshop;

‘the apprenticeship system would not only seem dormant but dead’. (p43)

This laissez-faire voluntary apprenticeship system continued until the 1960’s when it was removed through the Industrial Training Act of 1964, however, it seems that this act had little impact on the quality of the apprentice training provision.

'The continuous decline in basic workmanship suggests that more and more inadequately trained semi-skilled tradesmen are employed by contractors on council contracts and this in turn reflects the decline of the apprenticeship system in the private sector'.

The new legislation heralded the introduction of state intervention and regulation, and more importantly state financing, through Industrial Training Boards, such as the CITB. Increasing state involvement in the training provision was also a feature prior to the Industrial Training Act (see Appendix A).

3.2.2 State Involvement in Training During the 1970's.

State intervention in training can be perceived as an attempt to resolve the contradictions in the training provision within the construction industry (Bedale et al, 1981). Under the capitalism system, training (or the reproduction of skilled labour power) is essential for the continued production of surplus value. However, workers are free to sell their labour to any individual capitalist. Although workers may be trained by one enterprise, they may opt to work elsewhere once training is complete. Individual enterprises may be reluctant to train, particularly in a situation where labour is free to move. Consequently, the cost of training is spread unevenly across an industry. A contradiction exists between the needs of the industry as a whole for a trained workforce and individual enterprises who sustain the cost of training. The failure of the industry to sustain adequate levels and quality of training is a symbolic of the contradiction. The boom-and-bust cycle of capitalist industry further exacerbates the situation.
There are several aspects of the construction industry which heighten the training contradiction. These includes; little or no continuity of work or production arising from the one-off nature of construction projects; and the inability of site management to ensure the smooth running of site operations, thus creating shortages in certain skills just when they are required in general and in specific geographical areas.

The rationalisation and standardisation of training through the Industrial Training Boards (ITBs) for young people, and Skills Centres for adults was an attempt by the state at resolving problems in training provision. State intervention in the 1970's can also be seen as a response to youth unemployment, for example, the Training Opportunities Programme (TOPs) and various special programmes under the then Manpower Services Commission. The problem of training was as much as a problem of redundant apprentices as it was of shortages in skilled craftsmen. Hussain (1976) views initiatives on unemployment and employment policies as highly significant, particularly in explaining what the main features of training were in the 1970's, namely the shift towards off-site provision. This approach was identified by Bedale et al as an attempt by the state, through the CITB, to control the content of training and its financing; to ensure that a certain level of attainment was reached. This implicitly recognises that if firms were just given money to train not all of them would necessarily do so.

The growth of the further education provision is another aspect of increased state involvement in training. Further education in industrial training was first introduced under the National Apprenticeship scheme in 1945. Bedale et al suggested that a further education element, for 16-19 year olds, was introduced, in part, as a response to the arguments of educationalists, for example the Crowther report in 1958. Faced with the increasing cost of training, recent government policy intends to shift the responsibility for financing the training provision to industry, in effect putting training onto a voluntary basis.
3.3 Youth Training in Britain in the 1980's

During the 1980s training for young people entering the construction trades was provided through the Youth Training Scheme (YTS). The principal managing agent for the scheme was the Construction Industry Training Board (CITB). Additional grants to employers were made by the CITB to supplement the government contribution to YTS. In 1989/90, 69 per cent of the CITB’s training expenditure was devoted to Youth Training (Callender, 1992). Evidence would suggest that the total YTS package offered was an attractive option for training young people, sufficient to keep the number of training places offered by construction employers steady over the period 1981-91, following a long decline in the 1970’s (Steedman and Hawkins, 1994). In 1983, there were 17,000 YTS starters on schemes administered by the CITB, by 1987/88, this had risen to 22,000. Table 3.1 shows Youth Training (YT) as a proportion of first year trainees between 1989 and 1992. It can be seen that over 60 per cent of new trainees were on YTS schemes.

Table 3.1: Youth trainees as a percentage of first year intake

<table>
<thead>
<tr>
<th>Year</th>
<th>First year intake</th>
<th>First year YT trainees</th>
<th>YT trainees as a percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>29,400</td>
<td>15,354</td>
<td>52 %</td>
</tr>
<tr>
<td>1990</td>
<td>24,000</td>
<td>15,984</td>
<td>67 %</td>
</tr>
<tr>
<td>1991</td>
<td>19,800</td>
<td>12,872</td>
<td>65 %</td>
</tr>
<tr>
<td>1992</td>
<td>16,600</td>
<td>11,327</td>
<td>68 %</td>
</tr>
</tbody>
</table>

Source: CITB (1994)

3.3.1 New Objectives for Employment and Training

Despite the success that resulted from setting up the Youth Training Scheme, the government were dissatisfied with the training provision in Britain. This centred on two issues; first the number of people in training was lower in Britain than other Western European countries(1); and the lack of employer involvement in financing training and in contributing to the development of training programmes and policies.

(1) Green and Steedman (1993) found that only 27 per cent of British young people achieved GCSE at grades A-C in English, mathematics and science compared with 62 per cent in Germany and 66 per cent in France reaching a similar standard; only 29 per cent attained the equivalent of two A-levels as against 68 per cent in Germany and 48 per cent in France.
The government responded by introducing National training targets, and measures to shift the responsibility for training onto employers. In the long-term, the government's intent was to put all training onto a voluntary basis.

To a degree, the Engineering Construction sector had already adopted new arrangements that embraced several aspects of the government's new vision of training (Delo, 1990). Engineering construction companies are active in training for one main reason, generally they are large organisations who employ skilled workers directly. The rise of self-employment and labour-only subcontracting in the rest of construction made it difficult for training organisations, such as the CITB, to involve these mainly small firms in the training provision (Briscoe, 1989b).

Dissatisfaction with existing training arrangements led to radical changes in the conditions under which youth training was provided from 1990 onwards and formed the context for the introduction of National Vocational Qualifications (NVQs) into Youth Training. These changes were embraced in a government White Paper published 1991 entitled 'Employment for the 1990s'. This legislation set out a significantly new vision for the labour market in Britain, that embraced industrial relations, pay and training. The government's aim was to create a flexible labour market which would enable the British Economy to respond more rapidly than in the past to changing technologies and world trading conditions.

### 3.3.2 Implementing the White Paper Proposals

The abolition of virtually all the remaining Industrial Training Boards was one of the proposals in the White Paper. In their place, locally based Training and Enterprise Councils (TECs) were established and comprises local employers. TECs would administer government funds available to train young people in a revised Youth Training (YT) scheme and the training of the long-termed unemployed through the Employment Training (ET) scheme. It was intended that TECs would encourage local companies to invest more heavily in the training of their employees.
However, no government funding would be forthcoming. Eighty-two TECs had been established by the end of 1991, covering the whole of England and Wales.

The government's intention was to shift the financial burden for training young people from the state to the employer. However, important concessions in the way the scheme was administered were made to employers to compensate them for the additional financial burden. Under the YTS scheme, youth trainees were entitled to off-the-job training, plus a specified duration for training: two years by the end of the scheme. The YT scheme, introduced in 1990, offered a work placement with an employer to young people aged 16 or 17 and paid a small allowance set by the government. In these respects, YT is similar to the former YTS scheme. YT differed from YTS in that it could be of an entirely flexible duration depending on the needs and circumstances of the company providing training. Furthermore, YT trainees were no longer entitled to off-the-job training but could receive all training on-the-job while working for the company. These measures were designed to reduce the cost of training to the employer and thus compensate for the reduction in government funding.

Additional measures introduced by the government included a system to assess the quality by output, and allowing funding to follow output rather than being determined by inputs to training. TECs funding YT from 1990 onwards made payments for youth training to firms based on the numbers of trainees working towards recognised qualifications, with a proportion of the funding withheld unless the qualification was achieved. The qualification that was to play the vital role of assessing the quality of youth training was the newly established National Vocational Qualification (NVQ).

### 3.3.3 The Origins of National Vocational Qualifications

Dissatisfaction in government, industrial and educational circles with what was known as the jungle of vocational qualifications led to the introduction of NVQs. In 1985, a government-appointed working group undertook a review of existing vocational qualifications.
In the subsequent report, published a year later, one of the main recommendations was the establishment of the National Council of Vocational Qualifications (NCVQ) (Manpower Services Commission and the Department of Education and Science, 1986). By 1987, NCVQ had set out its framework and criteria for a revised system of vocational qualifications. This proved to be far more radical than had been foreseen in that it required the revision of all existing vocational qualifications, so that they would conform to the criteria laid down by NCVQ. Abolition of existing vocational qualifications and their replacement with entirely new arrangements was necessary. The criteria as laid down by the NCVQ were as follows;

To be accredited as a National Vocational Qualification, a qualification must be:

- based on national standards required for performance in employment, and take proper account of future needs with particular regard to technology, markets and employment patterns;

- based on assessments of the outcomes of learning arrived at independently of any particular mode, duration of location of learning;

- awarded on the basis of the valid and reliable assessments made in such a way as to ensure that performance to the national standard can be achieved at work;

- free from barriers which restrict access and progression, and available to all those who are able to reach the required standard by whatever means; and

- free from overt or covert discriminatory practices with regard to gender, age, race or creed and designed to pay regards to the special needs of individuals.

3.3.4 Implementation of National Vocational Qualifications

National Vocational Qualifications (NVQs) were to be awarded at five levels (see Table 3.2), which were deemed equivalent to academic qualifications.
A level is defined as, ‘a measure of competence of an individual’s competence to carry out a range of work to standards….. agreed by industry.’

NVQs have been developed by Employer-led industry lead bodies in conjunction with NCVQ and the Employment Department. This includes a comprehensive framework of vocational qualifications that cover all categories of employment, and occupational groups within the construction industry.

Table 3.2: Definition of NVQ levels

| Level I: Competence in the performance of a range of varied work activities of which may be routine and predictable. |
| Level II: Competence in a significant range work activities, performed in a variety of contexts. Some of the activities are complex or non-routine and there is some responsibility or autonomy. Collaboration with others, perhaps through membership of a work group or team, many often be a requirement. |
| Level III: Competence in a broad range of work activities performed in a wide variety of contexts and most of which are complex and non-routine. There is considerable responsibility and autonomy, and control or guidance of others is often required. |
| Level IV: Competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources is often present. |
| Level V: Competence which involves the application of fundamental principles and complex techniques. Very substantial personal autonomy and significant responsibility for the work of others and for the allocation of substantial resources features strongly, as do personal accountabilities for the analysis and diagnosis, design, planning, execution and evaluation. |

Source: Agapiou (1991)

Taking the bricklaying trade as an example, then NVQ Level 1 would only deal with some bricklaying, stone masonry, plastering and tiling;
'Level 1 is a foundation qualification one that may be offered to low achievers in secondary schools as part of a handyman's suite of qualifications. It is not a mandatory pre-qualification for progression to Levels 2 and 3'. (2)

The principal qualification for a bricklayer is NVQ level 2. It requires proficiency in a range of bricklaying skills required in modern building construction. The bricklaying operatives must be capable of working alone under general direction and supervision. Level 3 requires competence in more complex aspects of bricklaying including liaising with other supervisory staff in a construction project.

3.3.5 Key Characteristics of NVQs

The identification of core skills and competences required in a wide variety of occupations and at different levels has many advantages for the company and promotion of adult training in the workplace. Employees without formal qualifications, but with significant experience in an industry can receive an affirmation of competence on the basis of workplace assessment. Small and inexperienced companies without training departments will have no problem formulating training plans and procedures on the basis of NVQ qualifications. There are no restrictions on access to these qualifications by age or training mode (as there were with traditional apprenticeships). In 1993, the government formally identified NVQ as the vocational route mainly for those who have left full-time education (3).

In a report that examines the implementation and delivery of NVQs in construction, Callender (1992) suggested that there is one serious disadvantage to codifying existing levels of competence, particularly in industries where skills are inadequate, e.g. the case in the construction industry.

(3) Letter from John Patten to Sir Ron Dearing distributed with Press release entitled, Patten announces 'Vocational A-levels'. Department for Education News, 227/93, 8 July 1993.
'Inadequate skill levels are set out as standards to be aimed at, and are perpetuated rather than improved by NVQs'. (Callender (1992), p50)

- **Role of Lead Industrial Bodies (LIBs)**

National Vocational Qualifications (NVQs) are employment-led rather than education-led, in contrast to previous qualifications. Lead Industrial Bodies (LIBs) were established to develop the standards of occupational competence and these were devised through a functional analysis of work roles with particular attention being paid to the purpose and outcome. The role of LIBs was to develop standards and competencies which were relevant to industry's needs.

They aimed to meet the criticisms levelled at earlier vocational qualifications, namely that they were irrelevant to industry's needs and were overly theoretical; that there was an imbalance between theory and practice; and a shortage of hands-on experience in the courses taught. Figure 3.1 shows the model for deriving work-based competencies that were to be followed by LIBs.

The first step was mapping the occupational area. This involved defining the boundaries of the industry, and to some extent, the occupational overlap with other industries.

The second step was a functional analysis of work roles within the industry. Once these exercises had been completed, the statements of competence and performance criteria could then be produced. The majority of LIBs represent an industry or sub-sector within the industry. The CITB is the LIB for the construction industry. It does not embrace all the different sectors of the industry, but liaises with their LIBs. The different LIBs in construction are presented in Table 3.3.
Figure 3.1: The role of lead industrial bodies  
(Source: Callender, 1992)
### Table 3.3: LIBs in the construction industry

<table>
<thead>
<tr>
<th>Construction industry sub-sector</th>
<th>Lead Industrial Body (LIB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and Civil Engineering</td>
<td>Construction Industry Training Board (CITB)</td>
</tr>
<tr>
<td>Thermal Insulation Contracting</td>
<td>Thermal Insulation Contractors Association (TICA)</td>
</tr>
<tr>
<td>Electrical Contracting</td>
<td>Electrical Contractors Association (ECA)</td>
</tr>
<tr>
<td>Engineering Construction</td>
<td>Engineering Construction Industry Training Board (ECITB)</td>
</tr>
<tr>
<td>Heating and Ventilating Contracting</td>
<td>Heating &amp; Ventilating Contractors Association (HVCA)</td>
</tr>
</tbody>
</table>


- **Assessment**

  In the development of NVQs, emphasis was placed on performance criteria and range statements rather than on a simple list of what was to be learned. Separate assessments are not necessary as long as students were capable of undertaking specific tasks, in addition to acquiring necessary knowledge and understanding. The emphasis is on what students can do, rather than what they know. NVQs are based on student-centred learning in which students are given responsibility for accumulating portfolios of evidence to show that they are capable of performing the specified tasks. Those judging the evidence and making the assessments can be the trainers or people in the workplace. They are independent of time or passing exams - there are no compulsory written tests. Students progress at a rate to suit their individual abilities and personal development - the notion of time serving which was a feature of the old apprenticeship system has become irrelevant.

- **Awarding Bodies**

  NVQs in construction are jointly awarded by the CITB and the City and Guilds of London Institute (CGLI) both approved by NCVQ to award NVQs for specified construction trades.
Awarding bodies have to serve three functions; to design qualifications based on statements of competence; to award qualifications based on valid assessments; and to monitor and evaluate an assessment and verification system. It is clear that in seeking to develop an education that is of a distinctly practical nature, NCVQ have departed from established educational practice. The introduction of NVQs marks a radical shift in the vocational training provision. The key differences between NVQs and previous vocational qualifications are summarised in Table 3.4.

Table 3.4: Key differences between NVQs and previous vocational qualifications

<table>
<thead>
<tr>
<th>National Vocational Qualifications</th>
<th>Previous Vocational Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syllabus</td>
<td>Syllabus</td>
</tr>
<tr>
<td>There is no formal syllabus for NVQs, it is up to the lecturers to cross-reference the activities listed in the Training Specifications with the units of competence required at the particular NVQ level.</td>
<td>National syllabus clearly defining technical knowledge to be covered.</td>
</tr>
<tr>
<td>Assessment</td>
<td>Assessment</td>
</tr>
<tr>
<td>There are no compulsory written examinations. Assessment of NVQs is based on an assessor's observation of the trainee as he or she performs the specified tasks required to demonstrate competence.</td>
<td>Qualifications are awarded on the basis of a combination of marks awarded on: externally set assessments, marked internally but externally moderated; and an externally set and marked examination requiring the student to answer multiple choice questions</td>
</tr>
<tr>
<td>Course duration</td>
<td>Course duration</td>
</tr>
<tr>
<td>Course duration varies. Totally dependent on the student's individual performance</td>
<td>Fixed duration</td>
</tr>
</tbody>
</table>

Source: Smithers (1993)

Few studies have identified the constraints that hinder the delivery and implementation of NVQs. The following section below highlights the key factors that have constrained the implementation and delivery of NVQs, and examines substantive issues which bring into the question the ideas underpinning the new qualifications as they relate to the construction trades.
3.4 The Implementation and Delivery of Construction-Related NVQs

In general, there are two sets of issues, which together constrain the progress and aims of construction-related NVQs. These are;

- necessary preconditions for their successful implementation; and,

- substantive issues which question the ideas underpinning NVQs, and whether they can work in practice.

3.4.1 Preconditions for the Successful Implementation of NVQs

Callender (1992) identified three key preconditions necessary for the implementation and delivery of NVQs in the construction industry. These are:

- **Access to information**

  Employers, employees and training providers require information on the rationale, nature and content of NVQs. This is vital, particularly for the construction industry, that is increasingly dominated by the number of small firms who often have little access to information in general;

  *Many employers had not heard of NVQs. Small employers who were not members of any employer federations or other information networks being particularly unaware. Yet these groups make up the majority of employers in construction.* (Callender, p 14).

Employees and trainees were similarly unaware of NVQs. In a survey conducted on behalf of NCVQ only 61 per cent of respondents had heard of NVQs (NCVQ, 1992). In the short term, access to information is essential to speed up the introduction, of NVQs and increase confidence in the process and the qualifications.
In the long-term, it may improve the supply of NVQs by encouraging more training providers to become involved in the new qualification and, therefore, broaden access. Greater access to information on NVQs may increase demand from both trainers and trainees.

- **Funding and Resources for Training Providers**

The cost of introducing NVQs into the construction industry are relatively high when compared to other occupational areas (Department for Education and Science, 1991). These costs are associated with both the criteria to become an accredited Assessment Centre and the demands of NVQ competencies. Training providers are required to have adequate facilities in order to be able to assess and train NVQs. Providers are therefore required to adapt their buildings and their use of space. For example, the NVQ in carpentry and joinery requires the construction of a realistic staircase so there must be enough space to allow the construction of full-size rather than half-sized models. Construction is resource intensive in terms of materials. Many materials are expensive and not reusable, such as timber. These costs are being absorbed by providers as opposed to employers because of the difficulties of assessing students in the workplace. This is despite the fact that NVQs were designed to make it easier for employers to train on their premises rather than sending trainees to college. The majority of employers in construction are small employers with less than 20 employees, who still choose to send their trainees to Further Education colleges rather than train them in their premises for reasons of cost and time (Steedman and Hawkins, 1994). The cost of training can act as a disincentive to train, particularly for small employers (Agapiou et al, 1995a). In contrast, large national training providers are often able to limit costs much easier than their smaller counterparts, for example, buying materials in bulk or by negotiating relaxations with the CITB on performance criteria and competencies. The relevant authorities need to acknowledge the extra costs associated with construction-related NVQs in funding mechanisms.
The role of Training and Enterprise Councils

The problems a provider faces over costs are heightened by the nature of the funding body and funding arrangements, particularly for those providers who provide YT places. As previously mentioned, TECs are responsible for the administration and distribution of training funds. TECs were established to meet local training needs. However, construction is a national industry with an itinerant workforce in contrast to many other industries. Training requirements are often difficult to predict within a given locality and are dictated by large building projects. The duration of construction work is limited and TECs may not respond fast enough to the demand for construction training in their catchment area. The cyclical nature of the construction industry may also discourage TECs from funding training, particularly when there is no apparent demand for construction skills.

Output-related funding for Government sponsored training schemes, such as YT and ET was introduced to encourage the take-up of NVQs. In essence, it represented a commitment to payment by results. Each TEC operates its own system of output-related funding with Further Education Colleges. In general, at least 25 per cent of funding is retained for students on YT programmes in all occupations unless trainees reach NVQ Level 2 within the two-year period funded by YT (Felstead, 1994). This system of funding can cause difficulties for both providers and TECs. While output-related funding can act as an incentive to encourage trainees to attain a recognised qualification, this is only possible so as long as assessors are sufficiently independent to make objective judgements of trainees’ progress. However, lecturers’ jobs in some FE colleges are directly dependent on funding through TECs to support YT programmes, but it is the same lecturers who are required to assess their students’ NVQ attainments. There would be a temptation either to select trainees who are most likely to succeed and consequently deny access to training programmes to certain types of trainee - a policy of exclusion, or adopt more lax assessment procedures. The TECs need to assess their impact on access to training provision, monitor NVQ pass rates and establish the effect on their training budgets under the new funding arrangements.
3.4.2 Substantive Issues

In addition to key preconditions for implementation there are even more serious issues of substance, the nature of which bring in question the philosophy and ideas that underpin NVQs. In particular, whether construction-related NVQs can work in practice.

- NVQ competences

The purpose of training is two-fold; to provide people with the skills they require in the industry, and to maintain those skills as technology and working practices change. The main aim of NVQs is that they should be industry-led and meet the needs of industry, hence the role of Lead Industry Bodies in setting up the new vocational qualifications. The intention was that more relevant qualifications would improve standards and increase the numbers working toward recognised qualifications.

In a comparative study of old and new training arrangements, Smithers (1993) identified that the training of plumbers, for example, was inadequate, and that there was little incentive for plumbers to become properly qualified. The replacement of City and Guilds course 603 for plumbers with NVQs in plumbing at Level 2 and 3, however, resulted in a variety of problems relating to the length and content of the new courses. The City and Guilds certificate was normally achieved in three years, but TECs only provide funding for two years. In contrast to the new NVQ in plumbing, the City and Guilds course involved both practical and (compulsory) written assessment. The whole range of plumbing tasks as well as the underlying knowledge of physics, electronics, mathematics and technical drawing were tested. The introduction of the plumbing NVQs was an attempt to correct the perceived flaw in the earlier City and Guild courses.
In particular, the under representation of practical skills testing in the workplace and overly theoretical aspects that were infrequently used by a plumber. However, general job knowledge has been sacrificed at the expense of greater emphasis on job performance. According to Callender (1992) the narrowness of competencies may encourage rigidity rather the flexible application of skills.

Training arrangements and the acquisition of skills vary considerably across the construction industry (Gann, 1989). The electrical installation sector has been successful in maintaining employment-based craft training. In particular, the JIB Electrician Apprenticeship scheme run by Electrical Contractors Association (ECA), the sector’s Lead Industrial Body, was a considerable success. Nevertheless, they were subsequently required to draw up the NVQ Level 2 in electrical installation. The alternative would have been to forgo £10 million of public funding routed through the TECs. The introduction of NVQs for electricians has led to fears that the standards of the new qualifications would not match those being phased out:

'It is widely feared among electricians that the new NVQ level 2 will develop with nothing like the technical knowledge and installation skills provided by the previous training scheme. It is also feared that many employers will be reluctant to fund training beyond NVQ 2........ and that skills base of electricians in this country will therefore be severely eroded' (Smithers, p 24).

As previously mentioned, NVQs are awarded on the basis that students are able to demonstrate a number of specified occupational competencies. Assessment is criteria-referenced, with the criterion that must be satisfied clearly drawn up in advance. The reasoning followed by NCVQ dictates that where a given occupation is defined in terms of a set of competencies, a satisfactory performance in each and every one of these competencies is essential in order for the candidate to achieve an award. This is particularly important for the lower level NVQs where there is a severe constraint on the amount of general educational content that a student is required to demonstrate.
Clearly, it would be unsatisfactory if an experienced craftsman, able to demonstrate the practical competencies required, failed to be awarded an NVQ level 2 certificate. However, the level of competence in mathematics, for example, may not go beyond the elementary. To ensure that experience tradesmen do not fail their assessment through lack of mathematics, requirements have been pitched at the most basic and elementary levels. However, the desire that NVQs should be used by employers to certify their operatives' practical experience has resulted in a youth training programme that requires a demonstration of competence in only the most basic mathematical operations. Only around one-third of the mathematical topics included in the City and Guilds 588 Brickwork course syllabus, for example, are specified in the NVQ Level 2 (Bricklaying) assessment (Steedman and Hawkins, 1994). Appendix B presents examples of the basic mathematical concepts that students are required to master.

- **The role of LIBs**

  The role of Lead Industrial Bodies is ill-defined. Their development and representation have not been adequately co-ordinated. The majority of LIBs represent a single industry or a sub-sector of an industry. With a few exceptions, it is rare that one LIB would co-operate with another. This is a serious drawback of the present structure. In particular, as it neither encourages interest with the same occupations found in other industries nor promotes development of occupational-based competencies. However, NVQs were introduced to enhance the transfer and progression of skills both between and within industries and occupations.

  The duplication of NVQs in occupational areas that goes beyond the remit of different LIBs is a practical consequence of the above constraint. One of the main aims of NVQs was to streamline the qualification jungle. Contrary to this, the introduction of NVQs for the same occupation devised by different LIBs has led to a proliferation of qualifications. This is not only a problem between different LIBs, but even within occupations that fall under the authority of a single LIB.

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The conflicting interests of the different sub-sectors in construction have contributed to a fragmentation of the NVQ provision. In the late 1980's several sectors elected to establish their own Industry Training Organisations, thereby freeing themselves from the control of the Construction Industry Training Board (CITB). This has allowed some sub-sectors to develop their own NVQs, unhindered by conflicting interests of the sub-sectors remaining in-scope (affiliated) to the CITB.

3.5 Summary

The objective of this chapter was to review the developments in the training provision in Britain and assess the impact of these changes on training arrangements in the construction industry. Traditionally, there have been two main routes down which construction craft skills have been developed: the formal route via apprenticeship; and government-sponsored training schemes. In conjunction with these forms of provision, other, ad-hoc training methods have developed within the traditional construction trades. These were based on the trial-and-error method of learning a trade.

The post Second World War period as a whole has been marked by the general decline in craft-based apprenticeship - a decline reinforced by the spread of subcontracting over the last 25 years. The last ten years in particular have witnessed a drastic decline in trainee recruitment which has brought the level of training in the industry to an unprecedented low. Underpinning these trends over time is the contradiction between the short-term interests of individual enterprises engaged in the search for profits and the wider needs of the construction industry and its clients. The concept of coordinated craft-based training was further undermined by the introduction of the Youth Training Scheme in the early 1980's. The YTS scheme in all its features was consistent with the government's commitment to a market-led economy, and its consequent efforts to erode the Industrial Training Board system.
Changes in the construction industry have transformed and diversified the industry's skill and training needs. However, the fragmented structure of the industry and its volatility have made it difficult to meet these new and changing needs. It is against this background that National Vocational Qualifications (NVQs) were introduced.

One of the objectives of the NVQs was that they would achieve common national standards throughout all industries and occupations and that NVQs would be comparable across industries. This, in turn, would facilitate both flexibility and transferability of qualifications between occupations. It is difficult to assess whether this objective will be achieved in the short-term, in view of the varying number of units in different NVQs; the proliferation of NVQs; and fragmentation of the training provision evident in the construction industry.

There is a clear need for the establishment of specific minimum standards for each stage of training in all occupations, with certification of recognised levels of competence and attainment. Such standards should form the basis for the registration of skills, leading eventually to that industry database which could be so valuable at the local level. The compilation of a database of construction workers, based on the registration and certification of tradesmen may provide a mechanism for gathering information on the availability of skills on a regional basis. The introduction of NVQs into the construction industry, coupled with the registration of trades on the basis of these new qualifications should go some way to achieving this goal. Without such a database much needed employment planning in the construction industry will remain wishful thinking.

The next chapter describes the research methodology adopted. In particular the strategy chosen for the development of the proposed labour resource model.
CHAPTER FOUR

RESEARCH DESIGN

4.1 Introduction

Chapter Two highlighted the need for interested parties in the construction industry to understand and anticipate the skill needs of their workforce. This can only be achieved if they are in possession of detailed information on the availability of labour resources on a regional basis, and are aware of the restrictions and limitations on the employment planning process. Chapter Three identified the need for a regional data base of labour skills, and the mechanisms required to facilitate long-term employment planning. This chapter describes the methodology adopted. This includes a discussion of alternative methodologies and the rationale behind the selection of the research methodology. Various research strategies are also highlighted, and the strategy adopted is rationalised.

4.2 Research design and objectives

Within construction management research there is a limited number of methodologies which are particularly favoured and in current use (Bresnen, 1990). Because of this, it is often not possible to provide examples of construction management research when discussing aspects of a particular methodology. The guiding principal for developing any research methodology is that it must completely address the research questions identified (Black, 1993). The need for an appropriate research design arises whenever there is need to generalise research findings, either in terms of frequency or prevalence of particular attributes or variables, or about the relationships between them.
The need for a good design becomes very acute when undertaking ambitious and complex studies. Conclusions must be valid and able to form a sound basis for generalisation and further action.

The research design is the logical sequence that connects the empirical data produced by research to the study's initial research questions and ultimately to its conclusions (Yin, 1989). One of the principal purposes of the design is to help to avoid the situation in which the collected data does not address the initial research questions. The research design should therefore:

- provide hypothesis/propositions about these questions;
- develop a data collection methodology; and
- discuss the data in relation to the initial research questions and the hypothesis/propositions.

Buckley (1976) identified that the scientific method of research should comprise the following steps:

- knowledge steps from observations which take place through a definable searching process;
- the research problem is defined, which means answering why the research is being undertaken and what purpose it is supposed to achieve;
- a research plan must be formulated comprising the selection of appropriate strategies, domains and techniques;
- inquiry ensues in accordance with the plan and is directed by the need to obtain relevant and sufficient evidence;
the outcome of the inquiry is stated in explicit terms which may result in support or rejection of the existing hypothesis; and

the conclusions are documented with sufficient support and clarity that they establish what was done, what was found, and what significance the findings may have.

Buckley (1976) described these steps as crucial to the assurance of quality research. The methodology adopted in this research is based on the above steps. Based on the first two steps, the research problems were defined through a preliminary literature review. The problems identified through this search led to the formulation of the following objectives (see Section 1.3):

- identify and collate important and reliable sources of data on labour resources relevant to the construction industry in Europe. This would involve interpretation of the various definitions used and eliminating double, or treble counting. If the key reliable sources of data were identified, explained and made available to industry, this would, in itself, be a significant contribution;

- construct a model to predict labour resource trends. This would facilitate clearer planning by construction companies and could well be a major factor in stimulating investment in devising new construction methods; and

- assess the acceptability of movement between various regions of Europe, and measure what is likely to be the effect of the 'free movement of labour' on the supply of construction skills.

4.3 Research strategy

Having identified the research problem and the objectives, the next step was to choose the appropriate strategy that would help to achieve the objectives. Buckley (1976) suggested the following four methods:
• **Opinion research**
If the researcher seeks the views, judgement or appraisals of other persons with respect to a research problem, he/she is engaged in opinion research (e.g. questionnaires, opinion polls, and interview).

• **Empirical Research**
An empirical research strategy requires that the researcher observe and/or experience things for himself/herself rather than through the mediation of others (e.g. case study, field study, laboratory study).

• **Archival research**
This is concerned with the examination of recorded facts (e.g. original documents or official files or records, publication of data by other investigators).

• **Analytical research**
Analytical Research relies on the use of internal logic on the part of the researcher. The researcher has the resources required for solving the problem himself/herself. No explicit reference to external data is necessary.

Because the research covered a number of complex and inter-related issues a step-by-step approach was adopted. There was a large volume of literature on the subject of labour resources in the construction industry. Therefore, archival research was used at the initial stages of the research to define the problem and formulate the objectives. Analytical, opinion, empirical and research were found inappropriate for this aspect of the research. These techniques are useful for identifying new variables and possible relationships between variables.

The overall strategy chosen was based on a combination of different techniques in accordance with the research objectives (see Figure 4.1). Archival research was used to identify the restriction and limitations on the proposed planning process. This approach were also used to identify the nature and sources of labour resource data.
Several sources of centralised national statistics were identified. These included the European Construction Institute (ECI), the International Labour Office, and European Union documentation. Opinion research was used to supplement this information. This was because much of the information sought was unpublished, and held by employers associations and trade organisations in each European country.
One of the major disadvantages of the survey approach was that the important variables had to be known in advance. Therefore, guidance on the preparation of the questionnaire survey was sought from members of the ECI's Construction Manpower Task Force.

Archival research was used to identify the various approaches to modelling labour resource trends. Analytical research techniques were then used to develop an appropriate model for forecasting purposes.

The acceptability of movement of construction labour between various regions of Europe was assessed using Archival research. Opinion research was considered inappropriate because it would not cover the range of experiences of construction employers and employees within Europe.

Having decided on the appropriate strategy, the research itself was undertaken in the following two main phases:

- Phase One: literature review; and
- Phase Two: labour resource data collection and development and testing of labour supply model.

Details of the research strategy adopted is presented in the next section.

4.4 Phase One: literature review

A literature search was undertaken to investigate the various issues relating to future skill requirements and employment planning in the construction industry. Much of the literature was obtained from the Pilkington Library (Loughborough University) and some through the Inter-Library loan facilities available at Loughborough University. Several important findings were identified from this review (see Chapter 2 & 3). In particular, that the future supply of construction skills depends on the recruitment of young entrants, together with some upgrading of semi-skilled operatives to skilled operatives.
This finding helped to define the framework of the proposed planning process. The next section describes the methodology adopted to identify and collate labour resource data, and develop the proposed labour supply model.

4.5 Phase two: labour resource data collection and analysis

In order to achieve an adequate supply of labour skills the construction industry must appreciate the complexity of labour resource requirements; understand the long-term planning implications; have reliable data; and be aware of any restrictions or limitations on the planning exercise. Having defined the framework of the proposed planning exercise, the next step was to develop the necessary information tools in accordance with the research objectives identified earlier. This section describes the data collection process and the development of an appropriate labour model.

4.5.1 Nature and sources of existing European labour statistics

The first stage was to establish the main central sources of construction industry labour statistics throughout Europe. In particular, to identify the extent to which existing available data is broken-down by sector, region, trade and whether these statistics are updated regularly.

Main central sources of centralised national statistics were identified initially. These included the International Labour Organisation (ILO) and the Statistical Office of the European Communities (EUROSTAT). However, on examination the statistical information held by these organisations was not broken-down into appropriate categories. In particular, broad classifications of construction were used to collate labour statistics. Furthermore no statistics were available relating to specific region, sectors trades or skills. A new approach was therefore adopted.

The United Kingdom institutional structure of the construction was used to identify appropriate sources (see Section 6.7).
The aim was to seek from similar organisations in other European countries relevant labour resource data. Descriptions of the information held were then obtained through a questionnaire approach.

- **Questionnaire design**

Since the questionnaire was to be self-administered, there was a need for it to be self-explanatory. In order to ensure this, a covering letter and an introductory page describing the aims and objectives of the research were attached to the questionnaire. The questionnaire was divided into two sections as described below:

**Section One** comprised: the details of the organisation including, geographic location; main activities; sector of operations, and familiarity with the main and secondary sources of construction industry labour resource data in that particular country.

**Section Two** included; respondent's knowledge of the sources of labour resource data, including the extent to which the available information is broken down by region, sector, occupational trade, skill level and frequency of publication.

Detailed information was provided by official and institutional sources in 17 European countries. The results were published in 1992 by the European Construction Institute as *Sources of European Labour Statistics* (Agapiou et al, 1992). The first edition of the report represents details of the available information for 10 European Union (EU) member countries. The second edition of the report has been expanded to include Austria, Sweden, Finland, Switzerland, Hungary and Poland.

**4.5.2. Development of the labour supply model**

In order to assess the various options open, a comprehensive literature review was undertaken with several useful approaches being identified. Lack of data in the appropriate form has meant that very little research has been done in the development of labour forecasting models for the construction industry.
One approach that was considered was to modify existing labour forecasting models that represent other industries. In this research, only the supply-side was considered. The model was developed from the human capital approach to analysing labour supply to a training market limited by the number of training places made available by companies. The approach was originally applied to the supply of apprentice entrants to the engineering sector, and has been adapted, in this investigation, for the construction industry training market. The results of this part of the research have been published in a paper entitled Forecasting the supply of construction skills in the UK (Agapiou et al, 1995).

4.5.3 Acceptability of movement between various European regions

The modelling exercise described above assumed that the construction industry is able, when it chooses, to recruit a supply of new trainees. The acceptability of movement labour skills within the European Union was also assessed through a comprehensive literature review. The aim was to develop a framework from which the effect of free movement of labour on the supply of construction skills could be examined. This exercise drew on literature available through the Pilkington Library (Loughborough University) and other publications identified through several on-line search facilities. A number of issues relevant to labour mobility in the construction industry were examined. These included:

- patterns of labour mobility within the European Union;
- risks and benefits of such movement;
- bilateral and multilateral measures to control movements of labour skills; and
- European initiatives to promote mobility of construction labour.

To supplement this information structured interviews were undertaken with officials from training authorities in the UK, Irish Republic, Germany and Spain. This exercise was undertaken to identify whether different training methodologies within Europe are a significant barrier to the free movement of construction operatives.
The results of this comparison were published in a report entitled *Construction craft training in Ireland, Spain, Germany and the UK* (Agapiou et al, 1994).

### 4.6 Summary

This chapter has described how the research was undertaken, and justified the methodology adopted during the research. Alternative methodologies were presented and the one adopted was rationalised. In order to achieve its objectives, this research comprised two phases. Phase One was aimed at determining the initial observations through literature review, in particular the restrictions and limitations on the proposed employment planning process. Phase Two focused on data collection and analysis. A questionnaire survey was identified as a suitable method to collect labour resource data. The purpose was to establish a model for the collection of data that could be applicable to any country in Europe: a prerequisite to developing an appropriate employment model for forecasting purposes. The next chapter reviews the general methodological approaches to employment supply-side forecasting. Chapter Six provides an overall assessment of the data sources available to serve the labour supply model. The methodology adopted in the development and testing of the proposed forecasting model is then presented in Chapter Seven.
CHAPTER FIVE

EMPLOYMENT PLANNING & FORECASTING IN THE
CONSTRUCTION INDUSTRY

5.1 Introduction

This chapter reviews the general methodological approaches to employment planning and forecasting as practised in the UK. A brief review of general employment planning, and limitations of the techniques used is followed by an examination of the relevance of employment planning to construction. Thereafter, the anticipated benefits from reliable, comprehensive forecasts of construction skill demand and supply and the possible limitations of such an exercise are discussed.

Construction is a key activity in any economy. It influences the final flow of goods and services provided in the economy - the Gross National Product (GNP) - and in turn is influenced by the size of that GNP. One of the most persistent features of the construction industry has been the pronounced and frequent changes in demand produced by fluctuating economic activity. The problems resulting from unstable patterns of demand take various forms and are difficult to deal with satisfactorily. It is not only in terms of output that construction makes a significant impact on the UK economy, for the industry also exerts an influence on national employment levels. Typically, between six and seven per cent of the UK labour force work in the construction industry (Briscoe, 1992). Construction still remains labour-intensive and craft-based, but in addition to traditional craft trades it has a requirement for many newer skills. The requirement for particular skills varies between different sectors of construction. The more traditional skills are essential in the repair and maintenance sector, whereas new, more technical skills are important in new-build sector.
As both the demand for construction output and the mix of work changes so demand for different construction skills varies. In contrast to most other industrial sectors, fluctuations in construction output are very pronounced and the associated movement in skill demand can similarly be strong and rapid.

The construction industry is a national industry. Activity is widely distributed across all geographical regions of the UK. Demand for certain types of work, however, can be concentrated in particular regions at different times. The Channel Tunnel is an example of a large civil engineering project that created an intense demand for construction skills in the South-East, particularly in the Kent region. The commercial building boom in London in the late 1980’s is another example of intensified regional demand for construction skills.

Some inward and outward mobility of the skilled workforce can be expected for any given region. The net impact for any one region is unlikely to be very large, but for selected occupations such mobility could be an important in the determination of labour supply. In general, while a few young, highly skilled operatives are found to be extremely mobile within regions, most operatives move around within a given locality (Briscoe, 1990b). In the 1980’s, the main movement was from the North of Britain towards London and South-East, where employment demand was strongest.

Of potentially greater significance in the future is the possibility of the construction industry obtaining a portion of its skill requirements from other European Union member countries and elsewhere. Currently, this is an area of much speculation and a great deal of ignorance. In the future it may be appropriate to adjust the skill supply for certain trades by a small percentage to allow for an influx of European-based skills. However, there remains the possibility of British operatives being attracted into European Mainland by higher wage differentials, thus, overall supply adjustments could go either way. The planning of construction skills training may provide a more systematic approach to matching supply and demand, and must be undertaken on an occupational and regional basis.
Several agencies and organisations have responsibility for the supply of new construction skills in the UK. In addition to the CITB and ECITB, TECs, Local authority employers, private sector companies, trade unions, and other training providers all have a concern with construction training. Clearly, if the numbers to be trained are to be properly planned an improved ability to forecast employment demand and supply into the medium-term is an important requirement for the efficient planning of training in the construction industry.

5.2 Potential Benefits of Employment Planning

The identification of imbalances between the demand for and the supply of specific skills is perhaps the most important benefit to be gained from a systematic employment planning exercise. Construction contains a large number of quite distinct occupations or skills categories and shortages in any particular category can restrict output and reduce productivity. The experiences of the construction industry in the late 1980's highlighted the problems that arise when the supply of skills in the region fall seriously short of the demand level (Briscoe, 1990b). Construction delays, high wage payments and widespread pay and poach practices were common in the London building market in the period 1987-89. If employment forecasts had been available to provide advanced warning of likely shortfalls, then training providers might have been able to boost the supply of skills and thereby mitigate the damaging effects of shortage.

Traditional apprenticeship training can take three years, therefore, it is necessary to plan several years ahead if supply is to match demand. Employment forecasts emphasise the implications of past patterns of change for future demand for skills, often using quite sophisticated techniques. The aim is to present training providers and other employment policy makers with information on the labour market environment that they may face, clarify past trends and identify new ones. The information provided by such assessments is a key input into decisions to be made about the scale and content of different education and training programmes by government agencies, educational providers, companies and trade unions.
A sophisticated, rigorous employment forecasting model can yield benefits beyond a single set of projections for use in planning training programmes. Explicit alternative assumptions can be examined within the model framework and alternative scenarios explored. Thus, basic employment projections can be tested for their sensitivity to changes in key parameters. In the future it may be appropriate to consider a range of possible skill demand levels rather a single set of estimates.

Once the forecasting model has been developed it can be used to provide benchmark estimates for further analysis of the construction labour market. The projections provide information not only for planning training but also for financial budgeting, through the estimated numbers contributing to training board levy income and grant expenditure.

In addition, projections can provide information for planning in the Training and Enterprise Councils (TECs) in their locality. Similarly, forecasts produced for particular occupations or skills may be valuable to particular construction federation bodies, such as the Federation of Master Builders or the Building Employers’ Confederation.

Systematic employment planning can be used to co-ordinate the activities of the various agencies concerned with training and other labour market issues in the construction sector. In the past, many of these organisations have operated independently, often taking decisions on the basis of incomplete information. The employment planning framework offers the potential for gathering information for the whole construction labour market. Significantly, this market is linked to other sectors of the UK economy and such a framework can illustrate how changes elsewhere in this economy can have an impact on construction.

It is important to identify the benefits and limitations of what such models can and cannot provide. Whilst the potential gains from employment planning are considerable, it is important not to have high expectations.
In particular, employment forecasts do not offer a crystal ball from which an accurate picture of the future can be gleaned. Rather they spell out the implications of a series of assumptions about the future development including the assumptions about patterns of behaviour of the key actors in the labour market. In particular, it is important to recognise that labour requirements cannot be forecasted precisely and that the idea that the implications for numbers of trainees at a very detailed level can be simply derived mechanically from an employment forecast is highly suspect (Briscoe and Wilson, 1993).

5.3 A Review of Employment Planning

Forecasting has been undertaken since time immemorial, even the Greeks had their Delphic oracle. Fortune tellers have used the stars, palms and tea leaves to attempt to peer into the future. In more recent times, the pre-eminence of the ‘scientific’ method and the development of computers has resulted in the dramatic growth of formal forecasting of socio-economic trends.

Forecasts are used to minimise uncertainty by building a picture of what tomorrow might be like, given information about today and the recent past. This then enables intervention if the picture of tomorrow is in some way undesirable. However, where the outcome of the forecast is explicitly used to alter behaviour, this will inevitably cause the actual events to diverge from the forecast. It is important to recognise that an employment forecasting model utilises time series data and employs well-understood econometric techniques to perform appropriate computations. However, although such an approach is widely adopted, as discussed below, there are some significant limitations which restrict the eventual usefulness of such models and their resulting predictions. It is important to remember these limitations when using the forecasts and making planning decisions.

Formal employment forecasting has been undertaken in one form or another for a number of years and there is an enormous body of literature covering work at both a macro and micro level.
Several useful reviews have been conducted of this work by a number of authors, for example, Hughes (1991a and b), Colclough (1990), Smith and Bartholomew (1988), and Youdi and Hinchliffe (1985). The present discussion is limited to a summary of the main features of these works.

Employment forecasting became prominent at a national level during the 1960's as economists attempted to advise governments on how to avoid imbalances between supply and demand for skills, appearing as structural unemployment or skill shortages. At the time, it was hoped that detailed re-employment plans could be developed and then used to guide policy makers on the provision of educational and training programmes at a very detailed level.

In practice, the methods adopted tended to be rather naive and mechanistic. This resulted in early forecasts that were usually very inaccurate, particularly on the supply-side. Typical of the methods adopted by economists was the linking of demand for particular skills to output projections for different industries, often through some form of input-output model. The links were generally a series of fixed coefficients. This approach was, however, heavily criticised by Ahamad and Blaug (1970) as failing to recognise the possibility of substitution of one factor of production (or skill) for another.

5.3.1 Criticisms of Employment Planning

Colclough (1990) offered three main criticisms of the general employment requirements approach:

- that national level employment planning is irrelevant because markets will respond to their own accord to ensure that the correct skills are produced.

- that the fixed coefficients approach is invalid since it ignores the possibilities of economic substitution; and
that inaccuracies in the assumptions will be compounded so making the
projections of little value.

However, these criticisms have all been rejected by employment planners (Briscoe and
Wilson, 1993). With regard to the first criticism, they point to the evidence of market
failure (reflected in persistent skill shortages) and to the long-lags in training which can
lead to temporary but long-lasting imbalances in occupational labour markets. With
regard to the second point they highlight empirical evidence that the elasticity of
substitution for skills is low and argue that wage structures tend to be stable over the
long-term. The third criticism is rejected on the grounds that the problem of
forecasting inaccuracy is not unique to employment forecasting but applies to any
economic predictions. Hughes (1991a) suggests that employment forecasts are
significantly more accurate than any others, nevertheless and there is evidence that
policy makers have found them valuable.

5.4 Employment Planning Practices in the 1990's

Employment planning, in the 1990's, has continued to be practised, albeit in a less
mechanistic fashion. Most industrialised countries now undertake regular labour
market projections, however, these are used as general aids to those formulating policy
to illustrate the implications of a continuation of past economic and labour market
trends in the future, rather than as an indicative input into educational planning.

Employment forecasts can be subject to wide margins of error but this does not
invalidate them, any more than does other economic forecasts. The major
problem in all social science forecasting is of course that the forecast itself may alter
the behaviour and indeed this is often a key objective. In any event, forecasts should
not be taken too literally or as telling policy makers what to do. They should be
treated as one among many pieces of information which planners need to assess before
taking decisions and used to help evaluate the risks that exist in the present situation
Employment forecasts can contribute to the decisions which have to be taken with regard to education, training, and choice of occupation by providing, as Colclough (1990, pg. 20) argues ‘a detailed, consistent and plausible picture (if properly done) of how the future might look’.

5.4.1 Methodological Approaches to Forecasting Labour Demand

Employment forecasting has adopted a variety of different techniques. The fixed coefficient manpower requirements approach is the most common method of tackling the demand side. As noted above, this has usually involved making a series of links from Gross National Product to output in individual sectors, to employment, to the demand for particular skills. In most of the early work these links were all in the form of fixed coefficients. More recently, the models used have been more sophisticated, allowing for changing coefficients and responses to economic variables such as prices and relative wages (see, for example, Briscoe and Wilson, 1991).

Surveys of employers, asking them what their future demand will be, has been another popular approach. However, this approach has been heavily criticised. This centred upon the lack of any firm theoretical foundation as well as the practical problems of ensuring that all respondents are adopting common assumptions about the future scenario and that their responses are mutually consistent. Such methods have been used more recently by Rajan and Pearson (1986) and can, if used with care, produce useful results. This approach is particularly valuable where the available data are inadequate to build more sophisticated time series econometric models.

Employer surveys are certainly useful, nevertheless there is considerable doubt as to whether they can be used to obtain a qualitative picture on the state of a particular labour market. It is more common to use Delphi techniques to assess future prospects in areas that are hard to quantify. Holden et al (1990) argue that this approach relies on obtaining a consensus of expert opinion.
5.4.2 Methodological Approaches to Forecasting Labour Supply

Typically, the approach on the supply-side has been to develop simple stock-flow models relating the total stock of employment in period t to that in period t+1, using an accounting identity linking the main inflows and outflows to the stock (see, for example, Briscoe and Wilson, 1993). Supplementary models have been used to determine the proportion of the stock that are economically active. The main outflows considered in this approach are those due to death, retirement and other exits from the workforce, such as emigration. The main inflows related to the flow of new entrants (qualified as appropriate), re-entrants to the workforce and migration. Inter-occupational mobility also needs to be considered if the focus is on a particular occupation.

During the 1960's, quite sophisticated systems of demographic accounts were developed in the 1960's with parallel the national economic accounts. However, Government showed little interest in this work. Consequently, labour supply employment models have not flourished to the same degree as the macroeconomics models based upon the economic accounts. Nevertheless, various ad-hoc surveys have been used by employment planners attempting to fill the gaps in information, in addition to models which allow for some response in flow and activity rates to economic and other factors.

In more sophisticated models, detailed econometric analysis of time series data has been performed to explain historical trends in rates of flow and economic activity rates and to project them into the future. However, where the data are limited these rates are assumed fixed or extrapolated from a few observations. Wilson et al (1990) suggest that data limitations have restricted the development of more sophisticated models to particular occupational groups, where plentiful information on the various stocks and flows are available.
5.4.3 Company Level Employment Planning

Companies also have an obvious interest in monitoring their own workforce and assessing the implications for recruitment of such factors as age structure of the workforce, inter industry mobility rates, and changing patterns of demand. At the company level, personnel planning is now a well established. Larger companies have a specialist personnel manager in quite a senior position to undertake this function (Fellows et al., 1983). At the company level, the range of models and methods is, of course, even broader, ranging from very simple rules of thumb to quite complex models paralleling the national level one described above. They tend to focus more on the short-term than the national models, reflecting the different interests of governments and individual companies. The former are generally more concerned with the longer-term development of the economy and the provision of education and training programmes which involve long lags between entry and qualification. They are, therefore, much more interested in projections 5-10 years ahead. Companies on the other hand tend to be concerned with immediate problems relating to recruitment and transfers to other industries.

5.5 Employment Planning in the Construction Industry

5.5.1 Aggregate Industry Forecasts

Projections for construction employment are rare and relatively few published examples can be found. This contrasts with the availability of very detailed estimates for construction output and order, produced on a frequent basis. The CITB has, from time to time, attempted to develop employment forecasting models. An early example of planning in Scotland can be identified (CITB, 1968), but in general such exercises were one-offs and they did not lead to any comprehensive national-level forecasting. The CITB has also commissioned other organisations to undertake work on their behalf. In 1978, Construction Markets produced a set of proposals for projecting the regional for construction demand. However, this work was never completed and no continuous forecasting exercises were undertaken.
More recently, CITB commissioned Binder Hamlyn (1988) to undertake a detailed survey of construction occupations. However, this work was more concerned with identifying the current status of various occupations, rather than employment forecasting as such (CITB, 1988).

Both the Institute for Employment Research and Cambridge Econometrics produce forecasts for construction employment levels into the medium term. However, these were aggregate forecasts, and to be of practical use to the construction planner, these figures need to be disaggregated.

Others have also attempted partial exercises along these lines (see for example, Briscoe et al (1980) and Briscoe (1982 and 1989a). However, such exercises are far from comprehensive and they have not been continuously revised and updated.

Other examples of labour demand forecasts can be found in the literature. The Building and Civil Engineering EDCs (1976) used a set of fixed resource coefficients, derived from survey research work carried out by the Building Research Establishment (BRE), to produce medium-term forecasts for selected construction occupations. However, Hillebrandt and Meikle (1985) make clear, despite an identified need for this type of information, much of the BRE work was never published and the exercises to establish the link coefficients were one-off and have not been continued.

Predictions of short-term labour demand are regularly produced in the Building Employers’ Confederation State of Trade Surveys. These are published on a quarterly basis. Survey returns from around 600 member firms were weighted to provide some evidence on the proportion of firms expecting to increase (decrease) its employment over the immediate period ahead. Whilst this is undoubtedly valuable in terms of its regular availability and continuity, its usefulness for employment planning into the medium-term is extremely limited. Other employers’ organisations also from time to time perform employment surveys that yield potentially useful results.
Whilst the several training agencies and particular the CITB publish training statistics for construction occupations on a regular basis, exercises using these data to make supply forecasts are rarely attempted. Whenever supply shortages arise, various studies are published into selected aspects of labour supply either for individual occupations or for regions and localities (see for example, Marsh et al (1980). Frequently, training and labour supply is examined as one aspect of a much wider issue (see, for example, Gann (1989) on operative training for building services sector). Many articles appear in the construction press on the subject of training and recruitment into the industry, but few of these are analytical to any degree. Perhaps because much of the available data relating to skill supply is partial and incomplete, construction planners are unwilling to publish any longer-term projections.

5.5.2 Company Level Forecasts

Where construction companies engage in employment planning they are unlikely to make the results publicly available as the exercise is often deemed to produce commercially valuable information. The larger firms, such as Tarmac and Wimpey, have training departments committed to taking into account the firm’s future employment needs. Through the offices of the National Contractors Group, these larger firms have exhibited concern for a more co-ordinated approach to training in the industry and by inference a need for employment planning.

The publication Building Britain 2001 (Centre for Strategic Studies in Construction, 1988) initiated a series of studies carried out by the University of Reading, and funded by the National Contractors Group. A central preoccupation of this work was training supply and the adequacy of the industry skill base to meet the demand for labour. Some econometric modelling was also incorporated in the subsequent report. This included supply estimates the year 2001 (Centre for Strategic Studies in Construction, 1990).
Whilst this series of reports dealt with the need for better information on employment and training, they do not in themselves provide any disaggregated forecasts and indeed, they are largely based on a simple reworking of the Cambridge Econometrics projections referred to above.

The large construction firms represent only a small percentage of all firms in the industry. Outside the top echelon of large contractors there exist two-hundred thousand smaller firms or so, the majority of which have little interest in employment planning, beyond the horizon of the immediate order-book. In particular, as Buckley and Enderwick (1989) stated skill needs in construction are most commonly met by subcontracting for the external labour market.

The special characteristics of output fluctuation and uncertainty which dominate construction make the subcontracting of labour skills especially attractive. Even some of the much larger firms make use of this external market for obtaining some of their craft skills. In the past, it was common for many smaller firms to provide a regular source of trained labour via the traditional apprenticeship system. However, many of the small firms are now labour only subcontractors, often only employing one or two operatives. Such persons have generally receive training at an earlier stage but do not undertake very much training on their own account.

The increasing importance of this group raises serious questions about the long-term sustainability of the stock of construction skills.

5.6 Limits and Problems With Employment Planning

5.6.1 Limits to Understanding

The world is a very complex place. Most socio-economic variables are the outcome of the decisions and actions of many different individuals and institutions. Chance factors, in addition to well laid plans influence the eventual outcome.
In developing models to explain behaviour the objective is to identify and isolate key factors which are held to affect the variable of interest. This is often much easier said than done. It is quite difficult to disentangle the various influences that are thought to be important.

Most models are set up on the basis that behaviour is fixed. This itself may be a questionable assumption, especially in the social sciences. Behaviour may alter in responses to new events or changes in exogenous variables (that is variables whose determination lies outside the system being modelled). In some cases behavioural relationships may lie hidden because previously inexperienced influences may come into play. An example of this was in models to explain aggregate consumption which failed to include inflation as an explanatory variable until inflation reached significant levels in the 1970's. Inflation had always been a potential influence, but its effect remained hidden while it was not at a high level.

In producing any particular forecast a view must be taken about any exogenous factors that may be important (for example government policy is frequently regarded as exogenous). The sensitivity of the forecast to alternative assumptions can however be assessed by developing a range of scenarios rather than just a ‘fixed point’ forecast. Long-term forecasts, for several years into the future, will need to consider a range of such scenarios. These forecasts will be subject to continuous revision as the alternative futures are determined.

5.6.2 Data Problems

A major problem area in much forecasting work relates to data. This may reflect lack of data on key parameters. It may also reflect inadequate data in terms of accuracy fitness for the purpose it is being used. Frequently, the data available are lacking, often they have been collected for a different purpose and are therefore less than ideal for the development of a forecasting model. Clearly, there is no substitute for good quality, regular information. It is often not until the model building has begun that is possible to accurately identify data requirements.
In the first instance, of course, it is necessary to do the best one can with whatever data are available. In the construction context, information on employment in construction occupations at the regional level is not always reliable and this needs to be borne in mind when applying the resulting projections. The quality of data available for the construction labour market is discussed in greater detail in Chapter Six.

5.6.3 Methodological Problems

Econometricians have identified a whole series of methodological problems in the development of time-series models (see, for example, Gujarati, 1988). One of the major problems comes under the heading of multi-co-linearity. Most variables in economics are highly trended and it is therefore often very difficult to disentangle are separate influences of different variables. It is also too easy to discover spurious relationships which simply reflect the fact that the unrelated variables are both trended (and therefore closely correlated) while in reality there is no relationship between them. A second class of problem relates to simultaneity. Variable X may depend on Y, but Y may also depend on X. Technically, X is said to be an endogenous variable, that is a variable determined within the system that is being modelled. This contrasts with an exogenous variable which is entirely determined by factors outside the system being modelled.

Considerable care is required in such circumstances if misleading influences are not to be drawn. It is of course correct that nothing is truly exogenous and that everything depends upon everything else. The key is to identify which are the essentially exogenous variables in any system and which need to be treated as simultaneously determined.

5.7 Summary

This chapter has examined the relevance of employment planning to the UK construction industry. There are, of course, benefits from a comprehensive forecast of labour demand and supply.
Despite this, little work has so far been undertaken, and what has been done is somewhat incomplete. More often than not, this is due to poor quality of available data. This problem needs to be addressed by the relevant agencies in the short-term.

Where agencies, such as CITB, attempted to formulate policies to ensure future balance between supply and demand for construction skills, reliable sets of demand and supply forecasts are a key requirement. In particular, where demographic trends are likely to produce recruitment difficulties in the 1990’s, it is especially important for those planning training to try to ensure close correspondence of trainee supply to skill demand. Clearly, an improved ability to forecast employment demand and supply into the medium term is an important requirement for the efficient planning of training in the construction industry. Trainees from the most significant inflow to the stock of qualified construction craftsmen, and hence are (and will be) an important factor in skill shortages. It is, therefore, useful to construct models to gain an insight into influences on supply of trainees. However, this exercise depends on the availability of reliable labour resource data to serve the model. This issue is examined in the next chapter.
CHAPTER SIX

AVAILABILITY OF LABOUR RESOURCE DATA IN THE CONSTRUCTION INDUSTRY

6.1 Introduction

The construction industry is potentially rich in its sources of statistical information. Fleming (1980 and 1986) provided a comprehensive guide to the available sources of statistics in construction. However, some of these data series suffer from serious discontinuities, while others are unreliable and of poor quality. Chapter Five identified the importance of good quality data in the development of employment forecasting models. This chapter assesses the UK data series available to serve a model and includes a critical examination of: data on construction employment; the supply of new trainees to the industry; and other key data series.

The construction industry is both diffuse and ill-defined, as a result there is an absence of a single reliable source of labour resource data in almost every European country (Agapiou et al, 1992). Such information is vital in a footloose industry such as construction and is essential for an inward investor to any region. The availability of construction skills is a major consideration in investment decisions. However, there is a plethora of data available from many sources on the subject of labour resources. However, most of these data are unintelligible to construction companies. The nature and sources of labour resource data throughout Europe were also indentified. The main implications of these findings for model development have been presented.
6.2 Definitions of the Construction Industry

Construction covers a wide range of processes from those in simple house building, to the construction of power stations, through to large scale civil engineering work on road and dams. This work is undertaken by a wide variety of agents including, not only private-sector contractors, but also organisations whose main activity is not construction. Public sector organisations, such as local authorities and central government corporations, perform a significant proportion of construction work (Briscoe and Wilson, 1993).

Clearly, the limits of the construction industry are difficult to define. In practice, a narrow definition has been adopted by government statisticians. The definition only embraces production enterprises whose main activity can be clearly distinguished as construction and from whom data can be collected. For general statistical purposes, construction is defined as division 5 of the Standard Industrial Classification (SIC). First introduced in 1948, SIC classification has been revised three times. The present definition of the industry, along with its previous definitions are presented in Table 6.1.

In terms of coverage, there is no general agreement as to what the definition of construction ought to be in the UK (Cannon, 1994). In the current definition, which has remained unchanged for a number of years, it includes building and civil engineering activities, in addition to building services. There is no data on the share of construction held by each sector. The Engineering Construction sector is not even included in the definition of construction. Yet a cursory glance at the accounts of the largest contracting firms reveals that those who have undertaken civil engineering work often have core activities they define as Engineering Construction.

Although a strong case can be made to incorporate engineering construction data into construction statistics, the main activities of engineering construction firms do not fall within the definition of construction as classified under division 5 of the SIC. Rather, they form part of the oil and gas extraction industries.
Table 6.1: The standard industrial classification for construction (division 5)

<table>
<thead>
<tr>
<th>SIC (1980)</th>
<th>SIC (1968)</th>
<th>Corresponding MWI or sub-division 1968</th>
<th>Heading or part covered</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
<td><strong>Activity heading</strong></td>
<td><strong>Heading</strong></td>
<td><strong>Construction</strong></td>
</tr>
<tr>
<td>500</td>
<td>5000</td>
<td>General construction demolition work</td>
<td>500 pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction Division 5</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non-specialist building and civil engineering work; the building and civil engineering establishments of government departments, local authorities and New Town Corporations and commissions; establishments specialising in demolition work; the hiring of contractor’s plant (with operatives).</td>
</tr>
<tr>
<td>501</td>
<td>5010</td>
<td>Construction and repair of buildings</td>
<td>500 pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Erecting and repairing buildings of all types.</td>
<td></td>
</tr>
<tr>
<td>502</td>
<td>5020</td>
<td>Civil engineering</td>
<td>500 pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction and repairing roads and bridges; erecting steel; and reinforced concrete structures; other civil engineering work such as laying sewers, gas or water mains, and electric cables, erecting overhead lines and line supports and aerial masts; asphalting.</td>
<td></td>
</tr>
<tr>
<td>503</td>
<td>5030</td>
<td>Installation of fixtures and fittings</td>
<td>500 pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establishments specialising in sections of construction work such as installing heating and ventilating apparatus, plumbing and other fixtures and fittings.</td>
<td></td>
</tr>
<tr>
<td>504</td>
<td>5040</td>
<td>Building completion work</td>
<td>500 pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establishments specialising in building completion work such as painting and decorating, glazing, plastering, flooring and on-site carpentry and joinery.</td>
<td></td>
</tr>
</tbody>
</table>

The 1968 SIC was last revised in 1980, in an attempt to bring the UK classifications into line with those employed by the Statistical Office of the European Communities (Eurostat). Most of the statistical information published after 1982 are based on the revised version. The Standard Industrial Classification is drawn up on the basis of industrial establishments according to their principal activity.
In the case of construction, this normally refers to the office address from which the firm operates. The SIC classification system provides a very crude measure of the size and shape of the construction industry (IPRA, 1991). An enterprise that mainly operates in another industry, but has some employees working in construction would not be included in the construction statistics, unless those operatives were employed in a separate building works enterprise.

A comprehensive register, maintained on a regular basis, is a prerequisite for collecting statistics from enterprises within the scope of the construction SIC in spite of the absence of any compulsory registration requirement. Fleming (1980) described the early problems with maintaining an efficient statistical reporting system for the construction industry, and more recent difficulties arising from the rise of labour-only sub-contracting (Fleming, 1986). The large number of small firms in the industry and the site-based nature of construction work make it difficult to identify and locate many construction firms. This is compounded by the transient nature of the construction workforce and the existence of the informal sector (Cannon, 1994).

Although both the Department of the Environment (the sponsoring department for construction) and the Department of Employment (the department responsible for collecting labour market statistics) use the SIC system, they use different registers to collate employment statistics. As a result, the figures produced by each department for construction employment, while broadly similar, show some discrepancies. These issues have been discussed in greater detail below.

6.3 Time Series of Aggregate Construction Employment

Employment data in construction are complex because of the wide variety of sources available, the different methodologies used and the significance of self-employment in the industry (Ball and Wood, 1995). There are two principal sources of data on construction employees:
• Department of Environment (DoE) series based on quarterly returns from construction firms; and

• Department of Employment (DE) series based on figures from the biannual census of employment, the short-term employment survey and the Labour Force survey.

The coverage and reliability of these series are discussed below

6.3.1 DoE Employment Data Series

The DoE provides one of the principal employment time series for the construction industry. The system used to collect data is based on a register of private contracting firms, from which samples are drawn. Quarterly returns are obtained from these firms on a regular basis, supplemented by data from Direct Labour Organisations (DLOs). Annual returns are based on a larger sample of firms and it is these figures which are used to determine the total employment figure published by the DoE in Housing and Construction Statistics.

The total figure is sub-divided into four categories; contractors' operatives, contractors APTC (non-manual) staff, public sector operatives and public sector APTC staff. Each of these categories refer to employees in employment. The DoE also publishes a series on self-employed workers in the industry. These data are based on estimates from the Labour Force survey. Fleming (1986), and more recently Ball and Wood (1995) noted that the DoE series suffered from an incomplete register of firms and poor coverage of the operatives employed by labour-only subcontractors. Substantial improvements have been made to the coverage of the DoE series in recent years. The register of firms has been extended by cross-matching records held by the Inland Revenue for VAT purposes. In spite of improvements to the system, a number of problems still remain. While some companies make returns for each division, other make single returns covering associated companies each of which are legally separate firms. The DoE also has difficulty identifying new entrants to the industry, many of whom are very small.
The unemployment (and related vacancy) data which are currently available no longer indicate the main occupations of those on the register. Prior to 1980 unemployment returns recorded the last industry where those available for work had found employment. Today there are detailed total figures and overall regional data, but no clear indication of the numbers with construction skills. The regional unemployment figures, net of any recorded vacancies, would provide a good starting point for estimating potential supply from the stock of unemployment. However, for individual occupations in given regions, use would need to be made of local information, such as the various employer's surveys where questions are asked about difficulties in skill recruitment, e.g. BEC state of trade enquiry.

6.3.2 DE Data Series

The Department of Employment (DE) also produces an employment series for the construction industry. In contrast to the DoE series, the figures are not broken down by trade, sector or region. In addition, the DoE use a wider definition of the construction industry than that employed by the DE. Until the early 1970's, the DE series was based on an annual count of national insurance records. Since then, the census of employment has been used as a guide-line for collecting data. This is based on a postal survey of all construction firms registered to the construction SIC. Between 1978 and 1988, it was only conducted on a bi-annual basis. The most recent figures are based on the 1989 census. These have been published by the DE in the Employment Gazette (April 1989). Another census was conducted in 1991.

Smaller monthly and quarterly enquiries are used to estimate employment between each census; use is also made of DoE returns to produce monthly statistics for construction employment. Since 1989 the DE series has incorporated figures from the Labour Force Survey to overcome an element of undercounting in its published data.
'Until the mid-1980's the DE series was known to underestimate employees in employment by at least 10 per cent because of a misclassification of public sector construction workers and an absence of small firms on the DE register' (Ball and Wood, p 309).

Fleming (1986) noted that the absence of small firms on the DE register can also lead to double counting, particularly where an employee has two different jobs; this person will be counted twice under the DE census method. The failure by firms to identify construction workers separately form their non-construction colleagues is another problem area. Fleming (1986) suggested that for this reason the DE census, in the past, has failed to record some of the direct labour employed by local and public authorities, which tend to be classified to the local government industry.

A comparison of DoE and DE employment series over time reveals significant discrepancies between the two sets of data (see Figure 6.1). Though, in recent years the difference between them has reduced.

In 1968, the DoE estimate recorded some 263,000 more employees in employment than the DE data series. Over time the discrepancy has narrowed so that by 1988 the two series are within 12,000 of each other. Since 1968, when the LFS figures were incorporated into the DE series, the DE estimate has been higher than the DoE figures. However, Briscoe and Wilson (1993) found a strong correlation between these two sets of data.
6.4 Employment by Construction Trade

There are two principal sources of data on occupational trends in the construction industry; the CITB levy series; and the LFS series. Details of these series are discussed below.

6.4.1 CITB Levy Series

The CITB levy series is a by-product of the administration of the levy-grant system of training, in which the CITB imposes a pay-roll levy on private sector construction firms to collect revenue, which it then distributes to those firms who provide training. Until 1989 the CITB published annual employment statistics broken-down by trade, including figures for all directly employed workers and separately for trainees only. The collection of trainee statistics was discontinued in 1989. Currently, the CITB generates employment data for 44 individual construction trades. Most of the CITB’s key statistics are regularly in Housing and Construction Statistics, along side the DoE labour data.
In contrast to the DoE statistics, the CITB data only provide details of the traditional craft trades, all of which have been in existence since the end of the Second World War. Employment statistics for the newer trades, such as suspended ceiling specialists are included in the DE statistics, although these are not broken down by trade. The CITB employment statistics, while more detailed than that produced by the DE and DoE, is not as comprehensive in its coverage. It excluded all construction workers employed by government authorities. In addition, it only covers employers in-scope, or affiliated to the CITB, thereby excluding a large number of very small companies and self-employed workers. Despite these limitations, the CITB series provides an important source of information on occupational changes in the construction industry.

6.4.2 Labour Force Survey (LFS) Series

The Labour Force Survey (LFS) is a multi-purpose survey of households living at private addresses in the UK. It is undertaken and published by the Office of Population Censuses and Surveys (OPCS) on behalf of the Department of Employment. The LFS survey was initiated in 1973 to satisfy European Community Statistical requirements. Its main purpose is to produce regional and national statistics of employment and unemployment in the UK for comparison with other European Community countries. As information is sought from individuals, as opposed to employers, the survey offers the advantage of being able to provide data that cannot be obtained readily, if at all, from an employers survey (e.g. on self-employment). Between 1973 and 1983, surveys were undertaken on a biannual basis, but since 1984 the survey has been conducted annually. The LFS provides the only reliable series for self-employed workers in the construction industry.

Secondary sources of construction industry labour statistics also exist. These sources are either employer organisation trade associations or training bodies not affiliated to the CITB.
The data held by these sources relate to skilled trades not covered under the construction SIC, defined above, but whose activities full within a broad classification appropriate to all aspects of construction. Table 6.2 presents details of the statistics held by each organisation.

6.5 Craft Training Statistics

The only time series, of any length and consistency, for measuring the number of construction craft trainees, broken down by trade, is that produced by the CITB from employment levy statistics. These data suffer from all the same discontinuities as the CITB statistics. For some trades, particularly the newer ones, there are no data on trainees, whilst for others the data are only available from 1975 onwards.

It is well known that firms not affiliated to the CITB also provide training in the construction trades. Training for adults, rather than young people, is undertaken as part of government-funded Employment Training schemes. However, these figures are not included in the CITB training statistics.

The CITB has recently begun compiling training statistics from college survey returns. Beyond the CITB levy statistics, these data provide a more accurate measure of formal training in the construction industry. Most youth training programmes involve college attendance and so by collating data on college starters it is, in theory, possible to analyse the trainees which are registered with the CITB, and those which are sponsored by other organisations. However, it should be noted that this college survey does not cover all trainees; not all colleges provide returns, most of those on adult training schemes are not covered by these statistics, and any operative receiving informal site-based training, without any college attendance will be unrecorded by the survey. YTS trainees only represent about one-third of total college trainee starters. Again, this proportion varies from one trade to another across different schemes.
<table>
<thead>
<tr>
<th>Source</th>
<th>Region</th>
<th>Sector</th>
<th>Occupational trades</th>
<th>Skill level</th>
<th>Publication frequency</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Industry Training Board</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction</td>
<td>Bricklayers, masons, carpenters, joiners, painters, plasterers, roof slaters and tilers, paviours, miscellaneous craftsmen (excluding mechanical engineering services), scaffolders, roof sheeters, roofing felt fixers, floor and wall tilers, mastic asphalters, floor coverers, glaziers, fencers, demolishers, steeplejacks, cavity wall insulation operatives, demountable partition erectors, terrazzo workers, crane drivers, earth moving plant operators, other mechanical plant operators, bar benders and steel fixers, steel erectors, concrete, plumbers and gas fitters, heating &amp; ventilating engineering workers, electricians</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td>Collects and compiles information from all firms on the CITB register in levy returns in April and October. The information relates solely to firms registered with CITB. Information about the number of self employed labour-only workers is also available. From 1991 data is no longer collected by trade. Only total numbers employed by region are now available.</td>
</tr>
<tr>
<td>Engineering Construction Industry Training Board (ECITB) (a)</td>
<td>All</td>
<td>Engineering construction</td>
<td>Steel erectors/riggers, pipe fitters/welders, mechanical fitters, scaffolders, insulators, platers, electricians, instrumentation personnel, thermal insulation engineers</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>Engineering Construction Industry Training Board (ECITB) (b)</td>
<td>All</td>
<td>Civil engineering, Engineering construction</td>
<td>Steel erectors/riggers, pipe fitters/welders, mechanical fitters, scaffolders, insulators, platers, electricians, instrumentation personnel, thermal insulation engineers</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>ECITB (b) Engineering Construction Industry Information System</td>
<td>All</td>
<td>Civil engineering, Engineering construction</td>
<td>Steel erectors/riggers, pipe fitters/welders, mechanical fitters, scaffolders, insulators, platers, electricians, instrumentation personnel, thermal insulation engineers</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td>Database of manpower requirements based on information supplied by clients</td>
</tr>
<tr>
<td>Source</td>
<td>Region</td>
<td>Sector</td>
<td>Information Available</td>
<td>Skill level</td>
<td>Other information</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Engineering construction</td>
<td>Steel erectors/riggers, pipe fitters/welders, scaffolders, platers, electricians, instrumentation personnel, thermal insulation engineers</td>
<td>Skilled Apprentice Trainee</td>
<td>Operational since 1993</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Engineering construction</td>
<td>Steel erectors/riggers, pipe fitters/welders, scaffolders, platers</td>
<td>Skilled Apprentice Trainee</td>
<td>Weekly (expected)</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Engineering construction</td>
<td>Pipe fitters, welders, electricians, instrumentation personnel</td>
<td>Apprentice Trainee</td>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Heating and Ventilating</td>
<td>All</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Electrical contracting</td>
<td>All</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>ECTB</td>
<td>All</td>
<td>Thermal Insulation</td>
<td>All</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>National Engineering</td>
<td>All</td>
<td>Construction</td>
<td>Association</td>
<td>Skilled Apprentice Trainee</td>
<td>Annual survey of trades and categories employed</td>
<td></td>
</tr>
<tr>
<td>Contractors' Association</td>
<td>All</td>
<td>Electrical contracting</td>
<td>All</td>
<td>Skilled Apprentice Trainee</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>Contractors' Association</td>
<td>All</td>
<td>Thermal Insulation</td>
<td>All</td>
<td>Skilled Apprentice Trainee</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>Contractors' Association</td>
<td>All</td>
<td>Construction</td>
<td>Engineers</td>
<td>Skilled Apprentice Trainee</td>
<td>Annual</td>
<td></td>
</tr>
</tbody>
</table>
Training statistics compiled from the college survey relate to those attending college who actually started training courses. Whilst data are also collected on those completing training programmes it is difficult to link college starters with those who complete their studies. Briscoe and Wilson (1993) estimate that 70 per cent of starting trainees actually complete their training programmes.

Whilst the college survey information may help to provide a more accurate picture of the numbers under formal training in the construction industry, it sheds no light on the extent of informal training. A CITB survey of construction operatives found that the number of trades in which a majority of respondents had received any formal training was relatively small (CITB, 1988). It appears that statistics which measure registered trainees significantly underestimate that total supply of skilled labour entering the construction industry.

6.6 Other Key Data Series

In order to forecast the supply of labour it is necessary to link construction employment to dependent variables such as industry output and real wages. A description of the available source of such data is provided by Fleming (1980 and 1986).

6.6.1 Output Data Series

There are two principal sources of production statistics for the UK construction industry:

- Department of Employment; and
- Central Statistical Office (CSO).

The nature and coverage of the statistics held by these sources is discussed below.
• **DoE series**

The main source for output statistics is the Housing and Construction Statistics, published by the DoE. Each year the DoE publishes a large volume of data for the most recent ten year period. It also produces information on the most important key series on a quarterly basis. Output data are broken-down into three categories; by type of work done; by sector carrying out work; and by region of the country in which the work originates.

Output statistics are produced in terms of both current and constant prices, and also a set of index numbers. The data are often revised and therefore the latest available set of statistics should always be used, on the assumption that these are the most accurate. The base year used to calculate the constant prices and index number is frequently changed. Such a change can give rise to continuity problems, although sufficient information is published to enable the user to form a linkage between the respective series valued at different base year prices. The output statistics valued in constant prices is far more useful than current price data, as the effects of price inflation are eliminated and changes in real output can be examined over time.

• **CSO series**

Output statistics for the construction industry are also published by other government agencies. In particular, the Central Statistical Office (CSO), through its monthly publication, Economics trends and monthly digest of statistics and its annual publication, United Kingdom National Accounts (Blue Book). Most of these statistics cover the United Kingdom rather than Great Britain. In other respects the CSO data differ from those published by the DoE, more significantly in the coverage of the output enquiry. Consequently the two series cannot be compared.

6.6.2 Wages and Hours Worked Series

The DoE's New Earnings Survey produces annual information on average weekly earnings and hours worked in the construction industry. In theory, the large sample used allows information to be collected on an occupational and regional basis.
However, inspection of the data reveals very wide variation between the average figures reported for each trade. Moreover, since these earnings and hour data are only collected from direct employees and usually only for those workers covered under formal pay agreements, it could be argued that the statistics are not representative of all construction workers, including the self-employed.

If taken together, the primary and secondary sources of labour statistics provide an accurate measure of construction employment in the UK. The information available is categorised by region, industrial sector and occupational trades. It is also updated regularly and differentiates between all or most of the sectors and occupational trades. However, there is the potential for double counting and the statistics are inconsistent, disparate and incomprehensible. In practice, the industry requires a single reliable source of employment statistics. Clearly, there is a need to improve the availability of information which is required by a client (or contractor) intending to undertake project work in any given location. This applies not only at a national level, but also an international level. To date, little research has been undertaken on the availability of employment data in other European countries. The next section identifies the nature and sources of construction industry labour statistics within selected European countries.

6.7 Nature and Sources of European Labour Statistics

The basis of the study was traditional research methods - that is, a mix of desk-based investigation, library searches and fieldwork in the form of a postal survey.

6.7.1 Library Search and Desk Study

Two main sources of construction industry labour statistics were identified through the literature search:

- National labour force surveys; and
- International Labour Office.
The nature and coverage of the data held by these sources is discussed below.

- **National labour force surveys**
The most comprehensive sources of information on construction employment and unemployment by sector and occupation are the national labour force surveys.

In the European Union counties, these data are collated by the Statistical Office of the European Community on a regular basis. Almost all western European countries use (or make reference to) the same sector classification, i.e. NACE rev.1 (see Figure 6.2). The countries of central and eastern Europe are in the process of reforming their statistical systems, using as models the instruments and standards of Eurostat. Data from national labour force surveys are reasonably comparable across countries. However, there are limitations in using these statistics, as Eurostat's system of classification is broad and not sufficiently detailed to provide statistics relating to specific regions.

- **ILO data series**
The ILO does not focus particularly on Europe. However, ILO labour statistics are better developed in parts of that continent than in most parts of the World. There are two sources of information on construction industry labour statistics; the Year Book of Labour Statistics and the Quarterly Bulletin of Labour Statistics. These were reviewed, however the information was not broken down into the appropriate categories.

6.7.2 Questionnaire Survey

Once the information held by the official sources had been reviewed it became clear that the information required would have to be obtained from other sources. At this stage an alternative approach was adopted.
Figure 6.2: NACE rev.1 classification of the construction industry
Figure 6.3: The UK institutional structure of the construction industry

UK Construction Industry

SECTORS

- Electrical Contracting
  - Heating & Ventilation
    - Heating & Ventilation Contractors' Association
  - Joint Industry Board for Electrical Contracting
- Heating & Ventilation
- Engineering Construction
- Thermal Insulation
  - Thermal Insulation Contractors' Association
- Building & Civil Engineering
  - Federation of Civil Engineering Contractors
  - Building Employers' Confederation
  - National Contractors' Group

- Oil and Chemical Plant Contractors' Association
- National Engineering Construction Employers' Association
This involved adopting the UK institutional structure of the construction industry (see Figure 6.3) as a model (e.g. employer associations, training bodies etc.) and to seek from similar organisations in European countries, data that they produce regarding labour statistics. Contacts were then made with each institution, in turn, requesting a list of organisations that were of an equivalent nature. A wider definition of the construction industry was used to identify the sources of construction industry labour statistics in Europe. This included, not only the building and civil engineering sectors, but also the electrical contracting, heating and ventilating, thermal insulation and engineering construction sector.

Sixty-four potential sources of information covering 16 countries were identified. It became clear that they would have to be contacted through some sort of questionnaire approach if all countries were to be adequately covered. Each organisation was contacted by letter explaining the purpose of the research and asking them to complete a brief questionnaire (see Appendix C).

- **Summary of results of returned questionnaires**

A positive response to the request was received from 34 individual organisations. The extent to which the available statistics are broken down by sector, region, trade and skill level for each country is shown in Table 6.3.

**6.8 Main Implications for Forecasting Purposes**

A wide range of data series have been assessed and after taking into account the characteristics of these series in terms of coverage, continuity, availability and frequency of publication, some firm implications can be drawn:

- trainees form the most significant inflow to the stock of qualified construction craftsmen, and hence are an important factor in skill shortages. It is therefore useful to construct a model to gain an insight into influences on supply on trainees;
<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Region</th>
<th>Sector</th>
<th>Occupational trades</th>
<th>Skill level</th>
<th>Publication frequency</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Central Statistical Office</td>
<td>All</td>
<td>Building, Engineering construction, Heating and ventilation, Thermal insulation</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly Quarterly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>Office Nationale de Sécurité Sociale</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction, Heating and Ventilation, Thermal insulation</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly Quarterly</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Danish Employers Confederation</td>
<td></td>
<td>Building, Civil engineering, Engineering construction</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly Quarterly</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>Danmarks Statistik</td>
<td></td>
<td>New buildings (including extensions), Repair and maintenance of building, Engineering construction, Civil engineering</td>
<td>Bricklayers, carpenters and joiners, painters, plumbers, electricians</td>
<td>Skilled Apprentice Unskilled</td>
<td>Quarterly</td>
<td>Data is collected from a quarterly survey of 3600 establishments. Information on the number of unemployed, as a whole, is also available</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Source</td>
<td>Region</td>
<td>Sector</td>
<td>Occupational trades</td>
<td>Skill level</td>
<td>Publication frequency</td>
<td>Other information</td>
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</tr>
<tr>
<td>Finland</td>
<td>Finnish Association of Electrical and Telecommunication Employers</td>
<td>All</td>
<td>Electrical contracting</td>
<td>Carpenters, building workers, earthmoving and related machinery operators, painters, floor layers, electrical fitters, other electrical workers, plumbers, platers, welders, bricklayers, asphalt and road workers</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tilastokeskus Statistikcentralen</td>
<td>All</td>
<td>Building, Civil engineering</td>
<td></td>
<td></td>
<td></td>
<td>Unemployment statistics are also available</td>
</tr>
<tr>
<td>France</td>
<td>Caisse Nationale de Surcompensation du Bâtiment et des Travaux Publics</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction, Heating and ventilating, Thermal insulation</td>
<td>Steel erectors/riggers, pipe fitters/welders, mechanical fitters, joiners, scaffolders, insulators, plasterers, platers, electricians, instrumentation personnel, thermal insulation engineers, bricklayers, steel fixers</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Statistisches Bundesamt</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction, Thermal insulation</td>
<td>Scaffolders, plasterers, insulators, thermal insulation engineers, bricklayers, platers</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>Central Statistical Office</td>
<td>Building, Civil engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Establishment type survey on employment and earnings</td>
</tr>
<tr>
<td>Country</td>
<td>Source</td>
<td>Region</td>
<td>Sector</td>
<td>Occupational trades</td>
<td>Skill level</td>
<td>Publication frequency</td>
<td>Other information</td>
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</tr>
<tr>
<td>Ireland</td>
<td>Central Statistical Office</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction</td>
<td>Steel erectors/riggers, scaffolders, insulators, platers, electricians</td>
<td>Skilled Apprentice Trainee</td>
<td>Monthly Quarterly</td>
<td>Annually Statistical information is collected from a survey of building and construction firms with more than 20 employees on a monthly basis</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Service Central de la Statistique et des Études Économiques</td>
<td>All</td>
<td>Building, Civil engineering, Engineering construction</td>
<td>Platers, electricians</td>
<td></td>
<td>Annually</td>
<td>Construction employment statistics are collected as part of a monthly survey of 12,000 establishments</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Central Bureau of Statistics</td>
<td>All</td>
<td>Construction, Installation on construction projects</td>
<td>Platers, electricians</td>
<td></td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Statistisk Sentralbyrå</td>
<td>All</td>
<td>Building, Civil engineering, Engineering contracting, Electrical contracting</td>
<td>Plumbers, pipefitters, welders, electricians and electrical fitters, construction carpenters</td>
<td>Skilled Apprentice Trainee</td>
<td>Annually (estimates)</td>
<td>Figures for total numbers in each occupation are also broken down by gender.</td>
</tr>
<tr>
<td>Poland</td>
<td>Central Statistical Office (GUS)</td>
<td>All</td>
<td>Statistics are not subdivided into sectors, but come under the general heading of Building</td>
<td>Occupational classifications are used</td>
<td></td>
<td>Annually</td>
<td>Unemployment statistics are also available</td>
</tr>
<tr>
<td>Portugal</td>
<td>Instituto Nacional de Estatística Serviço de Estatisticas da Construção</td>
<td>All</td>
<td>Building, Engineering construction, Civil engineering, Heating and Ventilating, Thermal insulation</td>
<td></td>
<td>Skilled Apprentice Trainee</td>
<td>Annually</td>
<td></td>
</tr>
</tbody>
</table>
the proposed model should be developed for UK construction industry, because of the detail of information available, and readily accessible;

aggregate data should be used forecast supply because of the lack of reliable information broken down by construction trade and region; and

CITB levy statistics, DoE output data and the New Earrings Survey wage series should be used to develop the model for forecasting purposes because these data are the most comprehensive available.

6.9 Summary

The objective of this chapter was to establish the main central sources of construction industry labour statistics throughout Europe. In particular to identify the extent to which the available data were broken down by sector, region, trade and whether these statistics were updated regularly.

Key sources of available labour resource data relating to the construction industry in 17 European countries were identified and descriptions of the information held by each source were obtained through a questionnaire survey. The identified sources demonstrated that the availability and quality of the existing construction industry labour statistics varied considerably from one country to another. Statistics across Europe were not consistent in relation to their scope, definition and timing of collection.

Even within countries the data were suspect. In the UK and Switzerland, for example, the information available is categorised by region, industrial sector and occupational trades. UK statistics are compiled from different sources with different definitions. In Ireland, the information is available for all sectors of construction. In the Netherlands, Poland and Hungary construction is more broadly classified. There is a potential for double counting and the statistics are inconsistent, disparate and incomprehensible.
The research has demonstrated that due to the differences in available data, meaningful comparisons of labour statistics between one country and another are near impossible to achieve. For some meaningful cross-comparison some uniform approach has to be adopted across the whole of Europe. This raises the issue of whether the existing data collection techniques are acceptable. As an approach to identifying sources of labour statistics, the EC classifications are ill-defined in terms of their relationship to construction trades, and therefore the trade associations where much of the appropriate statistical information is held. There currently appears to be an opportunity for those in the construction industry who require employment data to have an input into the further development and expansion of existing European classifications.

The development and testing of the proposed labour supply model is presented in Chapter Seven
CHAPTER SEVEN

FORECASTING THE SUPPLY OF CONSTRUCTION SKILLS:
A MODEL FRAMEWORK.

7.1 Introduction

This chapter investigates whether or not the human capital approach used to analyse the flow of new entrants to the engineering industry, as established by Bosworth (1988), could be applied to construction. In particular, the chapter tests the hypothesis that the proportion of school-leavers choosing to train as construction operatives depends on the real craft wage, and the long-term prospects of the construction industry.

The chapter also outlines the development of an aggregate labour supply model to forecast training inflows to construction based on the theory of occupational choice, and adapted from earlier work undertaken for apprentice entrants to the engineering industry. This approach has yet to be applied to labour supply in the construction industry, and merits further investigation. Results of this investigation should, therefore, complement the recent work undertaken by Briscoe and Wilson (1993) on the development of employment forecasting models for the construction industry. The need for a supply forecasting model is discussed and the findings of previous relevant research on the application of occupational choice to labour supply in Britain have been presented. A statistical description of the main data trends, and a summary of the results of the regression analysis including the estimates of the supply elasticities relating to wages, unemployment, output and other relevant factors are also presented. Regression equations have been developed from the latest econometric techniques. In order to highlight which of the key variable supply-side variables have a critical effect on the model system a sensitivity analysis is performed. Conclusions and recommendations have also been presented.
7.2 The Need for a Labour Supply Forecasting Model

The future supply of construction skills depends on the recruitment of young entrants, together with some upgrading of semi-skilled operatives to skilled jobs. The declining number of young people available to enter employment, however, has considerable implications for the construction industry, particularly in the search for eligible recruits to train for future skill requirements. The number of people being trained in the traditional construction skills declined during the 1970’s and 1980’s. This led to acute regional skill shortages.

During the United Kingdom construction boom of the late 1980’s, successive construction industry surveys reported how an increasing number of respondents had experienced difficulties in recruiting bricklayers, carpenters and plasterers. These shortages were particularly acute in London and the South-East, where extensive building projects put pressure on an already short supply of skilled craftworkers. In a recent Building Employer Confederation State of Trade Enquiry, 75 per cent of 600 companies surveyed reported difficulties recruiting bricklayers, and half of them reported that carpenters were also in short supply (Building, 1994).

By and large, the industries only response to labour shortages has been to increase remuneration. This results in companies poaching labour from each other and leads to inflationary rises in the cost of construction, which in turn reduces demand and temporarily solves the skills shortage.

Taking account of forecasted shortages, the medium-to-long-term option of redesigning construction methods, for example investing in robotics, is an under-utilised practice. The long-term option of establishing training programs to solve labour shortages is infrequently applied. If skill shortages are to be avoided in the long-term, more trainees will have to be recruited to the industry to match the output demand, particularly in regions where demand for skills is highest.
The lack of any central planning in the construction industry can lead to a regional concentration of major projects. This can place an enormous strain on labour resources in individual regions. Moreover, the availability of labour is a major consideration in investment decisions. Regions where highly skilled construction operatives are available will attract more investment at the expense of other regions which do not possess the necessary skills.

The case for concise up-to-date information on the availability of construction skills in the United Kingdom was made as early as 1987, to the House of Commons Select Committee on Employment, by the Union of Construction Allied Trades and Technicians (UCATT). Yet, these issues have so far not been addressed in any detail. Constructing some robust models predicting the trends in labour resources would, therefore, be beneficial. The subsequent forecasts could then be used by construction companies as a basis for planning training levels by occupation, and by region. If employment forecasts had been available to provide prior warning of the likely labour shortfalls, particularly in the South-East during the late 1980's, then training providers, might have been able to increase the supply of skills and thereby lessen the effects of shortage. In addition to being used to predict trends in labour resources, employment forecasting models can also be used to examine alternative assumptions within the model framework, plus the opportunity to examine different scenarios. In this way, basic employment projections can be tested for their sensitivity to changes in key underlying variables.

The lack of appropriate data has resulted in very little research being directed towards the development of labour supply forecasting models for the construction industry. One approach that can be considered is to modify existing labour supply models that represent other industries. Two types of model have been developed to forecast labour supply in the engineering industry.

The first, is founded on accounting principles. Green and Bosworth (1988), and later Briscoe (1990a), combined loss rates from craft stocks and flows from the engineering industry training system.
The number of craftsmen and technicians employed in the engineering industry in any one year was assumed to be depleted by losses to other industrial sectors, movement into unemployment, and retirements. Trainees successfully completing their training enhanced the stocks of skills. However, Briscoe concluded that labour supply was governed by a complex mix of variables. In particular, real wage rates in engineering relative to other industries, were found to be important determinants of the ability of firms to retain existing skills and recruit new trainees. In particular, as this is an important factor in attracting young people, whose numbers will decline as a proportion of those entering the UK employment market during the 1990's (see section 2.2). Modifications to the stock flow model were made by Briscoe and Wilson (1993) in order to develop a supply-side model for the construction industry. Supply projections for different occupations by region were made, allowing for: retirements; net movements to other industries; skills availability from the pool of unemployment; and regional mobility.

The second type of model, developed to forecast labour supply in the engineering sector, was based on the theory of occupational choice, where individuals make their choices in terms of comparative total net advantages. In these models, relative earnings were found to have an influence on young peoples' occupational decisions. However, non-monetary factors, such as the image of construction, also influence young peoples' choice of occupation.

In a report analysing the British construction industry's training requirement for new entrant training, current perceptions of construction, as an industry of limited opportunities were cited as major factors that discouraged potential entrants (CITB, 1994). This confirmed the results of earlier research that revealed that young people had negative images of construction work, and in particular the training opportunities offered by the industry (CITB, 1988). Traditionally, youth training (YT) has made a significant contribution to training within the construction industry. In recent years, the lack of student placements have meant that the number of students joining youth training schemes has declined.
This trend may have serious implications for building craft training where 20 per cent of the YTS students are placed, and which represent about 80 per cent of the building craft training programme (Harvey and Ashworth, 1993).

Young peoples’ perception of the value of construction industry training dictates their occupational decisions, particularly if the decision to participate in a training programme will lead to improved job prospects. Main and Shelley (1990) found that having participated in a YTS, the individual’s probability of being in a job significantly improved. However, this improvement was small relative to having achieved good exam results and was frequently offset by the negative effects of a deprived family background.

7.3 Previous Research

There is a large body of literature that relates occupational choice theories to labour supply. Becker (1964) was the first to recognise that educational choices could be regarded as individual investment decisions(1). He outlined the theory of human capital and presented various empirical tests of the analysis, including estimates of the gains from University and High School education in the United States in the 1940’s and 1950’s. Changes in attendance rates were observed for this period and found to be highly correlated to educational investment. This work was developed by other researchers to the related issue of occupational choice(2).

Occupations require different levels of education, hence, the choice of occupation can be closely related to former education decisions. When individuals have the opportunity to enter several occupations, the final choice is influenced by the anticipated financial returns offered by each job. In making occupational decisions, individuals will consider earnings and job opportunities relative to what is obtainable elsewhere.

(1) See. also. Schultz (1962).
(2) See. for example. Fleisher (1970).
Lindley (1974) developed models for apprentice recruits and all school-leavers entering the British engineering industry. He relied on the earnings of youths and adult manual workers in engineering, relative to the corresponding figures for all industries, to reflect the relative prospects perceived by young people when considering entering an engineering apprenticeship or take another job. The relative uncertainty associated with future earnings was assumed to be dominated by the awareness of the pool of unemployed engineering craftsmen, relative to the total pool of unemployed workers. Demographic factors were also introduced into the analysis. In particular, the total number of school-leavers entering the employment market was used as a measure of shifts in the supply schedule resulting from changes in the numbers of school-leaving age and educational policy. The supply of potential apprentice recruits, \( L_A_t \), was given by the following:

\[
L_A_t = f(SLT_t, EY_t, EM_t, (Uc/UT)t) \quad \text{Equation (7.1)}.
\]

Where: \( SLT_t \) is the total numbers of school-leavers under eighteen entering the labour force; \( EY_t \) is the average weekly earnings of youths in engineering relative to those in the economy as a whole; \( EM_t \) is the corresponding relative average weekly earnings of adult manual workers; and \( (Uc/UT)t \) is the current unemployment of skilled workers in the main engineering trades relative to the total unemployment in the economy.

The results were consistent with Human Capital theory. According to theoretical expectations, changes in the observed number of recruits were positively related to relative earnings and negatively related to relative unemployment. However, Lindley noted some problems in the analysis, associated with the variables used in the estimation. Earnings variables, for example, were point observations whereas apprentice recruitment levels were recorded as annual totals. Zabalza et al (1978) used a similar approach to analyse teacher supply in Britain.

In contrast to other studies, neither socio-economic factors, personal tastes, nor ability were considered by Lindley. Robertson and Symons (1990) found that the father’s profession had a strong effect on British children’s occupational choices.
This concurred with findings by Clarke (1980). Personality variables were also shown to have a statistically significant influence on the occupational expectations of minimum-aged school leavers (Bradley, 1991).

In a study to determine the extent to which the supply of volunteers in different US states varied in relation to relative military-to-civilian earnings and civilian unemployment, Altman (1969) found that individuals with average mental aptitude were more influenced by increased pay than those with higher mental aptitude, i.e. better high-school examination results.

Bosworth (1988) examined a number of aspects of supply and demand for craftsmen in the engineering industry. The study focused on the inflows and outflows from the relevant employment stock, including the inflow of trainees. Previous studies had shown that the supply of trainees was determined by the expected rate of return from training (Williams and Gordon, 1981; Bosworth and Ford, 1985). On the basis of this work, Bosworth developed a set of training equations to represent the supply of trainees, \( S_T \):

\[
S_T = \tilde{c}(W_Q, W_U, V) \quad \text{Equation (7.2).}
\]

Where: \( W_Q \) is the wage rate of qualified individuals; \( W_U \) is the wage rate of trainees; and \( V \) represents other variables, including the direct cost of training. The supply of training places appears to be determined by the combined needs of individual firms. These were found to be influenced by two factors:

- the level of demand for the firms' products, \( Y \); and
- the perceived probability of employment at the time of the training decision reflected in the level of activity in the industry.

The number of new trainees (\( T \)) was obtained from the following function, where \( Z \) denotes other variables, undefined by Bosworth.

\[
T = g(W_Q, W_U, Y, Z) \quad \text{Equation (7.3).}
\]
He suggested that the dynamics of the process depended on the availability of data. In exploratory regressions, Bosworth adopted a simplified form of Equation 7.3, based on the real craft wage, \( W \), engineering output and lagged values of the dependent variable.

The results of Bosworth’s analysis demonstrated that:

- the levels of new trainee registrations were sensitive to both output and wages, and therefore, consistent with a Human Capital View of labour supply to a training market limited by the number of training places made available by firms;

- higher real wages increased the supply of trainees; and

- the level of activity in the industry drives the supply of training places.

Real wages, output and socio-environmental factors (such as the media and personal contacts) that influence young people’s perceptions of particular industries or careers, have been shown to be important in determining occupational choices. Prior expectations would suggest that real wages and output would have a positive effect on the numbers in construction training as found for new entrants in the engineering industry (Bosworth, 1988). Whereas, socio-environmental factors could have either positive or negative effects on training levels.

The measurement and incorporation of socio-environmental factors into the analysis of construction industry labour supply still remains problematic. One possibility is to use an approach first proposed by Lindley (1974) for new entrants to the engineering industry. In particular, that the number of school-leavers interested in entering a particular industry are influenced by the numbers who entered jobs, in that industry, in previous years, through whom they receive information and encouragement. Some survey findings exist that would support this assumption.
A sample of 12 to 14 year old British boys were asked how helpful they had found various sources of careers information. Information received from family and friends was found to have a strong influence on the choice of career (CITB, 1988). Moreover, Hatchett (1978) found that in a survey of Inner London Education Authority (ILEA) craft students, 67 per cent of students had some members of the family working in the construction industry.

Other factors, such as demographic trends and changes in the population of school-leaving age would also be important in determining future craft trainee supply, since these are measures of the supply schedule that result from changes in population structure and educational policy. It could be argued that the analysis should take into account the impact of changing technology on demand for construction labour. However, technological change in the construction industry has been mainly restricted to small improvements in material specification, product ranges, fixings, and sealants, or in hand tools and equipment (IPRA, 1991). Moreover, the large volume of maintenance and refurbishment work forecast for the 1990's will continue to require traditional skills, such as plastering, carpentry and bricklaying (Agapiou et al, 1995b).

### 7.4 Regression Analysis

#### 7.4.1 Data Utilised

A critical examination of available construction industry data was presented in Briscoe and Wilson (1993). A number of limitations were identified in the analysis of training, earnings and output statistics. The main problems related to the coverage and consistency of the available data. Details of all the relevant data series used in building the labour supply model are described in this section.

- **Craft entrant data**

  Figure 7.1(a) illustrates two time series that may be used to determine the supply of new entrants to construction. The first series represents the number of trainees registered under the Construction Industry Training Board (CITB) programmes.
These are produced from employment levy statistics held in the CITB database. The second series represents apprentice registration statistics collected by the National Joint Council for the Building Industry (NJCBI). These data relate to training in the traditional craft trades, such as plasterers, carpenters, and bricklayers.

Of the two series, the CITB data are more comprehensive in scope, but the NJCBI data exclude the numbers of trainees on training schemes administered by other organisations. However, as the CITB intake series excludes non-CITB trainees, the two series will be combined in order to provide a more complete picture of the number operative trainees for the period under consideration. These aggregate data are illustrated in Figure 7.1(b).

![Figure 7.1(a): Construction industry first-year trainees, 1976-90](image)
Figures 7.1(b): Combined CITB and NJCBI training data series, 1976-90

**Earnings data**

Variations in earnings by region and by trade should, in theory, be included in building a forecasting model. In practice, only broad aggregate series of earnings for the whole construction industry have been used for forecasting purposes (Briscoe and Wilson, 1993). There are two sources of data relating to average earnings in the construction industry, as presented in Figure 7.2(a). Figures for average weekly earnings of full-time employees are included in the Department of Employment's *New Earnings Survey* (NES). However, these data only relate to direct employees. Figures on the earnings of self-employed workers have been excluded. A wider measure of average earnings can be derived by taking the data on total wages and salaries, included in the Central Statistical Office's *Blue Book*, and dividing them by the total number of employees in the industry.

The corresponding figures for youths, however, cannot easily be derived from this data source. Therefore, the NES data used to derive relative earnings ratios will be used as a basis for model development (Figure 7.2(b) & (c)). The average wages used in the calculations are deflated by the output prices in construction.
**Figure 7.2(a):** Average earnings of adults in the construction industry

**Figure 7.2(b):** Relative youth earnings
Figure 7.2(c): Relative adult/youth earnings in construction

- Output data

Series relating to output disaggregated by main type of construction activity are presented in Figures 7.3(a)-(d). These data are taken from the Housing and Construction Industry Statistics.

Figure 7.3(a): Total construction output, 1976-90
Figure 7.3(b): Output in new public and private housing

Figure 7.3(c): Output in repair and maintenance
Figure 7.3(d): Output in other works

- *Young people entering the employment market*

The series relating to the numbers of school-leavers entering the labour market in Britain have been taken from the Department of Education and Science, published in the Employment Gazette (see Figure 7.4). The actual figures represent the remainder of all young people, after the number of leavers entering full-time education has been subtracted from all the school-leavers in the academic year.

Figure 7.4: School-leavers entering the employment market
Demographic trends

The demographic trends series used in this analysis is represented by the UK population of men and women aged between 15 and 24, and are taken from the figures produced by the Organisation for Economic Co-operation and Development (OECD) for years 1950 - 1990. These data have been presented in Figure 7.5.

![Figure 7.5: UK population aged between 15 and 24 year old](image)

7.5 Data Trends

The hypothesis presented here is that relative earnings and output are important variables in determining supply to a given occupation. A clear relationship between supply, earnings and output cannot simply be found by examining these graphs, but there are some characteristics of the data that merit closer examination. Figure 7.1(b) shows that for trainees supply declined sharply between 1980 and 1983. This fall can be associated with a decline in relative youth earnings between 1977 and 1980 (see Figure 7.2(b)). Supply grew between 1988 and 1990. This increase can be related to a rise in relative earnings between 1985 and 1988. There is clear evidence that time lags are present. Whereas, a fall in the supply of trainees between 1983 and 1986 could be associated with the decline in the relative youth/adult earnings ratio during the same period (see Figure 7.2(c)).
Bosworth (1988) suggested that the supply of training places in the engineering industry was determined by the needs of firms. These were influenced by two factors: the demand for the firm's products; and the perceived probability of being in employment at the time of the training decision, reflected in the level of activity in the industry. Similar influences could also apply to construction training market. Figure 7.3(a) presents the total output series for the construction industry. The decline in intakes between 1979 and 1982 can be associated with the fall in construction output during the same period. This indicates that there may be a relationship between total construction output and the supply of trainees.

7.6 Model Functional Form

The above analysis suggests that in some way construction output and relative earnings have a strong influence the supply of trainees. Demographic trends and young people's perception of the industry are also key factors in determining labour supply.

The basic equation used to develop an aggregate labour supply forecasting model for training inflows to the construction industry is,

\[ tct^* = a + b(rywt)^* + c(ryawt)^* + d(rawt)^* + e(cof)^* + f(dyt)^* + g(tct-1)^* + h(slt)^* \]  
Equation (7.4).

Where \( tct \) is the intake of craft trainees, \( rywt \) is the average weekly earnings of youths in construction relative to earnings of youths in all industries and services, \( ryawt \) is the average weekly earnings of youths in construction relative to earnings of adults in construction, \( rawt \) is the average weekly earnings of adults in construction relative to earnings of adults in all industries and services, \( cof \) is the volume of construction output, \( dyt \) is the UK population aged between 15 - 24, and \( slt \) is the total number of school leavers entering employment. Equation (7.4) is specified in current log values denoted by (*).
7.7 Econometric Methodology and Results

A step-by-step approach was adopted to arrive at a dynamic specification of the labour supply model. Firstly, the technique of co-integration was used to develop a general form of the model. Co-integration of two, or more, time series suggests that there is a long-run, or equilibrium relationship between them. A general-to-specific model form was then developed using the approach presented in Hendry (1985). All econometric analysis was undertaken using the PC Give® Version 7 econometric modelling system. The procedure followed is described at greater length in the following section.

7.7.1 General Long-Run Specification

The first step was to establish the time series properties of the relevant variables. Annual data representing these variables were collected for the period 1976-1990. Each of the time series assembled were tested in their logarithmic forms to determine the order of integration of the each of the time series individually.

This was undertaken using three available tests; the co-integrating regression Durbin-Watson (CRDW) test; the Dickey-Fuller (DF) (Dickey and Fuller, 1981); and Augmented Dickey-Fuller (ADF) tests. The CRDW test can be used to find out if the time series are co-integrated. The DF and ADF tests can be used to check if time series have a unit root, and therefore if they are stationary. The time series behaviour of each of the series under consideration is presented in Table 7.1.

The CRDW test results, as shown in Table 7.1, indicate that the time series are integrated to the first order, i.e. they are stationary only after first differencing. The critical value of the Durbin-Watson statistic being 0.259 under the null unit root hypothesis (Sargan and Bhargava, 1983). However, the results of the Dickey-Fuller tests indicate otherwise, and so that the series are non-stationary.

---

(3) Jenkinson (1986) suggested that this is a common finding in economic time series.
Table 7.1: Time series properties of supply model key determinants

<table>
<thead>
<tr>
<th>Variable</th>
<th>CRDW</th>
<th>DF</th>
<th>ADF(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logarithmic values, data from the period 1976-90 inclusive</td>
<td>Co-integrating Regression Durbin-Watson test</td>
<td>Dickey-Fuller test</td>
<td>Augmented Dickey-Fuller test, allowing for 1 degree of autoregression</td>
</tr>
<tr>
<td>ryw</td>
<td>1.73</td>
<td>-3.378 (significant at 5%)</td>
<td>-3.820 (significant at 5%)</td>
</tr>
<tr>
<td>ryaw</td>
<td>1.63</td>
<td>-2.403</td>
<td>-2.064</td>
</tr>
<tr>
<td>raw</td>
<td>1.92</td>
<td>-1.626</td>
<td>-0.0459</td>
</tr>
<tr>
<td>co</td>
<td>1.59</td>
<td>-1.477</td>
<td>-1.351</td>
</tr>
<tr>
<td>dy</td>
<td>1.99</td>
<td>-0.581</td>
<td>-0.209</td>
</tr>
<tr>
<td>sl</td>
<td>1.93</td>
<td>-1.159</td>
<td>-0.080</td>
</tr>
</tbody>
</table>

Engle and Granger (1987) suggested that critical values of the Dickey-Fuller tests could be used as a rough guide to see if residuals were stationary. Only the relative youth wage ratio has a statistical value that indicates rejection of the unit root hypothesis. Briscoe and Wilson (1991) argued that the critical values used in these tests are affected by unknown features of the process generating the data. This particularly applies when small samples of data are used in this analysis. The results of these tests were, therefore, not conclusive (Jenkinson, 1986). Further analysis was necessary.

The next stage of the analysis was to test whether groups of variables which economic and other theory suggest should be related to each other, in the long run, are co-integrated. Regressions were performed using Ordinary Least Squares (OLS) regression analysis, in terms of current levels only, to test whether the residuals were stationary or not. Initial experimentation was performed with wage and output variables only. Prior theoretical expectations suggest that wages and output variables will give rise to an acceptable model specification. The results of these regressions are presented in Table 7.2.

Table 7.2: The existence of a long-run relationship in a model of output and wages only

<table>
<thead>
<tr>
<th>Constant</th>
<th>ryw</th>
<th>ryaw</th>
<th>raw</th>
<th>co</th>
<th>( R^2 )</th>
<th>CRDW</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.54</td>
<td>-1.88</td>
<td>0.74</td>
<td>0.55</td>
<td>0.83</td>
<td>0.62</td>
<td>2.45</td>
</tr>
</tbody>
</table>

\( R^2 \) is the coefficient of determination, adjusted for degrees of freedom. CRDW is the Co-integrating Regression Durbin-Watson test.
Economic theory suggests that the relative earnings and the output variables would possess positive signs. The results in Table 7.2 are more or less as expected. Two of the three wage variables, and the output variable have positive signs. All the variables are significant at the five per cent level, except the coefficient on the relative adult earnings ratio, rawt. However, it should be noted that the t-values on the coefficients are badly biased (4).

The results of this preliminary analysis suggest that intake, output and wages do not form a co-integrated data set alone. In order to produce an improved long-run specification of the supply model, additional variables will have to be introduced into the system, or substituted in place of the output and wage variables.

A trial-and-error approach was adopted in order to produce a more acceptable model specification, using the theoretical and data analysis presented in section 7.5 as a rough guide. Additional variables, including those representing demographic trends were added to the original specification, and other variables initially assumed to be relevant were discarded altogether.

Table 7.3 shows the results of the co-integration regression for the long-run specification of the trainee supply model. In general, the results show a significant improvement on the results reported in Table 7.2, for the simpler form of the model. It can be seen that all the coefficients possess the expected signs, and the majority are significant at either the 1 per cent or 5 per cent level (5). In addition, the coefficient of determination $R^2$ has improved significantly. The relative youth wage variable, $ryw_t$, originally thought to be relevant, was finally discarded from the analysis as it was found not to make a significant improvement to the long-run relationship. Whereas, the demographic and the socio-environmental variables, sl, dy and $tc_{t-1}$, were found to improve the specification.

(4) Stock (1987) demonstrated that if co-integration holds that biases in the parameter estimates will be of the order $(1/T)$ and that the estimates will be super-consistent. Convergence will occur at a faster rate than normal OLS estimates.

(5) t-values are probably biased (Stock. 1987).
Other variables, such as the effect of immigration, although considered important, since immigration can have a negative impact on trainee supply (i.e. substitution effect), were not included in the analysis because of the lack of available information\(^{(6)}\).

A comprehensive model which completely satisfied all the co-integration tests emerged after lengthy experimentation with different combination of variables. The preferred long-run specification is;

\[ tct^* = a + b(ryawt)^* + c(rawt)^* + d(cot)^* + e(slt)^* + f(dyt)^* + g(tct_{t-1})^* \]  

Equation (7.5),

where (*) denotes logarithms.

7.7.2 Dynamic Specification of Supply Model

A general dynamic model specification was derived from the long-run relationship, developed in the previous section, following the approach of Hendry (1985). The following over-parameterised model containing the key regressors, plus lags on all the variables, was proposed:

\[ \Delta tct = a + b_0(\Delta ryawt) + c_0(\Delta rawt) + d_0(\Delta cot) + e_0(\Delta slt) + f_0(\Delta dyt) + g_0(tct_{t-1}) + b_1(ryawt_{t-1}) + c_1(rawt_{t-1}) + d_1(cot_{t-1}) + e_1(slt_{t-1}) + f_1(dyt_{t-1}) \]  

Equation (7.6).

In an unrestricted form, specified in logs and first differences, Equation (7.6) has 12 terms, including the constant term. However, the data series used in this investigation only has 15 observations, or 13 after allowing for the proposed lag structure. The number of degrees of freedom is, therefore, very small.

\(^{(6)}\) Immigration can also play a supplementary role in that the entry of skilled immigrants can be linked to the condition that they provide jobs for potential trainees. In the UK, foreign migrants probably only represent an insignificant proportion of the construction labour force, albeit large numbers of construction workers have traditionally been imported from Ireland. During 1993, 35,000 Irish Nationals were employed in the UK construction industry (Woolford. 1994).
Based on the methodology described in Engle and Granger (1987), a restricted form of the supply equation was obtained by replacing the last four terms of Equation (7.6) by a single variable which is the residual, lagged one period, from the long-run cointegrating regression equation reported in Table 7.3.

Table 7.3: The existence of a long-run relationship between intakes, wages, output and other potential variables.

<table>
<thead>
<tr>
<th>Constant</th>
<th>ryaw_t</th>
<th>raw_t</th>
<th>co_t</th>
<th>sl_t</th>
<th>dy_t</th>
<th>tc_t-1</th>
<th>R^2</th>
<th>CRDW</th>
</tr>
</thead>
<tbody>
<tr>
<td>-38.33*</td>
<td>0.155</td>
<td>2.318</td>
<td>1.985**</td>
<td>1.142*</td>
<td>3.26*</td>
<td>0.433*</td>
<td>0.75</td>
<td>2.85</td>
</tr>
</tbody>
</table>

R^2 is the coefficient of determination, adjusted for degrees of freedom. CRDW is the Co-integrating Regression Durbin-Watson test. * and ** indicate significances at the 5% and 1% levels respectively (t-values may be biased).

The error-correction model (7) can be written as follows, where E_t represents the error-correction term, that is, the residuals from Equation (7.5).

\[
\Delta c_t = a + b_0(\Delta ryaw_t) + c_0(\Delta raw_t) + d_0(\Delta co_t) + e_0(\Delta sl_t) + f_0(\Delta dy_t) + g_0(tc_t-1) + h_0(E_{t-1}) \quad \text{Equation (7.7)}.
\]

Equation (7.7) is a restricted form of Equation (7.6). A simple F-test can be used to test for the validity of these restrictions. Details of this procedure can be found in most econometrics text (8). The results of this test indicate that the restrictions placed on the lagged levels of the independent variables are acceptable. If the general form (i.e. Equation (7.7)) is estimated, some of the coefficients will turn out to be insignificant. In this case the equation is, clearly, over-parameterized and requires simplification to achieve a more parsimonious representation of the process generating the data. This is achieved by estimating Equation (7.7), eliminating the least significant variable and, at the same time checking that the resultant residual sum of squares (RSS) does not vary significantly from the original sum of squares reported for the general unrestricted form of the supply equation. The resultant restricted error correction equation has been presented in Table 7.4.

(7) The error-correction model, Equation (7.7), is specified in first differences, implying a lag of up to 2 years in terms of levels of each variable.

Table 7.4: Preferred trainee supply equation for restricted-error correction model

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable</th>
<th>log tc (co-integrating equation)</th>
<th>Δlog tc (Dynamic specification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td>-38.33* (-3.06)</td>
<td>1.557 (1.686)</td>
</tr>
<tr>
<td>ryawt</td>
<td></td>
<td>0.155 (0.424)</td>
<td></td>
</tr>
<tr>
<td>rawt</td>
<td></td>
<td>2.318 (2.55)</td>
<td></td>
</tr>
<tr>
<td>coi</td>
<td></td>
<td>1.985** (3.54)</td>
<td></td>
</tr>
<tr>
<td>slt</td>
<td></td>
<td>1.142* (3.24)</td>
<td></td>
</tr>
<tr>
<td>dyt</td>
<td></td>
<td>3.26* (2.41)</td>
<td></td>
</tr>
<tr>
<td>tct,</td>
<td></td>
<td>0.433* (2.03)</td>
<td></td>
</tr>
<tr>
<td>Δrawt</td>
<td></td>
<td>2.96** (7.88)</td>
<td></td>
</tr>
<tr>
<td>Δcoi</td>
<td></td>
<td>1.110* (2.48)</td>
<td></td>
</tr>
<tr>
<td>Δdyt</td>
<td></td>
<td>4.56** (4.82)</td>
<td></td>
</tr>
<tr>
<td>tc,</td>
<td></td>
<td>-0.343 (-1.737)</td>
<td></td>
</tr>
<tr>
<td>E,</td>
<td></td>
<td>-0.57** (-5.00)</td>
<td></td>
</tr>
</tbody>
</table>

Results of diagnostic tests

- $R^2$: 0.75
- DW (Durbin-Watson): 2.85
- F (generalised F test): 28.95
- RSS (residual sum of squares): 0.0089
- Wald test, $\chi^2$: 144.73

* and ** indicate significances at the 5% and 1% levels respectively. Logarithmic variables, data from the period 1976-90 inclusive.

Wald test $\chi^2$ represents the joint significance of all variables in the regression.

Table 7.4 demonstrates that the majority of the coefficients were positive and significant. However, the lagged dependent variable (insignificant) and the error-correction term (significant) are negative. In this regression, real adult wages and output are the most important variables, as findings from previous research would suggest, so supporting the initial hypothesis\(^9\).

\(^9\) These findings are consistent with the Human Capital view of labour supply.
In addition, demographic trends represented by the population aged between 15 and 24, and socio-environmental factors (the influence of friends and family on young people’s occupational choices), measured by the one-year lagged of the dependent variable, were also found to have a strong influence on trainee supply. In addition to the estimation, various diagnostic tests were also performed before the equation could be described as the best specification. The results of these tests were, generally, good (see Table 7.4). There is no evidence of the existence of autocorrelation, ARCH, heteroskedastic disturbances, parameter instability or functional form mis-specification.

• Sensitivity analysis
The results of the sensitivity analysis used to test the robustness of the model to changes in the key variables confirms that the real craft wage, construction output and demographic trends have a positive effect on trainee supply (see Appendix D).

7.8 Limitations of Proposed Model

The proposed model can be used to produce short-term forecasts for operative trainee supply to construction. Generating disaggregated medium-term projections would, however, require an equation that incorporates the dramatic changes that have occurred in the UK construction sector over the past 30 years, or so. Such a model could then be used in conjunction with the CITB employment forecasting model, which presently projects the gap between employment demand and supply. Since a model is only as good as the data used in its development, then this would only be possible if there was a major improvement in the availability of supply-side data, particularly training statistics.

The work presented here has at least highlighted the problem faced in modelling the supply-side. In particular, the lack of good time series data. If a similar approach to modelling the flow of new entrants to construction was the subject of further research, an improved set of time series data would be required. This would include a more comprehensive set of training statistics, incorporating all training undertaken in the construction sector, broken-down by occupation and region.
Since the CITB is not the only organisation providing training to the construction sector, the number of trainees registered represents only a proportion of those training in the construction sector\(^{(10)}\). The college survey returns, which the CITB has recently started to collate could provide a basis for collecting more detailed information.

7.9 Summary

This chapter presented an aggregate supply model for craft trainee entrants to the UK construction sector using annual data for the period 1976-1990. The model was developed from the Human Capital view approach to analysing labour supply to a training market limited by the number of training places made available by companies. This approach was originally applied to the supply of apprentice entrants to the engineering sector, and has been adapted in this investigation for the construction training market.

A step-by-step approach was used to arrive at a dynamic specification of the labour supply model suitable for forecasting purposes. The technique of co-integration was used to develop a long-run specification of the supply equation, which was subsequently reduced to a more parsimonious representation. The hypothesis that the proportion of school-leavers choosing to train as construction operative depends on the real craft wage and the long-term prospects of the construction sector was also tested. The results were consistent with this hypothesis. The real craft wage and output have a strong influence on the supply of new entrants, but so do demographic trends, and socio-environmental factors, such as young people’s perceptions of construction. The sensitivity analysis confirms that these key variables have a positive effect on the construction training market.

In its present form, the proposed model can be used to produce short-term forecasts for construction operative trainees. Nevertheless, at least the methodology for developing a model to forecast construction skills has now been established. Medium-term forecasts will require further model building. However, this work will have to await the collection of detailed information on key supply-side parameters on a more consistent basis.

\(^{(10)}\) The CITB estimates that only about third of all those training in the construction sector are registered with the organisation.
The next chapter assesses the acceptability of movement between various regions of Europe. This is required in order to measure what is likely to be the effect of free movement of labour on the supply of construction skills.
CHAPTER EIGHT

LABOUR MOBILITY IN THE CONSTRUCTION INDUSTRY: A EUROPEAN PERSPECTIVE.

8.1 Introduction

Some inward and outward mobility of the skilled workforce can be expected, for any given region. The net impact for any one region is unlikely to be very large, but for selected occupations such mobility could be an important element in determination of supply. The UK construction industry has a long tradition of recruiting workers from Eire. The completion of the single European Market opens the possibility of Britain obtaining a proportion of its skill requirements from other EU countries and elsewhere. This is currently an area of much speculation and a great deal of ignorance. This chapter assesses the acceptability of movement between various regions of Europe. Past and current patterns of construction labour mobility are examined, this includes an analysis of the benefits and risks of such movement. Measures to create a regulatory framework at bilateral and multilateral levels, and initiatives to promote labour mobility are also reviewed.

8.2 Regional Mobility and Labour Supply

The approach to modelling the labour supply presented in Chapter Seven assumed that the construction industry is able, when it chooses, to recruit a supply of new trainees. However, problems with skills shortages in the late 1980's and future demographic trends suggest that the industry may face real difficulties recruiting sufficient numbers of new entrants in a growth economy.
Construction companies need to assess whether the employment of individuals from other regions of the UK and Europe is a viable solution to this problem. The issue of regional mobility of construction workers has been examined by a number of authors and a recent summary is given in Briscoe (1989a). In general, whilst a few young highly skilled operatives are found to be extremely mobile between regions, most operatives move around within a given locality and region. In the 1980's, the main movement was from northern regions of Great Britain into London and the South East, where employment demand was strongest. Large prestige projects, such as the Channel Tunnel, can become a magnet for mobile labour because the relatively high rates of pay made the tunnel and temporary accommodation worthwhile. Normally, however, the wage differentials are unlikely to be sufficient to overcome the high costs of moving between regions.

Analysis of the most recent data from the Labour Force Survey for 1990 substantiates the above observations; see Briscoe (1992). Virtually all the recorded movement is concentrated within an economic planning region. It is of course, quite possible that some unrecorded labour working in the informal sector may provide a cushion for regions enjoying high employment demand. The skills profile of such workers is impossible to detail, but for the most part these operatives are likely to be less skilled labour-only gangs. Overall, it is improbable that the numbers are large and given the lack of real information, their contribution to labour supply may effectively be discounted. The UK construction industry has a long tradition of recruiting labour from the Irish Republic. The completion of the unified single market opens the possibility of also obtaining labour from other European Union countries, where pay differentials may make working in the UK an attractive proposition for individuals from the less prosperous regions of Europe.

The free movement of goods, services, capital and people is essential for regional economic development and integration.
Labour mobility may also have a positive effect on the economic performance of the European Union (EU) by allowing economic specialisation, and easing potential labour shortages, and therefore wage pressures (Thom, 1992). A report to the European Commission on Strategies for the Construction Sector identified two reasons why free movement of construction workers would be beneficial. 'Firstly, to respond to local fluctuations in construction markets; secondly, to create the cross-fertilisation that will help increase competition and improve technologies, procedures and regulations'. (Commission of the European Communities, 1993, Ch 8, p 9).

High skills levels contribute to both social and economic cohesion and help to remove imbalances between regions. Consequently, the European Commission has introduced two directives dealing with the recognition of craft qualifications in member countries. Governments also recognise that skill increases productivity and competitiveness, improve workers' living and working conditions, and enhances their employment prospects. Much of the focus has been on the development of continuous education and training programmes. The success of these programmes has been affected by inadequacies in the definition of skill and qualification requirements.

EU countries have been unable to agree as to what constitutes a vocational qualification. In Britain, it is a certificate of achievement. In other countries, notably Germany, it is a licence to practise. In the extreme case a British plumber, no matter how qualified and experienced, theoretically could never work in Germany. However, a German non-plumber could set up in Britain and work without restriction as a tradesman (Jones, 1993). Even more frustrating are the differences between countries in how skilled workers are defined. Different classification systems exist because there is no consensus on the definition of a skilled worker. This has inevitably led to disagreements over what trades have been included in construction. For example, stonemasons are excluded from craft classifications in Germany, whereas in the Netherlands they have been included (BIBB, 1992, Agapiou et al, 1994). However, both countries exclude plumbers and joiners.
Some trades that are regarded in the UK as unskilled or semi-skilled, particularly those related to concrete work, are organised as skilled craft trades elsewhere.

It is unclear whether or not the combined effects of the Unified Single Market and the legal framework required to ensure mutual recognition of qualifications in Europe will create a labour market similar to that in the United States. Anecdotal evidence suggests that formal restrictions and inequality of qualifications are less important than proposed by the EU’s experts. National regulations have not prevented the movement of workers within the EU. Between 60,000 and 70,000 British construction tradesmen, for example, were reported to be working on German construction sites for lower pay than German craftsmen (Von Waldersee, 1995; Salz-Trautman, 1994). Nevertheless, with the establishment the Unified Market and the further integration of Europe, it has become necessary to assess qualifications from a European perspective. This will require a clearer understanding of all the main construction skill requirements and training systems in each country. This was underlined in the recently ratified Treaty on European Union (see Table 8.1). In particular, Articles 126 and 127 of the Maastrict Treaty focused on the need for member countries to exchange information on vocational training systems in the expectation that this would encourage mobility.

8.3 Trends in Work Organisation and Employment Practices

Construction is one of the EU’s key industrial sectors: output in the construction industry accounts for almost one-tenth of its combined GDP. With a combined work force of 8.5 million the European construction sector is as important as the agricultural sector (Zachmann, 1992). Small and medium-sized firms, which number almost one million, predominate in the EU. However, the nature of employment in the European construction industry is not clear, nor is the extent and variety of employment of foreign construction labour within individual European countries. Current trends in employment practices have been discussed in the next section.
Table 8.1: Articles 126 and 127 of The Treaty on European Union.
(Source: Peck, 1994)

<table>
<thead>
<tr>
<th>Article 126</th>
<th>Article 127</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Community shall contribute to the development of quality education by encouraging co-operation between the Member States and, if necessary, by supporting and supplementing their action, while fully respecting the responsibility of the Member States for the content of teaching and the organisation of education systems and their cultural and linguistic diversity. 2. Community action shall be aimed at:</td>
<td>This article recommends that members of the community strive to</td>
</tr>
<tr>
<td>• developing a European dimension in education, particularly through the dissemination of the languages of the Member States;</td>
<td>• facilitate adaptation to industrial changes, in particular through vocational training and retraining;</td>
</tr>
<tr>
<td>• encouraging mobility of students and teachers and encouraging the academic recognition of diplomas and periods of study;</td>
<td>• improve initial and continuing vocational training in order to facilitate vocational integration and reintegration into the labour market;</td>
</tr>
<tr>
<td>• promoting co-operation between education establishments;</td>
<td>• facilitate access to vocational training and encourage mobility of instructors and trainees and particularly young people;</td>
</tr>
<tr>
<td>• developing exchange of information and experience on issues common to the education systems of the member states;</td>
<td>• stimulate co-operation ... between educational or training establishments and firms ... and develop exchanges of information and experience on issues common to the training systems of the Member States.</td>
</tr>
<tr>
<td>• encouraging the development of youth exchanges and of exchanges of instructors;</td>
<td></td>
</tr>
<tr>
<td>• encouraging the development of distance education.</td>
<td></td>
</tr>
</tbody>
</table>

This includes an analysis of the various forms of employment, and the implications these practices have for free movement of construction labour.

Various forms of non-permanent employment in particular temporary work and contract labour (including migrant labour), play a major and rapidly growing role in the European construction industry (Hellmann, 1992). The extent of this phenomenon is not very clear. However, the International Federation of Building and Woodworkers (IFBWW) has identified the main trends in employment within Europe. The main findings of the IFBWW study were that:

- non-permanent employment in the construction industries is widespread and on the increase;
flexible and insecure forms of employment, and contracting work to subcontractors are also on the increase.

Sole independent trade subcontractors are to be found in insulation and acoustics, scaffolding, stonemasonry, wood craft, stone floor, tile and floor-laying work and a wide range of assembly jobs for so-called independent kitchen furniture fitters; and

construction activity has historically been based on project-oriented work and changing work-sites. This has meant that construction has traditionally employed temporary workers engaged on fixed-term contracts. However, during recent years, this trend has accelerated at an alarming rate, whilst the protection for workers has not kept pace.

There are a number of different categories of permanent and non-permanent employment in the construction industry. These definitions may vary within individual European countries. Hellmann (1992) usefully described the various forms (see Table 8.2).

The construction labour process in Europe

A highly complex structure has emerged in the construction industry within Europe. It is now very common (and often encouraged by governments) to use subcontractors to a large degree. However, this practice is unpopular with both trade unions and employers. A recent International Labour Office (ILO) report suggests that the over reliance on subcontractors, often employed on harsh contractual conditions, can result in higher final costs for the client (ILO, 1992). The report also indicated that the abuse of self-employment can lead to safety and health risks and is an impediment to the sustained development of national construction industries, particularly since the workers affected are not often afforded the protection of social security systems, such as sickness and unemployment benefit.
Table 8.2: Categories of employment in the construction industry

<table>
<thead>
<tr>
<th>Category of employment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal work in the formal sector</td>
<td>A full-time job paid on a monthly basis with a normal distribution of working hours performed in companies that apply statutory provisions and protection against unfair dismissal. This category of work provides a small degree of job security and financial benefits depending on the worker’s ability and/or company seniority and where job contents are determined by collective provisions, particularly collective agreements.</td>
</tr>
<tr>
<td>Atypical or precarious work</td>
<td>All forms of employment that differ from the traditional patterns in respect to the number or distribution of working hours, organisation and location of production and the way in which wages and work regulations are determined. Specific examples include part-time workers, the majority of whom are not protected by unemployment, health or pension insurance schemes.</td>
</tr>
<tr>
<td>Self-employment</td>
<td>Sole independent tradesmen accountable to themselves, owning their own means of production, and responsible for planning and carrying out work often without supervision. The vast majority of workers in this category are in reality non-permanent employees, working under someone else’s direction without their own tools and according to working hours and at a pay rate established by a subcontractor. The extent to which these workers are artisans working as independent tradesmen or as labour-only subcontractors is difficult to determine. Self-employed workers often have to forego important aspects of protection afforded by labour legislation, social security and collective agreements.</td>
</tr>
<tr>
<td>Work in the informal sector</td>
<td>Workers are informal in the sense that for the most part they are unregistered and unrecorded in official statistics. Informal workers are often beyond the reach of social protection, labour legislation and protective measures in the workplace. The informal sector provides workers with low and irregular incomes and highly unstable employment.</td>
</tr>
</tbody>
</table>

The increase both in temporary or contract labour, and self-employed workers has often been associated with the recession that affected construction throughout Western Europe during the late 1970’s and early 1980’s. However, the increasing use of such flexible and precarious forms of employment is in part due to new personnel policies which construction companies have been implementing since the mid-1970’s. This practice has been made possible by government policies to deregulate national labour markets and reform social security systems.
Attempts to reduce the coverage and value of state welfare benefits have been widespread. Many European governments place higher priority on the control of inflation than on maintaining full employment. There has been a general trend towards extending market pressures: privatisation of nationalised industries; and cuts in government subsidies to loss making firms and industries.

Changes in government social and labour markets policies during the 1980’s were accompanied by the adoption of new business practices by the construction industry. This has had a profound effect on the structure of employment throughout Europe. Changing construction methods, on-site working conditions and alternative working arrangements allow construction firms to react flexibly to the demands of the relevant market. This is due in the first instance to a well-defined division of labour, embracing such elements as:

- supply and market orientation;

- specialisation of the construction sector and trade segregation, coupled with diversification of services offered; and

- reduction in the levels of employment, accompanied by the increased use of contract labour.

Growth in construction is commonly associated with higher levels of employment in the industry. Reductions in employment levels in German construction during a period of sustained growth in the early 1990’s are indicative of a crisis in the industry. Yet this may also indicate the reliance on foreign contract labour employed on German construction sites. Peaks in construction demand in the early 1990’s were addressed through the engagement of contract labour from Eastern Europe.
8.4 The Movement of Construction Labour Within Europe

The poor coverage of available statistical information makes any description of construction labour mobility towards and within Europe problematic. The extent and variety of such movement is not sufficiently recorded by the available statistics of the EU, which have been based on national statistics. Some very useful, but limited information is available. These figures are often outdated and only collected on an ad-hoc basis.

Employment in the European Construction industry is already characterised by a large number of foreign workers, though their numbers differ from country-to-country. In the UK, foreign craftsmen represent only a small proportion of the construction workforce. During 1993, an estimated 35,000 workers from Eire were employed in the UK construction industry (Agapiou et al., 1995b). The situation is different in other European countries. In Belgium, France and the Netherlands significant numbers of foreign workers are employed in construction (Gross, 1992). During 1989, for example, 25 per cent of workers employed in the French construction industry were foreign nationals; in (West) Germany this figure was around 10 per cent, if only those employees subject to social security contributions are taken into account (Gross and Syben, 1992). In principle these latter employees worked under the same conditions as their national colleagues, and are in this respect integrated into the society.

German reunification and stable demand in the western regions (Länder) created significant skill shortages in the construction industry. The industry responded to these shortages by recruiting large numbers of temporary workers under bilateral quota agreements between Germany and various eastern European countries, such as Poland. In 1992, an estimated 100,000 construction workers were employed on a short-term basis (Hellmann, 1992). Many of these workers were legally employed, however the rate of pay and conditions received was usually less favourable than that for German craftsmen.
It should be noted that rationing by quota requires payment of the standard wages, but workers on temporary contracts were paid between DM5 and DM10 per hour. This was significantly less than the rate paid to German nationals. The hourly rate for a German national was normally DM56.

The extent of irregular employment of foreign labour in Europe is difficult to estimate. Construction is a labour-intensive industry and, next to the hotel and catering sector, it belongs to that sector where workers foreign to the region and the specific occupation are most readily able to find employment. Furthermore, the control of working conditions and irregular employment in construction rates among the most difficult due to the specific conditions of production.

Despite the removal of many administrative constraints and legal barriers on worker mobility, for example, the removal of border controls, labour mobility amongst the EU countries is insignificant (Koslowski, 1994; Salt et al, 1994). The vast majority of irregular construction labour originates from countries outside the European Union.

Whereas, the northern European countries, especially Germany, are confronted with labour that originates from Central and Eastern Europe, increasing flows from the Maghreb region can be observed in the Southern EU countries. The majority of irregular workers, in Portugal, are employed in the construction industry. In Italy, and even in Greece, irregular workers are employed as seasonal or occasional workers on construction sites. One reason is that in these countries national labour markets are not sufficiently organised to cover the seasonal shortages of mainly unskilled construction workers. Irregular employment also avoids payment of social security contributions, in addition to considerably lower wages already paid to foreign workers.
Benefits and risks of labour mobility

The employment of foreign nationals in individual European countries can be distinguished by different rights of access to national labour markets, by different qualifications levels and by varying employment conditions (Gross, 1992). Foreign construction workers in regular employment often receive lower wages than similarly qualified nationals, despite prescriptions for regular treatment. However, there tends to be little or no distinction in working conditions on the basis of nationality. The current trend towards forms of dispatched employment, i.e. workers on contract for services, and the irregular employment of foreign labour offers both benefits and risks for the construction industry in individual European countries.

Employers and employees recognise the benefits of labour migration. In the short-term, workers moving from countries with low-wage levels and a lack of employment opportunities to countries with higher incomes levels are able to improve their individual living conditions, even if their income is comparatively lower than that of national employees: this is even more so if they transfer part of their income to their home country. If this is done in the form of high-quality consumer goods and to countries where currencies are not convertible, and whose exchange rates do not roughly correspond to their purchasing power, migrant workers also gain speculative advantages.

The employer from the host country can financially benefit from the use of foreign workers, even for those employed on regular contracts providing that services are costed on the basis of lower foreign wages. This practice avoids employer contributions to social security benefits and premiums provided for by private occupational schemes, such as entitlement to holiday pay or time lost due to unfavourable weather or economic cycles. Employers openly express an interest in employing foreign nationals, and even a preference for irregular employment in order to avoid such high incidental costs (Commission of the European Communities, 1991).
The employment of foreign labour can also be used to ease regional skill shortages, particularly in countries where labour-intensive construction work is considered unattractive. However, this can also impede the development of new construction techniques and methods. Construction still remains a labour-intensive industry throughout Europe. Irregular and low-wage employment can slow down the substitution of labour by capital-intensive methods. This in turn can restrict the growth in labour productivity and the development of efficient practices.

While the demand for labour exceeds supply, the employment of foreign labour does not directly threaten national workers. However, unrestricted access to labour markets can dampen pressures to increase wage levels (Straubhaar, 1990), and threaten the social achievements of trade unions.

There are also risks and benefits for the home countries of migrant workers. In particular, labour migration can ease the strain on national labour markets and relieve the tension of social conflicts (Segbers, 1991). However, empirical proof that migrant workers contribute to the development of their home countries is difficult to establish. Straubhaar (1988) noted that there are only marginal effects on national economies.

The classical doctrine of free trade states that regional economic development is limited by the free movement of goods, capital, services and people (Straubhaar, 1990). However, if the advantages of labour mobility are to be realised then an adequate framework to regulate free movement must be established. The development of this framework is crucial if the efficient allocation of resources expected from this is to be achieved.
8.5 Measures to Create a Regulatory Framework

A number of bilateral and multi lateral measures to regulate labour mobility within the European Union have been adopted over the past 40 years. These have been examined below.

8.5.1 Bilateral Regulations

An individual’s decisions to migrate are subject to government intervention whenever the aims of the individual and society diverge. The host country is often in a better position to regulate potential labour migration than the workers country of origin. Thus, under the provisions of the Single European Act, each member country was required to take its own measures to regulate labour movement. These measures apply to workers from countries outside the European union. In each country the legal treatment of foreign workers in terms of wages, and social security provisions is determined on the basis of a work permit or quota system. Since 1973, Germany has regulated labour migration from Central & Eastern Europe, the EFTA countries (Norway, Switzerland and Iceland), Lithuania, Turkey and Russia through bilateral agreement with these countries.

During the 1980s new measures were adopted. Limited, project-bound work permits are now issued to foreign workers based on contracts between their own company and a German enterprise under a strict quota system. In 1992, 99,840 foreign nationals were employed on this basis. In 1991, two-thirds of foreign contract workers were employed in the construction industry. Half of these workers were recruited from Poland (Budesanstalt für Arbeit, 1992). Their working conditions are covered under the provisions of the working agreement between the foreign and German enterprise, subject to approval from the respective foreign and German authorities. The necessary approval depends on the fulfilment of certain minimum criteria as far as wages are concerned. Rates of pay must be in accordance with German collectively agreed conditions.
The number of foreign workers employed under this quota system has declined in recent times due to the effects of the recession in the German construction industry. The number of such workers fell by 45 per cent between October 1992 and July 1993 (Gross, 1992).

Legislation introduced in 1993 imposes maximum limits on the number of foreign workers employed by German construction companies under fixed-term contracts or Werkvertrag (informMSEP, 1993). Table 8.3 shows the maximum limits on foreign employment under these new regulations with respect to the numbers of workers in individual firms.

Table 8.3: Maximum limit on the numbers of foreign workers permitted in German construction firms under fixed term contracts.

<table>
<thead>
<tr>
<th>Size of company labour force</th>
<th>Maximum limits on employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 or under</td>
<td>up to 6 employees</td>
</tr>
<tr>
<td>200 or under</td>
<td>20 per cent of German workforce up to an absolute maximum of 30 workers</td>
</tr>
<tr>
<td>more than 200</td>
<td>15 per cent of German workforce up to a maximum limit of 200.</td>
</tr>
</tbody>
</table>

Changes in work-permit conditions since 1993 have further restricted this form of employment. Employment quotas will continue to be reduced on the basis of labour market adjustment clauses included in agreements reached between Germany and the countries of central and eastern Europe.
The interests of German workers are not threatened by the employment of foreign workers under contract to German enterprises, as long as workers are accorded equal treatment. However, it is difficult to ensure that foreign workers adhere to the terms of these contracts. Instruments are available, but only administrative checks can generally be made. The assignment of workers once they have entered the country may deviate from that originally proposed between the parties in the agreement as to the site location, the work to be performed as well as to payment. The abuse of the quota system in this way can have displacement effects particularly on regional labour markets. In structurally weak economic regions, this can threaten jobs and lead to temporary lay-off of workers (Leuschner, 1992).

Foreign contractors are only able to compete with German enterprise on an equal basis because they are subject to foreign labour and social regulations. This phenomenon is known as social dumping (EFBWW, 1994). The fact that foreign workers are not covered under the German social security system, because the liability for contributions does not apply to short-term contracts and collectively agreed wage agreements, merely exacerbates the problem.

This is the experience on which the fear of social dumping is founded. The western German economy, with a high standard of labour regulation, is a major candidate for social dumping, i.e. wage flexibility in a deregulated Single European market. A number of fears were articulated in the rich EU countries in the years proceeding the completion of the unified market (e.g. Deubner, 1990). However, evidence suggests that fears of social dumping are largely unfounded, and that the effects of German re-unification and the recession are currently more significant than the impact of European integration (Sadowski et al, 1994). EU regulations may, however, function as a cushion for uncontrolled competition from the poorer EU member countries and third countries, and may prevent the prospect of social dumping.
8.5.2 Multilateral Regulations

A number of articles have been drawn up by EU institutions to regulate and control labour mobility through legislation aimed at improving the living and working conditions of employees. These relate to establishing equality of wage relations throughout the countries of the EU. The principle of equality in wage relations allows for wide range of interpretations (Janssen, 1992). It may be interpreted as *equal pay for equal work*, but may, justify unequal pay for unequal work, i.e. wage differentials according to skills, hazards results, etc. In the UK, this principle is widely identified with anti sex-discrimination according to the Equal Pay Act (1970), which stipulates equal pay between men and women, but at the same time, permits unequal pay between men employed on the same job arising from extreme fluctuations in the course of seasonal and economic cycles. In Germany this principle is usually identified with legally binding collective agreements (Allgemeinverbindliche Tarifvertrage) which are compulsory for all employers of a sector in which the agreement has been signed. The German approach to equal pay is similar to that formulated in the Treaty of Rome (1957).

The Community's Treaties and Charters on workers' rights emphasise the need to create conditions that would facilitate labour mobility between member states. This explains why issues related to the equalisation of living and working conditions have always been high on the policy agenda. As with social security systems, disparities in the treatment of workers within the EU not only inhibit mobility but also act as a source of unfair competition.

Several references were made in the EEC treaty (1957), to the need to improve living and working conditions, although no clear guidance was given on how equalisation between member countries should be defined and achieved.
Article 117 stated 'the need to promote improved working conditions and an improved standard of living for workers, so as to make possible their harmonisation while the improvement is being maintained'.

The areas identified in Article 118 of the Treaty for close co-operation included: labour law and working conditions; prevention of occupational accidents and diseases; occupational hygiene, the right of association; and collective bargaining. Article 120 dealt with equal holiday pay. Key aspects of working conditions were thus recognised as social policy issues in the Treaty. However, it did not specify the standards to be achieved, nor did it set a timetable for implementation. Despite these limitations, economic interests in the early years of the EEC provided a powerful incentive for community action in the area of industrial welfare. The authors of the Treaty seem to have expected the development they were suggesting would follow automatically from the operation of the common market, both through the harmonisation of social systems and from procedures as laid down by law (Hantrais, 1995). The argument was that common standards of protection against industrial accidents were needed to prevent any one country from gaining a competitive edge and to avoid a situation where migrant workers might receive different treatment from one member state to another. According to the preamble of the Treaty, social progress and equalisation or harmonisation are synonymous with economic progress.

The link between social and economic progress was made in the European Charter of the Council of Europe of 18 October 1961 and confirmed several times in preambles, articles and amendments to the Treaty of Rome and finally in the Community charter of fundamental social rights of workers of 9 December 1989, 'the same importance must be attained in the social aspects as to the economic aspects and..., therefore, they must be developed in a balanced manner'.

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It is significant that the 1989 Community charter places emphasis on harmonisation between member counties, an element which was not explicitly formulated in the 1961 Social charter of the Council of Europe. The single European Act of 1986 reiterated the aim of harmonisation, but introduced the important principle of qualified majority voting in the Council of Ministers for decisions on legislative action in this area.

The new Article 118a advised member countries to ‘pay particular attention to encouraging improvements in the working environments, as regards the health and safety of workers’. However, it limited the scope for community intervention as to avoid imposing undue administrative, financial and legal constraints on small and medium-sized enterprises. According to the preamble of the 1989 Charter, the objective for harmonising living and working conditions in the scope of the single unified market is linked with economic and social cohesion, and is intended to avoid distortions in competitive trade relations. Six of the 26 objectives explicitly refer to the principle of equality. Most of the other objectives define a floor of rights or minimum conditions.

The next landmark in policy for the improvement of living and working conditions was the Maastrict Treaty on European union, and the agreement on social policy signed in 1992 by all member countries except the UK. In contrast to the earlier treaties and charters, the Maastrict treaty explicitly excludes any harmonisation of laws and regulations of member countries. The Union would, however, ‘assist member countries by taking initiatives to help them co-ordinate policies and programmes rather than instigating legislative action of its own’.

- **Equality in wage relations within Europe**

The principle of equality in the sense of harmonisation, does not prejudice against wage differentials according to skill, type of work and output. Its main intention is to minimise differences between regions, countries and races as a means of promoting the process of federation or unification of economies.
Conversely, inequality would accelerate social division, discord and fragmentation. If this logic is followed, then every country ought to be eager to establish equality in wage relations in order to maintain its unity. It might also be argued that the principle of equality, as an element of the collective rate and agreement, inherently requires to be implemented at the highest possible level of society, i.e. the state, as in the case with national collective agreements. However, with regard to equality in labour relations, European countries exhibit widely divergent developments of wage forms and wage levels between each other and within many EU countries. In the UK, France, Italy and Spain wage agreements in the construction industry are segmented and differ to varying degrees according to various criteria. However, in Belgium, Germany and the Netherlands they are more homogeneous, particularly through the use of legally binding collective agreements at national level (Lanove, 1990).

Disparities in wage levels between EU countries has prompted the CEC to adopt appropriate measures. A proposed directive covering the temporary posting of workers within Europe has been drafted. This directive aims to regulate certain terms and conditions - notably working time, paid holidays and minimum rates of pay-of workers posted to another EU member country on a temporary assignment.

One of the genuine barriers to the free movement between EU countries is the inequality in wage relations. Differences in wage levels within Europe, for instance, can give construction companies an unfair advantage, particularly if they employ significant numbers of foreign workers, not subject to local regulations. However, any attempt to establish what is the wage of a construction worker, as to be comparable to the wage paid in another country is fraught with difficulties (Gross and Syben, 1992). Therefore, the proposed directive can be seen as response to national measures to regulate labour migration on the basis of equality of wage relations and working conditions.
The intention of the European Commission to propose legislation to regulate the posting of workers was first indicated in its Social Action Programme, accompanying the Social Charter. The Commission’s reasons were as follows.

'The free movement of services, capital, goods and persons will increase considerably with the single market and is precisely the purpose of the single market.'

'The fact that, in some sectors, the freedom to provide services includes undertakings to send workers to another member country raises the issue of working conditions, which are generally defined by regulations applicable to the country where the undertakings has its registered office. Due to the fact these working conditions are different, there is a risk that, in addition to disadvantages for workers, this will give rise to distortions of comparisons between undertakings' (Commission of the European Communities, 1989, p 23).

As a result, the CEC argued that the action of providing services, particularly in relation to sub-contacting services, should take into account:

'the application of national legislation on public order......and respect for generally binding collective agreements' (Commission of the European Communities, 1989, p 24).

The Directive on posted workers was duly drafted in the context of existing legal provisions designed to resolve issues involving conflict of laws, such as the 1980 Rome Convention and the 1989 European Court of justice case, Rush Portuguesa (IDS European Report, 1993). It was submitted to the Council of Minister in June 1991 (Commission of the European Communities, 1991) and following the usual round of consultations - notably with the Economic and Social Committee and the European Parliament - was amended in June 1993.
However, this directive has yet to be adopted by member countries. Failure by EU countries to agree on the provisions of the directive has led some governments to take unilateral action, pending its adoption.

Faced with growing unemployment the German government has introduced legislation to force employers to pay foreign construction workers the same minimum wages as local workers (Bolton, 1995). However, it is should be noted that this only applies to those directly employed by firms working in Germany. The problem of implementing the directive lies with the fact that the parties involved cannot agree a reasonable time after which a person working in an EU country should be covered by local conditions. The itinerant nature of construction workers only compounds the problem. Together with the nature of construction employment it seems doubtful that any agreement will be concluded in the short-term. Until agreement is reached, a serious gap in labour and social legislation will persist, opening the door to social dumping and undermining the existing provisions of collective agreements. Despite the need for collective action in this area, national interests will remain a higher priority for many European governments.

There are a variety of wage systems within Europe. An understanding of wage systems is therefore important. Regulated wage systems, for instance, reflect developments in the skills of the labour process, and underpin the training provision, whereas deregulated systems are can lead to the fragmentation of industry-wide skills and so undermine formal training (Clarke, 1992b). In a socio-legal context the existence of different wage forms makes the establishment of equivalence between qualifications problematic. This in turn, can have an effect on the reliability of comparisons. Successive rulings, for example, by the German Federal Social Court, suggest that equivalence must be assessed between qualifications and occupations which have the same remuneration grades in collectively negotiated pay settlements.
Remuneration grades are the most reliable expression of the qualitative value associated with a given occupational activity by those participating in the employment system i.e., the two sides of industry (Benner, 1991).

This signifies that the direct establishment of equivalence for qualifications obtained outside German is the way in which employment is remunerated. The wage employment relation - and hence the wage form and the training provision this denotes - has no uniform structure within Europe. Indeed, the degree of disparity differs significantly in each country, with particular wage relations being especially dominant and playing an all pervading role in reproducing and upgrading the skill base.

Several studies have attempted to identify disparities in wage relations in the construction industry in and between selected European countries. By examining the different aspects of the wage forms, they have shown their inter-relation, such as the effects of changes in conditions of employment on the training provision. The following section critically examines the findings of these studies. This focuses on the work of the European commission and research carried out by a network of researchers in several European countries engaged in a wide range of studies on labour in the construction industry. An understanding of the training provision within the context of developments in the labour process is also important. In particular, it can be considered a prerequisite for mutual recognition, as it can be for the convergence of vocational training policies throughout Europe. This issue is also discussed.

8.6 Mutual Recognition of Qualifications

Directives providing for the mutual recognition of qualifications have been adopted by EU member countries in relation to many professions and occupations, including architecture and engineering (Spencer-Chapman and Grandjean, 1991).
Initially, the Commission of the European Communities (CEC) adopted a sector-by-sector approach to establishing the comparability of qualifications (Thom, 1992). This involved detailed harmonisation of minimum criteria which training for a particular profession had to meet. Since education and training had been harmonised the qualifications would be equivalent and, therefore, recognised in all EU member countries. Article 57 of the Treaty of Rome, to which additions were made by the Single European Act (SEA), is the legal basis for measures in this area. The four separate directives, issued in accordance with this Article, and other Commission initiatives that apply to different groups working in the construction industry are described below.


This directive requires EU countries to recognise any architectural qualifications of university degree standard in another EU country, provided it covers certain areas specified in the directive and provided it is of a specified minimum duration. However, unlike the harmonisation directives that apply to professions such as doctors, dentists and nurses, minimum criteria for required areas of training are not specified. The range of education, professional training, and the roles undertaken by architects in different countries led to problems in agreeing this directive. In Germany, for example, the education and function of the architect encompasses the work of a structural engineer, and to some extent the contractor's site management team. Seventeen years passed before the directive was finally adopted in 1985. Implementation of most of the provisions followed in 1987, with the remainder a year later.

- **First General Directive on Professional Qualifications** (89/48/EEC)

The problems associated with the architect's and other directives, particularly in agreeing training criteria, or in specifying course content, led the CEC to adopt a new approach. This approach merely requires the member countries to recognise qualifications awarded in another member country, subject to certain provisions.
The first such directive was adopted by the Council of Ministers in 1988. It deals with a general system for recognising professional education and training in regulated professions for university or equivalent courses of three years duration. The directive came into force on 4 January 1991 for all professions regulated by the state. Courses for engineers, surveyors and other construction industry professionals lasting for at least three years are covered by this directive. In most EU countries many of these professions are regulated by law, whereas, in the UK, for example, they are self-regulated. Provisions have been made in the directive, therefore, to take account of different circumstances in the UK and elsewhere. Activities have been deemed to be regulated:

‘if its is pursued by the members of an association or organisation the purposes of which is, in particular, to promote and maintain a high standard in the professional field concerned and which, to achieve that purpose, is recognised in a special form by a member country etc.’ (Spencer-Chapman and Grandjean, 1991, p 173).

In the UK, the chartered institutes satisfy the criteria and have been delegated power to exercise functions under the directive. The body that regulates the profession must accept a qualified person from another EU country, subject to only certain provisos that may be imposed. A host country may, for example, require evidence of professional experience where education and training in the other country is at least a year shorter than in the host country.

*Second General Directive on Professional Qualifications* (92/51/EEC)

In 1992, the second general diploma directive on the mutual recognition of professional qualifications was adopted. This was an extension of the approach taken for the professions and applies to occupations lower down in the hierarchy. The directive covers the recognition of qualifications gained after education and training other than higher education of at least three years duration.
One of the fundamental problems with this directive, however, relates to the regulation of occupations. Many activities that are regulated in one country are not regulated in another. In Germany, it is necessary to have a qualification to practice as an electrician or plumber, whereas, in the UK no formal qualifications are necessary.

- **Certificates of Experience Directive (64/427/EEC as amended by directive 69/77/EEC)**

A number of EU directives make provision for the issuing of certificates of experience covering trades and occupations in different sectors. Directive 64/427/EEC provides for such certificates to be issued for construction trades. The aim of this directive is to ensure that experience of practising a particular trade in one member country is recognised in another member country.

- **Comparability of vocational qualifications**

The CEC, assisted by the European Centre for the development of Vocational Training (CEDEFOP), has sought to establish a measure of comparability of vocational training in skilled trades among member countries. The exercise was initiated by the Council of Ministers in 1985. Subsequent Council resolutions in 1990 and 1992 allowed CEDEFOP to complete their work by 1993. This covered occupations and their corresponding vocational qualifications from 19 industrial sectors, including a comparison of construction qualifications representing 38 different trades at Euro-level 2 (National Vocational Qualification (NVQ) level 3). In principle, therefore, both jobs and the qualifications can be compared. Nevertheless, this comparability falls far short of direct equivalence. The latter goal is impeded by fundamental differences in national qualifications and certification schemes.

The results of the comparability exercise for the construction industry have been published by the CEC in four officials journals (OJs).
Table 8.4 presents details of the relevant publications and the list of construction trades covered in the study. Table 8.5 shows an example of the results of the exercise for the stonemason and bricklayer trades.

Table 8.4: Details of construction craft and related trades covered under CEDEFOP’s comparability scheme.

<table>
<thead>
<tr>
<th>Construction sector</th>
<th>Public works sector</th>
<th>Metal work sector</th>
<th>Electrical sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>OJ No. 89/C292</td>
<td>OJ No. 93/C20</td>
<td>OJ No. 91/C196</td>
<td>OJ No. 90/C321</td>
</tr>
<tr>
<td>Stone mason &amp; cutter</td>
<td>Crane operator</td>
<td>Refrigeration Fitter</td>
<td>Energy distribution</td>
</tr>
<tr>
<td>Painter &amp; Decorator</td>
<td>Scaffolder</td>
<td>Steel erector</td>
<td>networks electrician</td>
</tr>
<tr>
<td>Mason Bricklayer</td>
<td>Construction plant operator</td>
<td>Construction</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>Floor &amp; Wall tiler, Mosaic design layer</td>
<td>Platelayer/Tracklayer</td>
<td>metal worker</td>
<td>fitter</td>
</tr>
<tr>
<td>Concrete worker</td>
<td>Scaffolder</td>
<td>Ventilation</td>
<td>Building Electrician</td>
</tr>
<tr>
<td>Roof Slater &amp; Tiler</td>
<td>Mason Paviour</td>
<td>pipefitter</td>
<td>Maintenance</td>
</tr>
<tr>
<td>Roofing Felt Sheeter</td>
<td>Mastic Asphalter/Insulator</td>
<td>Plumber</td>
<td>electrician</td>
</tr>
<tr>
<td>Roof Sheeter &amp; Cladder</td>
<td>Insulator</td>
<td>Boiler Plater</td>
<td>Electrical fitter</td>
</tr>
<tr>
<td>Construction Carpenter</td>
<td>Pipelayer</td>
<td>Pipe fitter</td>
<td></td>
</tr>
<tr>
<td>Construction Joiner</td>
<td>Sewer Builder</td>
<td>Welder</td>
<td></td>
</tr>
<tr>
<td>Plasterer</td>
<td>Well driller</td>
<td>Mechanical</td>
<td></td>
</tr>
<tr>
<td>Insulator</td>
<td>Water Worker</td>
<td>fitter</td>
<td></td>
</tr>
<tr>
<td>Building Glazier</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The CEC’s aim was to establish a system of comparison and information that would be utilised throughout the EU. Analysis of the results of the exercise have, on the whole been favourable. Commission reports have, in general, underlined the benefits of the work done by CEDEFOP, emphasising the value of the scheme in promoting mutual awareness of different qualifications across the EU (see, for example, EIRR, 1992). However, several problems with the results are apparent, particularly in relation to the construction trades. These relate to: the accuracy of the information; the methodology used in the comparison; the differences between skills as trained, i.e. the content and level of courses, and skills as practised; and the continuous development of the nature of the job, through the influence of technological de-skilling on trade demarcations.
Table 8.5 Descriptions of practical job requirements for the Stonemason & Cutter and the Mason Bricklayer trades

<table>
<thead>
<tr>
<th>Stonemason and cutter</th>
<th>Mason Bricklayer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duty:</strong> The stonemason &amp; cutter is a skilled worker capable of performing, in an autonomous and responsible manner, finishing and laying of cut stones and producing claddings and coverings of natural stone.</td>
<td><strong>Duty:</strong> The mason bricklayer is a skilled worker capable of performing, in an autonomous and responsible manner, bricklaying and masonry repair works for building and maintenance of structures, in particular using artificial and natural stone, brick and block.</td>
</tr>
<tr>
<td><strong>Tasks:</strong> On the basis of technical documentation and in accordance with current health and safety regulations, he/she performs primarily the following tasks: 1. Organizing his/her workplace. 2. Cutting and measuring stones to be used: setting out and preparing templates. 3. Preparing the cut stones with handtools or machines and finishing their surfaces by means of the techniques usual in the occupation of stonemason. 4. Carrying out preparatory work for laying and fixing of stone blocks and slabs. 5. Moving, placing and fixing stone. 6. Producing decorative elements in stone. 7. Pointing and grouting of joints. 8. Producing surface finishes in accordance with stonemason techniques. 9. Maintaining, repair and restoring stones.</td>
<td><strong>Tasks:</strong> On the basis of technical documentation and in accordance with current health and safety regulations, he/she performs primarily the following tasks: 1. Participating in the organisation of the site and safety arrangements and in the organisation of his/her workplace. 2. Laying the foundations. 3. Laying drainage and sewage pipes for buildings and constructing inspection chambers (manholes). 4. Constructing loadbearing and non-loadbearing external walls and partitions. 5. Making and spanning openings. 6. Building in and placing elements. 7. Building chimneys and fireplaces. 8. Setting out and building staircases. 9. Applying mortar rendering. 10. Placing damp proof courses and also heat and acoustic insulation. 11. Carrying out maintenance, repair and restoration work.</td>
</tr>
<tr>
<td><strong>Remarks:</strong> 1. In Denmark, Germany, Greece, Luxembourg, Italy and Ireland, the stonemason and cutter also produces sculptured and artistic works and makes gravestones. He/she also makes gravestones and monuments in Belgium and the Netherlands. 2. In the Netherlands, the stonemason and cutter carries out maintenance of hand tools. 3. In Denmark and Portugal, the tasks listed under points 4, 5, 7 and 9 are also carried out by the mason bricklayer.</td>
<td><strong>Remarks:</strong> 1. In Belgium, Germany, France, Greece, Luxembourg, Portugal and the Netherlands, the mason bricklayer also carries out shuttering, concreting and reinforced concrete work. 2. In Denmark the task described under point 3 is not carried out by the mason bricklayer. 3. In the UK, the trade s that a bricklayer. 4. In Denmark, Ireland and Spain, the mason bricklayer also does refectory work. 5. In Portugal, Ireland, the Netherlands and Spain, the mason bricklayer also carries out simple tiling work. In Denmark he/she carries out all types of tiling work. 6. In Denmark, Portugal and Spain, the mason bricklayer also carries out the work of the roof slater and tiler. 7. In Ireland, the tasks described under point 6 are normally carried out by the carpenter. 8. In the Netherlands, the mason bricklayer does not normally carry out the task described under point 8. 9. In Denmark, Germany, Spain and Greece, the mason bricklayer does cementing and plastering.</td>
</tr>
</tbody>
</table>

Source: CEDEFOP
There are inaccuracies in the description of the practical job requirements and the comparative tables of certificates and diplomas for the construction trades. In Britain, for example, the trade of stonemason is generally divided into two parts; the banker mason, who works and shapes the stone at the yard or quarry or sometimes on site; and the mason fixer who actually lays the stone, whom is now commonly replaced by the bricklayer, except in high quality restoration work. In the tasks listed in Table 6.3 it appears that laying drains would also be one of the mutually agreed requirements. However, this is the exception in Britain.

There are a number of problems with the methodology adopted by CEDEFOP. International comparisons can give rise to difficult problems in the area of occupations and qualifications. Bertrand (1992) argued that comparative studies need to be multi-dimensional and include institutional, sociological and cultural aspects. These aspects tend to be specific to the national context and cannot be easily compared.

In CEDEFOP's work, job descriptions comprising elements common to all countries, for each occupation were agreed. The problem faced by experts involved in compiling the lists of national qualifications was the definition of occupational levels corresponding to Level 2 of the European classifications. These definitions leave room for interpretation. Moreover, while it may be easy to list tasks in a particular job, it is difficult to define the average situation, given the differences that exist in the division of labour between companies. An additional problem relates to the classification systems used in individual countries, and the fact that occupations can be entered into through a variety of ways. An analysis of the classification systems used in EU countries, revealed a large variety of methods used to identify and classify skilled workers (Bertrand and Marechal, 1981). Differences were identified from one country to another, but also in many cases between various systems used in the same country. The definition of the skilled worker category is the reason for the existence of different classification systems.
The continuous developments of the construction labour process since the Second World War is another aspect overlooked in the CEDEFOP exercise. Clarke (1992a) recognised that even though the construction labour process has become more qualified, many labourers and craftsmen have at the same time been de-skilled. Increasing mechanisation on site and the growth of off-site prefabrication, for example, has had a profound effect on the carpentry trade. However, all trades have been affected. This includes plasterers, painters and bricklayers, through the increased use of plasterboard, concrete and steel frames.

'The overall effect is that building workers have become less differentiated from each other as skills are more on a par, with each required to have skills including labourers. Work processes, have therefore, become significantly more integrated, interdependent, and overlapping, requiring a greater knowledge of how the work of one impinges on another and how to communicate this' (Clarke, p 19).

The dilemma faced by CEDEFOP revolves around the definition of a skilled construction trade. What constitutes a construction trade in one country may be different from that in another country. In all EU countries, the skilled worker category exists, albeit implicitly, if not in the classification directories, but it is the definition that is the problem. It is a difficult problem to solve because it concerns the very concept of qualifications; a social concept. Definitions therefore relate to the social and institutional context. Differences between countries in relation to the definition of skilled workers can arise for two reasons: from the vocational training system, in particular, whether vocational is school-based or industry-based; and the recognition given to that training in industrial classification systems. This recognition often depends on the historical nature of relations between the two sides of industry; i.e. employers and trade unions.

Craft classifications must be seen in their historical, industrial and social context. However, several problems must be overcome before a practical instrument for comparison can be developed. Bertrand (1992) identified three main problems:
• the conflict with efforts to list and classify tasks brought about by the trend towards the blurring of occupational activities, the restructuring of the work and the instability of the work organisation;

• how best to describe corresponding national situations in terms of occupations, access and training in the development of a European grid of basis tasks; and

• the required level of detail in the identification of core tasks.

The CEDEFOP exercise is useful in that it defines the parameters of future comparative studies and in promoting mutual awareness of construction training systems. However, the mutual recognition of qualifications must remain a long-term objective. The lack of formal recognition of qualifications between Germany and Britain, for example, has not prevented the employment of large numbers of British craftsmen on German construction sites. It may be that existing informal systems will bring about the formal recognition of qualifications at a later stage. Clearly, there is a need to compare not only vocational training systems and qualifications but the historical, industrial and social constraints on construction skills used and training provided within a national context. Several studies have attempted to make quantitative and qualitative assessments of differences that exist between European countries. This work is reviewed in the section below.

8.7 Comparability of Construction Training Systems, Qualifications and Wage Labour Relations

There has been a spate of comparative studies of the construction labour process in Europe over the past few years which have been invaluable in pinpointing peculiarities in different countries. Table 8.6 presents a summary of recent studies of the labour in the European construction industry.
Table 8.6: Recent studies on labour in the construction industry in Europe

<table>
<thead>
<tr>
<th>Research Group</th>
<th>Title of Research</th>
<th>Geographical Coverage</th>
<th>Methodology Adopted</th>
<th>Final Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helen Rainbird &amp; Gerd Syben</td>
<td>Restructuring a Traditional Industry: Construction Employment &amp; Skills in Europe.</td>
<td>Britain, Denmark, France, West Germany</td>
<td>Various</td>
<td>Book Published 1991</td>
</tr>
<tr>
<td>European Foundation for the improvement of living and working conditions</td>
<td>From Drawing Board to Building Site: Working Conditions, Quality, Economic Performance.</td>
<td>Belgium, France, Germany, Italy, Netherlands, UK</td>
<td>Data analysis</td>
<td>Project Report Published 1991</td>
</tr>
<tr>
<td>International conference supported by Deutsche Forschungsgemeinschaft und Fachhochschule Dortmund</td>
<td>Development of wage forms in the European Construction Industry.</td>
<td>(West) Germany, Britain, GDR, Hungary, Soviet Union</td>
<td>Various</td>
<td>Conference Proceedings Published 1991</td>
</tr>
<tr>
<td>David Lanove</td>
<td>The wage cost in the construction industry: Attempted comparison.</td>
<td>All EC states (except Denmark &amp; Luxembourg)</td>
<td>Based on data collected from employers’ federations</td>
<td>Project Report Published 1990</td>
</tr>
<tr>
<td>University of Westminster, Fachhochschule Dortmund and University of Technology in Eindhoven</td>
<td>Comparative analysis of the impact of vocational training on quality and productivity in the construction of housing.</td>
<td>Britain, the Netherlands and Germany</td>
<td>Detailed empirical site studies</td>
<td>Academic papers, workshops Completed Autumn 1995</td>
</tr>
<tr>
<td>Isabelle Dupré (BERES) &amp; Janet Druker (University of Greenwich)</td>
<td>Collective agreements and Social partners in the European Construction industry today.</td>
<td>Belgium, France, Germany, Great Britain, Italy and Spain</td>
<td>Surveys of union and employer organisations at national and European levels</td>
<td></td>
</tr>
<tr>
<td>Research Group Researcher(s)</td>
<td>Title of Research</td>
<td>Geographical Coverage</td>
<td>Methodology Adopted</td>
<td>Final Product</td>
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</tr>
<tr>
<td>Jörn Janssen (Fachhochschule Dortmund) &amp; Bruno Racine (ERETRA), in co-operation with Linda Clarke (University of Westminster) and Janet Druker (University of Greenwich)</td>
<td>Transformation in the employment of labour in the European Construction Industry.</td>
<td>France, Germany, Britain and Italy</td>
<td>National surveys</td>
<td></td>
</tr>
<tr>
<td>BAQ research institute for employment, labour, qualification</td>
<td>Wages and income in the European construction Industry.</td>
<td>France and Germany</td>
<td>Case studies, questionnaires and statistical analysis</td>
<td>Project report; &quot;information pool&quot; of data on structures of income in construction in Europe To be completed by the summer of 1996</td>
</tr>
<tr>
<td>Linda Clarke (University of Westminster), Phillipe Méhaut and Frédéric Gérardin (Université de Nancy) Jörn Janssen and Hans Günter Müller (Fachhochschule Dortmund) and Bozena Mikolajczyk and Andrzej Borowicz (University of Lodz)</td>
<td>Disparities in wage relations and the reproduction of skills in the European Construction Industry.</td>
<td>Britain, France, Germany and Poland</td>
<td>Case studies of different categories of labour, the site on which these are found and the firms responsible; macro level statistical analysis.</td>
<td>Project report, academic papers. Intermediate results: Academic papers and European Seminar on wage forms in the European Construction industry. Project period April 1994 to April 1996</td>
</tr>
<tr>
<td>Claudio Pellegrini</td>
<td>Collective Bargaining in the Construction Industry; Wages; Hours and Vocational Training in Belgium, the Federal Republic of Germany, France, Italy, Spain and the UK.</td>
<td>Belgium, Federal Republic of Germany, France, Italy, Spain and UK</td>
<td>Data analysis</td>
<td>European Commission Report published 1990</td>
</tr>
<tr>
<td>Research Group Researcher(s)</td>
<td>Title of Research</td>
<td>Geographical Coverage</td>
<td>Methodology Adopted</td>
<td>Final Product</td>
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</tr>
<tr>
<td>BAQ research institute for employment, labour, qualification Co-operating institutes: Bartlett School for Architecture and Planning, Technical University of Denmark, Ecole des Ponts et Chausées, Universita di Venezia, Hochschule Bremen</td>
<td>Joint Ventures in the European construction industry.</td>
<td>Denmark, Britain, Germany, Italy</td>
<td>Case studies, open questionnaire based interviews, analysis of documents</td>
<td>Project report; consisting of four or five case studies and theme papers. Intermediate results; International consortia in the European Construction Industry (intermediate report). Theme papers on project management and concession contracting Completed September 1995</td>
</tr>
<tr>
<td>Linda Clarke, University of Westminster</td>
<td>Training Provision and wage form: the example of the construction labour process in Europe.</td>
<td>Britain, Germany, France</td>
<td>Surveys</td>
<td>Project Report Draft publication 1992</td>
</tr>
<tr>
<td>S.J. Prais and Hilary Steedman, National Institute for Economic and Social Research Co-operating institutes: various training organisations and bodies in the UK and France</td>
<td>Vocational Training in France and Britain: The Building Trades.</td>
<td>France and Britain</td>
<td>Data analysis, structured interviews</td>
<td>Academic papers published 1986</td>
</tr>
<tr>
<td>Research Group Researcher(s)</td>
<td>Title of Research</td>
<td>Geographical Coverage</td>
<td>Methodology Adopted</td>
<td>Final Product</td>
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<td>--------------------------------------------------------------------------------------------</td>
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<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>John Henry, Regional Technical College, Limerick (Ireland) Co-operating institutes; Bovis Construction Ltd. (UK); ORCO group (Greece); Fach Hochschule Hildersheim/Holzminlen (Germany)</td>
<td>“Conquest” - skills analysis for Construction supervisors. Conquest - Construction Qualifications European Skills Training is a project supported by the European Commission under the task force in human resources FORCE programme.</td>
<td>Germany, Greece, Ireland and UK</td>
<td>Questionnaires, workshops</td>
<td>Academic papers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intermediate results; Conference paper published 1995</td>
</tr>
<tr>
<td>BAQ research institute for employment, labour, qualification</td>
<td>Leading staff on site in construction.</td>
<td>France and Germany</td>
<td>Questionnaire based interviews, analysis of documents</td>
<td>Project report Project concluded in April 1995</td>
</tr>
</tbody>
</table>
Nevertheless, the findings and conclusions of each needs to be treated with a certain amount of care, given the dangers of any comparative analysis described above. The purpose of this section is to examine the validity of some of these studies.

The most extensive international comparative research on forms of employment of construction labour hitherto was carried out by the French Centre d'Études et de Recherches sur les Qualifications (CEREQ) from 1986 to 1988: *Comparison internationale du BTP*. It covered four selected countries of the European Union—Germany, France, Italy and the UK and was financed by Plan Construction under the Ministry of Building. The survey work was undertaken by four teams from each country. Related to the depression in the industry in the mid-1980’s in France, the guiding question was whether the crisis was attributable to the nature of the construction sector or to the peculiarities of the French mode of employment. The main findings of the study suggest that in order to understand the organisation of initial vocational training in each country, it must be related to the educational system as a whole, and also to labour market mechanisms (Campinos-Dubernet and Grando, 1992).

Contrasts were drawn between the three types of training model:

- **market-led industry-based model** geared strictly to short-term labour market shifts, which operate in Italy and the UK; and

- **training-led school-based and industry-based models**, which tend to anticipate both a quantitative and qualitative supply and demand for labour, and emphasise contents of programmes that involve a high degree of institutionalisation, e.g. provision of a network of vocational schools and training centres jointly funded by industry and government, found in Germany and France.

The market-led industry-based model is highly dependent with a loosely institutionalised nature.
Thus technological developments would be difficult to incorporate into education and training systems. Training in both Italy and the UK was identified as heterogeneous, both in terms of quality and quantity with very little commitment to training from either state or industry. The French and German training systems were found to differ as do the role played by industry. Whereas, the dual system-consisting of extended periods of study coupled with on-the-job training predominates in Germany. In France, the school-based vocational training system is the norm.

The CEREQ study is undoubtedly the most comprehensive study on the development of labour in the European construction industry. It also set a standard for comparative work, being a penetrating and theoretically consistent attempt to identify and analyse qualitative rather than quantitative (though these are not neglected) differences between the four countries. It shows the extent to which the construction industries bear the features of modes of employment specific to national conditions of the sector.

Most of the comparative studies embarked on since have not had the same theoretical ambitions as CEREQ and are therefore more descriptive, and unconcerned with analysing historical development and the rationale of different systems, leaving differences largely unexplained. Examples are the studies of Pelligrini (1990), comparing wages, hours, benefits, and forms of employment in six West European countries, and the European Federation of Builders and Woodworkers (EFBWW) comparing provisions in collective agreements, including detailed aspects of working time, pay and earnings, and benefits, in sixteen countries (EFBWW, 1991).

These studies illustrate the weakness of any comparison of this nature; provisions under each item vary so much from one country to another, and without an examination of the different social and historical contexts to which they are attached it is impossible to understand why this is so and wherein real differences lie.
Similar problems were encountered with other studies. In a comparison of wage cost relating to skilled construction operatives in EC countries (with the exception of Denmark and Luxembourg) based on collective agreement and statutory charges, Lanove (1990) noted that the objective of the study were difficult to achieve, and that any attempt to identify with maximum accuracy the nature of the wage cost in each country was fruitless.

However, the value of the study is perhaps not so much that it allows for quantitative comparison of wage rates and costs, but more that it shows the qualitative differences in the composition of the wage components and the difficulty in identifying an average, minimum or maximum, rate in some countries, whereas it may be relatively easy in others. Since the study was published, the situation of the wage cost have dramatically changed in Europe due to two main factors; the influx of east European labour and the economic recession in western Europe. Fluctuations in wage costs vary widely according to industrial relations and the legal position of labour in the individual countries. But, although the results of the study may have been invalidated, the qualitative analysis is useful.

An understanding of sociological, historical and industrial aspects is also important for the comparison of training systems. Several studies have compared vocational training and qualifications for the building trades in France, Germany and the UK.

The work undertaken at the National Institute for Economic and Social Research (NIESR) falls into this category of research: see for instance the work of Prais and Steedman (1986), Steedman (1992) and Steedman and Hawkins (1994). Although valuable in their description of differences in national qualifications and training systems, these studies give no consideration to the inter-relationship between training and wage labour relations in individual countries. This contrasts with the approach taken by Clarke (1992a) in a similar study on training in Germany, France and the UK.
The wage form is understood as the qualitative aspect of the wage relation, relating all forms of payment—wages, salaries, incomes, bonuses, allowances, insurances and benefits— their respective methods of negotiation and determination. If the wage form implies a particular means of reproducing and developing skilled labour, it follows that different wage forms frame different forms of the training provision. Clarke (1992a) noted that the way in which skills are defined predetermines both the value they are accorded and the way in which training provision is conceptualised.

Comparing existing qualifications and training systems is a difficult process. Without examination of their different social and historical contexts it is impossible to understand the true nature of national training arrangements and wherein differences lie between different European countries. Even the examination of these different contexts is fraught with difficulty, especially given the very different approaches in each country.

A great danger exists if particular aspects of the labour process in each country are simply directly compared across countries, without first confronting the significance of each variable within the country ensemble considered. A one-to-one comparison of variables isolated for each country has little explanatory value and may just end up propagating a best model derived from one country but not transferable to another.

8.8 Summary

This chapter has assessed the acceptability of movement between various regions of Europe. This included an examination of patterns of such movement and an analysis of the risks and benefits of labour mobility. Measures to regulate and control labour mobility, along with initiatives to promote the movement of labour were also reviewed.

The completion of the single unified market has given rise to current discussions relating to the freedom of movement within the European Union on the one hand, and migration towards the EU on the other.
Any such discussion has to take into account that migrations and foreign workers as well as migration flows within and towards the EU present a rather heterogeneous picture. In this chapter current trends and especially the problem of short-term contracts for migrant workers were outlined. However, the extent and variety of labour mobility is not sufficiently recorded in national labour market statistics to allow any reliable analysis to be undertaken. This situation is compounded by casual nature of employment in the construction industry throughout Europe. However, some useful, but limited data were identified. These data indicate that the number of foreign workers employed in the European Construction industry varies from one country to another. As does their country of origin. Whereas, in the northern European Union countries, especially Germany, the majority of foreign construction labour originates from Central and Eastern Europe, in the southern EU counties workers originate from the Maghreb region of north Africa.

The benefits and risks associated with labour mobility were identified as follows:

**Benefits**

- workers from low-wage countries moving to countries with higher-income levels can improve their individual living conditions;

- employers in the host country can gain benefit financially from the use of foreign labour providing that services are costed on the basis of lower foreign wages;

- the employment of foreign workers can be used to ease skill shortages, particularly in countries where labour-intensive construction work is considered unattractive.

**Risks**

- providing that the demand for labour exceeds the supply, the employment of foreign labour does not directly threaten national workers. However, unrestricted access to labour markets can restrict further improvements in workers' rights;
• casual and low-wage employment can delay the substitution of labour by capital-intensive methods. This can restrict growth in labour productivity, and the adoption of efficient construction methods;

• further erode training and the development of an indigenous skilled workforce; and

• differences in wage levels within Europe can give construction companies an unfair advantage in high-wage countries, particularly if they employ significant numbers of foreign workers not subject to local regulations.

The free movement of labour across national borders was always one of the long-term aims of the European Union. A number of measures to promote the freedom of movement of workers. These incorporate, in part removing unnecessary barriers to labour mobility, and in part encouraging and promoting movement. The principle of free movement was enshrined in the original Treaty of Rome, and one of the objectives of the single European market has been to facilitate labour mobility by encouraging cross-national comparability of qualifications, social security cover and conditions of employment.

As part of its Social Charter providing basis rights for workers, the European Commission has also made a number of proposals to ensure that atypical work in the construction industry is more closely regulated: in the field of safety at work, conditions of employment, labour law and social security. However, dramatic results have so far not been achieved.

The unified single market may accelerate existing developments, particularly those inherent in occupational and vocational training systems. Harmonisation of vocational education and training systems in Europe is however, neither possible nor desirable the face of existing differences and the interest of the preservation of cultural variety. The current activities of the European institutions are aimed at opening-up vocational training systems to allow the exchange of information and people, and to facilitate the slow process of integration.
Europe-wide descriptions of practical job requirements and their respective qualifications drawn-up by the European Commission should be treated with a certain amount of care. CEDEFOP, the organisation responsible for comparing vocational training and qualifications for the construction trades defined skills in terms of practical job requirements. However, the danger in this approach is that these definitions and the training associated with them may then be narrowly conceived and even specific to a particular firm.
CHAPTER NINE

CONCLUSIONS, RECOMMENDATIONS AND FURTHER RESEARCH

9.1 Introduction

The overall aim of this thesis was to develop a systematic planning process that offers the opportunity for gathering information for construction labour markets throughout Europe. Such a process would benefit the construction industry by identifying imbalances between the demand and supply of specific construction skills. In order to plan, the construction industry must: appreciate the complexity of labour resource requirements; understand the long-term planning implications; have reliable information; and be aware of any restrictions or limitations on the planning exercise. These were reflected in the main objectives of this research which were to: identify and collate useful and reliable sources of data on construction labour resources throughout Europe; construct a robust model to predict labour resource trends; and assess the acceptability of movement between various European regions. Conclusions resulting from the objectives are presented in this chapter. Recommendations are made, and the direction of future research is also suggested.

9.2 Conclusions

The competitive success of any industry depends upon its ability to employ and sustain an appropriately skilled workforce. Demand for skills arise directly from firms' attempts to achieve competitive success: from striving to reduce cost and to extend markets. Conversely skill shortages retard the growth of industry. Such shortages often give rise to many adjustments that generally have adverse effects on output and productivity.
Firms adjust their operations to adapt to available supplies of labour, raw materials and other inputs. To this extent, skill shortages may not persist for long. But adjustments made by firms in order to survive skill shortages may involve heavy costs to the economy in terms of lost employment and output, and poor quality.

Future skill requirements, and training initiatives designed to meet them, are highly topical issues in the construction industry. Recently there has been much discussion in the construction press about the crisis in training and the mounting concern over skill shortage (e.g. Building, 1996). The Construction Round Table (a client-dominated forum) recently published a report critical of the level of competence across the whole industry (Construction Round Table, 1996). The government are about to commission a thorough review of construction training led by the Construction Industry Board (CIB). Interested parties in the construction industry can only hope that the report goes beyond identifying problems and solutions, but also finds mechanisms to turn the rhetoric into reality.

One of the main findings of this research was that in the future general recruitment of construction labour is likely to be more difficult in the light of known demographic changes and new sources of supply may need to be found (see Chapter 2). Beyond the issue of training quantities lies the need to train for appropriate skills.

Appropriate training can only be developed if training needs are carefully identified. This requires that interested parties in the construction industry understand and anticipate the skill needs of their workforce. This can only be achieved if they are in possession of detailed information on the availability of labour resources on a regional basis.

The construction process is undergoing a gradual transformation, mainly as a result of new technologies being introduced into the supply industries. These changes in turn have far reaching consequences on the nature of work, the occupational skills required and on the job content. These developments are not restricted to one particular country.
Consequently, when taken together with the measures to create a single European market, they will compel the construction industry to pay particular attention to finding European solutions.

Organisations concerned with labour market issues in construction have traditionally worked independently, often taking decisions on the basis of incomplete information. The development of a systematic employment planning process offers the opportunity for gathering comprehensive information on the availability of labour skills on a regional basis. The essence of this research was to develop the information tools that would be useful for the proposed process. The following section presents a summary of the research findings in three sections:

- nature and sources of labour resource data in Europe;
- development of labour supply forecasting model; and
- acceptability of movement of labour within Europe.

9.2.1 Nature and Sources of Construction Labour Statistics in Europe

The research has demonstrated that the construction industry has no reliable information base upon which to relate supply and demand forecasts, either in the numbers or in skill levels, either at international, national or local levels. Key sources of available statistical information relating to the construction industry in seventeen European countries were identified, and descriptions of the information held by each source were obtained through literature search and questionnaire survey.

The identified sources demonstrated that the availability and quality of the existing construction industry labour statistics varied considerably from one country to another. Statistics across Europe were not consistent in relation to their scope, definition and timing of collection.
Even within countries the data were suspect. In the UK and Switzerland, for example, the information available is categorised by region, industrial sector and occupational trades. UK statistics are compiled from different sources with different definitions. In Ireland the information is available for all sectors of construction. In the Netherlands, Poland and Hungary construction is more broadly classified. There is a potential for double counting and the statistics are inconsistent, disparate and incomprehensible. This is compounded by the casual nature of employment in the informal sector within individual European countries, and because the majority of construction firms are small, many employing no more than five people.

The research has demonstrated that due to the differences in available data, meaningful comparisons of labour statistics between one country and another are near impossible to achieve. Whilst this is not important for the primary purpose of providing statistics and sources for clients working in a particular country, it is an unsatisfactory situation for Europe as a whole. One consequence is that companies' labour resource decisions are taken on the basis of partial information. This can result in erroneous policies being adopted. If, for example, it is believed that there is no local stock of unemployed quality labour available, then firms will continue to maintain poaching practices and will implement them at the first sign of upturn.

Though neither the availability of information nor the availability of employment planning per se will guarantee the avoidance of future shortages, both are an essential first step towards those policies that must be adopted. Unless and until a reliable database of construction skills is developed, much needed employment planning will be near impossible to undertake.

There are several ways in which the necessary information can be generated. One might be to design new local employer surveys. This will be expensive and time consuming, and justifiability resented by the industry. Another might be to disaggregate the national data generated by labour force surveys. These are all insufficiently comprehensive, accurate, timely and/or precise enough in their occupational definitions to provide the information required.
Whatever form of database is decided upon, the main focus must be at the local labour market level. The compilation of a database of construction workers, based on the registration and certification of tradesmen, may provide a mechanism for gathering information on the availability of skills on a regional basis.

It is well known, from the studies of Clarke (1992a) for instance, that there are many routes to achieving trade or craft status in the construction industry, of which apprenticeship is only the most visible and statistically measurable. At the other end of the spectrum, many operatives have little or no formal training, and the achievement of craft status has not been dependent upon the generalised, recognised uniform standards. This often makes it difficult for recruiters to make informed choices. It also raises the question about the quality or otherwise of available construction skills.

On the evidence of this research, there is a clear need for the establishment of specific minimum skill standards for each stage of training in all occupations, with certification of recognised levels of competence and attainment. Such standards should form the basis for the registration of skills, leading eventually to that industry database that could be so valuable at a regional level. The recent introduction of competence-based qualifications in the UK construction industry, coupled with the registration of trades on the basis of these new qualifications, should go some way to achieving the ultimate goal of formal recognition of construction skills.

9.2.2 Development of Labour Supply Forecasting Model

The future supply of construction skills is governed by the recruitment of young people, together with some upgrading of semi-skilled workers to skilled jobs. The potential for modelling labour supply was identified and provided an insight into influences on this supply of trainees.
A human capital approach to analysing labour supply was used as a theoretical framework for developing such a model. This approach was originally applied to the apprentice entrants to the engineering industry by Bosworth (1988) and has been adapted in this thesis for the construction training market. In accordance with this approach, each individual is perceived as having a choice between two occupations; in this case, to enter the construction industry as a craft trainee or any other job outside the industry. In making occupational decisions individuals are likely to consider earnings, not in the actual sense, but relative to what they could get in alternative occupations. The hypothesis that the proportion of young people choosing to train as construction operatives is governed by the real craft wage and the long-term prospects of the construction industry was also tested. The results were consistent with the human capital view of labour supply. The craft wage and output were found to have a strong influence on the supply of new entrants to construction, together with demographic factors and socio-environmental factors, such as young people's perception of the industry.

The declining number of young people entering the labour market and increased staying-on rates will intensify competition between employers for that category of employee. Employers offering the most attractive remuneration package and career structure will have the greatest success fulfilling their skill requirements. Those industries not known for offering competitive pay and employment prospects, such as construction, will inevitably suffer from this practice. This prospect may lead some construction employers to adjust their remuneration packages.

Unlike other industries, such as manufacturing, the adoption of such a policy would not only depend on continuity of work, but also that industry's ability to train new entrants in the first place; level of activity in the industry governs the supply of training places. The rise of employment and labour-only subcontracting in the 1980's coincided with lower levels of formal training. Very few of these firms engage in any training; to do so would be to jeopardise current profits. In the future, the construction industry is likely to face severe difficulties recruiting new entrants from the available pool of young people.
In its present form, the proposed labour supply model can only be used to predict short-term trends. However, the methodology for developing such a model has been established. Medium-term forecasts will require further model development. This work will have to await the collection of detailed statistical information on key supply-side variables on a more regular basis.

9.2.3 Acceptability of Movement Within Europe

The construction industry requires a high degree of mobility from its employees. Contracts of employment tend to be short-term, people work for many different employers, and there is poor job security with alternating periods of high and low employment. Throughout Europe employers and employees in the construction industry recognise the benefits of labour mobility, at least from an economic perspective. However there are risks involved in such movement. If low paid migrant workers are employed in countries which have a highly regulated labour market this can lead to unfair competition between enterprises and threaten the development of the indigenous labour force.

In the future, if there is likely to be significant flows of labour skills between Britain and the rest of Europe and *vice versa*, then this movement will be governed by several factors, such as the state of the economy, market pressures and the availability of employment opportunities in Britain and elsewhere. Common European labour regulations and the mutual recognition of qualifications are less significant in promoting labour mobility. Employment planners in the construction industry will need to identify the direction of the net flow, and any resulting change in the skills composition. If these international movements should prove to be significant an attempt should be made to model flows, and integrate such a migration model into the employment planning process. A large amount of data would be required for such an exercise in addition to co-operation from the appropriate European construction planning authorities.
Looking much further ahead into the future, therefore, it may not be sufficient to envisage the planning of construction skills in a purely domestic context, international factors would also need to be taken into account.

9.3 Recommendations

The following recommendations can be made on the basis of the investigations presented in this thesis. These relate to future strategies and the availability of construction industry labour statistics required for planning purposes.

9.3.1 Training Strategies

In the late 1990's, the 16 year-old male school-leaver with low academic achievement will represent a smaller proportion of the UK population. It is widely recognised that this 16 year old is the construction industry’s traditional source of labour, so recruitment difficulties are almost certain to arise. It will become increasingly important for construction employers to offer good training if they wish to effectively compete with other industries and sectors for a share of this increasingly scarce resource.

Alternative sources of supply may need to be explored, including adults, young women and migrant workers from other European countries. In the first instance, construction companies should consider re-training their existing workforce to meet future skill requirements.

Construction companies need to clearly identify their training needs in the context of their markets and technology; they need managers skilled in understanding their own labour resource requirements, and how best to provide on-site work experience.

Construction depends upon a supply of highly skilled operatives to provide flexibility across a multitude of tasks in different types of work. Technical knowledge is growing in importance relative to manual skills.

All workers in complex projects need to be trained to have a broad overview of the characteristics of new machinery and prefabrication, and in modern construction methods.
The continuing decline in the number of people receiving training needs to be reversed. The industry needs to work hard to remove barriers that hinder the commitment of resources to training, the organisation of training and the provision of appropriate training courses. Clients could help to promote training by writing clauses into contracts, as is currently practised in the engineering construction sector. Training needs to be carefully regulated when it forms part of the contractual agreement.

9.3.2 Availability of Construction Industry Labour Statistics

Support needs to be given to the new skills certification scheme through encouraging contractors to use skill-certified operatives. This certification scheme will help provide information on the availability of skills on a regional basis, which is so vital for predicting the supply of labour skills.

In the future the move to National Vocational Qualifications in construction promises the prospect of comprehensive registers of labour skills by occupation and region. Obviously it will take time to build this NVQ register and in the short-term there are likely to be many gaps. Perhaps by the end of the decade sufficient progress will have been made for reliable annual statistics on construction occupational training to be collated. Once these are in place it will be possible to produce medium-term forecasts of training inflows to construction using the model described in this thesis.

It is crucial that the appropriate European agency commission a study to assess the feasibility of harmonising the reporting and collection of statistics related to construction. However, any attempt to establish a common definition of construction throughout Europe is fraught with difficulty. The definition of construction is heavily dependent on the relationship between industrial partners and collective bargaining practices; these vary from one country to another. Nevertheless, a core definition could be adopted, incorporating all activities which are common to construction in each country. The revised classification must reflect and enhance existing methods of collecting labour resource data if future supply predictions are to have any degree of accuracy.
9.4 Further Direction of Research

Throughout this thesis, the author has made a number of recommendations for further research and development, these are now summarised below.

The importance of reliable, good quality data in decision making and planning cannot be over-emphasised. Therefore, better and more readily available data on the demand for, and the supply of construction skills is very important for effective employment planning and forecasting in the industry.

Any type of research on construction labour resources will be useful, because this area of study is not fully explored. There is a need for research into the feasibility and cost of alternative mechanisms for improving the type of data relevant to planning construction labour resource needs.

Considerable research into employment flows in the industry is needed. Investigators might begin by assessing factors that influence labour mobility, particularly at the European level.

It has been demonstrated that data on construction employment and unemployment by trade, sector and region are remarkably sparse throughout Europe. In the absence of these data, it is virtually impossible to obtain a quantitative assessment of the state of the national construction labour markets.

Because of the importance of employment data in the forecasting and planning for construction labour, research on the costs associated with data collection and the benefits of collecting such data is important. This research must focus on how to evaluate the costs and benefits of collecting such data in the construction industry.
References


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Green, A and Bosworth, D.L (1988) Demand and Supply of Craftsmen and Technicians in Engineering. Project report to the Engineering Industry Training Board. Institute of Employment Research; Coventry, University of Warwick.


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APPENDIX A

Main developments in construction training since 1945
Main developments/trends in construction training since 1943/5

The 1943 White Paper 'Training for the Building Industry' expressed concern over the need for expansion of the industry after the war with the shortage of skilled labour. Its recommendations set the pattern of training for twenty years or so;

1. Special Training Scheme for adults (started 1945). These were short courses (six months) in Government Training Centres (GTCs) with grants provided by central government. There had been vocational training schemes since 1917 in such Centres for disabled ex-servicemen, and, after 1924, for unemployed. The 1948 Employment and Training Act established vocational training on a permanent basis. But the programme was actually run down from 80 Centres in 1947 to 13 Centres in 1962. After-1962 there was expansion again and by 1971 there were 52 Centres. From 1974 the Centres were the responsibility of MSC/TSA, and under the TOPs scheme continued to expand to 60 Centres in 1979.

2. Establishment of Building Apprentice Training Council: "to observe and advise on all matters concerning recruitment and education of training of young persons for the industry and to encourage by all appropriate means development of craft apprenticeship schemes on comprehensive basis."

It was an advisory not an executive body e.g. it set up a register of apprentices and issued a series of recommendations including the National Apprenticeship Scheme, which was adopted and administered by National Joint Apprenticeship Board of the industry, with regional and local Joint Apprenticeship Committees (representatives of employers and operatives). The Scheme included written agreements by the employer and the provision of further education (one day or two half days a week) for up to 18 years old. The Committees (local) were responsible for encouragement of recruitment, arranging apprenticeship agreements, transferring boys from employer to employer, sending forward names of approved apprenticeships for registration. They also supervised the Apprentice Master Schemes in the area.

The Apprentice Master Scheme was a temporary measure in the immediate post war period, set up by Ministries of Works and Labour in conjunction with Ministry of Health. New apprentices were trained on local authority sites by an apprenticeship master - instructors employed by firms nominated by JAC. The local authority had a special contract with the Apprentice Master, under the guarantee the Ministry of Works reimbursed any excess costs of building from the scheme.
Six months training with further education (FE) counted towards apprentice timeserving. The scheme was discontinued in 1952 due to high costs of building under the scheme.

In 1957 the Building Apprentice Training Council produced its Final Report and its functions were taken on by NJAB.

The 1958 Carr Report dealt with apprenticeships, recommending that the State should continue to play an encouraging and supportive role, and leave training to the industry.

The 1959 Crowther Report recommended expansion of FE and proposed that all 16 and 17 year-olds receive FE.

The 1961 ‘Better Opportunities in Technical Education’ (White Paper) recommended expansion of courses for technicians, craftsmen and operatives, with the result that the local colleges soon offered such courses.

The 1964 Henniker-Heaton Report recommended the doubling of day release, but compulsory day release was excluded from its terms of reference.

In 1960 the NAJB decided to encourage expansion of pre-apprenticeship courses in the light of the Carr and Crowther recommendations, including in the general education of 15 year olds a practical introduction to building.

In 1963 the apprenticeship period was reduced from five to four years in some regions and, nationally, in 1965.

The 1964 Industrial Training Act was intended to:

a) ensure a good supply of trained workers;
b) improve the quality and efficiency of industrial training;
c) distribute training costs equitably.

It established Industrial Training Boards (ITBs). The Construction ITB was one of the first established (July 1964) and is one of the largest.

ITBs are tri-partite organisations of employers, unions and educationists. They are required to impose levy on firms, and are empowered to pay grants to firms and organisations providing approved training.
With the 1973 Employment and Training Act the position of ITBs was changed with the general reorganisation of manpower services. MSC through the TSA (Training Services Agency) has a hand in the Boards' financial management and independent power to raise levies is reduced, by the introduction of exemption from the levy if the firms meet a certain level of training. Administrative expenses are met by public funds through the MSC.

Financial leverage of the MSC also increased with Special Measures 1975-79, to combat unemployment. These included: premium grants (per capita grants to employers recruiting young people for long term training); grants for training award schemes e.g. finance of first year training with FE e.g. CITB's.

New Entrants Training Courses were established in 1974/5. The 1974 apprenticeship period was reduced from 4 to a maximum of 3 years (NET 2_ years). Therefore two types of training have come to exist at craft level; on-job with day release of block; and NET - up to 6 months off-job plus day release in the 2nd and 3rd years.
APPENDIX B

Examples of Mathematical competence in the NVQ 2 Brickwork course
Examples of mathematical competence in the NVQ Level 2 Brickwork Course

*Ratio* - for example, ‘If a scale of 1:20 was used for a detail drawing, what would 5mm on the drawing actually represent full size?’

*Addition* - for example, ‘Add together the following dimensions taken from a detail drawing: 8.500m, 3.720m, 0.470m’.

*Area* - for example, ‘If a block wall contains 10 blocks per square metre, state the number of blocks required for a wall 4.0m long and 1.500m high’. Conversion of units eg, ‘A datum peg is 1.725m above the concrete foundations. How many courses of bricks are required to build a wall 2.775m high?’

*Multiplication and division* - for example, ‘If a half brick wall contains 60 bricks per metre squared, state the number of bricks required for a wall 8.0m long and 1.5m high’.
APPENDIX C

European Labour Statistics Questionnaire
INTRODUCTION

1. We are keen to establish what are the main central sources of construction industry labour statistics throughout Europe, in particular, to identify the extent to which the existing available data is broken down by sector, region, trade and whether these statistics are updated regularly.

2. The construction industry includes building, civil engineering and engineering construction, plus ancillary sectors, such as heating and ventilating, thermal insulation and electrical contracting.

3. Construction industry labour statistics include the number of operatives employed and those unemployed in the industry.

4. We would, therefore, be grateful if you would complete the following brief questionnaire and kindly return it to:

   Andrew Agapiou,
   Department of Civil Engineering,
   Loughborough University of Technology,
   Loughborough, Leicestershire, LE11 3TU, U.K.

Thank you for your help, please return the questionnaire by 31 May 1992.
LOUGHBOROUGH UNIVERSITY OF TECHNOLOGY
EUROPEAN STATISTICS QUESTIONNAIRE 1992

GENERAL INFORMATION

1. What is the name of your organisation?
..............................................................................................................................

2. What country is it based in?
..............................................................................................................................

3. What type of organisation is it?
Trade ........................................ Professional ........................................
Official/Governmental ................... Other, please specify..............................

4. Are your members active in the following sectors of the construction industry?
Building ........................................ Civil Engineering ..............................
Engineering Construction .............................. Thermal Insulation ..............................
Heating and Ventilation .............................. Electrical Contracting ..............................
Others, please specify ..........................................................

STATISTICAL SOURCES

5. What are the sources of construction industry labour statistics in your country/organisation?
Please include a contact name and address, if possible.

(a) primary sources ..........................................................
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(b) secondary sources ..........................................................
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(c) other relevant sources ..........................................................
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### Availability

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#### By Skill Level:

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#### Updated:

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#### By Trade:

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| Telecommunications Fitter | Energy distribution | Networks Electrician | Mechanical Fitter | Welder | Pipe Fitter | Boiler Plater | Plumber | Ventilation Pipe Fitter | Construction Metal Worker | Steel Erector | Refrigerator Fitter | Stonemason & Cutter | Painter & Decorator | Mason Bricklayer | Floor & Wall Tiler | Concrete Worker | Roof Slater and Tiler | Roofing Felt Sheeter | Construction Carpenter | Construction Joiner | Plasterer |  |
APPENDIX D

Sensitivity Analysis
Sensitivity Analysis

The supply of labour skills depends on a number of different factors. Construction output and the real craft wage were found to have a positive effect on trainee supply, along with demographic trends and young people's perception of the construction industry (see Chapter 7). The dynamic specification of the trainee supply model in Table 7.4 indicates the effect of a change in each of the four variables holding all else constant. Despite the problems associated with the quality and reliability of the key input data used in model building, data errors seems likely to be small. There is a need, however, identify how the model system would be affected by variability in the key data by performing a sensitivity analysis. This was undertaken by simply altering the value of each variable in the system, in turn, and then re-running the regression analysis.

Figure D1 shows the influence of changes in the key variables on trainee supply in construction.

The results of the sensitivity analysis are fairly predictable. It should be noted that these results are peculiar to the labour supply model being developed. They reflect the details of the specification of the model and its data base. Nevertheless, the information presented in Figure 1D provides a useful guide to the effect of changes in the key supply-side variables on trainee supply. Whereas, changes in the real craft wage, raw, and the demographic trend variable, dty, have a uniform effect on trainee supply, changes in construction output, co, have a more dramatic effect on the construction training market - trainee supply increases exponentially as output increases.

The trainee supply model was developed using aggregate data. If more detailed and reliable statistics were available, it would then be possible to assess the likely effect of changes in key variables on different sectors of the construction training market, including the proportion of women and ethnic minorities in the construction industry.
Figure D1. Results of Sensitivity Analysis