



The maturity of project management in different industries: An investigation into variations between project management models

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Abstract

This paper presents the results of an investigation into the nature and extent of variations between project management practices in six industries. The investigation had the practical purpose of supporting a group of pharmaceutical R&D organizations in their search for an optimum project management model. A total of 10 ‘domains’ was identified using qualitative methods and these formed the basis for a programme of 31 in-depth interviews with knowledgeable project management practitioners in 21 organizations drawn from the six industries. Each interview elicited a quantitative assessment of the practices relating to the domain, using pre-determined scales, and qualitative comments on the practices based on the experiences of the interviewee. Differences between companies and industries were found to exist in each domain. The most highly developed project management models (which might be said to equate to measure of project management maturity) were found in the Petrochemical and Defence industries, which on average scored highly on most dimensions. Other industries (Pharmaceutical R&D, Construction, Telecommunications, and Financial Services) displayed some interesting differences in different domains, but did not display the coherence or scores of the two leading industries.

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1. Introduction

If you are a project manager, and you suspect that the basic approach to project management in your organization is not ideal, what can you do to convince senior management of the benefits of adopting a different model? Can you trust your own intuition and experience? Where can you look for evidence that there are better ways of approaching the management of projects across an organization?

One place to start is by talking to practitioners in different organizations, or even in different industries, and this paper describes one piece of empirical research that was designed to provide someone asking these questions with some kind of a “road map”. But is it

likely to prove fruitful? Does the literature on project management suggest that this might be a sensible topic to study empirically?

Modern project management has its roots in the second world war, and developed in a limited number of engineering based industries during the 1950s, 1960s and 1970s [1]. More recently, the demand for project managers has mushroomed, as project working has increased dramatically in a broad range of industries [24].

One might reasonably expect “industries of origin” to have developed a more advanced model of project management than industries such as Pharmaceutical Research and Development which adopted project management disciplines and practices somewhat later. But did they?

Are these “industries of origin” in some way more “mature” than later adopters of project management? Is there evidence that being more “mature” in project management brings with it an improvement in project management practice?

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2. Project management maturity

The concept of process maturity was born in the Total Quality Management movement, where the application of statistical process control (SPC) techniques showed that improving the maturity of any technical process leads to two things: a reduction in the variability inherent in the process, and an improvement in the mean performance of the process [3].

Through the widely adopted “Capability Maturity Model” for software organisations, developed by the Software Engineering Institute of Carnegie-Mellon University between 1986 and 1993, this concept of process maturity migrated to a measure of “organizational” process maturity. Integral to the model is the concept that organizations advance through a series of five stages to maturity: initial level, repeatable level, defined level, managed level and optimising level. “These five maturity levels define an ordinal scale for measuring the maturity of an organization’s software process and for evaluating its software process capability. The levels also help an organization prioritize its improvement efforts.” [4] The “prize” for advancing through these stages is an increasing “software process capability”, which results in improved software productivity.

Since software is developed through projects, it is natural that the concept of organizational maturity would migrate from software development processes to project management, and this has been reflected in an interest in applying the concept of “maturity” to software project management [5]. Possibly as a result of this a number of project management maturity models appeared during the mid-1990s that were more heavily influenced by the thinking of the project management profession. For example, Ibbs and Kwak [6] used one of these models in their attempt to demonstrate the organizational benefits of project management. This particular model from IPS, along with others such as that from ESI/George Washington University and Kerzner [7], incorporates elements from the PMBOK® Guide [23].

Other models that are being used to assess project management maturity include the assessment of project management processes as a part of the organization’s overall assessment of the quality of its business processes, using models such as the Baldrige National Quality Award (see <http://www.quality.nist.gov>) or the European Forum for Quality Management’s “Business Excellence” model (see <http://www.wfqm.org/imodel/modell1.htm>). The Project Management Institute is developing a standard for organizational project management maturity, known as OPM3™ [3,8].

Every aspect of project management has two dimensions—a technical dimension and a human dimension. The technical dimension encompasses those groups of practices or processes that are integral to project management,

while the human dimension includes not only the people who are operating these processes, but their expertise.

It could be argued that the process of planning or managing a large project is very different in nature as well as in scope from processes such as issuing customer invoices. One of the differences is the extent to which individual expertise, knowledge and judgment are brought into play. As Lechler’s research has corroborated [9], where projects are concerned it is people who get things done.

Indeed the continuous gradual performance improvement as processes mature is in sharp contrast with the way individuals acquire skill. For example, Hubert and Stuart Dreyfus [10] identify five stages in skill acquisition: novice, advanced beginner, competence, proficiency and expert. What distinguishes the final two stages is that although experts and proficient performers are familiar with the rules of good practice, they no longer select and follow rules. Rather they perform smoothly, effortlessly and subconsciously.

But regardless of whether it is appropriate to apply the concept of process- or organizational-maturity to project management or whether it is preferable to think in terms of developing skilled practitioners through some form of “situated learning”, or even some combination of the two, it seems logical to conclude that the longer an industry is subjected to commercial pressures to perform, the more mature both its processes and its practitioners are likely to become.

Taken together, these two dimensions, the human and the technical, will coalesce in a corporate culture that either promotes good project management practice, or that inhibits it. And it is in order to review the literature on corporate culture, before describing the empirical research that is the subject of this article.

3. Corporate culture

The 1980s saw an outpouring of management writings on the subject of culture, with the runaway success of Peters and Waterman’s “In Search of Excellence” [11] illustrating the extent to which the genre touched the hearts of the management community.

These authors have concentrated on what might be called the “behavioural side” of management and organisation. They have argued that the difference between successful and not-so-successful organisations rests with the values and principles that underlie their internal organisation . . .

Organisational culture is the term that has come to comprise this set of behavioural variables that have drawn so much attention. “Culture” refers to the underlying beliefs, values and principles that serve

as a foundation for an organisations management system as well as the set of management practices and behaviours that both exemplify and reinforce those basic principles [12].

The culture of an organization, therefore, exerts a strong influence on all the members of the organization who are undertaking projects in or for it. This was recognized in the 1990 World Congress on Project Management, where one of the four main groups of topics was “Culture and Project Management”. The twin messages to emerge from this and subsequent literature are firstly that if the culture is unhelpful then it is important to change it and secondly, that irrespective of whether culture helps or hinders, “the effects of culture must be considered throughout the project.” [13].

Firstly, if the culture is unhelpful to the achievement of project goals, then the project may need to make some attempt to influence the culture for the better [14], although this may not be simple [15]. Cleland and King [16] illustrate well how certain aspects of corporate culture, notably the attitude and practices of senior managers, militate against the effectiveness of the planning process.

With regard to the need to consider the effects of culture, this will pervade many aspects of project management practice. The leadership style of a project manager needs to be adapted to the organisational culture [17]. The practices for managing people on the project team will be governed by the company’s HR practices [18], while the nature of projects and the potentially adversarial relationships between different organizations that are party to a contract is likely to create a culture of conflict and stress [19]. The impact of an adversarial relationship on cost in the construction industry is well illustrated in a survey of 262 projects carried out by the Construction Industry Institute, which shows a clear correlation between high trust and low cost, and between low trust and high cost [20].

4. Research questions

Thus, this brief review of relevant literature suggests it may prove fruitful to study the differences between project management in different industries, because:

- history shows that project management has been developing for longer in certain industries than in others;
- the study of process maturity reveals that this historical development is likely, under certain conditions, to lead to more reliable and predictable results than in others; and
- the study of corporate culture indicates that the development of a positive corporate culture can

support the development of superior practices in healthy environments.

There appear to be differences in the level of project management practised in different industries—so the research questions to be answered empirically are, “What are the differences in practice between industries, and what is the extent of the difference?”.

5. Research method

The study itself was part of a continuous “action learning” research methodology that has been described elsewhere [2] and was led by the authors of this paper. Integral to the method is a committed group of practitioners, each of whom is a “subject matter expert” with extensive experience of project management, who operate as a form of “Community of Practice”. A community of practice is defined as a group that shares knowledge, learns together, and creates common practices. Communities of practice share information, insight, experience, and tools about an area of common interest [21].

This is highly relevant to project managers since project management is a discipline that has been codified as a tradition through the combined experience of its practitioners—a group that could be considered as a global “community of practice” [2].

This community is both the “custodian” of the project management worldview, and also the group of people that, by the nature of their employment, is charged with delivering the practical results of employing their understanding of the “worldview”.

Project managers employed by a number of leading pharmaceutical R&D companies have formed their own community of practice since 1999 (Project Management Knowledge Network—PMKN), with the explicit goal of developing their understanding of project management and sharing common experiences. As a part of their search for an optimum project management model they undertook during 2001 a research study to investigate the research questions stated above.

The study had been preceded by a detailed comparison between members of PMKN and participating organizations in other industries, and objectives and terms of reference were agreed at a PMKN workshop. Fig. 1 shows how this study along with other research studies combines with different elements of the research methodology to create a commonly held knowledge pool.

6. Development of the research instrument

The instrument itself was developed by a group of Pharmaceutical R&D project managers with extensive

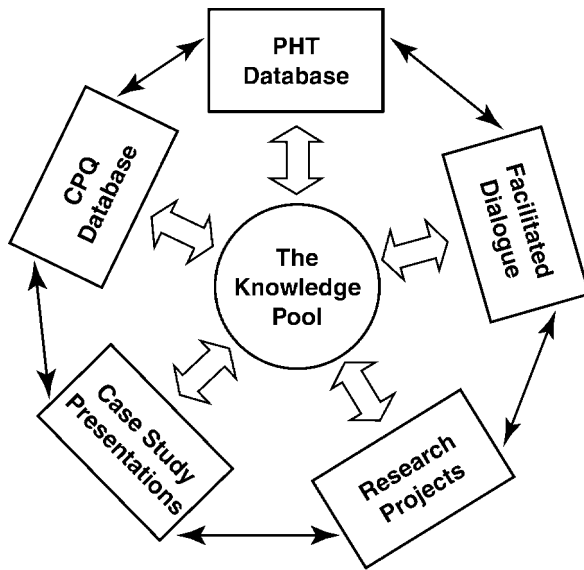


Fig. 1. Research elements of the knowledge pool.

PM experience across one or more industries. They drew extensively on their personal knowledge, training and experience and through a series of meetings using normative group techniques that were supplemented by an informal review process employing principles of Delphi techniques [22].

The resultant instrument identified a series of questions grouped together under nine “domains”, each of which was felt to distinguish important elements of project management practice that differed from industry to industry. The domains were:

1. Extent of project culture.
2. Extent of business (versus technical) culture.
3. Organisational understanding of multidiscipline project management.
4. Strength of project versus line management.
5. Degree of authorisation held by a project.
6. Extent of project management infrastructure, method and systems.
7. Centralization of project information for each project.
8. Competency of Project Management staff.
9. Ability to match project team to the needs of the development (stage and type).

This pilot version of the instrument was tested at a PMKN workshop in May 2001 attended by 24 project managers from 14 pharmaceutical R&D organizations, and a number of experienced project managers from other industries. A self-scoring questionnaire was answered for each of these nine domains against a scale between “worst practice” and “best practice” as adjudged by the working party who provided written guidance through examples along the scale.

The results, which have no statistical validity whatsoever, were nevertheless interesting as a pointer to the opinions of the experienced community attending the workshop, and provided encouragement that the nine domains were indeed potential differentiators between industries. Fig. 2 shows the mean of scores from the Pharmaceutical R&D companies compared with informed individual assessments of what other industries might score.

On the basis of this exercise, the working party decided to proceed to the second phase of the study.

The workshop in May had found difficulty in distinguishing adequately between several of the domains since there was felt to be both ambiguity and overlap, so the working party undertook further work to refine them so that each could be easily distinguished from the others.

As a result, the nine domains increased to 10 with five of them being further sub-divided.

1. Project culture

Pervasiveness of culture.

What is the extent of a project-based culture within the organization?

Team member identification.

Do members of project teams identify themselves mainly with the project they are working on, or with the functional discipline they possess?

Depth of project identification.

What is the lowest level at which people working on a project identify themselves primarily with a project?

2. Organizational leadership

Commitment of Upper Management.

How committed is upper management to the importance of developing and organizational project management capability?

Understanding of Upper Management.

How extensively does upper management reveal its understanding of what is necessary to develop and improve a project delivery capability?

3. Business culture

Business Focus.

To what extent are all governance decisions taken by the project team based on the business (as opposed to technical) case for the project?

Business Awareness.

To what depth in the project team is there knowledge of the specific business goals case and project execution strategy?

4. Multi-project management

Prioritising projects strategically.

Are all projects prioritised according to their strategic importance within the organization?

Resourcing projects fully.

Do the resources allocated to projects reflect their strategic priority?

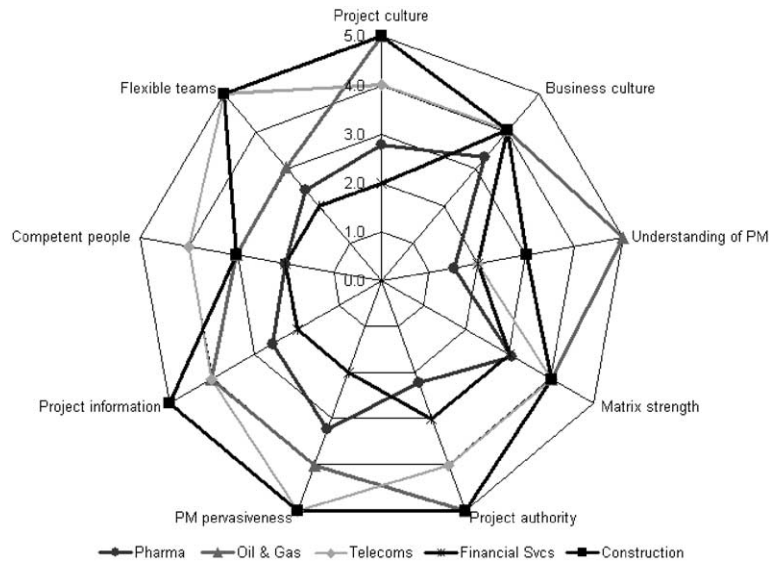


Fig. 2. Preliminary trial results of the prototype instrument.

Reacting to changing circumstances.

Is there flexible resource allocation responsive to changes in strategic priorities? Revising goals to resource changes. When resources are changed because of changing strategic priorities, are project goals changed accordingly?

5. PM structure, methods and systems
Extent of PM systems, methods and processes. How widely across the organization are common systems, methods and processes used for the management of projects?
Integration of PM systems, methods and processes.
How well are PM systems, methods and processes Integrated with mainstream business systems?
6. Degree of authorization
Project authorization.
Does the project team have the authorization/empowerment necessary to deliver the agreed project strategy. Is governance role to ensure project is being managed or is role to review and approve decisions?
7. Location of information
Centralization of information in each project.
To what extent are all project plans and functional plans and project deliverables centralized under the control of the project?
8. Matching team to project
Matching the team to the project stage or type.
To what extent is the organization capable of characterizing the development type and stage of a project, identify different types of teams (e.g. lightweight, heavyweight, autonomous), and adopt an appropriate governance structure that reflects the difference?

9. Capability of PM staff

Competency of PM staff.

Do you have the capability to deliver the projects that you need? Do you have a sufficient pool of competent project managers to deliver the project portfolio?

10. Strength of project vs functional management

Strength of matrix.

To what extent are people and dollars allocated to and managed by the project?

7. The conduct of the research study

Each of the 18 questions within the 10 domains was supported by a scoring scale developed by the working party, which, like the preliminary instrument, was based on a scale from 0 (worst practice) to 5 (best practice). Both extremes, as well as a number of intermediary points were described.

In order to improve the consistency of scoring, each set of data was obtained from a senior member of the project management community in the organization being interviewed, in an hour-long telephone interview. Only two interviewers were used, and the first two interviews were conducted jointly, scored independently, and the results calibrated.

Interviews were obtained with 31 organizations, as follows:

- Nine “big Pharma” R&D organizations (spending more than \$1billion per annum on R&D).
- Six “medium Pharma” R&D organizations (spending between \$250million and \$1billion per annum on R&D).
- Five telecommunication companies.

- Four defence organizations.
- Three financial services companies.
- Two major UK-based construction companies.
- Two Petrochemical organizations: One of the Top 3 integrated operators, and one of the Top 3 engineering contractors.

Numerical scores were obtained for each question, using the pre-determined ranges of scores (to produce a radar chart comparison), and the descriptive answers to each question were also kept (to perform a qualitative analysis of the different mental models underlying each organization's score.)

8. Results and discussion

The first interesting comparison was between big Pharma and medium Pharma (Fig. 3). On five of the dimensions, the results were indistinguishable. There was even a comparable spread of scores for these. On three dimensions, however (degree of project working, leadership and matrix strength) medium Pharma scored better than big Pharma. The reasons advanced during the interviews were all related to the closeness of the project management department to senior management, and the closeness (in time and hierarchy) of senior management to the project management of drug development.

The second area of interest was comparing the longest establish industrial practitioners of project management—petrochemicals and defence. As Fig. 4 illustrates, the intuition of the working party was dramatically

substantiated by the results of the telephone interviews. There is a qualitative difference between the tone of the answers given by the petrochemical managers and all others.

Defence was strong, but suffered on the same three axes as big Pharma. It appears that many people at the top of defence organizations (especially defence acquisition) are not themselves people who have experience, understanding or appreciation of the business benefits that can accrue from a disciplined approach to project management, and when that is coupled with the intensely political nature of defence acquisition, it puts defence lower on the “leadership” dimension than medium Pharma.

It is also interesting to see how bunched together the four industries are with regard to multi-project management. It appears that, at least from the point of view of the project management departments, multi-project management still leaves much room for improvement! This may be particularly in the area of understanding and adjusting resources from project to project on a continual basis. There is generally a gradient through the four sub-questions, with the first one (project prioritisation) generally scoring highly, and the fourth one (revising expectations when resources are removed) generally scoring poorly in all industries.

As other industries that were perhaps more recently converted to appreciate the merits of project management are included, the picture becomes more confused as can be seen from Fig. 5.

The profile for the construction industry as represented by the two companies interviewed is an interesting one. The very low dimension is “team types” which

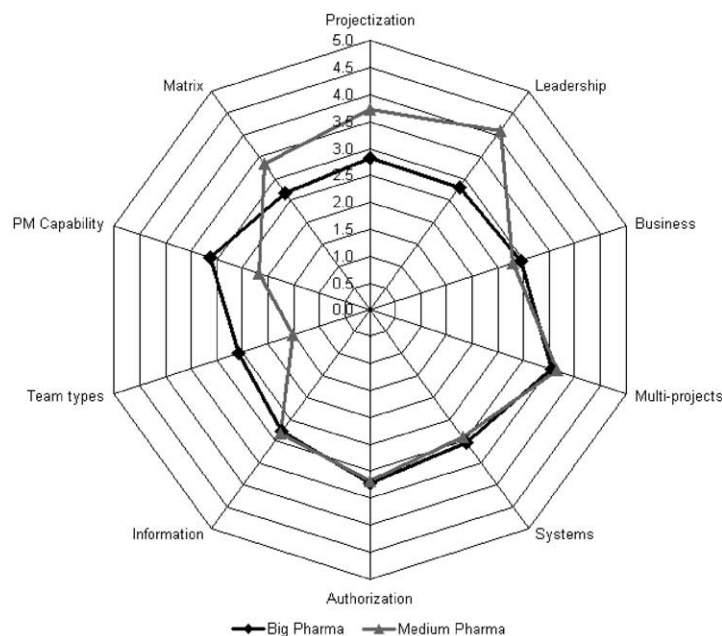


Fig. 3. Big pharma and medium pharma compared.

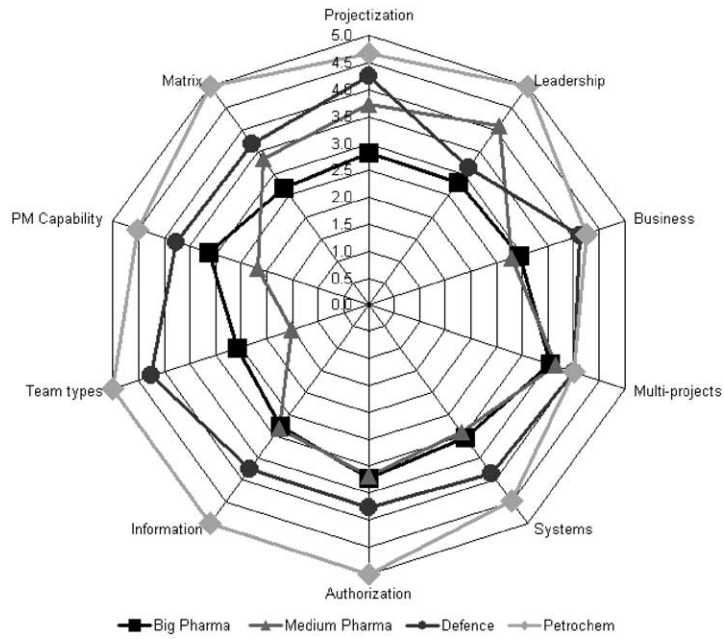


Fig. 4. Pharma compared with more "mature" industries.

could have something to do with relative homogeneity of construction projects compared to other industries and so tended to have one single project team structure applied to all projects.

On the other hand, the leadership of the construction firms was drawn from people whose entire industrial experience was of construction project management, and so the leadership was both highly committed to and highly knowledgeable about project management issues. This may also have accounted for the willingness to give

project teams the authority they need, and allow them to hold sufficient information to manage the project effectively.

9. Conclusions and further work

Just as with the pilot exercise carried out to validate the instrument, these results are more interesting as *qualitative* indicators of the different models underlying

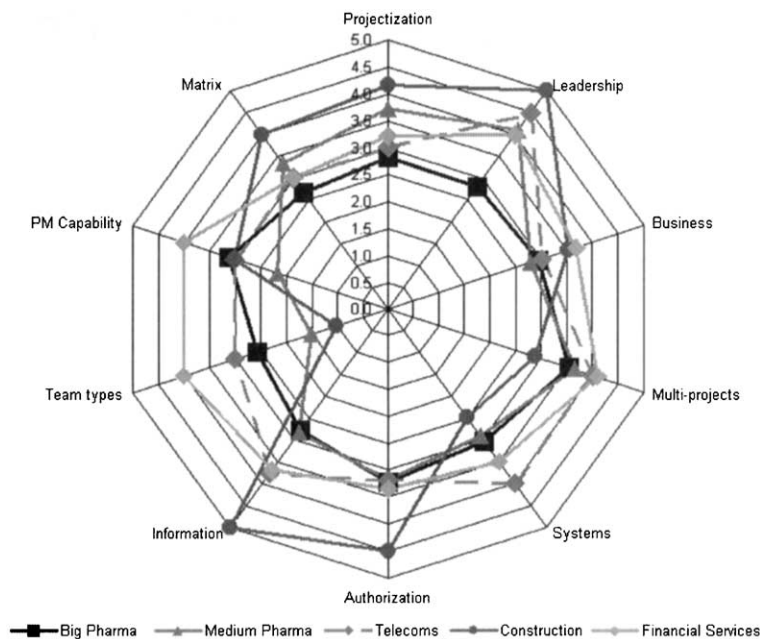


Fig. 5. Pharma compared with less "mature" industries.

project management in different industries than they are statistically reliable indicators of the maturity of different industries.

There is, however, some evidence in the results that the “industries of origin” are indeed more mature in terms of project management than industries that have adopted the approach more recently. The Engineering-based industries do score more highly than industries that adopted project management as a core capability much more recently, such as financial services or pharmaceutical R&D.

The petrochemical industry’s apparent pre-eminence as a source of excellence in project management is perhaps due to the prolonged pressure on reducing the costs of oil discovery and extraction due to the sustained low oil price in the 1980s. This was particularly true of the North Sea oil fields during the 1980s and 1990s, which gave rise to innovative co-operative ventures such as CRINE (Cost Reduction in a New Era).

The results provide a fascinating insight into the way that project management has developed differently when it is fostered and formed in different environments. They also open up the possibility of identifying a series of alternative “project management models” each of which provides a “habitable” way of managing portfolios of projects in a different industrial environment.

The group that sponsored the research used the results to identify a desirable profile to which they aspire. This profile, and how to accomplish it, will inform the group’s work for coming years.

It will be interesting to see whether further studies can build on these empirical foundations to reveal more precisely the mechanisms by which superior practices can be developed over time.

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