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Euroconstruction Report 1

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CONSTRUCTION INDUSTRY FEDERATION

and

TRINITY COLLEGE DUBLIN

Ireland

LEONARDO DA VINCI PROJECT

EUROCONSTRUCTION

Report 1

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5 April 1998

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Introduction

This report was prepared on behalf of the Construction Industry Federation as Ireland's initial contribution to the Leonardo da Vinci Project: Euroconstruction.

The report is divided into 3 sections.

Section 1 concentrates on the recent and likely future changes in the structure of the Irish construction market and the impact of these changes on project management and project financing. The recent growth of the industry is documented and predictions for the future of the industry in Ireland are summarised. The conclusions reached show that an increased involvement in the financing of public projects is required from the private sector if current levels of construction activity are to be maintained.

Section 2 identifies the needs of construction companies and project management specialists in the areas of project management and project financing. The findings show that an increased level of training, particularly in the area of project financing is required.

Section 3 reports on the existing educational and training courses in Ireland, both public and private, on project management and project financing. The report concurs with the results of the survey in section 2, that the area of project financing is not well catered for at present.

Section 1

Report on the recent and likely future changes in the structure of the Irish construction market and the impact of these changes on project management and project financing.

After a period of declining output (-7%) in 1992 and 1993, the Irish construction industry experienced a period of rapid growth between 1994 and 1996 - when output is estimated to have increased by a cumulative 40%. Output further increased at a rate of over 11% in 1997 and is forecast to grow at a rate of 8% in 1998.

The main positive factors affecting the performance of the industry have been the continuing rapid growth of the economy (average 4.5% per annum since 1991); the large volume of inward industrial investment; significant growth in employment and real disposable incomes; the ready availability of mortgage finance at relatively low interest rates (currently around 7% APR); and the success of the Urban Renewal Scheme underpinned by tax incentives.

An all time record of 33,700 houses were built in 1996. This was exceeded in 1997 when in excess of 38,000 houses were completed and a similar output is expected in 1998.

The value of the output of the construction sector exceeded IR£7 billion in 1997 and is expected to reach IR£8 billion in the current year. The industry now accounts for 17% of total economic activity in the State and is now significantly bigger than the output of the agricultural sector (£3.5 billion) and the tourism sector (£2.3 billion).

The Public Capital Programme (PCP), which is published by Government annually as part of the budgetary and estimates process, sets out planned capital expenditure by the State, State bodies and local authorities. The PCP affecting construction totalled £1.85 billion in 1996 and represented almost one-third of total building output. This includes project finance, loans and grant aid support. The construction element of the PCP has grown by just under 10% per annum, in real terms, since 1989 - with the assistance of substantial funding from the European Union (EU) under the Community Support Framework.

The bringing of Ireland's infrastructure gradually up to European standards has been greatly assisted by grant funding from the EU. A total of approximately

IR£4.7 billion worth of construction investment will be grant aided in Ireland by the EU over the period 1994 to 1999.

Ireland also has the fastest growing construction sector in the EU as demonstrated by the figures in Table 1 which are the percentage changes in GNP for various EU countries (Source: ESRI Quarterly Commentary). The prospects for the construction industry between now and the end of the century are good. The positive economic, monetary and demographic factors underlying the recent excellent performance of the industry look set to continue for the foreseeable future .

Table 1. Percentage change in GNP for various EU countries

GNP - % change		
Country	1996	1997
UK	2.5	2.75
Germany	1.5	2
France	1.5	2.5
Italy	0.75	1
Ireland	6.5	5.5
Total EU	1.5	2.5

Direct employment in the construction industry has now reached 100,000 which compares with the figure of 70,500 in April 1993. The outlook for 1998 is for continuing strong growth in employment of approximately 6,000. Allowing for indirect employment, the total number of people employed in the construction industry is now over 135,000, equivalent to 10% of the total number employed in the country. The construction industry has accounted for 14% of the total increase in employment throughout the economy since 1993 and this increases to over 20% when the full multiplier impacts are taken into account.

The continuing strong recovery in construction has major benefits for the Exchequer as over 30% of the money spent on construction represents state revenue. Furthermore, increased activity translates immediately into increased employment which reduces social welfare costs.

International comparisons

The *Strategic Review of the Construction Industry (1997)* published jointly by the Department of the Environment and the Construction Industry Council draws the following international comparisons between Ireland and other EU Member States:

- In 1994, fixed investment represented about 15% of GDP in Ireland, which was lower than the EU average (18%). Current figures are not yet available but it is generally agreed that this gap is reducing.
- Construction represented 62% of total fixed investment in 1994, which was above the EU average (58%).
- Housing investment in 1993 represented 47% of construction investment, which was higher than the EU average (43%).
- The cumulative growth in construction output in Ireland since 1994 is not matched in any other EU Member State.
- Construction output represented 13% of GDP in Ireland in 1995, which was higher than the EU average (12%).
- Construction output per capita (1995) in Ireland (1800 ECUs) was lower than the EU average (2000 ECUs).
- The number of houses built per 1000 population in Ireland (6.3 - 1992; 9.4 - 1996) is significantly higher than the EU average (5.3 - 1992).
- The market for construction work and building products in Ireland (1995) represents about 1% of the EU Internal Market.
- Ireland's construction costs at 1994 figures were significantly lower than the EU average (residential buildings - 64%; non-residential buildings - 86%; civil engineering - 73%; total construction - 71%).

Construction investment cycle

Construction investment in Ireland, as in all free enterprise economies, is cyclical. Private sector investment is the most volatile component and is responsive to expectations of economic (market) growth at home and abroad. Other factors affecting this volatility are the monetary climate (availability and cost of finance) and the fiscal climate (elements of tax regime particularly affecting construction e.g. mortgage interest tax relief, urban renewal tax incentives).

Public sector investment has also fluctuated, but less markedly than private sector investment. The scale of public investment depends on a variety of factors - including assessments of needs and policy on the public finances. The PCP has grown strongly in real terms each year since 1989, with the assistance of funding from the EU. This has had a major impact in limiting a downturn in construction demand between 1991 and 1993, relative to the experience of certain other EU Member States, and in the subsequent strong growth in construction activity between 1994 and 1998 inclusive. The industry however should not rely unduly on the PCP to stabilise the long term demand in construction for the following reasons:

- 1) The difficulty world-wide, of reliably forecasting investment. The performance and prospects of the industry varies between the key sub-sectors: housing, civil engineering and general building. This makes it virtually impossible to time accurately the release of additional public investment to offset a predicted falloff in private investment;
- 2) Constraints affecting public expenditure - in the interest of prudent budgetary management and a reduction of the overall tax burden. In addition, the Maastricht criteria governing eligibility for membership of the Economic and Monetary Union (EMU) impose a financial discipline on EU Member States wishing to participate in the EMU. Financing increases in the PCP in an economic downturn when tax receipts are under pressure will be increasingly difficult due to the constraints of the stability pacts which Ireland will be obliged by post 1999.
- 3) Expenditure on many areas of public investment is driven by increased demand to facilitate sustained economic growth and are therefore likely to be of a cyclical nature.

The PCP is primarily designed to finance priority public investment needs, having regard to the financial capacity of the Exchequer. A secondary benefit of the PCP is its positive impact on construction output. Maintenance of the PCP in real terms, would have a stabilising effect on output.

EU Funding Post 1999

EU assisted construction works in Ireland will total an estimated IR£4,7 billion (1994 prices) over the period 1994-1999. The great bulk of this projected capital expenditure is on transport infrastructure (46%), industrial development (17%) and environmental services (13%).

Payments made under the structural funding arrangement were made on the basis of the "Objective One" status assigned to Ireland for the last round of disbursement of EU funding. Such status is assigned to the EU's poorest regions - those with less than 75 per cent of the EU average per capita GDP.

However, during 1994-96 - the period used for assessing funding entitlements for the next round - Ireland's per capita GDP was approximately 90 per cent of the EU average, a level which precludes entitlement to Objective One status. Agenda 2000 proposes a "soft landing" with Ireland's £800 million a year share of EU structural funds substantially preserved in the first two years of the next century. However, Ireland will then face substantial annual cuts until the year

2006, when it will receive just 20 per cent of the £800 million which is now being received.

To offset the drop slightly, Ireland may benefit from the allocation after the mid-term review of a 10 per cent reserve designed to reward those countries which make good use of the funding. However, in 2006 Ireland is likely to fall into the "Objective Two" category - that for areas going through industrial restructuring or rural decline. Arrangements for funding after that are not yet decided but the likelihood is that the then new EU states, such as Poland, Estonia and Slovenia, will take a substantial proportion of the available funding.

Cohesion funds of up to £200 million per year have been paid to Ireland since 1994 for use on major infrastructural projects, such as roads, water supply projects, etc. For the period 1994-99, states with under 90 per cent of average EU GNP per head qualified for cohesion funds. Ireland will qualify until the 2004 midterm review of the next round of EU funding as eligibility is based on the average GNP per head during 1995-97, during which Ireland's figure stood at 85.7 per cent of the EU average. It has since risen above the 90 per cent threshold so Irish access to cohesion funding will almost certainly be cut off in the mid-term review. Up to 2003, Ireland will receive 9 per cent of the total EU cohesion fund, which amounts to some £220 million per annum. After that, this source of funds to Ireland appears certain to be cut off completely, based on our current GNP level.

Circumstances are changing. As the economy is forecast to grow at twice to three times the EU average over the next decade the following observations could be made:

- Ireland's infrastructure endowment will need to grow apace.
- A significant economic infrastructure development lag is already evident with congestion clearly a problem in many areas.
- EMU restrictions on the government's borrowing requirement suggest a new approach to the financing of public infrastructure and the provision of public services.
- By the year 2004 there will be a very sharp shortfall in EU Cohesion and Structural Funds which at present account for around 22% of the PCP.
- Private sector savings are growing, while the investment rate in infrastructure is among the lowest in the EU.

It is generally accepted within the industry that public funding will not be enough to sustain output in the early years of the next century. It is for that reason that

the other funding options are being explored. One such option is that of Public-Private Partnership (PPP).

A PPP is a partnership between public sector organisations on the one hand and private sector investors and businesses on the other, for the purpose of designing, planning, financing, constructing and/or operating an infrastructure project or a service normally provided by the State. Essentially, for the State, PPP shifts expenditure from capital spending now to future current spending.

The idea of the private sector investing in public infrastructure projects is not new. Nor is the concept of the private sector delivering public services. In the past, very few such schemes have been tried in Ireland, primarily because the Exchequer can borrow at cheaper rates than the private sector.

The key feature for a successful PPP is the allocation of project risks between the public and private sectors according to each party's ability to manage and bear these risks. The sensible distribution of risk can help broker deals faster and instil confidence between the contracting parties.

Private sector financing is not just about the private sector financing capital projects in return for an income stream, it makes use of private sector skills and management expertise to deliver public services more efficiently. Essentially this involves providing input at the design stage; delivering the best construction price or the most competitive cost base; arranging the necessary financing; and providing high quality project management.

PPPs are commonplace across the EU and are regarded as an essential feature in the financing of infrastructure. In mainland Europe France has, perhaps, developed the concept to the greatest extent with the "shared risk concession" between public and private partners being the most frequently used method of project financing. This mechanism is designed to yield an adequate rate of return for both parties. French local authorities have considerable experience of PPPs. With EU funding, PPPs are in progress in Portugal (Tagus Bridge) and Greece (Spata airport). New Member States too are testing the PPP formula. Finland used a Design, Build, Finance and Operate contract to up-grade a 70km stretch of primary road network. The rail link between Stockholm airport and the city's central railway is another example of a PPP. In the UK, the Private Finance Initiative (PFI) has increased the involvement of private sector finance in public sector projects such as infrastructure, health and education services, social welfare payment systems and prison services.

Impact on project management and project financing

The use of PPP as a means of construction would cause a shift in the control of projects from the clients to project management consortia. Consequently this would necessitate the acquisition of skills in the areas of project management and project financing by these consortia. Construction companies already use skills in the management of the construction phase of contracts but involvement in PPPs would require commitment to all the phases of projects from inception through to and beyond completion of the construction phase. A number of Irish contractors have already acted as Project Managers, guiding large projects from inception through to completion. The level of management in these projects however was generally confined to the control of the design and construction phases, it did not normally encompass the financing of the project or the operation of the facility after completion of the construction phase.

The consortium would therefore consist of contractors and other organisations with expertise in areas such as long term financing, banking and facilities management.

Conclusions

1. Ireland's construction industry has experienced a period of substantial growth from 1993 to 1998. Strong growth is forecast to continue at least until the year 2002.
2. The level of EU funding currently being received has had a major positive impact on growth in the industry. This level of funding will gradually decrease as Ireland's GDP approaches the EU average. Plans must now be put in place to cope with this anticipated reduction in funding.
3. Ireland's infrastructure will not have reached the standard of that in other EU countries by the time EU funding is reduced. The level of capital funding must then be sustained through either increased funding from the Exchequer or the formation of a number of Public Private Partnerships (PPP) to carry out key infrastructural projects.
4. The project management skills currently available in Irish construction have been used in the design and construction phases of projects rather than over the entire life-cycle of the structure, with a small number of notable exceptions (for example, the construction of toll bridges by National Toll Roads). Project financing experience within Irish construction companies is also concentrated on the period up to completion of the structure rather than over the entire life-cycle of the structure. Acquisition of such skills would be necessary for any company considering embarking on a PPP type project.

Section 2

Identification of the needs of construction companies and project management specialists in the areas of project management and project financing

Introduction

While the skills of project management would appear to be available at a specific level in at least some contracting organisations, the availability of project financing skills to the level required in a PPP type project are not generally apparent. In order to establish the needs of the industry in relation to the areas of project management and project financing, a survey was carried out among Irish contractors and practising project management specialists.

The following groups were represented among those who replied to the survey:

- independent project management consultants
- individuals working for construction - related consultancy organisations
- senior managers within construction companies
- construction managers and quantity surveyors working at project level within large construction organisations
- facilities managers

Survey to identify needs of project management and project financing

Those participating in the survey were asked to respond to the following questions:

1. Define your understanding of the term “Project Manager”?
2. Identify the needs in project management among senior management in construction firms and among project managers in construction?
3. What skills are required by a Project Manager?
4. In your opinion, are the training and educational opportunities currently available in Ireland adequate to prepare an individual for a career in project management?

5. What changes, if any, would you suggest should be made to our educational and training facilities in order to provide better preparation for a career in project management?
6. What are the needs in project financing among senior management in construction firms and among project financiers in construction?
7. What skills are required by a Project Financier ?
8. In your opinion, are the training and educational opportunities currently available in Ireland adequate to prepare an individual for a career in project financing ?
9. What changes, if any, would you suggest should be made to our educational and training facilities in order to provide better preparation for a career in project financing ?
10. Please comment on any aspect of the needs of clients or contractors in the area of project financing or project management.

The responses to question 1 described the role of the Project Manager as that of the client's representative who was responsible for all aspects of the project from inception to completion. A small number of respondents, while concurring with this use of the title Project Manager, referred to the alternative use of the title to describe the contractor's representative on site.

Question 2 produced a list of needs which concentrated on the need for training in the following areas:

- communication skills
- contractual and legal aspects
- information technology.

Also highlighted was the need to promote an understanding of the role of the Project Manager among clients and other construction professionals.

The responses to question 3 divided the skills required into two areas: inter-personal and organisational. Technical knowledge was also identified as essential.

Inter-personal skills included those of: leadership, motivation, negotiation and conflict resolution.

Organisational skills included: analysis, planning, monitoring, controlling and decision making.

Technical knowledge included: technical knowledge of the project, contractual knowledge, knowledge of legislation relating to construction (including health and safety legislation), appreciation of all stages of the project and an understanding of the input of each contributing individual or organisation.

Question 4 produced a wide range of responses, split broadly into three categories:- those who were satisfied that the current educational & training opportunities were adequate (20%); those who felt that, while the number of courses currently on offer were of a high standard, they were too few and were not spread sufficiently throughout the country to fulfil the needs of the industry (65%); those who stated that, while they have no particular views on this matter, they are aware of some courses currently on offer (15%).

Of the changes suggested in response to question 5, most respondents referred to the need for interdisciplinary understanding, with those preparing for a career in project management being given an opportunity to experience the work of each of the professions within the industry. Education should include actual project experience and the use of case studies in areas such as partnering and financing to broaden the exposure to a wider range of experience. Recommendations suggested a need for primary and post - graduate degrees in construction project management. It was also suggested that training in project management should be carried out using a similar system and to the standards required to achieve the designation of Chartered Engineer. The Institute of Project Management refers to the title Project Management Professional (PMP) which is awarded by the Project Management Institute in America to degree qualified project managers with 4,500 hours professional experience in the field of project management.

Questions 1-5 (inclusive) drew a broad response from those surveyed, suggesting a strong knowledge and understanding of project management. Questions 6-10 (inclusive) however provoked less of a response, suggesting that the respondents were generally less qualified in the field of project financing.

Respondents to question 6 concentrated on the training needs of project financiers. It was stated that construction organisations are not currently focused on such concepts as life cycle costing, with the most experienced not being currently involved beyond the completion of the construction phase of a project. Such involvement would require these organisations to acquire new skills. In the interim, organisations would need to hire the expertise from the financial services industry.

In response to question 7, replies fell into two categories:- those who understood a project financier to be a financial expert with experience in the construction industry; and those who understood such an individual to be a construction expert with training in finance. There are differences in the levels of skills which one would expect each of these individuals to possess. The basic necessary skills were identified as:

- ability to communicate confidently with financial institutions
- strong analytical skills in economics and finance
- a thorough understanding of finance in relation to legislation, interest rates, currency exchange rates and taxation
- ability to recognise potentially profitable opportunities
- interpersonal / managerial / communicative skills
- significant budgetary and cost control experience.

In response to question 8, the general consensus was that is an area which is not well served by current educational and training courses. Those involved tend to be either accountants or quantity surveyors who have developed the skills required through experience rather than through formal education or training.

The responses to question 9 reflected the earlier comments in relation to the changes necessary in the area of project management education and training, with suggestions including the need for specialist courses at primary degree and post-graduate level.

General comments (in response to question 10) on project management and project financing in Ireland included:

- the need for cultural change in moving from an adversarial approach in the industry towards a partnership / teamwork approach
- the need to establish the role of project manager as a separate discipline independent of the other professions
- the need to raise client awareness of the benefits of using a professional project manager.

Conclusions

1. The needs of Irish construction industry in relation to both project management and project financing are concentrated in the area of training.
2. There is a lack of awareness of the education and training available in these areas.
3. Training in construction project financing is generally perceived as an area where improvement is required.
4. There is a generally held view that project managers should possess a broad level of skill and knowledge in all professional construction disciplines rather than be a specialist in just one area.

Section 3

Report on the existing educational and training courses in Ireland, both public and private, on project management and project financing

Introduction

The provision of courses in project management in Ireland continues to increase as the demand for such courses rises. Due to such demand, the intake on the Trinity College Post Graduate Diploma in Project Management has been increased by 50% in the current year.

Provision of similar courses in project financing is weak, with no course currently available which specifically qualifies individuals in the area of construction project financing. A number of degree courses, however, are available in the area of construction economics and quantity surveying. These courses are generally aimed at the provision of quantity surveyors to the industry. Other financial and accountancy courses are available through the universities, but these do not cater specifically for the needs of the construction industry.

Educational & Training Courses

Course: *Post Graduate Diploma in Project Management*

Offered by: University of Dublin, Trinity College

Duration: One year.

Aims: To provide engineers and other suitably qualified graduates with a good appreciation of project management techniques and practice in civil engineering and construction. Further details of this course are contained in Appendix 1, a paper by Dr. T. Orr entitled *Education for Project Management*.

Topics

Covered:

- Project Management, Planning & Control of Projects
- Legal Aspects
- Project Accounting, Budgeting & Cost Control
- The Computer in Project Control
- Industrial Relations
- Health & Safety Regulations
- Personnel Management
- Contracts and Tendering Procedures
- Insurance and Claims

Course: *Diploma in Project Management*

Offered by: College of Business, University of Limerick

Duration: The Diploma in Project Management is taught during four semesters over a period of two years. During the course students are set a series of tutor marked assignments which are relevant to issues that occur within a project environment. In Year 2 of the programme, students undertake a project which gives them an opportunity to apply the skills learned during the course.

Aims: To teach the basic principles of good project management and related techniques through the study of eleven theoretical modules and one practical module.

Programme

Outline:

Year 1

Semester 1

Introduction to Project Management
Communication Skills
Basic Maths for Project Management

Semester 2

General Management Principles
The Projects Approach
Planning, Scheduling and Control

Year 2

Semester 3

Human Relations and Behaviour
Quantitative Methods
Project Assignment and Report
Career Opportunities

Semester 4

Computer Systems and Applications
Health and Safety
Project Assignment and Report

Course: *Master's Degree In Project Management*

Offered by: College of Business, University of Limerick

Duration: The Master's degree course in Project Management is part-time and held over four semesters during a continuous two-year academic period. The course commences each year at the end of September and is conducted over two 15 week semesters.

Aims: To prepare Masters' Graduates for career opportunities leading to senior executive positions in private sector companies and public sector organisations, or as managers within a project environment. Other career opportunities available include teaching and research.

Programme

Outline:

Year 1

Semester 1

Systems Approach: An introduction to Project Management
Organisations and Organisational Behaviour
Information Technology Skills

Quantitative Methods

Semester 2

Management Information Systems

Project Management Procedures & Techniques (A)
Project Planning and Control (A)
Decision Analysis in Projects
Research Project*

Year 2

Semester 3

Project Mgt Procedures & Techniques (B)
Project Planning & Control (B)
Human Resource Mgt.
Accounting
Research Project *

Semester 4

Quality Management in Projects
Financial Management
Business Economics
Research Project*

** the research project is also worked on by the student during the summer period between the spring semester of year 1 and the autumn semester of year 2.*

- Course:** *Diploma in Applied Project Management*
- Offered by:** Institute of Project Management in conjunction with University College Cork
- Structure:** A modular programme spread over 6 months with participants attending lectures 2 days per month.
- Aims:**
1. To help organisations of all types enhance their ability to compete by developing project management competency
 2. To prepare participants for certification as a Project Management Professional (PMP) through examination by the Project Management Institute (an independent American organisation)

Programme

Content: Project Management Overview

- Projects and their context, success and failure
- Management by Projects
- Project & Programme Management
- The role of the Project Support Office
- Global Project Management
- Project management information systems

Project Management Body of Knowledge

- Scope
- Time
- Cost
- Quality
- Risk
- Contract / procurement
- Human Resources
- Communications
- Integration

Managing People

- Project managers and their teams
- Motivation; problem solving and decision making
- Managing multi-disciplinary, cross-functional teams
- Organisational design and managing change
- Power, policies and influence in organisations
- Negotiation and persuasion

Managing Strategy

- Business policy and corporate planning
- Organisations and their environment
- Models and methods in strategy making
- Mission goals
- Competitive analysis; financial appraisal
- Stakeholder management
- Implementing through projects

Managing Finance & Contracts

- Owners and sponsors
- Investment appraisal, risk, raising finance
- Partners & consortia, supporters, suppliers and contractors
- Tenders, contracts

Consolidation

- Inter-modular case studies
- Project preparation & presentation
- Multiple-choice written examination

Course: *BSc Degree in Construction Management*

Offered by: Waterford Institute of Technology

Duration: Four years.

Aims: To prepare graduates for a career path in management of construction projects, construction product manufacturing facilities, property development, facilities management and in general business.

Subjects:

• Management Studies	• Project
• Construction Economics	• Construction Heritage
• Finance, Marketing and Law	• Mathematics and Computers
• Design of Structures	• Materials
• Geotechnics	• . Services
• Site Surveying	• European Language
• Construction Technology	• In Year 3, the first term is at the college followed by industrial placement from February to September
• Computers are used extensively in all subject areas.	

- Course:** *MSc Degree in European Construction Management*
- Offered by:** Waterford Institute of Technology jointly with the other three members of the ECMN, European Construction Management Network: ESIGEC, University de Savoie, Chambry, France, Fachhochschule, Karlsruhe, Germany, and The Nottingham Trent University, UK.
- Duration:** One year.
- Aims:** To educate managers for the EU construction industries by facilitating mobility within the EU's Single European Market, and by developing knowledge, skills and attitudes with regard to construction, business, culture and language.
- The acquisition of the necessary range of abilities to capitalise upon future in-service experience and training, and the development of the abilities and personal attributes which will be required by future managers of European construction firms.

Subjects:

- Management of Projects
- International Management
- Human Resource Management
- International - Economics, - Finance, - Marketing
- Technological Studies
- European Construction Law
- European Social/Cultural/Political Studies
- Dissertation OR Industrial Project
- French OR German (incl. one month intensive course)

Conclusion

At undergraduate level, project management is also taught in many Irish Universities and Institutes of Technology, as part of their civil engineering and architecture courses. A degree course in building, engineering and management is offered by the University of Ulster, as is a Master's Degree in Project Management.

Availability of training in Project Management in Ireland appears to be growing to match the current demand. There is, however, a shortage of specialist training courses in the area of project financing.

Conclusion

1. Ireland's construction industry is experiencing a period of expansion unparalleled in its history. A significant driver of this growth has been the funding provided under the EU Structural and Cohesion Funds. As the economy strengthens, Ireland is losing its status as one of the EU's poorer nations and will not qualify for the same levels of EU funding in the future. Ireland's infrastructure is still not up to EU standards and it is obvious that new funding options must now be investigated. One such option is Public Private Partnerships (PPP). To become involved in PPP, a construction company must develop skills in long term project management and project financing.
2. Those providing courses in project management have responded to the demand by developing several courses of differing levels in many locations across the country. Knowledge of all of these courses however is not widespread, as those surveyed, (as recorded in Section 2) commented regularly on some of the better known courses while displaying no knowledge of the others.
3. The provision of training courses in project financing is insufficient, according to those surveyed. Indeed while researching the availability of training courses in this area, the authors were unsuccessful in their search for a course which would provide the training necessary for a career in project financing on PPP projects. The development of such a course is recommended.

Appendix 1

Education for Project Management

Trevor L. L. Orr, Trinity College, Dublin University

1. Introduction

The concept of project management as a separate discipline has developed throughout the world during the last twenty years. Prior to 1970 the term project management was little used whereas today project management has matured and is now recognised as an important discipline and a distinct profession within construction and one which needs to be included as part of the education of those working in management capacities in this industry.

2. Courses in Project Management

To meet the need for education in project management, new courses on this subject have been established in many universities and institutions throughout the world. The first project management course in Ireland was the part-time postgraduate diploma course in Trinity College, started in 1977. An MSc course in general project management, including construction, has recently been started by the College of Business at the University of Limerick.

At the undergraduate level, project management is now taught as part of most civil engineering degree courses, including that at Trinity College. A four year degree course in construction management was started at Waterford RTC in 1987. A degree course in building, engineering and management is offered by the University of Ulster. Other courses in construction management are offered by the Institutes of Technology in Galway and Limerick, and the DIT Bolton Street, offers courses leading to membership of the Chartered Institute of Building (CIOB).

Apart from the universities and colleges, various other organisations, such as the Institute of Project Management, are now offering courses in project management.

3. Kinds of Learning

Before considering the specific subject of education for project management, it is helpful to examine the different kinds of learning that are involved in education. The following kinds of learning can be distinguished:

- Skills The ability to do specific tasks without necessarily being able to understand the process by which one does them. Examples of such skills include speaking, writing, computing and performing routine tests.
- Knowledge This is information that has been memorised and can be recalled in answer to a question. Some understanding is helpful as it is difficult to memorise meaningless material.
- Understanding This is the learning of the concepts and is a deeper type of learning than the learning of skills or knowledge. Understanding is essential in order to solve new problems and apply knowledge in new situations.
- Personal qualities These are attitudes and values, such as motivation, enthusiasm, inquisitiveness, independence and breadth of outlook.

All courses aim to provide these different kinds of learning in varying proportions depending on the nature of the course and the educational objectives. Undergraduate university courses are concerned with all these kinds of learning to provide a good education leading to a first degree. However, whereas university teachers generally emphasise the understanding aspects of their courses, often students will try to focus on the memorization of information in order to pass examinations.

A different type of course is the continuing education or updating course, such as the part-time diploma course in project management at Trinity College. This course is mostly concerned with providing knowledge and understanding although there is some teaching of skills, such as computing skills, and some development of personal skills is encouraged by the lecturers through the quality of their presentations and through relating their practical experiences.

4. Requirements for Project Management

In order to identify what courses offering education for project management should contain, it is worth examining the main characteristics of construction projects which are:

- New projects are constantly being undertaken and these are always prototypes in new locations with fluctuating levels and types of work.
- They normally require a relatively long time from conception to completion
- The construction phase is often conducted on a site remote from the contractor's main office
- Each construction project is unique and the inherent risks are higher than in other industries
- For each project a new team of workers at all levels is brought together for a limited period

to carry out the work.

These particular characteristics of construction projects, are in addition to the other characteristics found in projects in most other industries and need to be addressed in courses providing education for project management. The main qualifications and skills required by project managers in the construction industry are:

- technical expertise
- management expertise
- business expertise
- communication capabilities
- leadership skills

Undergraduate courses tend to concentrate on the teaching of technical expertise. There is some introduction to management and business subjects on civil engineering undergraduate courses but these subjects are not covered in depth. It is felt that the relevance of these subjects is more appropriate at a postgraduate stage, particularly on a part-time continuing education type of course where the student can readily relate the material to his work experience.

5. TCD Project Management Course

The information sheet for the Trinity College diploma course in Project Management states that "the aim of the course is to provide engineers and other suitably qualified graduates with a good appreciation and understanding of project management techniques in civil engineering and construction". Therefore, in the case of this course, it is an entry requirement that all the applicants already have the technical expertise required to be project managers. Hence, assuming the students have the technical expertise, the lecture programme concentrates on the teaching of management and business expertise with course modules on:

- project management and control in construction
- legal aspects of project management
- industrial relations
- insurances and claims
- tendering and contract procedures
- project accounting
- project budgeting and cost control
- the computer in project management

All of these modules are presented in the form of lectures, many with detailed handouts, with the emphasis on teaching knowledge and understanding. The only module where there is teaching of skills is on the computer module where students are given an opportunity to use project management related packages. Apart from the advantage of teaching computer skills, this module allows practical problem solving exercises to be carried out which enable the

students to apply their knowledge and to assess their understanding of different aspects of project management.

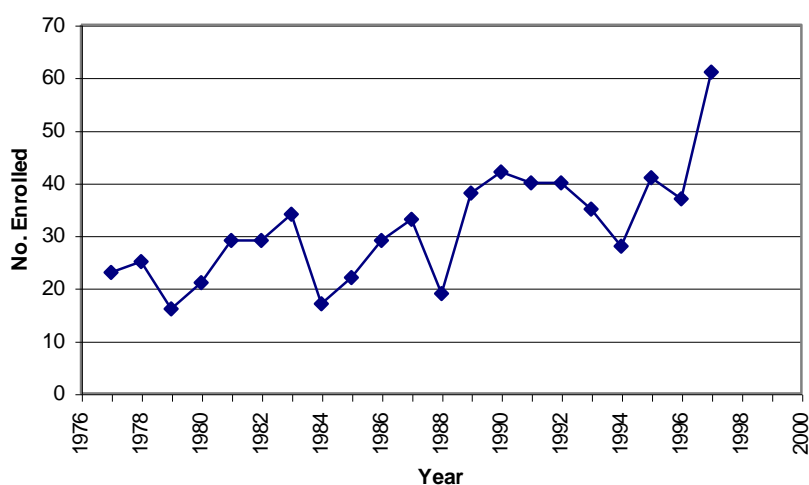
The teaching of communication capabilities is not given much emphasis in the Trinity College part-time diploma course, although discussion during the lectures and the questioning of the lecturers is encouraged. Proposals for the inclusion of a written project as part of the course have received serious consideration. However, so far a project has not been included because of the practical difficulties in organising and supervising such a project.

The fifth qualification required for a project manager, leadership skills, is probably the most important for a successful project manager. Leadership skills are not taught formally on the Trinity College diploma course although the development of expertise in the management and business areas together with relevant technical expertise and on-the-job experience lay a sure foundation for the acquiring of leadership skills.

6. Development of the TCD Project Management Course

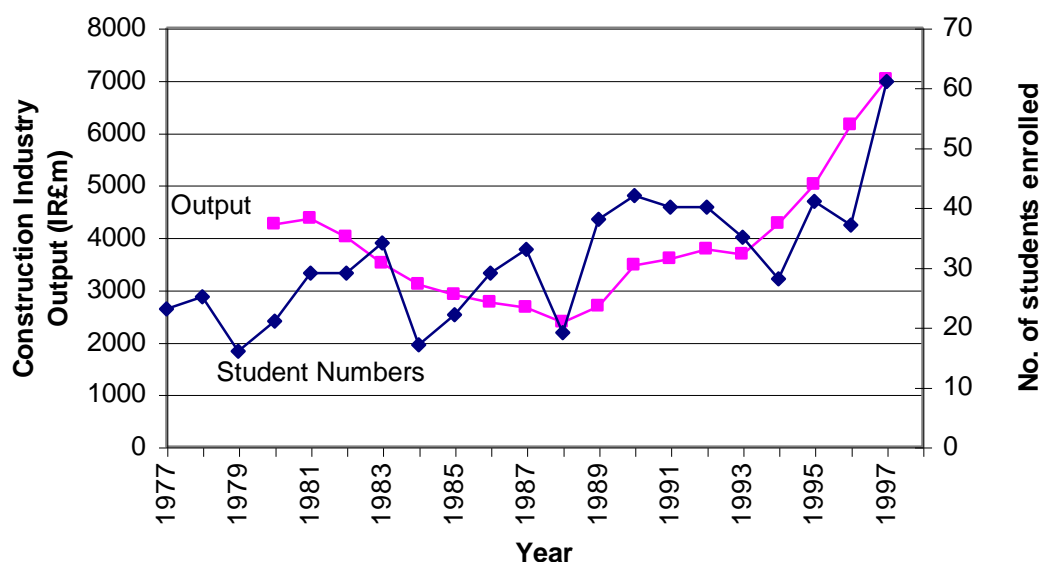
The Project Management diploma course at Trinity College started in 1977/78 with 23 students. It has been held every year since then with the number of students varying from a minimum of 16 in 1979/80 to a maximum of 61 in the current year as shown in Figure 1. The total number of students who have enrolled for this course is now 658. The variation in student numbers over the years partly reflects the peaks and troughs in the construction industry. This is shown in Figure 2 by the graphs of the total construction industry output between 1980 and 1997 plotted beside the graph of the number of students on the course since it started. The lowest construction industry output during this period occurred in 1988 which was also a year with a low number of students enrolled. The high numbers between 1989 and 1993 were due to the

Fig.1 Number of students enrolled each year for the TCD Project Management Diploma course



expansion of the construction industry but was also due to the course receiving support from the European Social Fund (ESF) under the Advanced Technical Skills Programme. This support resulted in the maximum number of students at that time being enrolled during the years 1989 to 1992 and waiting lists being established. The ESF support was discontinued in 1994 and the consequence of this was a temporary drop in the number of students enrolled to 28 during the academic year 1995/95. However, since 1994 the construction industry output has grown rapidly and, as a consequence, there has been a great increase in the numbers applying for places on the course. As a result of this demand the number of places on the course was increased by 50% in September 1997.

Fig. 2 Comparison between construction industry output and the number of students enrolled on the TCD Project Management Diploma



The Project Management diploma course was initially developed from an existing diploma course called Management for Engineers and Scientists established in 1972 for engineers working mainly in manufacturing industries. For this reason the Project Management course at the start was very broadly based and not particularly focussed on the construction industry. In 1985, T. Orr was appointed director of the course and a number of changes were made to the course structure to orientate it closer to the construction industry. For example, new modules were introduced on:

- tendering and contract procedures,
- insurance and claims,
- budgeting and cost control.

To maintain the success and standards of the course, a questionnaire survey of the students is carried out at the end of each year. The students are asked in this questionnaire to comment on

their degree of satisfaction with the course, the quality of the course content and the performance of the lecturers. They are also asked to suggest changes to improve the course. The results of the survey are studied by the course director and the lecturers and action is taken as necessary to improve the course and overcome any shortcomings or problems identified by the students. Generally the results of the survey show a very high degree of satisfaction with the course.

7. Future Developments

The discipline of project management has emerged during the past twenty years as a result of and in response to great changes that have been taking place in the world, both in the ways we conduct our lives and carry out our work. The way society is organised has changed dramatically and this has coincided with amazing developments in information technology and communications. No longer are we a small and relatively closed society. Instead, with these technological developments and the removal of trade barriers in Europe, all our activities, including the way construction projects are managed, are now carried out at a very different level and pace than was formerly the case. The consequence of these developments is that educational courses, such as the project management diploma course, need to be continually reviewed and updated. The questionnaire survey is one way of discovering how the course should be modified to accommodate new developments. Some changes that might be introduced in the future include more emphasis on:

- project management in the context of the Single European Market
- quality assurance
- contract law.

Another development that is likely to occur in the near future, availing of EC funding under the ERASMUS programme, is the start of new courses in project management with a European dimension to prepare graduates for work in the construction industry of the Single European Market. These courses will involve close collaboration between Irish universities or colleges and other European universities. It is likely that these courses will require students to travel abroad to other European countries for part of their studies and there may be an interchange of teaching staff.

8. Reasons for Attending Courses in Project Management

There are a number of reasons why people attend postgraduate, continuing education courses in project management. The first reason is because, as a result of all the changes that have taken place and are continuing to take place in society and in the construction industry, much of the information received by students in their undergraduate courses is soon either out-of-date or forgotten. Consequently all those working in the industry, and indeed also those working in the

universities, need to continually re-educate themselves and update their knowledge. This applies particularly to those areas, such as project management, where students may only have received a minimum education as undergraduates and to those areas that are changing most, such as the information technology areas.

Apart from keeping up-to-date, there are other important reasons why people attend continuing education courses. Probably the first reason that occurs to most people is the opportunity of obtaining further qualifications which will enhance their career prospects. Certainly in a time of increasing employment uncertainty, taking a continuing education type of course, and particularly one that is relevant to one's work, is a wise step.

A further reason for attending continuing education courses is the human need to continually strive for knowledge and self-improvement. Without a desire to better oneself one will stagnate and eventually decline. This need to continually strive to improve oneself is essential to success in this life, both in the workplace and at a personal level. It also applies to corporate bodies such as construction firms and consultancies. Continuing education courses provide the means whereby those involved in industry can improve themselves and thereby improve their companies and help ensure the success of their companies and the success of their own careers.