

# CONSTRUCTION MANAGEMENT LEARNING IN PORTUGAL

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## ABSTRACT

Construction management in Portugal is chiefly lectured in higher education institutions. Construction management topics are included both in undergraduate and graduate programmes. However, these programmes are seldom structured in terms of a specific curriculum or even in terms of options within other curricula. Moreover, some subjects are included in several courses lacking consistency to the set of subjects lectured. This paper reports a survey made to Portuguese higher education institutions in the scope of a Leonardo da Vinci project that aimed at establishing specific curricula for management in construction. The paper further presents the conclusions of the project and suggests a set of lecturing management areas in construction.

**Keywords:** construction management, higher education, new training courses, professional qualifications

## 1. THE LEONARDO DA VINCI PROJECT

The main goal of the Leonardo da Vinci project entitled “*Model of Professional Qualification Structure and New Methods of Promotion, Certification and Mutual Recognition of Managerial Skills in the Construction Industry according to the requirements of the European Union*” [Leonardo da Vinci, 2002] was to develop a system of mutual recognition of managerial skills, providing equal opportunities for civil engineers in the labour market of the European Construction Industry.

The project team consisted of the following organizations:

- WUT: Institute of Construction Engineering and Management, of Warsaw University of Technology (Poland);
- PBCP: Polish British Construction Partnership Ltd (Poland);
- FEMB: Construction Management Education Foundation (Poland);
- ECV: European Construction Ventures Ltd (United Kingdom);
- U.M.: University of Minho (Portugal);
- CIOB: Chartered Institute of Building (United Kingdom);

- CEM: College of Estate Management of University of Reading (United Kingdom);
- KZPB: National Union of Building Employers (Poland).

Basically, the project aimed at targeting:

- construction managers and civil engineering students who should be able to adjust their qualifications to the market needs and have the chance of acquiring a European certificate of qualifications;
- public and private learning institutes wishing to launch new studies focused on Construction Engineering and Management, responding to the market needs, and wishing to apply for appropriate accreditation from international institutions;
- small and medium size construction companies aiming at improving the qualifications of their staff;
- the European construction market as a whole, presently expanding to new member countries in Central and Eastern Europe.

The primary objective of the project was the continuous training and qualification of construction professionals according to the current employment market demand and was mainly focused on the needs of small and medium size construction companies.

The project objectives were attained by establishing:

- a structure of knowledge and a model of qualification profiles for construction professionals, as a basis for comparing and setting common standards within the EU;
- a professional certification system and an accreditation system for learning programmes in management for construction engineers;
- a comprehensive basis of educational materials and manuals for all qualification levels as well as a variety of training improvement programmes (including the creation of a methodological and organizational basis for distance learning education).

At the same time, the project strived to qualitatively improve the life-long acquisition of skills and competences of professionals (especially students), in initial vocational training at various levels, therefore facilitating the integration/reintegration process in the labour market. It also promoted and reinforced the contribution of training for our present complex and demanding economy, encouraging cooperation at various levels between vocational training bodies and companies.

For different reasons, both Portuguese and Polish training in construction are mainly focused on design, paying much less attention to construction project management than in other European countries. Therefore, the participation of the British institutions in the project was very important for bringing the experience of this country in this subject. Extensive experience and know-how from British partners have been transferred to Poland and Portugal mainly in certification, qualification of construction managers, accreditation of studies in the United Kingdom, international construction industry expertise and training and continued professional development courses in the area under discussion.

## 2. CIVIL ENGINEERING AND CONSTRUCTION MANAGEMENT

Civil engineering has long been the most recognised technical degree for working in any construction related area in Portugal, including construction project management. The relative isolationism of this country during a great part of the last century, the small dimension of the national construction market, the short number of graduates and the good reputation of the profession kept on that tradition until the present days [Teixeira, 2002].

Presently, a number of Portuguese higher education institutions offer a five year undergraduate programme in civil engineering with substantial roots in two main engineering schools founded several decades ago. Those schools have long established a quite broad programme in civil engineering that subsequently became followed by the newer ones [Bezelga and Teixeira, 2002].

Civil engineering graduation in Portugal traditionally covers a variety of areas such as structures, foundations, hydraulics, construction materials, construction technology, roads and town planning. Additionally, most curricula are design oriented, leaving little room for management topics [Teixeira (2004) and Teixeira (2004)]. Although the number of management related courses is slowly increasing, the broad nature of civil engineering undergraduate programmes does not allow young professionals to specialise in that field at this level. Therefore, graduate programmes on management for civil engineers seem to best fit professional needs [Portuguese Report LdV WP IV, 2004].

According to the results of the thematic network project EUCEET (European Civil Engineering Education and Training) civil engineering curricula may be structured into the following set of categories [Manoliu and Bugnariu, 2001]:

Table 1. Curricula structure for undergraduate civil engineering in Europe

A: Basic sciences; B: Engineering sciences; C: Core civil engineering subjects;  
D: Engineering specialisation; E: Economics and management subjects;  
F: Humanities, social sciences, languages and physical education;  
G: Field work; H: Final project.

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Each category encompasses a set of subjects (courses) delivered across the academic years. Table 2 shows the average percentage of contact hours of category E (economics and management subjects) out of the total contact hours in each academic year for the higher education institutions surveyed [Manoliu and Bugnariu, 2001].

Table 2 shows the relative low importance of economics and management subjects in Portuguese civil engineering curricula when compared to similar European curricula. It also shows how Portuguese higher institutions surveyed tend to concentrate these subjects on the last year of graduation. Taking into consideration the present trend towards the reduction of undergraduate programmes for three years only, category E subjects will probably become concentrated on graduation programmes after the introduction of Bologna Declaration principles in this country.

Nevertheless, some introductory courses at the undergraduate level would be beneficial for students who will not select graduation programmes on the economics and management areas.

Table 2: Average percentage of contact hours for category E in five year programmes of civil engineering in Europe and Portugal [Manoliu and Bugnariu, 2001]

<b>Academic Year</b>	<b>Average Category E out of total</b>	<b>Portugal</b>
First	2,8%	0%
Second	3,4%	0%
Third	2,9%	0%
Fourth	5,3%	0%
Fifth	9,5%	14,9%
Total	7,0%	2,9%

Management skills of construction staff is becoming a key requirement both for construction client and contractor employers, due to increasing complexity of construction projects and to present demanding market conditions of the construction activity.

Business organizations are increasingly aware of the fact that by improving competencies and skills of their human resources, they are able to sustain economic growth and enterprise competitiveness. According to the 2003 Observatory report of European Small and Medium Enterprises (SMEs), it is possible to identify three main groups of European countries according to their involvement in competence development activities. On the one hand, SMEs from several Nordic and Central European countries, namely, Norway, Finland, Sweden, Iceland, Liechtenstein, Austria and Ireland show a high involvement in formal and non-formal competence development activities, as well as a wide selection of methods for developing their in-house competence base. On the other hand, SMEs from the Southern European countries, namely, Italy, Greece, Spain, Portugal, France and also Luxembourg show the lowest involvement in these activities [European Commission, 2003].

The domestic system of education for construction professionals has not been modified and adapted to market requirements. Currently, education mainly focuses on technical knowledge. In addition, companies do not have any influence on the education system which is paradoxical because they are the entities who employ graduates. Construction companies in today's competitive and complex economic environment need construction managers not only with technical skills but also with various other interdisciplinary skills, for instance, technological, organizational, economical, managerial, sociological, administrative, and law skills.

### **3. CONSTRUCTION MANAGEMENT LEARNING IN PORTUGUESE HIGHER EDUCATION INSTITUTIONS**

Construction management learning in Portugal is mainly catered for by higher education institutions. Construction management topics are included both in their undergraduate and graduate programmes. However, these programmes are seldom structured in terms of specific curricula or even in terms of options within other curricula. Moreover, some subjects are included in several courses lacking consistency to the set of subjects lectured.

#### **3.1 Undergraduate Survey**

A survey conducted to undergraduate curricula demonstrated that degree programmes available in construction management from Portuguese higher education institutions are rare, almost non-existent. However, management topics in construction are included in most civil engineering degrees. Eight main Universities offering undergraduate civil engineering programmes can be identified in Portugal, and a set of other twelve institutions (both Universities and Institutes) also offer civil or construction engineering degrees. The following four most relevant Universities have been selected from the first group for this survey:

- Universidade do Minho (U.M.) ([www.uminho.pt](http://www.uminho.pt))
- Faculdade de Engenharia da Universidade do Porto (FEUP) ([ww.fe.up.pt](http://ww.fe.up.pt)).
- Faculdade de Ciências Técnicas da Universidade de Coimbra (FCTUC) ([www.uc.ci.pt](http://www.uc.ci.pt))
- Instituto Superior Técnico da Universidade Técnica de Lisboa (IST-UTL) ([www.ist.utl.pt](http://www.ist.utl.pt))

Civil engineering courses are typically 5 year full time programmes conducted by Civil Engineering Departments of the above institutions [Teixeira, 2004]. Typical specialisation areas include structures, geotechnics, roads and pavements, construction technology, hydraulics and environment, town planning and construction materials. No specialisation in construction management or project management could be found.

The results from this survey show that, during the first years, a wide range of subjects is covered with little room for management topics. Final years are more focused on specific areas and management related courses tend to be included in the Construction Technology specialisation area. Typical management related courses include the following learning subjects:

- Economic science (economic data; micro economics for construction and macroeconomic variables; fundamentals of finance mathematics and economic engineering).
- Corporate Management (organisation theory, strategic management, management accounting, cost analysis, human resources, stock management).
- Project Management (project management team, project planning, quality planning and certification).
- Construction economics (quantity surveying, estimating and tendering);

- Construction site management (site installation, site management, site plant and equipment, site safety);
- Construction planning (construction project planning and control).

However, according to the project results [Portuguese report, 2004], the learning subjects above largely fail to accomplish the learning requirements of construction management professionals. Therefore, new courses should be introduced in the scope of new specialisation areas.

### 3.2 MSc Survey

MSc engineering programmes in Portugal are typically two year graduate programmes comprising both training and the production of a thesis. The Civil Engineering Departments of the same Universities above (U.M., FEUP, FCTUC and IST-UTL) offer the most relevant MSc programmes.

All MSc programmes that were surveyed offer a set of courses in various civil engineering specialisation areas (commonly, the same of undergraduate programmes) possibly further divided, according to the specifics of each area (e.g., for the area of structures, the following may possibly exist: concrete structures, steel structures, computational mechanics, etc.). Four main approaches for construction management topics in MSc programmes are currently followed in the above institutions:

- Construction management topics are organised into an introduction course, pertaining to a basic module (as in the MSc in Municipal Engineering of U.M.).
- Construction management topics are included into MSc programmes in Construction (as in the MSc in Civil Engineering - Construction Technology and Management of U.M., in the MSc in Construction Sciences of FCTUC and in the MSc in Building Construction of FEUP).
- Construction Management is a specific scientific area of an MSc programme in Construction (as in the MSc in Construction of IST), thus providing full specialisation.
- Construction Management is an independent MSc degree (as in the MSc in Construction Management and Real Estate - MBA of U.M.).

A further training program involving a company association and a higher educational institution should be mentioned. AECOPS (Construction and Public Works Company Association) and the Portuguese Catholic University signed a protocol establishing the creation of the PAGECO programme (Advanced Management for Construction Programme) for construction management professionals.

It was concluded that the learning subjects included in most MSc programmes surveyed also fail to accomplish the management learning requirements of construction management professionals. This is because most of those programmes deal with broader areas of construction knowledge beyond management, and do not accommodate sufficient management topics in their syllabuses. The closest programme surveyed is the MBA of U.M. but it is currently deactivated. Therefore, new courses are needed in order to meet the learning requirements mentioned above.

## 4. NEW PROGRAMMES ON MANAGEMENT FOR CONSTRUCTION PROFESSIONALS IN PORTUGAL

### 4.1 Project results

According to the results of the project, the following four specialization areas have been elected:

- Project Management
- Construction Management
- Construction Company Management
- Real Estate Management

Proposed programmes were organized into the following three subject areas:

- Technical subjects.
- Basic subjects common to all areas of specialization areas.
- Professional subjects specific of each specialization areas.

Technical subjects required are already catered for in Civil Engineering graduation programmes from most higher educational institutions

Specialized subjects are otherwise covered differently among the programmes surveyed. Therefore, a specific programme was selected in order to perform a matching exercise for the learning subjects identified in the project. The current undergraduate programme of the University of Minho was selected for the exercise. For each subject area, a set of learning modules has been identified as discussed below.

#### 4.1.1 Basic Subjects

Some partial matching could be found between modules proposed in the Leonardo da Vinci project and U.M. courses. However, it was concluded that four new courses would be required as shown in table 3.

Table 3. Basic Subjects

Modules Proposed	U.M. Syllabus	New Courses
Mathematics for Managers	Organisation and management of construction I Operational Research	
Rudiments of Organization and Management		Production Technology
Sociology	Optional Cultural Course	Work Studies
Psychology	Optional Cultural Course	
Economic Policy		
Micro and Macro Economy	Organisation and management of construction I	Economic Engineering
Economic and Building Law		Legal Studies

#### 4.1.2 Professional Subjects

Tables 4 to 7 list matching courses and additional courses for the four specialization areas suggested above. In some cases, the relation between modules proposed in the Leonardo da Vinci project and new courses suggested is not one to one.

Table 4. Specialist Subject Construction Management

<b>Modules Proposed</b>	<b>U.M. Syllabus</b>	<b>New Courses</b>
Technological and Technical preparation of Construction Process Realisation	Organisation and management of construction I	Contract Procedures
Organizational Preparation of Construction Objects Realisation Processes		Construction Planning
Management of Construction Process Realization		Legal Studies Site Management
Building Cost Calculation	Organisation and management of construction I	Contract Procedures Site Management
Work Safety in Building Production and Production Ergonomic		Quality, Safety & Environment

Table 5. Specialist Subject Real Estate Management

<b>Modules Proposed</b>	<b>U.M. Syllabus</b>	<b>New Courses</b>
The Real Estate Management		Facility Management Contract Procedures
Administration of Properties		Facility Management Quality, Safety & Environment
Efficiency and Real Estate Evaluations		Real Estate Valuation

Table 6. Specialist Subject Project Management

<b>Modules Proposed</b>	<b>U.M. Syllabus</b>	<b>New Courses</b>
Organisation and Construction-Investment Project Management		Project Planning Monitoring & Control Contract Procedures
Environmental Protection in Construction-Investment realisation		Quality, Safety & Environment
Effectiveness of Construction-Investment		Financial Management



Table 7. Specialist Subject Construction Company Management

<b>Modules Proposed</b>	<b>U.M. Syllabus</b>	<b>New Courses</b>
Marketing in Management		Marketing
Human Resource Management		Included in Work Studies
Technical Resource Management		Production Management Production Technology
Production and Services Management		Production Management Production Technology
Company Management Organisation		Company Management Organisation
Strategic Management of a Company		Marketing Financial Management
Finances Management		Financial Management

## 5. CONCLUSIONS

According to the results presented in the previous sections, the following courses would be created in order to fulfil the training requirements in the four specialization areas at the University of Minho:

- Production Technology
- Work Studies
- Economic Engineering
- Legal Studies
- Contract Procedures
- Facility Management
- Real Estate Valuation
- Quality, Safety & Environment
- Construction Planning
- Site Management
- Project, Planning, Monitoring & Control
- Financial Management
- Marketing
- Production Management
- Company Management Organisation

These courses would be organized into two semesters, which would allow for four specialization profiles as follows:

<b>Construction Management</b>		<b>Real Estate Management</b>	
<b>1<sup>st</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Production Technology</li> <li>· Work Studies</li> <li>· Economic Engineering</li> <li>· Legal Studies</li> </ul>	<b>1<sup>st</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Production Technology</li> <li>· Work Studies</li> <li>· Economic Engineering</li> <li>· Legal Studies</li> </ul>
<b>2<sup>nd</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Contract Procedures</li> <li>· Construction Planning</li> <li>· Site Management</li> <li>· Quality, Safety &amp; Environment</li> <li>· Final Project</li> </ul>	<b>2<sup>nd</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Contract Procedures</li> <li>· Facility Management</li> <li>· Real Estate Valuation</li> <li>· Quality, Safety &amp; Environment</li> <li>· Final Project</li> </ul>

  

<b>Project Management</b>		<b>Construction Company Management</b>	
<b>1<sup>st</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Production Technology</li> <li>· Work Studies</li> <li>· Economic Engineering</li> <li>· Legal Studies</li> </ul>	<b>1<sup>st</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Production Technology</li> <li>· Work Studies</li> <li>· Economic Engineering</li> <li>· Legal Studies</li> </ul>
<b>2<sup>nd</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Contract Procedures</li> <li>· Project, Planning Monitoring &amp; Control</li> <li>· Financial Management</li> <li>· Quality, Safety &amp; Environment</li> <li>· Final Project</li> </ul>	<b>2<sup>nd</sup> Semester</b>	<ul style="list-style-type: none"> <li>· Marketing</li> <li>· Production Management</li> <li>· Company Management Organisation</li> <li>· Financial Management</li> <li>· Final Project</li> </ul>

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