

THE FUTURE PROJECT MANAGER - SOME CONSIDERATIONS OF KNOWLEDGE AND SKILL REQUIREMENTS

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ABSTRACT

The nature of project management practice today is quite different from two decades ago. Then, project management was essentially a technical and often engineering activity that resulted in a physical deliverable. The emphasis was to achieve the technical specifications that make up the project. Managing the projects essentially involved implementing a plan based on an operational sequencing of activities and providing a co-ordinating role for achieving the plan. Project managers were therefore drafted from persons with technical and engineering backgrounds. Today, project management has grown to become a managerial tool that can deliver improved performance for any organisation. Examples include the growing development of *enterprise project management*, which involves a multi-project management approach for all the operations undertaken by a company. The change in orientation from a purely technical or engineering to a managerial one means that project managers today are faced with a situation whereby the fundamental roles and functions they perform are witnessing a gradual shift in focus.

Equally, a structured approach to project management has become more common through the developments achieved in the Information and Communications Technology within the last decade. The IT oriented systems for managing projects which have resulted and are still emerging from these developments have contributed to changes in the role that many project managers perform. Adapting to such changes imposed by the way projects are organised requires project managers to acquire from time to time relevant knowledge and skills, to assist them to efficiently perform the tasks required of them. The paper presents some findings from a study that focuses on the development of project managers, and how they maintain their professional skills in a changing business environment. The study is based on the construction and engineering sector.

KEYWORDS:

Project managers, Knowledge, Skills, Experience, Construction

INTRODUCTION

Project management is often described as *the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project*. This view of project management focuses mainly on the technical skills, or the science of project management. Its main emphasis is to achieve the technical specifications that make up the project. Project managers in the past were therefore drafted from persons with technical and engineering backgrounds who could appreciate the technical requirements demanded by the project, and the skills for managing any particular project. The skills involved were often considered too specific and generally not transferable from one sector to another or from one project type to another. Managing the projects essentially involved implementing a plan based on an operational sequencing of activities and providing a co-ordinating role for achieving the plan.

Today, project management has grown to become a managerial tool that can deliver improved performance for any organisation. Examples include the growing development of *enterprise project management*, which involves a multi-project management approach for all the operations undertaken by a company. The change in orientation from a purely technical or engineering to a managerial one means that project managers today are faced with a situation whereby the fundamental roles and functions they perform are witnessing a gradual shift in focus. Within the construction sector the role of project manager is gradually being influenced by a shift from what was essentially a technical and often engineering activity that resulted in a physical deliverable, to general management for the technical or engineering functions and operations. Adapting to such changes imposed by the way projects are organised requires project managers to acquire from time to time relevant knowledge and skills to assist them to efficiently perform the tasks required of them (Gretton, 1993). A number of developments both within and outwith the construction sector have contributed to this gradual shift.

The paper briefly discusses some of these developments and presents some findings from a study that focuses on the knowledge and skill aspects of project managers and their perceived relevance in assisting them to maintain their professional skills within a changing business environment. The study is based on the construction and engineering sector.

WIDER USE OF PM TECHNIQUES

Whereas the use of project management techniques were widely applied in traditional project oriented industries and sectors such as construction contracting, the last decade of the twentieth century witnessed the application of project management concepts to several organisations outside this bracket that operated on the basis of functional units. This take-up of project management was driven by the awareness that every organisation's production or business activities could be organised as a series of tasks or projects for greater efficiency. Most organisations need to plan, prioritise and monitor many overlapping and competing with constrained resources. The emergence of *programme management*, which involves the co-ordinated support, planning, prioritisation and monitoring of projects to meet changing business needs present an obvious outcome of the take-up of extended project management. From an individual organisation's perspective the issues to be confronted were:

- What work does it need to do to meet established goals?
- What are the priorities?
- What skills and capacity does it require to complete the work?
- How does each project impact other work?

The use of project management approach facilitates the appreciation of these issues from an overall organisational standpoint.

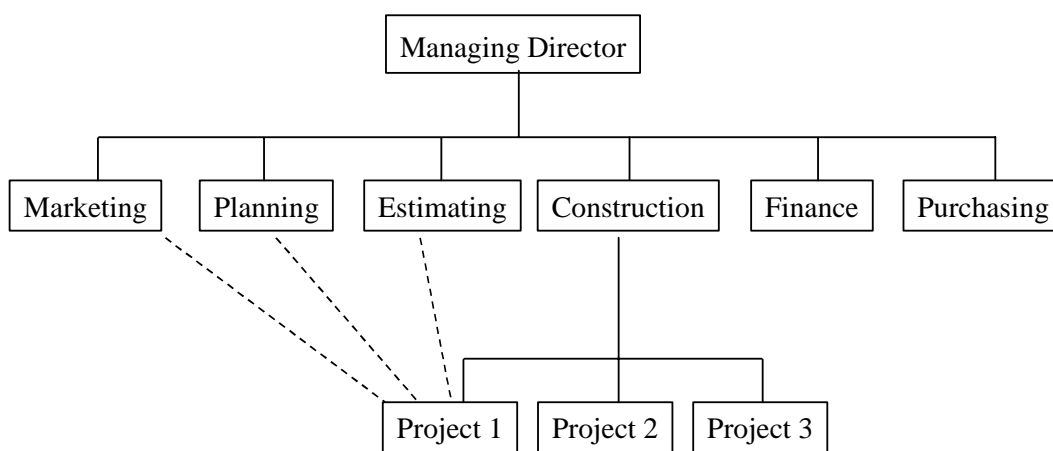
CHANGING EMPHASIS FOR PM

The wider use of Project management techniques within all sectors of economic activity has led to the emergence of generic project management models that are applicable to all organisations, be they functional-oriented or project-oriented. The challenge of most organisations in today's competitive business environment is effectively leading and managing the people who are focused on project delivery. This involves the development of the following general and transferable knowledge and skills for project managers.

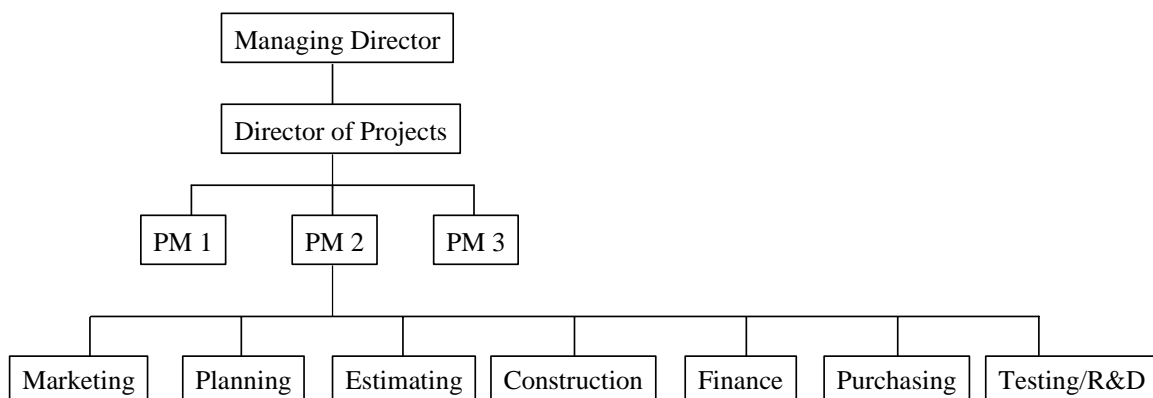
- Awareness for context, features and importance of project
- Establishing client relationship
- Forming and setting up project team
- Establish requirements for project
- Preparation of high-level project proposal
- Obtaining client agreement for proposal
- Organisation of team and engendering team-working

- Development of project strategic plan
- Preparation detailed project plans and implementation programmes
- Monitoring, controlling, and reporting on progress

The above requirements demanded of the project manager are not unique to the construction sector, or any specialist area for that matter. Within construction, this has meant the relegation of traditional activities, such as detailed planning and estimating, previously associated with the role of the project manager to a functional level where technical experts perform them as depicted by Figure 1. This secondary role for the technical aspects of construction operations and business processes has been contributed to by the proliferation of IT-options that within the last decade have taken the arduous aspects out of the technical tasks previously required of both project managers and technical staff. While this process is still on-going, it points to a future role for the project manager that will require more general and managerial skills, and only a technical competence to enable the appreciation of the features of the project.



a. Traditional organisation within construction organisations



b. Emerging project oriented construction organisations

Figure 1. Project oriented versus functional oriented organisations

Equally, the growth in remote working as a consequence of recent developments of computing, communications and the Internet have given a new impetus to the application of project management (McCaffer and Edum-Fotwe, 2000). Each work package undertaken remotely has to be performed as a project driven by the typical characteristics of time, quality and cost.

The concomitant effect of this wider use for project management is that a greater number of an organisation's employees now have to acquire project management skills. Of even greater significance is the way existing project managers are addressing themselves to the new roles that such changes in the industry impose on them. Within such a changing industry climate, project managers therefore increasingly find themselves accountable not just for the technical content of the project as expressed by the engineering and construction accuracy, reliability of the facility, and within-cost performance. Project managers find themselves confronted by issues, and undertaking additional roles, that have traditionally not been part of their responsibility (Gilleard and Chong, 1996; Shenhar et al. 1997). Both Ceran and Dorman (1995) and Russell and Jaselski (1997) recognised this changing role for construction project managers and argued that they must supplement their traditional functions with other *non-engineering* knowledge and skills to meet today's professional demands for which they become responsible.

PM KNOWLEDGE

Professional competency in project management is attained by the combination of knowledge acquired during training, and skills developed through experience and the application of the acquired knowledge. Modern project management practice, therefore, demands other *general* and *management* knowledge, coupled with skills that extend beyond the technical aspects of traditional engineering areas. For the construction sector, since projects traditionally formed part of a functional organisation, much of this additional knowledge will overlap with the general functions required for managing enterprises. Table 1 presents a summary of the general and managerial aspects for managing major construction and engineering projects.

Table 1. General and management aspects involved in PM role

Management-related	General issues
Finance and accounting	Economic analysis
Sales and marketing	Social trends
Strategic planning	Political developments
Tactical planning	IT advancements
Operational planning	Legal framework
Organisational behaviour	Statistics, probability theory and risk
Personnel administration	Conflict management
Personal time management	Stress management

PM SKILLS

Projects in construction cover several areas of specialisation. It is to be expected that construction project managers who specialise in, say, building works will not necessarily be specialists in water engineering projects. However, acquiring the knowledge inputs for a particular type of project area enables the project manager to develop two types of skills. These are specific skills, which relate directly and only to construction projects, and in particular, the areas that reflect their speciality; and general skills, which are transferable from the construction arena to other fields, but more importantly from one area of construction to another. The general skills provide much of the foundation for developing project management skills. They are often essential for the project manager to function effectively with their specialist knowledge. Walker (1996: pages 182-188) identifies the following general skills as relevant to construction project managers.

- *Leadership*:- that is provided at the three main levels of project leadership, technical leadership, team leadership and will involve the following skills.
- *Communication*:- involves the exchange of information. Effective communication is a broader skill and involves a substantial body of knowledge that is not unique to the project context.

- *Negotiation*:- these occur around many issues, during the life of a project, many of which involve the project manager.
- *Problem solving*:- involve a combination of problem definition and decision-making, which is concerned with problems that have already occurred. The problem definition aspect requires distinguishing between causes and symptoms.

According to Chen (1997) these skills combine with the traditional engineering knowledge of the project manager to produce what is described as the *new perspective* of project management. This new perspective identifies some key areas in which the modern project manager in construction needs to develop competency in order to perform effectively in the future as follows:

- *Entrepreneur*. The project manager is required to provide innovative solutions both for the product as well as the business processes involved in the delivery of the project's outcome. This requires both long-term and short-term perspective for the project and its wider business/industry context.
- *Manager*. The project manager has to see to the general functions associated with the project. These include managing human systems, logistics, information flows, and organisational relationships. The use of technology as a leverage for competitive advantage has become more important now to effective delivery of projects. This operates both at the production level and the use of IT resources.
- *Innovator*. The project manager is required to be astute regarding options that can be deployed for effective *technological innovation* to optimise the project's performance. The production process in construction combines specific activity phases including planning and scheduling, estimating and cost control, contract management and purchasing.
- *Production engineer*. The project manager is required to manage the effective implementation of each of these phases to achieve reasonable levels of efficiency.

The next sections present the outcome a study that focuses on the development of construction project managers and how they maintain their professional skills in a changing construction business environment.

PM KNOWLEDGE AND SKILLS DEVELOPMENT

The construction industry presents a suitable environment for reviewing the development of professional competency in project management. This is because nearly all its business activities are based on the project management approach and so it abounds in cases of successful project management that can provide useful lessons. A survey was undertaken to ascertain how practising construction project managers acquire the relevant knowledge and skills, which enable them to perform effectively in their professional roles. The survey elicited a key issue from the project managers regarding their perception of the relative importance of each of some identified knowledge and skill factors in contributing to their professional development and performance.

The research approach

The survey was administered by applying two research instruments, the interview technique and a postal option. The first instrument was implemented for a selected group of organisations for which several interviews were conducted with key professional personnel. This helped to assess the criterion for selecting successful project managers, and to determine the metrics for various factors identified in the objectives. The second phase of the survey involved the postal option. The main tool employed in collecting the core data for the survey was a structured questionnaire, which was developed by employing the outcome of the interview phase and various other criteria identified from literature. In all, 170 good responses from practising project managers were obtained out of 500 questionnaires, which were sent out for the postal survey, giving a response rate of thirty-five percent.

This level of response rate exceeded the norm expected for survey research in construction and also yielded a sample size suitable for the subsequent parametric analysis.

RESULTS AND DISCUSSION

The results of the survey were analysed by summary statistics, and present aggregated attitudes of the respondents regarding the relative importance of the various knowledge and skill factors for developing and maintaining effective project management competency.

Respondent attitudes on PM competency

This section presents respondent views on how various knowledge and skill factors contributed to their professional development, and its relevance in maintaining their competency. The various knowledge and skill requirements of construction project managers were organised into several elements that impact on competency of project managers. These elements define isolated knowledge and skills (*k-s*) that are usually offered in training modules for developing and maintaining project management competency. The survey elicited for each *k-s* element the degree of importance for developing and maintaining PM competency. Each *k-s* element was evaluated for a *k-s* factor. The rationale of the *k-s* factor is to identify the critical knowledge and skill areas for developing project management competency in construction determined by the wider perception of the construction industry. The *k-s* factor values ranged between 100 and 0, with higher values indicating a greater degree of importance. The analysis extracted two categories of *k-s* elements, the primary and the secondary ones. The survey also established the extent to which the different modes of acquiring such PM competency were relevant for the various *k-s* elements. These were expressed by indexed values of the contribution from different mechanisms for delivering project management knowledge and skills.

Tables 2 and 3 present the resulting *k-s* factors associated with each element. These have been organised respectively into primary and secondary groupings, to reflect the perceived impact of the various elements. All elements that yielded *k-s* factors above 80.0 were extracted to form the primary group. The *k-s* elements that returned factors between 50.0 and 80.0 formed the secondary group. Elements with factors below 50 were eliminated, as these did not provide strong enough evidence of perceived impact on developing and maintaining project management competency.

Different aspects of experiences that are skill based dominated the elements in Table 2. This is indicative of the important role of experience for achieving, maintaining and renewing skills and competency in construction project management. But of greater significance is the ability to employ such experience to address the changing conditions and requirements that the industry environment presents from day to day. Table 3 presents the elements that were categorised as secondary factors. This predominantly reflected elements of an academic nature, and which usually form part of many academic programmes in project management.

Table 2: Summary of primary k-s elements for developing construction PM

Generic PM function	Knowledge and skill (k-s)	k-s factor
<i>Technical skill</i>	Planning and scheduling	97.3
	Construction management activities	89.1
	Basic technical knowledge in own field	94.5
	Productivity and cost control	82.7
<i>Managerial skill</i>	Leadership	98.2
	Delegation	96.4
	Negotiation	95.5
	Decision making	91.8
	Motivation and promotion	90.0
	Team working	90.0
	Time management	82.7
	Top management relations	81.8
<i>Financial skills</i>	Establishing budgets	94.3
	Reporting systems	90.6
<i>Legal skills</i>	Drafting contracts	92.4
<i>Communication skills</i>	Presentation	95.3
	General and business correspondence	90.6
	Report writing	88.7
<i>General skills</i>	Chairing meetings	96.1
	Understanding of organisation	84.5

Table 3: Summary of secondary k-s elements for developing construction PM

Generic PM function	Knowledge and skill (k-s)	k-s factor
<i>Technical skill</i>	Forecasting techniques	74.5
	Quality control	72.7
	Estimating and tendering	70.9
	Material procurement	65.5
	Reading and understanding drawings	62.7
	Design activities and background	59.1
	Site layout and mobilisation	54.5
<i>Managerial skill</i>	Human behaviour	76.4
	Strategic planning	60.0
<i>Financial skills</i>	Project finance arrangement	74.5
	Establishing cash flows	65.1
<i>IT skills</i>	Project management software	75.6
	Spreadsheet	59.3
	CAD	55.8
<i>Legal skills</i>	Health and safety issues	76.2
	Industrial relations	57.1
	Preparation of claims and litigation	55.2
<i>Communication skills</i>	Public speaking	74.5
<i>General skills</i>	Marketing and sales	50.5
	Public relations	50.1

In Table 4, the relative contribution of different mechanisms for delivering project management competency is presented for the various k-s elements. This complements the relative significance of the k-s elements in Tables 2 and 3. Table 4 shows that for nearly all cases the contribution of

academic programmes to the competency of project managers is rated lower than that of formal industry training they attend while on the job. Similarly, the perceived contribution of formal training was out-ranked by that of experiences on the job. While these perceptions are of great importance to designing mechanisms that can facilitate the acquisition and maintaining of project management competency, there are obvious reasons why the contribution from academic input would rank the lowest in all cases. Project managers have generally acquired some years of working experience.

Table 4: Impact of competency delivery mechanisms on *k-s* element

k-s element	Indexed contribution		
	<i>Academic courses</i>	<i>Formal training</i>	<i>Job experience</i>
<i>Technical skill</i>			
Basic technical knowledge in own field	28.2	18.2	80.0
Forecasting techniques	8.2	9.1	64.5
Site layout and mobilisation	0.0	0.9	82.7
Material procurement	0.9	1.8	77.3
Operation research	5.5	1.8	13.6
Technical writing	17.3	20.0	51.8
Design activities and background	21.8	10.9	67.3
Reading and understanding drawings	21.8	11.8	81.8
Construction management activities	0.9	13.6	86.4
Planning and scheduling	3.6	13.6	77.3
Estimating and tendering	2.7	11.8	74.5
Productivity and cost control	3.6	15.5	72.7
Work study	4.5	7.3	18.2
Plant hire and management	0.9	0.9	24.5
Quality control	6.4	27.3	66.4
<i>Managerial skill</i>			
Leadership	3.6	23.6	83.6
Time management	4.5	23.6	61.8
Decision making	7.3	27.3	70.9
Negotiation	3.6	23.6	76.4
Delegation	0.9	8.2	79.1
Strategic planning	5.5	5.5	49.1
Human behaviour	8.2	20.0	63.6
Motivation and promotion	5.5	19.1	64.5
Recruitment	0.0	10.0	43.6
Team working	6.4	25.5	74.5
Top management relations	2.7	6.4	70.0
<i>Financial skills</i>			
Reporting systems	3.6	11.8	68.2
Project finance arrangement	9.1	13.6	59.1
Investment appraisal	10.9	13.5	32.7
VAT and Taxation	3.6	5.5	18.2
Stock control and evaluation	3.6	5.5	17.3
Establishing cash flows	8.2	16.4	47.3
Establishing budgets	7.3	12.7	80.9

Table 4: (continued)

k-s element	% contribution		
	<i>Academic courses</i>	<i>Formal training</i>	<i>Job experience</i>
<i>IT skill</i>			
Operating systems	5.5	5.5	15.5
Programming languages	9.1	4.5	8.2
Special applications	5.5	6.4	16.4
Spreadsheet	4.5	9.1	33.6
Database	3.6	5.5	25.5
Network systems	5.5	3.6	14.5
CAD	4.5	8.2	33.6
Project management software	5.5	10	39.1
Information systems and IT tools	4.5	7.3	17.3
<i>Legal skills</i>			
General legal background	10.9	12.7	34.5
Drafting contracts	3.6	17.3	69.1
Industrial relations	1.8	9.1	48.2
Health and safety issues	1.8	22.7	55.5
Preparation of claims and litigation	0.9	6.4	50.9
Trade unions and public authorities	0.9	4.5	41.8
<i>Communication skills</i>			
Presentation	3.6	34.5	73.6
Report writing	10	20	69.1
General and business correspondence	7.3	10.9	77.3
Public speaking	3.6	26.4	64.5
<i>General skills</i>			
Marketing and sales	4.5	10	32.7
Public relations	1.8	3.6	38.2
Understanding of organisation	4.5	7.3	67.3
Chairing meetings	3.6	12.7	78.2

This makes their academic background more remote to their immediate circumstances and so they are unlikely to regard this background as having a direct impact. Again, the perception of the project managers regarding academic programmes will be based on developments that occurred several years ago. Obviously, developments in academia may have moved on from that time, much like the changes that have occurred in industry and also to the demands placed on the project management function itself. Equally, academic programmes by their very nature address people from several different backgrounds. As such they can only be broad, and not specific to any project management job situation. It therefore has to be emphasised that for the dominant role of *experience* to be relevant for maintaining competency, this has to be built on a sound academic background. All the same, the evidence from the survey shows that academic programmes, although are essential to acquiring project management competency, do not significantly contribute to maintaining and renewing the same to any appreciable degree. The over-reliance on experience for maintaining the competency of project managers means that they can miss out on the broader outlook, since most experience acquired will be specific. The high indices associated with the contribution of experience as perceived by project managers however, implies that making academic programmes in project management relevant cannot overlook the experience factor.

CONCLUSIONS

The importance of project management to construction derives from the nature of how the industry's business activities are conducted. Its growing take up in other industries as a result of the productivity gains that can be associated with implementing this managerial technique cannot be overlooked. Developing the requisite competency to ensure efficient performance on the part of the managers who run projects is therefore essential to its success. This work was aimed at providing an insight on how such acquired competency can be made relevant to the changing business circumstances of the industry. The paper established the changing role of project managers and how increasingly, they are required to perform roles outside the traditional scope of project management. The survey established that the knowledge and skills necessary to maintain their competency, in order to fulfil these changing demands are acquired largely from their experiences. While this is very useful and directly relevant to their job situation, it excludes the benefit of the broader outlook demanded by the senior position of a project manager.

The study therefore focused on the knowledge and skill factors that construction professionals had to acquire in order to become project managers. These factors comprised academic background and experience-related knowledge as well as skills. The perception of the practising project managers regarding the relative importance of the factors to their professional performance also provides useful options for designing training programmes of future project managers.

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