

# Project management and project controls in Europe: Challenges for the future

Gianluca di Castri

AICE – Associazione Italiana di Ingegneria Economica (member of the ICEC) – Past President & Delegate. e-mail address: [gianluca.dicastri@aice-it.org](mailto:gianluca.dicastri@aice-it.org)

## ABSTRACT

With reference to different project cultures and to different kinds of projects, the paper aims to define the limits, bodies of knowledge and competence baseline of several professions involved in total cost management

### Purpose of this paper

The paper aims to point out the differences between project management and project controls as well as the fact that total cost management has a wider professional field of action of both project management and project controls. Some peculiarities of continental Europe are also taken into consideration, since the whole profession seems to be less defined in that region.

### Note

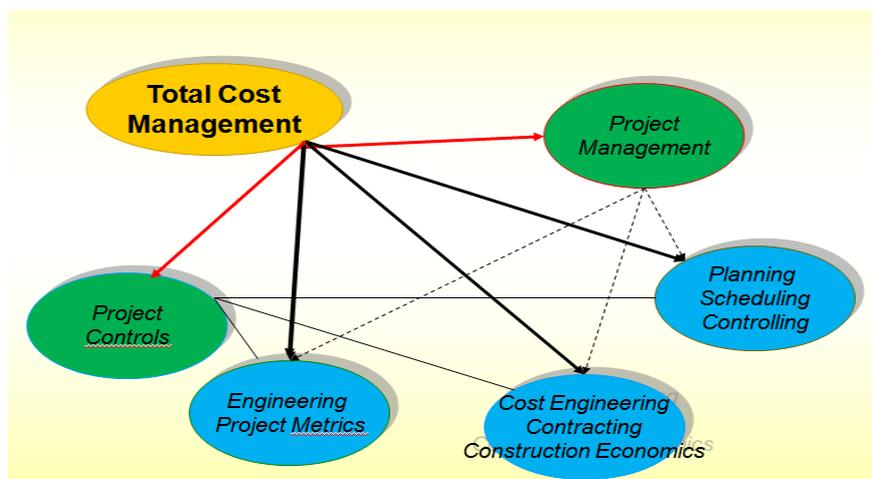
*This paper has been first presented to the IPMA & ICEC International Research Forum, Portoroz 2011 and has been included in the proceedings of the ZPM congress. After that, the paper has been updated, actually with minor modification, according to the results of further research whose main steps have been a joint AICE-IPMA Academy forum in Italy and a dedicated group on LinkedIn. It was then published in the ICEC Round-Up and it is now presented to the ICEC World Congress in Durban (June, 2012) as a keynote paper.*

**Key words:** Project management, Project controls, Construction economics, Cost engineering, Total cost management, Quantity surveying

## PROJECT CULTURE AND TOTAL COST MANAGEMENT

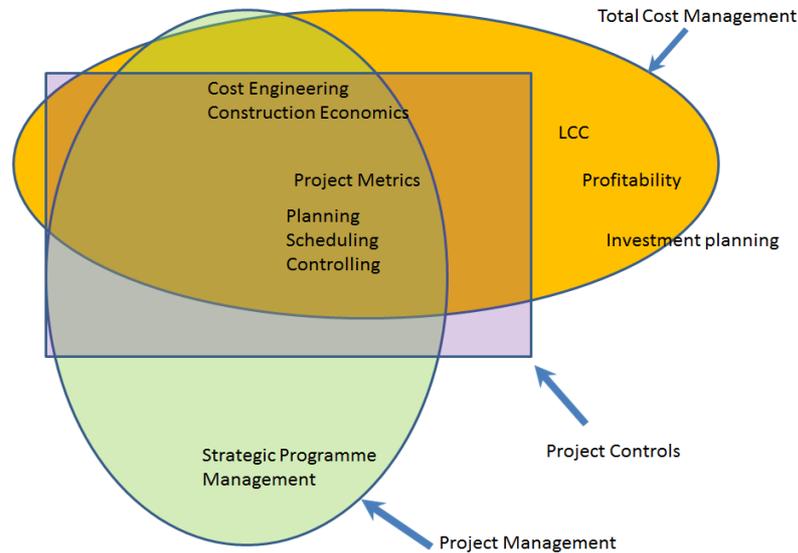
### Project culture

Italy, as well as the majority of continental European countries, belongs to the group of countries where the legal system is based on Civil Law (also called Romanist German System). This is different from the legal system based on Common Law and dominant in English speaking countries.



**Table 1 – project management and project controls**

In the majority of Common Law countries, Cost Engineering and Project Management have been separately developed, like two fully independent disciplines. The relevant professions are separate, like in England, in the majority of the Commonwealth countries and in the United States of America. In countries belonging to the Civil Law group of countries, i.e. in most of countries of continental Europe, the profession of Cost Engineer, Planning Engineer and Project Manager have had a common and sometimes confused development. This is also evident from the terminology: while in English speaking countries we have different definitions for Cost Engineering, Project Management, Planning Engineering, Quantity Surveying, Construction Economics, in Latin countries the overall term of ***Ingegneria Economica (Ingeniería Económica, Financiera y de Costos)*** has been used since the beginning. This overall concept has also been accepted by the ICEC in 1998, as **Total Cost Management**, whose meaning corresponds with the meaning of *Ingegneria Economica*, as far as the different languages will allow the correspondence.



**Table 2 - Areas of interest**

Total Cost Management (*Ingegneria Economica*) is a discipline that integrates cost engineering; contracting; construction economics; planning, scheduling, controlling; engineering and project metrics.

It is worthy to point out that, besides being involved in Project Controls, the main field of Total Cost Management is evolving towards lifecycle or capital asset management, investment decision making, profitability and business planning. Therefore studying the difference between project management and project controls actually does not cover the full range of activities of Total Cost Management, which is a wider concept.

It seems that we have several professions insisting on the same body of knowledge, albeit with different competence baselines. Such professions, listed below, are partially overlapping and some simplification is probably needed:

- Project Director,
- Project Manager,
- Project Engineer,
- Project Comptroller,
- Planning Engineer,
- Cost Engineer,
- Contract Engineer,
- Contract Manager,
- Programme Manager,

- Project Monitoring Consultant,
- Project Auditor
- Quantity Surveyor
- Construction Economist
- Asset Manager,
- Cost Manager.

At the bottom line, the graphical representation could be even more complicated (subject to further improvements)

**Table 3 – professions and bodies of knowledge**

		Profession								
		Project Director	Project Manager	Programme Manager	Strategic Asset Manager	Project Controller	Contract Manager	Project Planner	Construction Economist	Cost Engineer
Body of Knowledge	Economics	xx	x	xx	xx	x	x	x	x	x
	Finance	xx	x	xx	xx	x	x	x	x	x
	Law	xx	xx	xx	xx	x	xxx	x	x	x
	Contracts	xx	xx	xx	xx	x	xxx	x	x	x
	Accounting - Bookkeeping	x	xx	x	x	x	x	x	xx	xx
	Cost Accounting	x	xx	x	x	x	x	x	xx	xx
	Life Cycle Costs	x	x	xx	xxx	x	x	x	x	xxx
	Market	x	x	xx	xxx	x	x	x	xx	xx
	Organisation	xx	xx	x	x	x	x	x	x	x
	Process Engineering	x	x	xx	xx	x	x	x	x	x
	Project Engineering	xx	xxx	x	x	xx	x	xx	x	xx
	Project Metrics	xx	xx	x	x	xxx	x	xxx	xxx	xxx
	Process Metrics	x	x	x	xx	x	x	x	x	xx
	Operational research	x	x	x	x	xx	x	xxx	xx	xx
	Planning	x	xx	x	x	xx	x	xxx	xx	xx
	Scheduling & Controlling	x	xx	x	x	xx	x	xxx	xx	xx
	Business Management	xx	x	xx	xxx	x	x	x	x	x
	Cost Engineering	xx	xx	xx	xx	xxx	x	xx	xxx	xxx
Management science	xxx	xx	xx	xx	xx	xx	x	xx	xx	

### Some semantics

It is worthy to consider the different translations of some words related to our profession in several languages:

English	Italian	Spanish (castilian)	French	German
Total Cost Management	Ingegneria Economica	Ingenieria Económica, Financiera y de Costos	Gestion des coûts	Kostenmanagement
Cost Engineering	Ingegneria dei Costi	Ingenieria de Costos		
Project Management	Gestione di progetto	Ingenieria de proyecto	Management (gestion) de projet	Projektsleitung
Project Controls	Controllo di progetto	Control de proyecto	Maitrise de projet	Projektsteuerung
Project monitoring	Monizione del progetto			

The following must be noted:

- *Ingegneria Economica* in Italian has a wider meaning than the English “Total Cost Management”.
- The term “Cost Engineering” is normally translated into Italian as *Ingegneria dei Costi*, however, this term is difficult to explain to Italians, its actual meaning can be unclear for many.
- On the other hand, Project Finance is normally translated into Italian as *Finanza di Progetto* or *Finanza Strutturata* while the term *Ingegneria Finanziaria* seems to have a negative meaning, due to how the term has been used on television and in other media.
- Project controls in English has a wider meaning than *controllo* in Italian and *contrôle* in French, where it would be probably more suitable to use the word *maîtrise*.
- The correct word *monizione* for “monitoring” is not common in Italian, while the word *monitoraggio* is used that is actually a Latin word loaned through the English language.

Furthermore, there is some confusion between the term used for “professions” and the terminology relevant to the “disciplines”, as well as for the components of our body of knowledge and for the competences that are needed for the profession itself.

The terms “project”, “controls”, “manager”, “director” and others are not semantically equivalent in all languages. For instance:

- the Italian “controllo” and the French “contrôle” have a restrictive meaning if compared to the English “controls”,
- the Italian “progetto” does not mean “project” but “design plus engineering”,
- in military terminology, even in English, “command” and “controls” have different meanings.

The first challenge should then be to issue a multilingual glossary in the main languages (not only European). We could start from the work already performed by AFITEP in 2000; further works on terminology have been done by private companies such as FIAT, Snamprogetti (belonging to ENI group), PM Forum, PMA Europe Ltd. and others. Those works could be used for reference, together with the glossaries (in English) of the AACE International, PMI and others.

The work done by AFITEP is quite complete in French, German, English, Spanish and Portuguese; it needs to be updated and should also be completed with other languages, such as Italian, Arabic and Chinese.

A joint ISO, ICEC and IPMA project for a common glossary is in progress, where each national association could take responsibility for the relevant language.

As a cultural reference, in Latin we could say: OPERIS GESTIO (project management), OPERIS GUBERNATIO (project controls), INPENSARUM GUBERNATIO (cost control)

### **Project management and controls: definitions**

A definition of project management could be “application of knowledge, competences and methodology for the management of a complex project, in order to keep the project within the given limits (scope, time, resources or costs)”.

On the other hand, AACE International defines project controls as “management action, either pre-planned to achieve the desired result or taken as a corrective measure prompted by the monitoring process”. Project controls are mainly concerned with the metrics of the project, such as quantities, time, cost, and other resources; however, project revenues and cash flow can be part of the project metrics under control.

In detail, to keep a project under controls the technical side (actual progress, planned progress; workload standard, planned, actual) should be soundly monitored, as well as the project economics (BCWP, EV, BCWS) and accounting (ACWP).

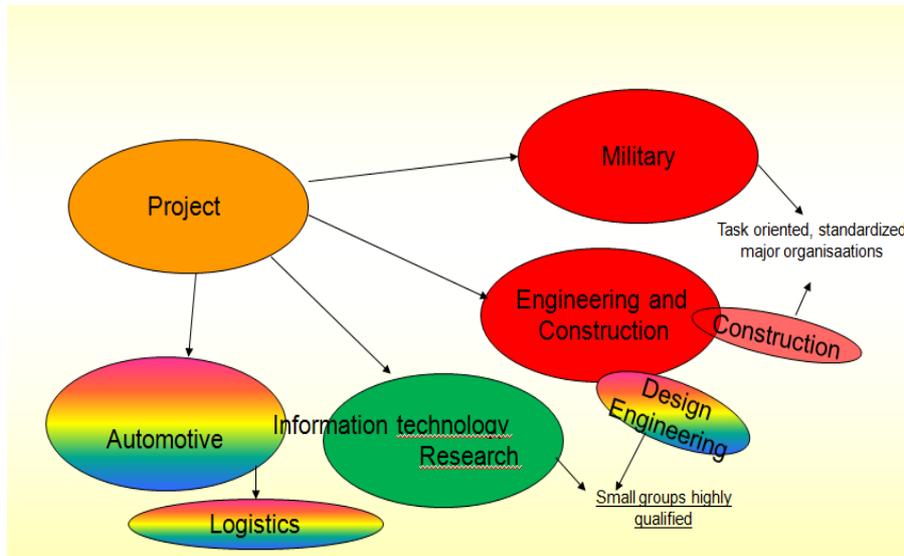
Traditionally controls were limited to comparing planned to actual, with any deviation managed by exceptions. The modern view is based on calculation of the progress through standard workloads, earned value and monthly overall calculation of the expected time and cost.

To have sound project management and controls having a good project manager or competent controlling staff is not enough. The whole organisation must have the proper level of maturity. The environmental characteristic and the legal framework are also important. It is worthy to note that a sound PM & C is costing 2% to 5% of the total capital cost, but allows savings of about 10% in time and 10 to 15% in costs

**Types of projects: hard and soft**

In so called “hard projects” the whole organisation is orientated towards the task, with a considerable number of people working at different levels. The workload can be calculated based on standard production data. Project metrics can be defined; as a matter of fact, there are plenty standards for project metrics for industrial projects (power generation, chemical, petrochemical, oil and gas). There are less data available for infrastructures and a lot of work still needs to be done for the building industry.

In “soft projects” we have less people of higher professional level, sometimes small groups of highly qualified persons, and the organisation is orientated towards human relations. The workload can be calculated using production data definitely higher than the standard. However, in most cases, project metrics are less defined.



**Table 4: projects**

In the first case the problem is “management” of the various processes and activities that are part of the project, while in the second case the

focus is on “leading” the people involved. In the example above the hard projects are military and construction, while the soft projects are information technology and research; other projects fall somewhere in the middle.

### **Organisation, practice and methods**

In major, international engineering and construction companies, the projects are organised as follows:

- The Project Director, whose responsibility is normally extended to several projects, is part of the senior management of the company and, in most cases, is part of the Directing Committee (namely to the higher committee of the management) or the Board of Directors. To be noted: some confusion can be due to the use of the word Director, whose Italian equivalent (*Direttore*) has a meaning equivalent to Top Manager, while the members of the Board are identified by the title of *Amministratore*.
- The Project Manager, one for each project, is normally part of the middle management but can be a top manager in case of a major project.
- The Project Office or Project Team is composed of the following sections (each section can be formed by one or more people according to the size of the project itself):
  - Project Engineering,
  - Planning and Project Control,
  - Project metrics (identified by several different terms, such as quantity surveying or, in Italian, *contabilità lavori* that means bookkeeping of the works),
  - Contract Management,
  - Cost Engineering.

Not all Project Controls are, in continental Europe, considered as an independent function, while they are part of the Project Management. However, in some companies the project controls can be centralised or can be present at both levels, under the General Management as well as under the Project Manager

In minor companies the situation is more confusing, the Project Management or Co-ordination being considered as part of the Engineering or Construction Department (Technical Project Management).

In theory, the project directing function should belong to the Owner or to the Employer, where different from the Owner. In its organisation there should be a Project or Programme Director with a Project Monitoring Office. This Project Director should be part of the senior management of the Owner's organisation, for projects considered of primary importance to

the Owner, while for minor projects or maintenance and refurbishing projects, a middle manager could be enough.

**Human factor**

The career path, in major engineering and construction companies, starts with Engineering or Site responsibilities at a minor level, such as Planning Junior Engineer, Cost Junior Engineer, Site Junior Engineer, Design Junior Engineer, and so on.

**Table 5: project phases**

Strategy		<i>Project phases</i>
	E P C C	
		Operations
<i>General Contractor</i>		
Proposal Mgr	Project Mgr	
	Project Director	
<i>Owner</i>		
Planning - Design	Project Monitoring Owner Engineering	Plant Mgr o eqv.
	Programme Mgr / Dir	

In general, only after having some experience as a full Engineer, the person can obtain a secondary responsibility as Project Coordinator or as Assistant to the Project Manager. This should be at lower management level.

The next step is full Project Manager responsibilities, at management or high management level, depending on the size and complexity of the project.

Consultants are working as project management consultants or as specialists in contract and claim management.

**Project Management and Controls**

The management must have some unity, while controls can be performed by different actors, sometimes at different levels in the organisation or in different organisations. If we refer to a ship, we can make a comparison between its trips and an engineering project:

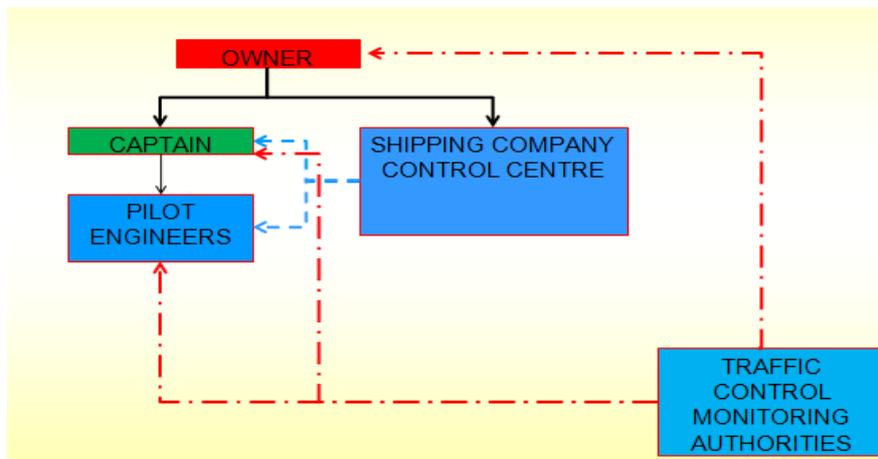
❑ **STRATEGY**

- The Owner decides the scope, namely where the ship has to go, when to leave and what to carry.

❑ **MANAGEMENT**

- The Captain takes the ship to its destination and leads the crew.
- **CONTROLS**
  - The Pilot (navigating officer) controls the course, the speed and deviations if any – The Engineers controls the fuel consumption (local level).
  - The Owner's Control Centre controls costs and revenues (central level).
  - Maritime or Traffic Control Centre controls the course and the movement of the ship (traffic control level)

**Table 6: control at different levels**



The same applies for engineering and construction projects: the previous example was a typical deterministic project, while the example of a stochastic project could have been when Queen Isabel of Castile said to Cristoforo Colombo "go westwards to see whether you can find Cathay...or maybe something else".

In reality, no project is fully deterministic or fully stochastic: a real project can be positioned in a continuum from 100% deterministic to 100% stochastic. During the life cycle, a project starts, in the strategic phase, quite totally as a stochastic project, when it is still possible to decide whether to execute the project or to cancel it. Afterwards, in the operational phase, when we have decided to execute the project and we have budgeted in terms of time and costs, the situation is quite fully deterministic. However, some long term projects still have a high percentage of stochastic activities; the project quoted above (discovery of America) had a higher percentage of stochastic activities than the project for sending the man to Mars in the 21st century.

The traditional view relevant to the relationship of managing and controlling was given by Henry Fayol (1841-1925), who defines the functions of management as:

- Forecasting;
- Planning;
- Organizing;
- Commanding;
- Coordinating; and
- Monitoring (French: contrôler: in the sense that a manager must receive feedback about a process in order to make the necessary adjustments).

In more detail, he defined the “Principles of Management” as follows<sup>1</sup>:

- Division of work. This principle is the same as Adam Smith's 'division of labour'. Specialisation increases output by making employees more efficient.
- Authority. Managers must be able to give orders. Authority gives them this right. Note that responsibility arises wherever authority is exercised.
- Discipline. Employees must obey and respect the rules that govern the organisation. Good discipline is the result of effective leadership, a clear understanding between management and workers regarding the organisation's rules, and the judicious use of penalties for infractions of the rules.
- Unity of command. Every employee should receive orders from only one superior.
- Unity of direction. Each group of organisational activities that have the same objective should be directed by one manager using one plan.
- Subordination of individual interests to the general interest. The interests of any one employee or group of employees should not take precedence over the interests of the organisation as a whole.
- Remuneration. Workers must be paid a fair wage for their services.
- Centralisation. Centralisation refers to the degree to which subordinates are involved in decision-making. Whether decision-making is centralised (to management) or decentralised (to subordinates) is a question of proper proportion. The task is to find the optimum degree of centralisation for each situation.
- Scalar chain. The line of authority from top management to the lowest ranks represents the scalar chain. Communications should follow this chain. However, if following the chain creates delays, cross-communications can be allowed if agreed to by all parties and superiors are kept informed.
- Order. People and materials should be in the right place at the right time.
- Equity. Managers should be kind and fair to their subordinates.

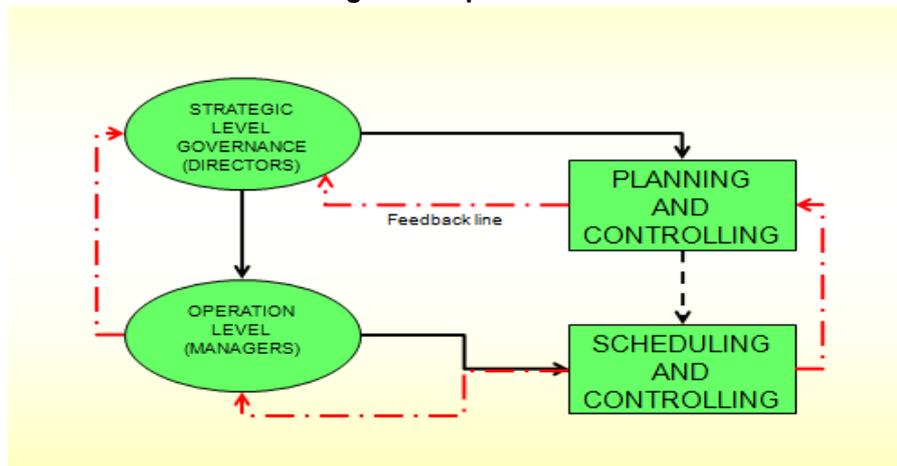
---

<sup>1</sup> [http://en.wikipedia.org/wiki/Henri\\_Fayol](http://en.wikipedia.org/wiki/Henri_Fayol)

- Stability of tenure of personnel. High employee turnover is inefficient. Management should provide orderly personnel planning and ensure that replacements are available to fill vacancies.
- Initiative. Employees who are allowed to originate and carry out plans will exert high levels of effort.
- Esprit de corps. Promoting team spirit will build harmony and unity within the organization.

A recent view (Luigi Pojaga, 1994) is focusing on the distinction between the strategic level (stochastic methodology, planning) and the operational level (deterministic methodology scheduling).

**Table 7 – controls at strategic and operation level**

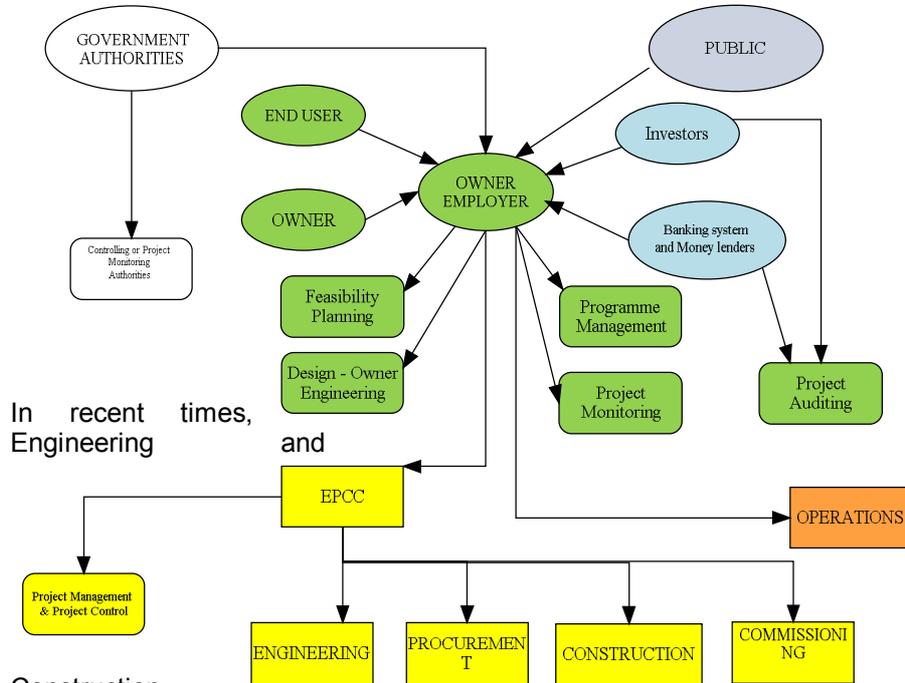


### Extension of project management and controls

The first point to be considered is that, for every project, there are several stakeholders impacting on the project itself, with difference in powers and in rights to interfere. We must consider the owner, first of all, that sometimes is not a single organisation, so we have to distinguish between owner, end user and employer. Furthermore, we must consider the banking system and other money lenders, the investors, the Government and other authorities as well as the public in general.

The picture below shows how projects relevant to the same owner can be integrated in the whole life cycle, as well as in multi-projects, programmes and portfolios.

**Table 8 – stake holders**



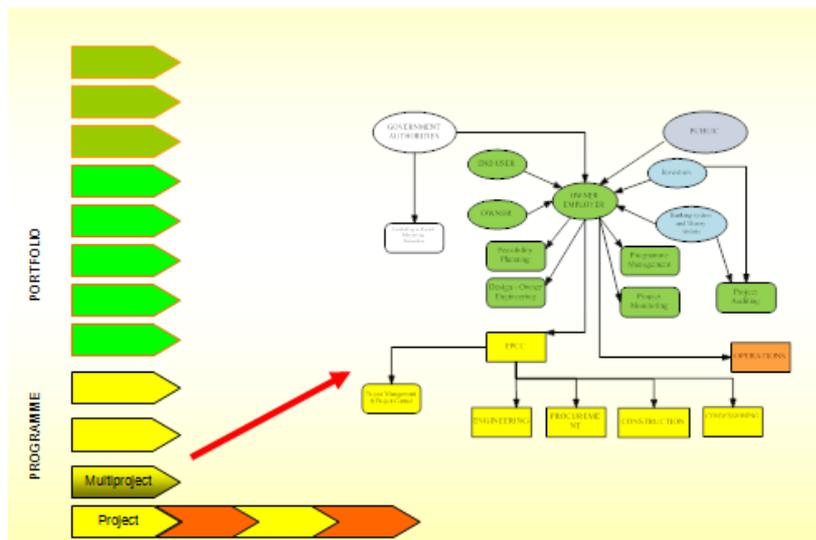
**Construction**

projects are changing («soft» projects are evolving as well). The main changes are:

- Involvement of more complex organisation, extension to other stakeholders.
- Extension of the «project» horizontally (programme, portfolio) and vertically (life cycle).
- Several controlling or monitoring organisations, from different parties, interact with the project management.
- Systemic view, new project metrics to measure size and complexity.
- New criteria to measure progress, performance and productiveness, i.e. to measure effectiveness and efficiency.

The terms “project”, “programme” and “portfolio” are defined in the glossaries of the PMI and of AACE International. The glossary of the AFITEP only defines “project” and “programme”.

**Table 9 – Extension of project culture**





For Engineering and Construction Companies the problem is the integration between several projects.

The Employer needs to integrate the different phases of the life cycle.

**Table 10 – Life cycle**

	Design	Tender	E P C C					Operations
			Management & Controls	Engineering	Logistics	Construction	Commissioning	
Contractor	Planning	Planning	General Supervision				Coordination	Operation
	Design	Contractual structure	Project Monitoring	Owner Engineering			Testing	Maintenance
	Feasibility	Negotiation and decision					Handing over	
	Estimating	Budgeting and Financing						
Project Director - Programme Manager								Plant Manager
General Contractor		Tender design	Management	Engineering	Procurement	Construction Management	Commissioning	Assistance
		Scheduling	Scheduling		Transportation	Prefabrication	Operation tests	Guarantee
		Estimating	Budget	Site Engineering	Warehousing	Construction	Reliability tests	Maintenance
			Controls	As built drawings		Precommissioning		
			Reporting					
			Accounting					
		Proposal Mgr	Project Control Mgr				Start-up Mgr	
			Project Mgr					

The Government or other territorial authorities have to integrate all projects that are insisting on the territory itself.

**INSIDE THE ICEC**

In 2014 the AICE will organise the ICEC world congress in Milan; this will be the right time to answer some questions:

- What is the future of the ICEC from 2014 onwards?
- Why is ICEC different from IPMA and PMI?
- Why is Region II different from other ICEC regions?

All the information quoted in the following pages have been extracted from the ICEC websites of the ICEC and IPMA associations in 2010 and had already been presented at the meeting of the delegates of the ICEC Region 2 in Copenhagen, November 2010.

As it is known, the ICEC divides its worldwide activities into four regions and the member associations into three categories: cost engineering, project management and quantity surveying (construction economics). The results are shown in the table below:

Region	No. of associations	CE	PM	QS
I - Americas	5	5		
II – Europe and Near East	20	5	13	2
III - Africa	9	2	1	6
IV – Asia Pacific	14	3	2	9
Total	48	15	16	17

Some associations belong to both federations, ICEC and IPMA, as shown below:

Region	Associations	ICEC only	ICEC + IPMA	ICEC + IPMA %
I America	5	5	0	
II Europe and Near East	20	8	12	60%
III Africa	9	9	0	
IV Asia Pacific	14	13	1	71%
	48	35	13	

However, if we refer to “continental Europe” only, we find that from 17 associations, 12 of them, namely 70.6%, belong to ICEC and IPMA. It seems that belonging to both ICEC and IPMA is typical of continental European associations.

We must then define the peculiarities of the ICEC towards IPMA and PMI. The main criteria seems to be the following:

### **Project controls vs project management**

#### **Life cycle costs vs. EPCC costs**

The path to be followed shall be:

- Define and update a common body of knowledge for the ICEC associations.
- Improve this body of knowledge towards a body of competence.
- Compare with IPMA and PMI and define boundaries and overlapped areas.
- Extend the body of competence to life cycle costs, cost management in PPP and other items to be defined.
- Improve and update standards and best practices.
- New standards for cost management in public private partnerships.
- New standards for project controls in public works.

- New standards for LCC.

### **CERTIFICATION**

We should try to compare the levels of ICEC and IPMA certifications, that, for the time being, can only be represented in a qualitative table. An effort to measure seniority and then quantify and compare levels of certification should be welcomed, where reference could be made to the levels of PMI, NVQ or to the GAPPS.

In Italy the AICE has two levels for certification accredited by the ICEC:

- Practitioner (PIE / ICEC A),
- Expert (EIE / ICEC A),

**Table 11 - Certification**

IPMA 4	CCE seniority level
IPMA 3	ICEC CCE
IPMA 2	ICEC PRACTITIONE R
IPMA 1	

We must find a way of measuring professional seniority, such as the “time span of discretionality” which can measure the level of a role and of the relevant work in any organisation.

The picture shows how seniority is composed by academic and professional background. However, a third dimension relevant to personal skills and qualities should also be considered.

Probably, project management and project controls have quite the same body of knowledge, while differentiation exists in competencies and their application to the profession.

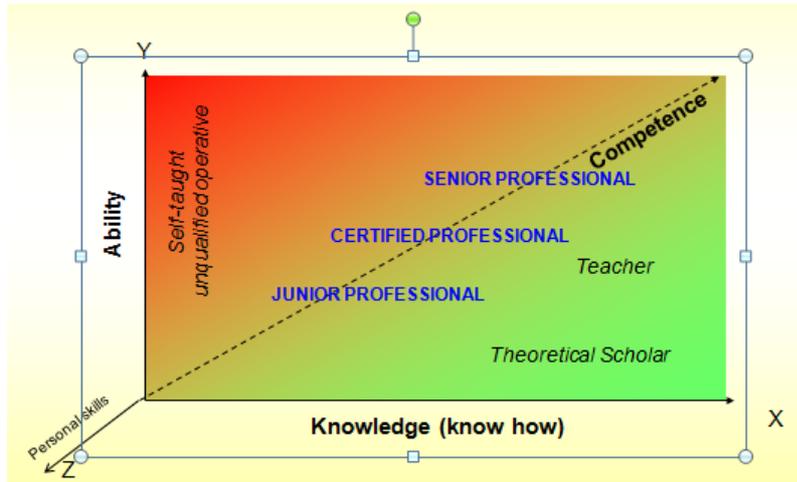
Project controls has more to do with project metrics, such as:

- measuring the site and complexity of the project,
- find the right parameters for such measuring (workload in standard man-hours or equivalent units, location factors and other indicators) and control (progress, time and costs, find proper indicators for quantity and complexity),
- find the metric way to identify the completion of the various phases such as mechanical completion, running and reliability test

completion, substantial completion, preliminary and final handing over,

- identify the metrics for contract and claim management and so on.

**Table 12 – Knowledge and competence**



### THE CHALLENGES FOR THE 21st CENTURY

As far as companies in general, as well as the whole economy are concerned, the challenges of the XXI century can be summarized as:

#### **Globalisation**

- Extend the market (new clients, new partners, new suppliers).
- Focus on effectiveness (performances), not only on efficiency (costs).
- Major organisation can be independent; minor organisations must form networks.
- Investment needed in innovation, medium-long term versus short term.
- Capability of creating value strictly related to innovation.
- Money that does not create value is generating inflation.

#### **Innovation**

- Increasing efficiency, reducing costs and structure.
- Increasing effectiveness: new products, new construction methods, new processes and procedures.
- Controlling the creation of value.
- Medium-long term planning and forecasting.
  - at global level (social, political, economy),
  - at market level,

- at company level.
- Find suitable clients, partners, suppliers.
- Find proper finance.
- Controlling risks.
- Managing change.
- Professional education, developing competencies.

### **Integration**

- Interaction between projects or processes requires integration.
- Systemic view.
- Project Integration Management (as defined by PMI and AACE Int.)
- Integration guarantees
  - efficiency,
  - effectiveness,
  - no redundancies.
- Integration
  - at project and process level, inside and outside the company,
  - in planning, scheduling, controlling,
  - information and reporting, integrated data base and integrated data management,
  - engineering, management, planning, scheduling and controlling standards,
  - standard workload - cost standards.

In Engineering and Construction, we should be able to optimise the total life cycle cost, including costs due to contingencies and uncertainty. This can be done by means of:

- Integrated data management.
- Use of physical data together with economics: resource metrics, workload.
- Contracts based on association between parties.

Speaking about integration, we must consider the different points of view.

A Construction Company has the problem of cross controlling contracts and working sites, controlling subcontractors, integrating planning, scheduling and controlling of all contracts in order to manage and control the whole company.

The General Contractor should focus on:

- Integration of all parties cooperating in each project.
- Integration of engineering, standards and procedures.
- Integration between projects.

The Owner has to refer to the integration of execution of operations as well as market production integration, sometimes also to the integration

between projects. The Bank or in general the investor or money lender thinks about comparing risks and integrating credit criteria and their management.

For the first time in centuries we can collect, file, organise, manage and send huge quantities of data and information. In a project this affects the whole life cycle, contract and document management, integration of technical database (drawings, bill of quantities, workloads) to economics and financial data, integration of time to costs, etc.

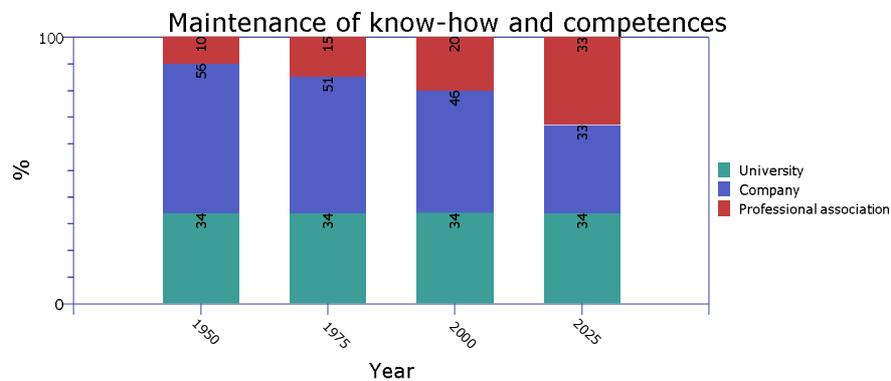
In our profession, eventually, our focus should be on:

- Systemic view of the project and of the whole life cycle.
  - i) Integrated data and information management: all project data could be kept in common databases, while every stakeholder could work on them with his application. In this way, discrepancies will be only in interpretation, while data will be shared.
  - ii) Life cycle integration and risk analysis.
  - iii) Integration of costs from standard to “real time”.
  - iv) Improving project metrics and extend metrics to contract management.
  - v) Integration with H & S and environmental sciences.
  - vi) Reduce life cycle costs and construction time.
- Integration and metrics in organisation and manpower planning.
- Networking.
- Contracts through association: shift form contracts based on conflicting parties, where each party aims to maximise its profit without considering the total cost, to associated contracts where all parties cooperate in reducing the total cost, since only they can maximize the profit in this way.
- Integration on education, BOK, competencies, professional certification. This is mainly with regard to the professional associations. As a matter of fact, in complex organisations, the activities can be classified by dividing all jobs into their basic elements or elementary tasks, which can then be referred to different dimensions of a proper matrix:
  - i) Functional dimension, that takes into consideration the different know-how and skills required and whose scope is to keep medium and long term company know how, competences as well as the corporate culture.
  - ii) Teleological or finalistic dimension, that takes into consideration the objective of each activity with the objectives of performances and results.
  - iii) Topographic dimension, that takes into consideration the different areas and subareas where the organisation operates and whose objectives are legal status, corporate image as well as commercial activity.

Since companies are reducing the functional branches and shifting toward organization by project, they are at risk of losing, at least in part, their know-how and corporate culture. There is a chance that, in future, professional organisations will become the main actors in keeping know-how and competence baselines as well as people's professional development. In this way, professional organisations could become the real masters of professional careers.

In other words, since lifetime employment probably will not exist any longer (as a matter of fact, it does not exist even now) and companies will hire people according to project, the "lifetime relationship" could be shifted to professional associations.

**Table 13 – Maintenance of know-how and competencies**



There is a risk of conflicting integration requirements. In fact, integration requirements of the various stakeholders can be conflicting between each other. In the past this was a main difficulty, to be solved only by keeping a separate and incongruent set of data, sometimes difficult or even impossible to compare. Now it is possible to study an integrated data system able to cope with all requirements.

In detail:

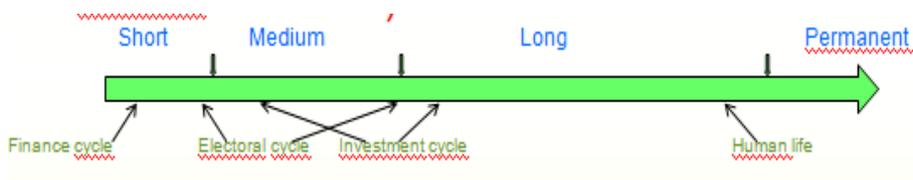
- From the project manager point of view, data relevant to the project and generated by various parties are to be integrated in the way they can be compared and used within the project and for project purposes, from several stakeholders. However from the owner's point of view there could be an additional requirement to compare data from different projects belonging to him (in this case, in general, less detail is needed).
- From the general contractor's point of view the main need is integration between several projects, belonging to different owners, so that data can be used for standards and estimating; the same could apply to other engineering or construction contractors.

- From the investor or banker's point of view, the main need is to compare the investment under monitoring with other, different kinds of investments and to keep the cash flow under control to ensure the return on the investment itself.

## **CONCLUSION**

As a general conclusion, we need to shift from a short term vision (financial cycle, electoral terms) to a medium or long term vision (whose reference is human lifetime and more).

**Table 14 – Time scale**



Today we have the tools for integrating and improving management and controls at all levels as well as to face long-term problems in a rational way.

Furthermore, it is necessary to rationalise our profession together with the other related professions by updating the bodies of knowledge and competence baselines and defining in a more precise way the limits and overlapped areas. This is of paramount importance in continental Europe.

## **BIBLIOGRAPHY**

### **Papers**

Gianluca di Castri

- The road to ICEC 2014 congress in Milano (ICEC Round-Up, October 2010).
- AICE and Bocconi University joint venture for the ICEC world congress (with A. Biffi – ICEC Round-Up, March 2010).
- Project Culture and Total Cost Management: the Italian case (interview for La Cible, 2000).

Carsten Wredstrøm

- My vision for ICEC in the coming years (ICEC Round-Up, March 2010).

### **Books**

- AACE International. 1999. Skills & knowledge of Cost Engineering: A project of the AACE International Education Board. Morgantown, WV,: AACE International.
- AFITEP. 2000 – Dictionnaire de Management de Projet. [s.l.]: AFNOR, 2000)
- Agliata, M. 2011. *La direzione dei lavori*, [s.l.]: Maggioli.
- Biffi, A. 2011. *Project based enterprise: Pensare e agire per progetti* Bocconi: EGEA, 2011.
- Di Castri, G. 2009. *Project management per l'edilizia*. [s.l.]:Flaccovio.
- Di Castri, G. 1992. *Lezioni di Project Management* [s.l.]: ANIMP, Etas Libri, 1992
- Patrone, P.D. & Di Castri, G. 1999. *Lineamenti di Ingegneria Economica*. Copenhagen, Denmark: Alinea
- Hackney, J.W..1997. *Control and management of capital projects*. Humphreys,K.K. (ed.) New York : McGraw-Hill Industrial Engineering Projects - (Spon, 1997)
- Hertogh, M., Baker, S., Staal-Ong, P.L., and Westerveld, E. 2008. *Managing Large Infrastructure Projects: Research on Best Practices and Lessons Learnt in Large Infrastructure Projects in Europe*. [s.n.]: AT Osborne.
- Jaeger, A.V. & Hök,G.S. 2010. *FIDIC: a Guide for Practitioners*. Heidelberg: Springer.
- Miller, R. & Lessard,D.R. 2000. *The strategic management of large engineering projects : shaping institutions, risks, and governance*. [Cambridge, Mass.] : [MIT Press],
- Oberlender, G.D. 2000. *Project Management for Engineering and Construction*. New York : McGraw-Hill.
- Patrone,P.D. & Piras, V. 2007. *Contract e project managemen* . Copenhagen, Denmark: Alinea.)
- Project Management Institute. *A guide to the Project Management Body of Knowledge - (ANSI/PMI 99-001-2004)* [s.l.]: Project Management Institute.