DESIGNING A LIBRARY FOR CONSTRUCTION MANAGERS THROUGH EUROPEAN COOPERATION

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Abstract

The identification, assessment and maintenance of project management competencies are essential for the performance of organizations working in the construction industry. Despite this, it is currently claimed by several parties that academy devotes little attention to this topic in the current curricula of most engineering and architecture graduations throughout Europe. Therefore, continuing professional development has been receiving increasing interest, as construction professionals seek for expanding their knowledge into several areas of management of construction companies and processes. This paper focuses on one of these initiatives, namely a large scale project entitled "Common Learning Outcomes for European Managers in Construction", financed by the European Union. The project aimed at developing seven learning manuals on a set of selected topics in project and construction management. Several European countries were involved in the project which allowed the participants to perceive their different feelings and market realities. However, it was possible to set up a common learning basis that can be successfully used for learning and developing knowledge in the topics approached in all countries.

Keywords: Construction – Learning – Management – Training

1. Purpose and background

The paper describes and analyzes some of the results of a large-scale project entitled "Common Learning Outcomes for European Managers in Construction", financed by the European Union. It aims to develop a library of seven basic manuals for construction managers, covering every phase of the construction process: from feasibility to operation, including design and construction. The project is based on the European Directive 89/48 on regulated professions in respect to scope of recognition, maintain of high standard in professional disciplines, promotion and certification of qualifications by international associations and organizations. The focus of this project is the construction industry, in general, and the construction manager, in particular. This takes place in the framework of generalised change that is under way in many European countries in order to adapt to the requirements of the European Space for Higher Education. Thus, this set of manuals is an

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opportunity for the future professionals to attain and to strengthen their basic managerial knowledge in order to develop their careers in the construction industry. This managerial knowledge will form a foundation for:

- Recognition and certification of managerial qualifications in construction, in European Countries for obtaining the title of EurMC (European Manager in Construction).
- Entering in post graduate education lectured in English, therefore allowing the increase of mobility among students going on scholarships through Erasmus-Socrates programmes.
- Trainning of construction staff through self-education CPD (Continuous Professional Development).

Aiming to develop a useful and applied set of texts, several authors work together. They all have a wide experience in the construction industry and, furthermore, develop their main task as professors in four different universities (Politechnika Warszawska, University of Salford, Universidad Politécnica de Valencia and Universidade do Minho) from four different countries (Poland, United Kingdom, Spain and Portugal). Each author has developed (alone or jointly) the manuals and chapters in which they could add more value due to their professional and academic practice. Furthermore, the Chartered Institute of Building (CIOB) and the Association of European Building Surveyors and Construction Experts (AEEBC) have also actively collaborated in the project.

The identification, assessment and maintenance of project management competencies are essential for the performance of organizations working in the construction industry (Russell and Yao, 1996; Trejo et al., 2003; Loría, 2006; Galloway, 2007). The concern for project management competency led to the development of standards currently used for assessment and certification (Crawford, 2005). The accreditation bodies for project management defined, years ago, the major areas of knowledge required for certification (APM, 1995; Duncan, 1996; Caupin, 1999). Nevertheless, a previous survey conducted in Lithuania, Poland, Portugal and Spain revealed that little attention is devoted in these countries to construction project management in academic courses, despite the demand for continuous professional development in this area (Teixeira, 2005; Teixeira et al., 2006; Teixeira and Píres, 2006; Sanz and Pellicer, 2007). Most of the university syllabuses are concentrated in traditional civil engineering or architectural courses that fail to efficiently deal with the most relevant features of the project management profession in the construction industry. Moreover, graduation courses in civil engineering and architectural degrees mostly cover an assortment of design oriented subjects, leaving little room for construction management topics that are essential for effectively conducting construction operations (Russell and Yao, 1996; Loría, 2006; Teixeira et al., 2006; Galloway, 2007).

It is well known that, currently, project managers are challenged by many non technical issues and perform several additional tasks that have not usually been within their functions (Pries and Janszen, 1995; Edum-Fotwe and McCaffer, 1999). Thus, contemporary project management procedures require additional management knowledge that goes beyond the facets of traditional construction areas (Russell and Yao, 1996; Long, 1997; Loría, 2006).

However, the usually packed civil engineering and architectural curricula do not let an easy solution for this problem. Pellicer et al. (2003) identified two alternative solutions for a similar problem: either through a change of syllabus making obligatory the required expertise, or by introducing appropriate topics in courses pertaining to the current syllabuses. But offering elective courses in selected topics of construction project management may be successful in some curricula while incorporating analogous subjects in other courses may be unfeasible in other curricula. Beyond academic traditional curricula, continuing professional development has been recently receiving increasing interest, as construction professionals

feel the need for expanding knowledge acquired at universities and are required to keep themselves up-to-date with new advances in the construction industry (Chan and Chan, 2002).

In recent years, it has been asserted that knowledge really required for project management practice is much wider than that learned at universities. A survey to 170 project managers from the UK construction industry showed that formal training and job experience mostly play a part for delivering project management competency (Edum-Fotwe and McCaffer, 1999). Professional competency in project management is truly achieved by the blend of knowledge gained during training and abilities developed through experience. This is due to the quickly changing construction environment, the continuous pressures on the project management profession, and the lack of teaching enough management subjects in the present university curricula.

2. Construction industry

Construction is a complex activity but encompasses considerable relevance in the countries' economies where it often performs as one of the three largest sectors. A generalised opinion puts the framework within an intermediate situation, between industrial activities and services. In addition, the construction activity depicts large doses of complexity, derived from a series of characteristics that define its activity, contracting and organisation. Its ultimate purpose is to design and complete a series of products (or infrastructures) and their subsequent commissioning for use, either free or with the corresponding payment to a third party. In the first case, the promoter is public, and in the second case, the promoter may be private (always) or public (in some cases).

The construction industry can be viewed as a process composed of five common phases: (1) feasibility, (2) design, (3) execution, (4) commissioning and operation, including maintenance, and, whenever required (5) dismantlement. Different contracts can be present in each phase, in series or in parallel (see figure 1).

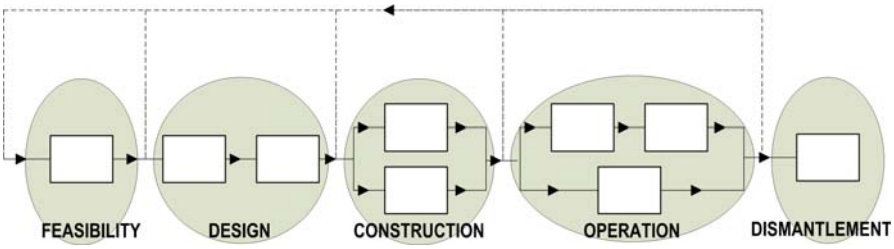

Figure 1. Phases of the construction process.

The production activity of the construction phase is defined by the execution of works, which presents specific peculiarities that condition the existence, structure and operation of companies operating within this phase. The production sets off after an order is placed. On the one hand, the product is unique: there are no two identical products, and the difference lays in the interaction with the soil. In addition, production is temporary and intermittent: it has a start and an end. Finally, the construction procedures employed are not usually identical and, in many cases, can be subject to mechanisation. Other specific peculiarities of construction as a productive activity are:

- The final product involves an infrastructure built on a specific site; the construction activity is carried out within the same place where the product will be set and not moved, which implies the spatial dispersion of the production process.

- In addition, production is divided in many different parts. It can take pace in any site with human activity, regardless of its importance, or even at any point of the world geography where an infrastructure is built. Construction sites constitute a relatively autonomous centre of work.
- The finished product is extremely heterogeneous, given the large diversity of applications of construction products.
- The size and complexity of the final infrastructure is variable.
- There are physical determining factors of the production process: topography, geology, use of natural resources, weather, urban planning, etc.
- The personality of the technicians taking part during the design, first and the construction, next, has an impact on the final result.

The typical characteristics of the sector not only derive from the peculiarities of the final product and the production activity, but are also imposed through the market by demand factors. Private demand is materialised punctually in time and space, for each particular contract. One of the immediate consequences is the low transparency of the market. In addition, as a consequence of its dispersion and division, there are strong fluctuations, which are greater when the geographical area of reference is smaller. The opacity of public demand is significantly lower, as a result of the legal requirements of publishing the tender prior to the awarding of the contract. In any case, the different bidders must compete in order to be awarded the contract. In most cases, the contract is awarded to the lowest bidder. As a consequence, the price of the product is formalised before the production takes place. This circumstance forces the entrepreneur to adjust the profit margins with great precision. In some cases, particularly during slumps in the economy, bids can be so low that the entrepreneurial surplus can be zero or almost zero, where the only benefit would be ensuring their presence in the market during some time.

Therefore, it can be inferred that the sector is characterised by the production of heterogeneous and highly differentiated goods, which take place in many different places and under different circumstances, with processes that are not usually subject to mechanisation and working in many cases by order; it is common to expand the temporary horizon of their activities in many cases. There is a strong correlation between economic cycles and production in the construction industry. During economic boom periods, the sector is one of the main driving agents of the economy, with indicators that are clearly above the mean, producing a dragging effect on the economy as a whole. On the contrary, during depressions, the sector clearly drops below the average, especially regarding private investment. Therefore, public investments in infrastructures is a priority for public expenditure and a basic tool for the State’s policy to foster the economy during slumps; they also promote regional equilibrium, aiming at major social and economic objectives, including the stimulation of employment, therefore favouring economic and social development.

3. The manuals within the construction process

As stated in the introduction, the outputs of the project are seven books. The length of each book is about 50.000 words or 120 pages in A4 paper size. The manuals are entitled as follows:

- Project management.
- Human resources management in construction.
- Partnering in construction.
- Economy and financial management in construction.
- Real estate management.

- Business management in construction enterprises.
- Construction management.

Each book is self contained and it can be read separately. However, reading the entire suite adds value, because the reader gets the whole picture of the construction process from a managerial point of view, allowing him/her to create links among the manuals hence, improving his/her understanding.

The first book describes the business context of project management including the key stages of the process and their inter-relationships. Project management is the professional discipline, separating the management function of a project from the design and execution functions. Therefore, it covers the whole construction process, from feasibility to dismantlement; nevertheless, the usual project management approach considers only the design and construction phases. The purpose of project management in the construction industry is to add significant and specific value to the process of delivering construction projects. This is achieved by the systematic application of a set of generic project-orientated management principles throughout the life of a project. Some of these techniques have been tailored to the sector requirements unique to the construction industry. However, the function of project management is applicable to all construction projects. Accordingly this book is the basis of the other six, due to the fact that it serves as a reference, not only in vocabulary, but also because it deals with the complete process. Furthermore, it links the different topics among them, allowing for a better view of the construction process.

The second book deals with the human resources management in the construction industry. It examines the roles, responsibilities, obligations and duties of the various stakeholders that take part in the construction activity. It considers not only the people, but also their performance at work and concludes with essential considerations for the manager. The text is equally applicable to consulting firms and construction companies' personnel. Human resources management is a strategically important function of any business, as well as the construction industry. This book illustrates the scope and requirements of 'good' human resource management principles applied to construction.

The third manual explains strategic collaborative working in the construction industry. Last decade in the United Kingdom, several official reports stated that partnering should be used as the basis of establishing long term relationships, rather than just being project based. According to these reports, construction industry should aim for continuous improvement; the benefits of this progress should be shared on an openly fair basis so that all stakeholders have a genuine incentive and motivation to find better solutions. In order to meet these goals, these project teams have to include from the beginning the design and construction skills working in fully integrated teams; hence, partnering applies mainly to the design and construction phases and, sometimes, to the operation phase. In addition to reducing costs partnering can also improve service quality, deliver better designs, make construction safer, meet earlier completion deadlines and provide everyone involved with bigger profits.

The fourth book illustrates economy principles and financial management applied to construction. They encompass the entire construction process, not only feasibility, but also design, –construction and operation. Construction managers are often afraid of making decisions due to lack of full knowledge in the field of economy and financial principles and the associated risks. Therefore, it is necessary to provide understanding of economy, recognize the methods of financing, and identify and manage risks while undertaking construction projects.

The fifth book deals with the housing market and property management. It comprises the economic environment where legalized land and residential buildings can be sold or purchased in accordance with free-market rules. Therefore, it focuses mainly in the feasibility phase and also covers, partially, the operation phase.

The sixth book describes the business context of construction organisations approaches including application of appropriate organisational structures within the context of business operations; it also recognises the impact of construction companies on the business performance within the industry. In the construction industry, projects are managed using business organisations that are prepared to work systematically with this approach. Projects involve the normal production of the company, matching orders or contracts executed for clients. Work teams are not stable. The management of projects (at the productive level) coexists with the management by projects (at the business level). This manual mainly focuses in companies that work in the construction phase.

Finally, the seventh book aims at the construction phase. The execution (or construction) of the project is its main subject. The contractor's point of view is chosen, even though the links with the owner are always taken into account. An envisioned outline of the management at the construction site is looked for, from the signing of the contract to the beginning of the operational phase. This manual "Construction Management" is developed, in some depth, in next section. Additional relevance is given to this subject, due to the fact that most of the construction managers start working in the construction site (CICCP, 2003).

4. Construction management

As stated previously, the last book deals with the construction phase of the whole process. During this phase, the design project is to be executed with the purpose of transforming it into an infrastructure that can be finally used. Therefore, the "owner" (or client) issues his/her orders to the construction company (or "contractor") during this phase, generally through contracts, which constitutes the construction works. The construction company manages different construction works, on different sites and with a temporary limitation, all within the same business structure. The business organisation must take into account this multi-plurality of production centres. Figure 2 outlines this scenario.

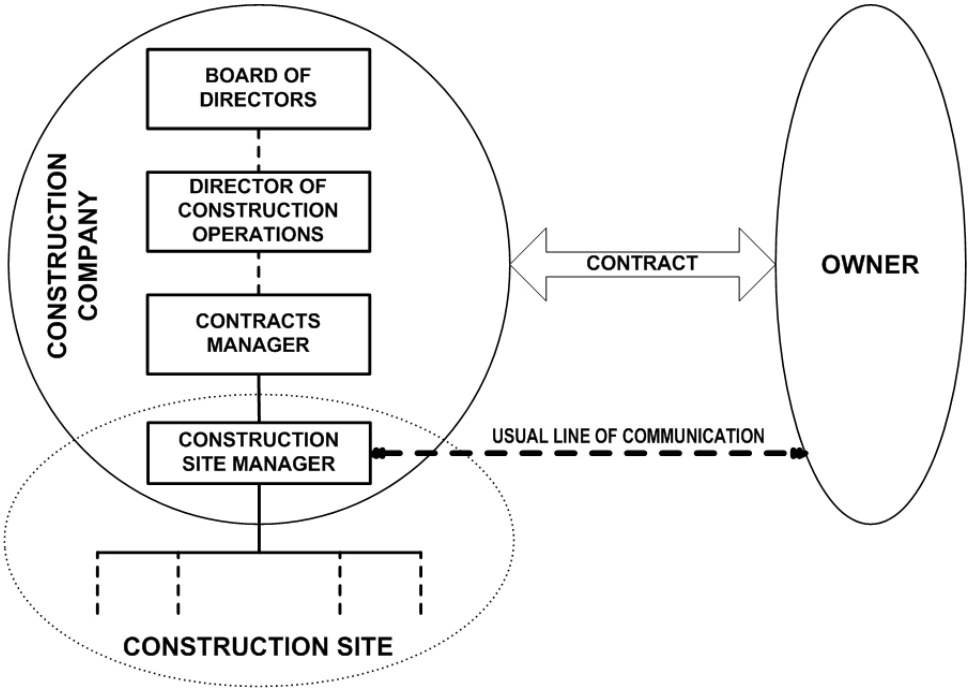

Figure 2. The construction site as the production basis in the construction process.

Each construction site manages its own human resources and materials; this organisation is simpler and more flexible than that of the company. Again, geographical dispersion and the immobility of the infrastructure is essential, which leads to different logistics problems at the construction site, regardless of the type of infrastructure and contractual conditions. The construction works require a maximum degree of centralisation, as opposed to the decentralisation that is so common within companies. To sum up, the organisational structure at the construction site must be simple, with clear lines of dependence, while being flexible, in order to adapt to the environmental circumstances properly.

In most cases, clients, collaborators, subcontractors, final users and even competitors look at the company through the individuals that are managing the construction works. Thus, it is important to know how to transmit a good image of the company, from the basic production centre represented by the construction site. The construction site manager is a driving agent of corporate culture, since he/she operates as the essential contact with the client, subcontractors and the social environment in general.

The construction industry is introduced, giving data on the construction sector in the European Union. It also presents the construction company, including some of its traditional organisational hierarchies, and the link between the firm and the construction site. The contract documents and the different agents that appear in the construction phase are also presented, giving a wide European vision. Documents of the design project and tendering documentation are analysed.

Other interesting issues such as communications, decision making, negotiation, information flow, documentation and record keeping are also analysed. It develops mainly the daily logs, the reports, the diary and the meetings. Basic issues related to the execution of works are also introduced, such as:

- Machinery and equipment: the selection of machinery, the calculation of its cost and, finally, the machinery maintenance.
- Productivity and performance: the study of works, techniques of work measurement, equipment performance, productivity assessment, value engineering and benchmarking.
- Site setup and planning: constrains of the site and the equipment, storage of materials, temporary facilities, jobsite offices and jobsite security.
- Technology and quality: construction processes and procedures in building and civil works, exploring the temporary works, innovation and quality management at the construction site.

Health and safety in the construction site, taking into account the European Union directives, gathers the general principles of prevention and the involved agents and their duties, site specific safety plans and incidents during the execution of works. Next, the environmental management at the construction site is shown and the issue of sustainability is also explained. Later on, the supply chain management in construction and the concept of lean construction are also explained.

Resources management gets a lot of attention in the book. Some of the subjects described are: the scope of activities, the assignment of resources to activities, their sequence, duration and monitoring. It develops the bar and network diagrams, cost of resources and cost control. Changes and claims during the construction phase, and progress payment procedures are also considered.

Finally, the closeout process of the construction works and also the construction contract is described. It analyses the testing and commissioning procedures, handover and occupation. It introduces the operation and maintenance manual and the as-built documents.

5. Conclusions

The need for further training in construction and project management has been extensively recognised by professionals and organizations worlwide. Several authors have been recognising that traditional graduations in civil engineering and architecture in several European countries do not provide enough knowledge on these topics therefore requiring people to enter into complementary training actions in order to overcome this problem. Actually, the traditionally packed curricula of most programmes offered by European higher education institutions and the legendary bias to design subjects leave little room for management topics and some resistance from academics to even consider that.

On the other hand, this yields the opportunity for developing specific training for those professionals, encompassing subjects not usually mentioned in the syllabus of their graduation courses. Moreover, professional competency in project management is truly achieved by the blend of knowledge gained during training and abilities developed through experience.

The project reported in this paper managed to merge under the same objective a set of authors from different institutions, countries and backgrounds for a common task of producing a set of learning manuals into several relevant topics of project and construction management. The contents were previously discussed in the scope of project meetings and gained the experience of previous research projects conducted by the same team in the topic of construction management training in Europe. The content of the manuals was later assessed by the project team members and by the project advisory board which has been set up with a set of relevant professionals from each country involved.

However, the success of the project can only be measured by the adhesion of training institutions to adopting the manuals for learning courses in the subjects approached and this can only be reported at some point in the future. Meanwhile, it is recognised by the authors that the project positively contributed to the development of construction management in Europe

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