

Exploring the front-end of project management

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This paper is a multi-case study exploratory investigation into the earliest stages of projects and their management. We refer to this throughout the paper as the ‘front-end’. We provide a definition of this phase of the project life cycle and conduct a literature review of the various topics that would suggest themselves to be apposite to the front-end. This includes governance and strategy; requirements and technology; estimating; risk and value; people and learning and development. Following this review of literature, we set out the approach taken in the empirical study. The context for the study was the UK, although many of the organizations investigated had a global presence and some of their projects were multinational in nature. We detail the research methods, the multi-case study route taken and the nature of the in-depth interviews with senior project management representatives from nine extremely credible organizations experienced in managing projects. Our findings are presented so as to identify the key set of findings determined after multiple passes of the interview details. These findings reflect both what comprises the front-end of projects and what management does in the front-end. Some of this would be expected of project management, but we found aspects of the front-end management that are not within the normal remit of what is considered to be traditional project management. These findings both reinforce the literature and offer new insights, for example, showing the strong influence of the commercial and economic non-project players in leading or influencing the front-end of projects. A considered set of conclusions are presented together with recommendations for further research.

Keywords: Critical success factors, front-end, governance and strategy, leaders and teams, project management.

Introduction

For many people, project management is about accomplishing an undertaking ‘on time, in budget, to scope’. As such it is pre-eminently an execution-orientated discipline. Thus, for example, the *PMBOK[®] Guide*, the ‘body of knowledge’ that the largest of the project management professional association uses to define the discipline, describes project management as ‘the application of knowledge, skills, tools, and techniques to project activities to meet project requirements’ (Project Management Institute, 2013, p. 5). But this perspective omits the issue of who manages the work that establishes these requirements? Who manages the iterations and the trade-offs that lie between the ‘ideal’ requirements and the fully worked-up project proposal? Who defines the budget, who determines the schedule targets, who develops the project strategy and who

manages the preparation of the project documentation needed for execution approval (sanction)? How is innovation in and around the project considered and managed? Who identifies the strategic risks in the project? How is value enhanced as the project proposition is developed? Who manages the project stakeholders, when, and how? Are suppliers involved? Who manages their involvement, when and on what basis? How is the project team selected and formed?

Such questions can be wrapped into a broader, bigger question: what really is, and should be, the role of project management in the early formative ‘front-end’ stages of a project? How is the role of project management different when it comes to the front-end definitional stages compared with the down-stream execution stages?

This paper addresses these questions in the belief that our understanding of the role of such ‘front-end project management’ is not well documented in the literature,

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despite evidence of the importance of the front-end—that many of the things that cause projects not to succeed have their origins in decisions made in the project's front-end and that the front-end is the part of the project that has the greatest opportunity for creating value—and that, despite its importance, 'front-end' management issues, responsibilities, roles and actions are too often ignored by official project management guidance.

In short, this paper proposes that front-end project management practice is poorly understood and is often inconsistent from project to project and between sectors. It is consequently often confused and there is a lack of clear, effective guidance on it. The research reported here, aimed at describing, understanding and evaluating management's roles in the front-end, would seem therefore, *prima facie*, to be potentially very useful.

What can we say about managing the front-end?

What do we mean by the front-end? There is not a single definition. For the purposes of this research, we consider the front-end to be the preliminary emergence phase[s] of the project (Morris, 2011). In practice, there would seem to be two common usages of the term. The simplest is the gathering of user, system, business and other requirements ending in the 'formal' acceptance by the sponsor and the project team of these requirements. In reality, however, the front-end of most projects involves a lot more work than this implies.

The front-end, in this second broader view, is often considered as 'fuzzy' (Kim and Wilemon, 2002), and it begins with the authorization by management of the expenditure of time, money and effort in order to develop the project definition. To be precise, it is the sponsor directly or the sponsor's management which provides this authorization as the sponsor is the holder of the business case as clearly implied in the following quote from a highly influential UK governmental body:

The SRO [Senior Responsible Owner] is the individual responsible for ensuring that a programme of change or a project meets its objectives and delivers the projected benefits. The SRO should be the owner of the overall business change that is being supported by the project and should ensure that the change maintains its business focus, has clear authority and that the context, including risks, is actively managed. This individual must be senior and must take personal responsibility for successful delivery of the project. They should be recognised as the owner throughout the organisation. (OGC, 2007, p. 5)

This is premised with the expectation that at some point later in the project's development, a risk analysed,

value optimized proposal will be submitted to the sponsor for the approval (sanction) of its full development and delivery (Morris, 1994; ICE, 1998). The front-end in this conception is anticipated as finishing with acceptance by the sponsor of the project definition documentation. It can also, of course, end with either the termination or the shelving of the undertaking. Upon receiving sanction approval, the remainder of the project life-cycle stages would then commence including resourcing/contracting and procurement; design; build/create; handover; commence in-use phases (consideration of these subsequent project phases are out of scope of this paper).

In principle, one might suppose that most of the functions associated with project management generally apply whatever stage of the project/product life cycle one was at. This is essentially the premise on which the *PMBOK Guide*® works, for example (PMI, 2004, 2008). But given the absence at this stage of hard project targets (budgets, schedules, etc.) and the developmental nature of the front-end, one might legitimately expect management to be qualitatively significantly different here from that of down-stream execution, which is from where our models for project management are typically derived. There is not a big literature explicitly exploring the extent to which this might or might not be the case, however, although Williams *et al.* (2009), Williams and Samset (2010), and Edkins and Smith (2012) explore the distinctive nature of the work to be done in the project's front-end. There have also been other studies looking at factors which have been seen to be associated with project success or project failure. Many of them suggest factors that are linked to the front-end as being important. Collectively, they show that the management of the front-end (a) is often critical to the overall success of the project and (b) involves a lot more than merely the establishment of requirements (Morris, 2013). A brief review of these papers now follows.

Meier (2008), reporting on 30 major Central Intelligence Agency (CIA)/Department of Defense (DoD) projects, concluded that

most unsuccessful programs fail at the beginning. The principal causes of growth on these large-scale programs can be traced to several causes related to overzealous advocacy, immature technology, lack of corporate technology roadmaps, requirements instability, ineffective acquisition strategy, unrealistic program baselines, inadequate systems engineering, and workforce issues. (p. 59)

Meier's summary echoes that of Morris and Hough (1987) 20 years earlier. Indeed, NASA had reached not dissimilar conclusions in its 1992 review of its programme

and project management performance: inadequate requirements definition; unrealistic dependence on unproven technology; annual funding instability; complex organizational structures; misapplied cost estimates; scope additions due to ‘requirements creep’ and acquisition strategy not promoting cost containment (NASA, 2007).

On many projects, particularly the larger ones, several subject areas will need to be drawn upon in shaping the project definition, be they from the strategic, social or political level, to those that direct and interpret policy, such as public sector regional or local planners, as well, obviously, as the enterprise’s internal expert functions. The way the sponsor engages and manages all these parties is particularly, and not surprisingly, critical. Miller and Lessard (2000), looking at 60 \$1bn+ projects, for example, found that the owner’s competencies in managing exogenous factors such as stakeholders and governmental or regulatory matters, and endogenous factors such as suppliers, were key—a view repeated by Grün (2004) re technology and design, and emphasized by Khurana and Rosenthal (1998), Crawford and Cooke-Davies (2005), Helm and Remington (2005), Crawford *et al.* (2008) and Thomson (2011). Flyvbjerg *et al.* (2003) similarly identified the critical role played by the sponsor, particularly in estimating and addressing risk.

The owner’s approach to project governance is particularly important. Governance ‘provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance’ (OECD, 2004, p. 11). The Association for Project Management (APM) (APM, 2004) goes usefully further, proposing 11 principles of project governance, including one arguing for a coherent linkage between the owner’s strategy (Mintzberg, 1987) and the project strategy, or at the very least, between the owner’s strategy and an approved project plan containing authorization points at which the business case is reviewed and approved.

APM, like several other project management bodies, talks about the project plan, rather than strategy. This, however, misses the dynamic nature of much of the front-end planning. Artto *et al.* (2001) concluded after an exhaustive study of project strategy that project strategy is a direction in a project that contributes to the success of the project in its environment. It is surprising, therefore, that there is so little research that looks at the interplay of sponsor business strategy with the associated project(s) it may generate.

Requirements are meant to be ‘solution free’ (Stevens *et al.*, 1998), but in fact the objectives, or indeed the character of the project, will shape the way requirements are defined. Many, though by no means all, requirements reflect stakeholders’—particularly the sponsor’s—strategy. For example, where an organization’s ‘end-game’ is to introduce innovation and its chosen route

is via a highly innovative project, then the project will probably be at the leading edge of many areas, such as technology, management approach and form of contracting. The nature of the requirements—whether they are routine or ambitious, standard or innovative—will be highly significant to the project strategy as the risk profile for the project will be heavily swayed by the nature of the requirements. Hence, though requirements definition may sometimes be left largely to the systems engineering function (Hood *et al.*, 2010), more often it needs melding and integrating with other actors’ wishes and abilities. In short, it needs managing.

Managing stakeholders’ interests vis-à-vis requirements and the project definition is, consequently, a very important front-end task (and in fact has just been recognized as such by being established as a new ‘knowledge area’ in the 2013 Fifth Edition of the *PMBOK® Guide*). A stakeholder is a person or party that has a stake—an interest—in the project’s realization. This may be ‘pro’ or it may be ‘anti’. The stakeholder may be internal to the core organizations involved in shaping the project, such as the sponsor, financiers, etc., or it may be quite exogenous to the project (Littau *et al.*, 2010). Local community opposition or environmentalist opposition are examples of the latter. Stakeholder ‘management’ comprises principally (1) identifying them; (2) assessing their power and position the project and (3) elaborating a management—‘influencing’ or ‘coping’ would be a better words—strategy for leveraging the ‘pros’ and blunting the ‘antis’. Of these, the first is the most significant. Too often a stakeholder appears ‘out of nowhere’ and can cause major disruption. Many projects suffer substantial scope expansion in an effort to accommodate stakeholder interests and concerns.

Interaction between stakeholders can sway the objectivity needed for planning, particularly for estimating targets. Estimating is *prima facie* a key front-end activity: it has a highly significant role in determining whether the project will be judged successful in meeting its goals; yet, it rarely receives much attention in the literature. Flyvbjerg *et al.* (2002), drawing on behavioural economics, in particular the work of Lavallo and Kahneman (2003), has emphasized deliberate ‘low-ball’ estimating habits for major projects as a deliberate ploy to achieve sanction/approval.

Thus, the front-end is where both value and risk get inherently built in. Their presence, for good or ill, needs managing. The risks being built into the project, via its definition, should be evaluated from the outset of the project: they will directly affect the confidence allocated to the schedule, cost budget and the whole conduct of the project.

The Oxford English Dictionary defines risk as ‘the possibility of loss, injury, or other adverse or unwelcome

circumstance' (OED online accessed August 2012). Modern project or programme risk management, however, distinguishes between such negative possibilities and 'unknowns'. Chapman and Ward go further, proposing that gate reviews become opportunities for value and risks to be formally addressed as part of a clearly defined performance uncertainty management process (Chapman and Ward, 2011).

Value Management (VM), as a term, covers Value Analysis, Value Planning and Value Engineering (CEN, 2000; Kelly *et al.*, 2004). Though often administered quite formally, it can usefully be considered as a state of mind—a disposition to seek out value at all times. And many project people believe that the early 'optioneering' phase of a project's front-end development is essentially a form of fundamental VM (Archibald *et al.*, 2012).

Benefits Management, a newer technique originating in the IT/IS sector (Ward and Daniel, 2012), is different from VM. It is concerned with the realization of benefits during project and programme implementation and in operations. Benefits are what the project or programme is done for. They can be measured quantitatively, such as financially, market share, output capacity, etc., and qualitatively, such as improving security or brand position or social cohesion. Managing benefits involves *inter alia* ensuring that they are 'harvested' effectively and that lessons learned from so doing are fed back so that future projects are changed and shaped (strategy, configuration, plans, etc.) accordingly. As such Benefits Management feeds into the front-end of forthcoming projects. Establishing benefits clearly and building the project measures around a set of benefit-orientated performance measures is a new and potentially powerful means of improving project effectiveness.

Project staffing is an absolutely critical management action, and is a vitally important front-end management function. Yet, in practice, getting the most appropriate staff in post is often extremely difficult, especially in the front-end where not only is the work often technically difficult but also the probability of the project not going ahead may be high, or there may be competition from other projects. Part of the trouble is that in the early stages of a project much of what is happening is typically complex, intangible and uncertain: management here is a lot less easy to explicate than in the more 'mechanistic' world (in the Burns and Stalker, 1961, sense) of 'build' and down-stream implementation. Front-end management entails work on a truly wide range of subjects, as we have noted: needs and requirements of various stakeholders, technology and design, policy and strategy, finance/economics and commercial arrangements, all of which need to be planned (scheduled and budgeted), risk-assessed and organized appropriately. The work is intellectual; the risks and opportunities can be substantial. None of

these fields are easy to work in, and the personalities involved will often be powerful. The style of management is often therefore altogether different from the execution-orientated project manager—ranging from the bold and encouraging, as, for example, in letting designers have the freedom to conjure up innovative and, where relevant, aesthetically pleasing designs; to the hard-nosed, as in negotiating fundamental financial terms and key commercial conditions. Williams and Samset (2010) rightly point to the psychological and social pressures and uncertainties which work of this nature often brings. Many project managers who are used exclusively to managing down-stream execution will be, and will feel, out of their depth here. One of the very first tasks in project initiation is clarifying purpose and team member selection. If the team's purpose is not clear, it is unlikely to be successful (Buchanan and Huczynski, 1985).

Certainly, there will be an elevated role for leadership by senior project management personnel in forming, shaping and giving voice to goals—establishing and 'selling' a vision; and motivating and influencing others to follow in the realization of that vision—doing what needs to be done to fill out that vision and deliver. Articulating goals and helping to shape strategies, whether through bold transformational assertion or inveigling through sheer cunning.

'Project chartering' is a popular form of helping the team buy-in to the project purpose. The 'Project Start-Up' concept has promoted the idea of combining behavioural team-building activities with project planning. Some companies have extended this idea to produce intense VM-driven, motivational team-building workshops, the goal being to work out how to achieve exceptional performance. The key to so much of project management performance is how players behave and time spent on making clear the expectations of team behaviour will be time well spent. These points start to build the project culture, which can itself be a powerful element in the project's latter development, as demonstrated on the project to create all that was the London 2012 Olympics (NAO, 2012).

Learning and Development

NASA has put a significant amount of work through its Project Academy¹ into capturing lessons and getting the organization to learn better how to manage projects and programmes. The UK has been trying hard too, and for some time. For example, in the defence sector, the 1966 Downey Report had argued for more time (around 15%) and resource to be spent on front-end work (Ministry of Technology, 1966), a view reiterated by Jordan *et al.* (1988) in their well-regarded 'Learning from Experience' report, and embodied in the Ministry of

Defence's SMART procurement protocols in 1997 (House of Commons, 2003). But merely spending time at the front-end is not a guarantee of success of course: the UK and US defense projects have continued to be late and over budget long after Downey (and SMART). Criticism was being levelled at the Ministry of Defence (MOD) for the same things that Meier summarized for Department of Defense/Central Intelligence Agency, but also due to bureaucratic procurement processes, ineffective decision-making and poor scrutiny of projects—in effect, failures of governance (Kincaid, 1997 p. 14). Thirteen years after SMART acquisition was introduced, MoD projects are still coming in late and over budget (NAO, 2013), largely, as recent analysis contends, because of insufficient de-risking in the front-end leading to a disconnect between risks and estimates (Kirkpatrick, 2009).

Why do not we improve? Part of the reason must be the genuine difficulty of achieving organizational learning. But part of it also is that we do not know generically what managing the front-end really comprises.

The aim of this study, therefore, was to investigate the nature of management in developing the front-end, and to see to what extent this relates to a broader discipline of project management.

Methodology

This research used qualitative multi-case methodology. The methodology is appropriate for our study as, first, each case functions as an independent experiment that can be compared and contrasted and so with we can identify the differences and similarities between front-end activities in different sectors and types of projects (Yin, 2003). The comparisons confirmed or disconfirmed emerging insights and concepts (Eisenhardt, 1989; Eisenhardt and Graebner, 2007), leading towards the development of theoretical prepositions as to how the front-end works in projects, what is common and what is contingent.

The research focused at the level of the firm in all but case. In the one exception, it was a specific new organizational approach taken by a larger company—effectively empowering a trading division to trial working in a new project-based market. We choose cases from a deliberately wide range of industrial sectors to provide a wider organizational landscape to research. The organizations ranged across a variety of markets and activities, from advanced manufacturing, through information technology, to traditional and multimedia creative productions. Table 1 summarizes the organizations involved in this research. In total, nine organizations were represented

Table 1 Summary of the case study organizations

Case	Sector/product/service	Geographical Focus	Supplier/client	Front-end delivery	Approach to project management	No of interviews
1	IT—wide range from infrastructure to software development	Mainly UK with global presence	Supplier	Combined in-house and outsourced	Commercial perspective dominates PM	3
2	Oil and Gas—exploration and delivery	Global	Client	Combined in-house and outsourced	Overall PM advanced, less so for front-end	2
3	Complex/advanced manufacturing	global	Supplier	In-house	Sophisticated and mature PM	3
4	IT in-house software development	UK centred, but global	Client	In-house	Adopts agile PM, but notes that it lacks full appreciation of agile	2
5	Aerospace R&D	European	Client	Outsourced	Science and systems dominated PM	1
6	Aerospace R&D	Global	Supplier	In-house	Systems Engineering and PM combined	1
7	Broadcast Media	Mainly UK	Supplier	In-house	Intuitive PM. Few formal PM processes or procedures	1
8	Pharmaceuticals	Global	Client	In-house	Immature PM strongly dominated by clinical science	2
9	Development/construction	UK	Client	In-house	Historically rigorous PM not deployed in this case	1

in the data collection and one-to-one interviews were held with more than one organizational representative where this was possible (range was 1–3 people). All individuals interviewed were senior or very senior in their organizations, typically being the heads of the project management function or above. Interviews took place between April 2011 and April 2012.

The organizations selected were all leading players and well practised in what they did and were well established and highly regarded in their fields. All are internationally renowned. Yet, as given in Table 1, they had different levels of project management maturity, formality and project management processes, providing polar cases for the comparison (Eisenhardt and Graebner, 2007). The organizations will not be named for confidentiality reasons.

The analytic focus was the set of activities executed at the front-end of projects, regardless of the organization where these were hosted. Interviews were conducted with both client/sponsor organizations and suppliers. Five project client/sponsors (cases 2, 4, 5, 8 and 9) were interviewed and four suppliers (cases 1, 3, 6 and 7). Table 1 provides an overview and includes in the column headed 'Approach to Project Management' and this is the observational assessment of the research team derived from both background information and reflective results from the interviews.

The research instrument was a set of 30 questions designated into 3 broad areas and was developed by the research team using both the literature and the research team's substantial practical project management experience (combined research team's practitioner experience circa 60 years). The three areas covered by the questions were as follows:

- What happens at the front-end? (18 questions).
- What do managers do at the front-end? (10 questions).
- How can management of the front-end be improved? (two questions).

The questions were reviewed by other academics and practitioners as part of the piloting exercise and adjustment to the instrument was made based on feedback given. The data included both information referring to the time period and retrospective data about the development of processes, activities and roles within the front-end, so that the front-end can be understood within its context and history. Corporate documents about the front-end and its process were also analysed when available.

Prior to the interviews, the questions were sent to the interviewee so they would be familiar with the areas covered. Each interview lasted between 1.5 and 2 hours and two researchers were present for all but two

interviews. Notes were taken during the interview and interviews were recorded when the interviewee felt comfortable. Each interview was written up in accord with a protocol agreed by the research team to provide consistency. Individual notes were compared and first impressions were exchanged amongst the interview team. A report structured around the interview guide was generated for each interview, and checked against notes and records, when applicable.

The data were analysed in three steps. The first step involved an in-depth understanding of the cases. Each case was analysed separately by the researchers personally involved in the interview and then the cases were presented to the rest of the research team. In the second step, each researcher compared and contrasted the accumulated case data individually, and shared their findings and concerns with the team. The team then compared the cases, and insights were derived and organized collectively. All answers were brought together into a single large spreadsheet and then each question was provided with a summary answer that also noted the level of consensus or difference. A series of research team workshops were then organized that involved challenging conversations and multiple iterations to articulate the specific and emergent points revealed through several rounds of data-sifting. The product of this significant set of analytic exercises was set of results derived initially from a range of subject matter expert practitioners that had an auditable trail from initial interview to final summary finding.

Findings

Front-end process

As noted earlier the nine organizations were divided into five clients and four suppliers. Considering the client set: in three cases, the project execution was either mainly (case 5) outsourced to other organizations with relatively little engagement of the client, or the project's execution was achieved jointly through in-house and outsourced (cases 1 and 2).

In all nine organizations, it was found that a form of front-end process existed and that this was managed. In all cases, leadership of the front-end was evident either by an individual or through an appointed or constituted Board. However, each specific approach was manifest as a general process for controlling and which developed the emergent concepts to a point where sanction was justified. Two organizations (cases 7 and 9) declared that they had no real process, but in discussion it was clear that there was an agreed and effective convention regarding an implicit process. These two organizations, one relatively small in terms

of overall staff numbers, the other a new type of project initiative effectively quarantined from the much larger parent organization, were found therefore to have a process which was managed, but neither organization had the process written and formally articulated. Instead, the process was implicit. At the other extreme, one organization (case 3) was quite explicit in making it clear where the front-end sat within its overall formal project life-cycle approach. This is not surprising as large and mature organizations that routinely engage in projects would be expected to have processes and methodologies so that its staff are clear on what is expected, so communications are not ambiguous, and so project performance is consistent and acceptable.

Presence of stage-gates

The research found that stage-gates of one form or another, where formal review takes place and permission is sought to proceed to the next stage of the project, were present in all cases and that the general issues under consideration at stage-gates were similar. Leading up to the critical stage gate of sanction the consensus view of the interviewees confirmed that exploration of alternatives was the norm, either within the context of potential solutions to a market opportunity (such as a TV or radio programme) or through technological alternatives (such as choices between engineering design concepts). Progress of the concept or idea was, however, measured in different ways. For organizations that are creating high-end engineering deliverables, Technology-Readiness Levels (TRLs) are used (cases 3, 5 and 6). For companies in which TRLs are inappropriate, context relevant alternatives are used that either measured the maturity/level of development of a product (e.g. popular media production) or the progress towards official certification for general use (such as a new drug).

The ultimate stage-gate of the front-end, the final sanction, varied in its precise manifestation. In some cases, it appeared as an absolute transition at which a significant commitment of resources was made (e.g. cases 2, 3 and 8). In other cases (1 and 7) further evaluative events were held to provide the sponsors with confidence to further invest resources. It was evident that a clear purpose of the front-end was to reduce both strategic organizational uncertainty and specific key project risks to levels which the sponsor was able to accept and to allow endorsement of the approach taken to that point.

In all cases, we found that after the sanction gate that concluded the front-end there was a significant increase in formality and a transition to more conventional project management. This can be considered in

terms similar to that used in both new product development and innovations (Anthony and McKay, 1992; Chesbrough *et al.*, 2006) of a developmental funnel where at commencement projects are considered strategically and with significant degrees of freedom to alter (Figure 1). As the evolving project/product is defined so it moves through the funnel, with increasing levels of consideration, scrutiny and, where appropriate, formality. Finally, the sanction stage-gate which represents the end of the front-end was always found to be the most formal and in all the cases considered was a multi-party event, in some cases also being a multi-day event and involving external scrutiny (cases 2, 3 and 8).

Competencies, leadership and staff

It was accepted in all nine cases that the front-end was essentially a strategically driven activity in which the engagement and consideration of both internal and external stakeholders was a critical requirement. The strategic imperative of successfully dealing with a range of stakeholders meant that the competencies needed in managing the front-end extended beyond those conventionally considered for the 'traditional' project manager. Interviewees described the competencies required under a range of headings: politics (intra- and inter-organizational politics), strategic visioning, technological and market awareness, and ability to engage with both economic (both finance and profit related) and commercial (legal contract) issues. In addition, the specific competencies identified from this research that appear to encapsulate best practice in managing the front-end are as follows:

- Leadership and decision-making (experience, judgement and interpersonal skills).
- Selecting individuals and forming teams (judgement and interpersonal skills).
- Technical and technology assessment (technical domain knowledge).
- Project scoping and estimating (project management skills).
- Risk and value assessment (technical domain knowledge and experience).
- Establishing and instilling an appropriate oversight and governance system (leadership, judgement and experience).

This last 'competency' is interesting as it is really a responsibility above and beyond the project manager: it is really a responsibility of the sponsoring organization, but supported by project management.

A key finding was that in all cases financial/economic and commercial considerations, and indeed expert staff from these areas (in two cases led by the Chief

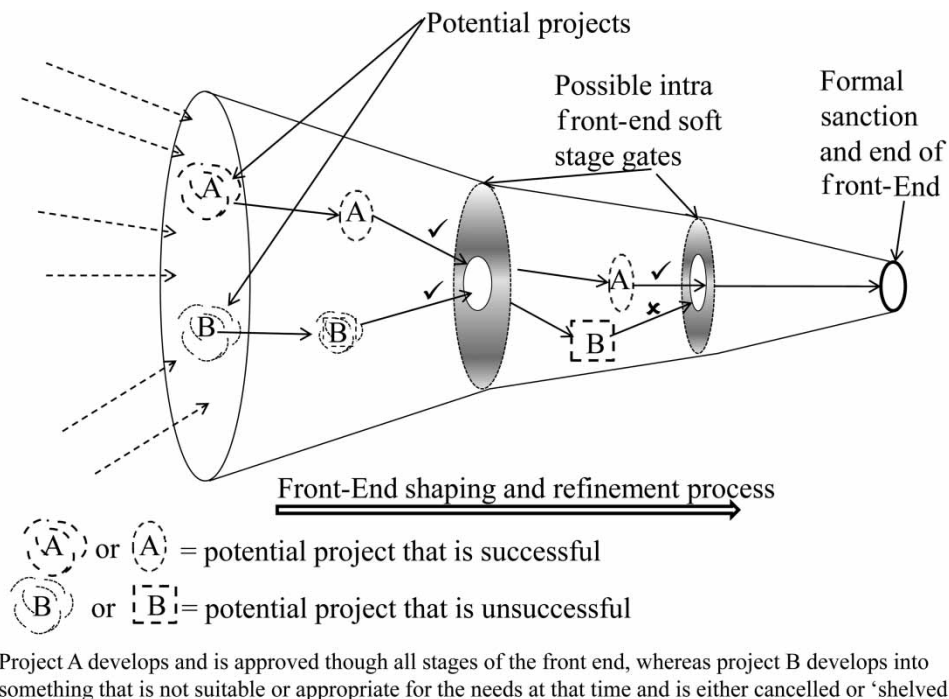


Figure 1 The front-end funnel

Financial Officer), dominated project governance. While not unreasonable, neither of these two fields come from a project management discipline: essentially commercial expertise is governing the emerging project.

Teams

Integrating the diversity of skills required within the front-end presents a management challenge (Thamhain and Wilemon, 1987) and this was reflected in the range of front-end team structures encountered. The composition of front-end teams ranged from dedicated internal groups of staff through to ad hoc arrangements that included external members (experts and/or potential partner organizations) and could be short-lived and/or dynamic in composition.

In the majority of cases no specific financial incentive (e.g. salary bonus) was given to the front-end teams as reward for successfully completing the activities that comprised the front-end (the exception was only occasionally in the past in one case). Rather, reliance was placed either upon normal staff appraisal processes and/or the kudos of being associated with a successful initiative.

The above findings can be contrasted with the set of topics identified from the literature earlier. This is given in Table 2.

Project management’s role in the front-end

The project manager’s (or director’s) role in developing the strategic level goals for the project was typically a smaller part of a more complex goal-setting system comprising both other players and a strategic process. As noted above, in some organizations the use of a stage-gate approach mandated a structured process with clearly allocated roles and responsibilities. In other cases, notably cases 7 and 9, the broad principles of a stage-gated approach were followed, but informally and implicitly with individuals taking more of a leadership role. In the main, the data showed that project managers were typically most involved in reporting and reviewing exercises within the front-end, with others in the project and organizational governance (dominated by economic/finance, commercial and technical) taking predominant positions of project goal setting. In some of the cases (e.g. major projects are cases 2 and 3), there was a clear role for a Project Director. This person interfaced or buffered between the strategic operational sponsor and the project delivery team. In smaller organizations (cases 7 and 9), the project director and project manager roles were combined.

In contrast to the typically lesser involvement that a project manager has in developing the strategic goals for a project, as most notably in case 8, the research revealed instances where the project manager had a more substantive role in setting the project sub-targets

Table 2 Contrast of the research findings with the literature

Front-end topics from the literature	Summary findings from the research	State of knowledge
The governance and strategy of the front-end of the project	Governance of front-end was found to be critical and driven by a clear combination of leaders allocated to 'own' the front-end and an oversight function provided by others outside the project. A noteworthy finding was the very clear role that the Finance Director or equivalent took as sponsor in the front-end	Known New
The requirements of the project and the relevant technology	The universal presence of a stage-gated process meant (if only implicitly) that the clarity of requirements and related technology were dealt with as part of the review process. It was not obvious from the cases that this was the responsibility of any single individual or role. In the three engineering dominated case studies the use of Technology-Readiness Level assessments were found to be routine	Clarification of known New
The engagement with the stakeholders of the project	The identification and engagement of stakeholders, both internal and external, was seen as one of the most vital functions of those managing the front-end. It was clear that the successful involvement of the many stakeholders whose views will need to be considered as part of the shaping and evaluation process was a vital aspect of the front-end and required a clear skill-set from the front-end project managers	Known
The establishment of project targets and estimates	Clearly defined aims and objectives were set as part of the front-end. In some cases these would be standard investment appraisal metrics such as net present value (NPV) or internal rate of return (IRR), but in others the targets for the project could be to enhance reputation or establish new markets	Known
The principal risks involved and value to be achieved	In many ways, the front-end is predominantly about the identification and subsequent management of principal risks and uncertainties to levels that the sponsor organization was content to proceed with. The clarity of understanding of these risks was not mirrored with the consideration of value. This reinforces the view that value is more esoteric and less capable of more scientific and rigorous evaluation. Yet, the value proposition articulated is what drives the project during the front-end	New
The people involved in the front-end	There is a diverse range of individuals and teams involved in the front-end as options and alternatives are considered. Dealing with this diversity of input whilst managing a fluid process and answering to the situational governance led to the appointment of project managers who had a clearly defined set of skills, often involving excellent interpersonal skills and breadth of knowledge that spanned not only project management, but also the sponsor's business and the key players and factors impacting from the external environment	Development of known

(Continued)

(cases 2, 3 and 6). The data divide into three categories: first those organizations where the project manager was significantly involved in setting the targets which were then approved by whomever (individual or collectively) was taking responsibility for the project. Second, there were cases where the project manager set the targets in conjunction with another respected individual (for example, the head of engineering in a new product development in a complex manufacturing environment). Third, the project manager was not involved in setting the targets, leaving it to others such as dedicated estimators.

The role of the sponsor in the front-end

The sponsor of the project took on critical roles aimed at achieving the best possible result for the sponsoring organization. This led to occasional significant involvement with aspects of the front-end process. In terms of achieving success, the sponsor's interest was in ensuring the viability of the business case. The sponsor's involvement with the process was through engagement with internal and external stakeholders, and being responsible for not allowing 'expectation creep' to occur. Across the cases, the sponsor made sure that the project goals and shareholder (or owner) expectations were set in alignment with each other and that any noteworthy changes were reported via governance arrangements, and as noted above, drawing on the project management function, to keep critically interested parties informed.

In all but one of the cases, there was no formal consideration of establishing contingency sums or time buffers as part of the front-end project management. What was noted was that where projects are considered too risky, for example, where the technology involved or sales market is still uncertain (e.g. cases 3 and 7), then projects were stopped from progressing to the next stage of the front-end. It is clear that the sponsor's view in formulating such a decision is decisive.

Management of the front-end

The review of the cases made it clear that the front-end was about both strategic project shaping, but also about reserving the option to stall or cancel (see Figure 1, project A c/w project B), an option long accepted in new product development (Balanchandra and Raelin, 1984; Bedell, 1983; Buell, 1967). In cases 7 and 8 most initiatives do not develop successfully to the reach the stage-gate that authorizes full sanction to proceed beyond the front-end stages, whilst in other cases (2 and 3) most do. However, in all the cases the

fact that an initiative did not become a sanctioned project/acquisition was not seen as a failure but rather a result of an effective and rigorous due diligence exercise. In cases 7 and 8, i.e. drug discovery and the development of entertainment products, a large attrition rate is the norm and is accepted as such. A useful comparison can then be made with a 'panning for gold' process where items or potential projects are subject to successive tests and comparisons until only sanctionable ones remain. The operation of the pan requires the interplay of strategic consideration coupled with operational or production-line skills. Balanced against this is the advocating of the individual project concepts and these remain with project-orientated domain experts.

For those projects that are sanctioned the value created by the activities within the front-end is evident in the identification of sets of benefits to be produced, the quality of a project management plan, the presence of formal project appraisal evaluation using standard metrics such as internal rate of return/net present value (IRR/NPV), the satisfaction of reduced risk to acceptable levels, and the positioning of the project in its external environment including any relevant political considerations.

The managed processes adopted in the front-end varied in the following areas:

- Amount of detail (most detail case 3; least detail case 7).
- Amount of flexibility/discretion afforded to the participants (most = cases 7 and 9; least = 3 and 8).
- Whether the implementation was procedural/mechanistic (cases 2 and 3) or instinctive/organic (cases 7 and 9).

While elaborate life-cycle process models have the advantage of thoroughness their implementation can seem time-consuming and resource heavy. Where employed at the front-end these highly formalized processes tended to be in situations where speed was not the essence (since they were operating alongside equally rigorous processes in other key stakeholder (sub)-organizations, as would be the case, for example, in certified engineering products in aerospace and pharmaceuticals). Where speed was the essence detailed definition of a highly prescribed front-end process was substituted by requiring key individuals to take responsibility for decision-making using their expert judgement.

Related but not synonymous is the level of discretion afforded to the actors in the front-end. Lower levels of detail typically meant greater levels of overt discretion. In the dataset, those organizations acting as suppliers to prime contractors, the front-end processes mirrored

in general terms those of the prime. This ensured compatibility and timeliness as the prime contractor's needs evolved and became more focussed.

The case study organizations undertook a range of project types and it was evident that the nature of the project was at the core of the project management approach taken. From the interview data collected it is proposed that this took two forms:

- First were those projects run from a mechanistic paradigm. In such projects, there were well-established protocols and systems with individuals holding defined positions and completing a range of duties as set out by the enterprise.
- Second were those projects run under a more instinctive/organic paradigm. Here, there was less formality, practice being dictated by an established and well-understood set of protocols and procedures, with a great reliance on key individuals to act responsibly and to implement the implicit practices prevalent within the organization.

Where the implications of poor judgement and decisions were likely to be significant, the processes tended to be more mechanistic and so therefore more transparent and defensible. The interpretation of Burns and Stalker (Burns and Stalker, 1961) that mechanistic approaches tended to be associated with predictive technology and a stable environment is also largely consistent with our observations although it is not clear whether the predictiveness and stability are not just results of a more formal, analytical and mechanistic approach. With the type of organizations and projects that formed the empirical data for this research being as noted, it is not possible to comment on how the front-end of major unpredictable projects such as disaster recovery are managed. Where an instinctive approach was seen our observations are consistent with the findings of Dreyfus and Dreyfus in that the approach was largely delivered by 'experts' who took a relatively free hand and were less concerned with following a script (Dreyfus and Dreyfus, 2005). However, even where a mechanistic approach was seen there was plenty of evidence of a very high level of individual competence.

Few interviewees felt that lessons from experience (lessons learned) were well handled and it was a common view that more could be done, but that this was largely dependent on the individuals and organizational culture. There was no argument presented for further investment in information and communication technologies to resolve this area. It is notable that in one case (case 7), it was felt that in a very creative environment lessons from the past may be counter-productive in stifling new ideas.

In general, projects were sanctioned when critical factors aligned. Three principal factors emerged:

- market readiness,
- technological/concept readiness and
- programmatic readiness including resource/capacity availability.

During the front-end all of these aspects are being explored and progressed. In some cases, all of these are effectively concurrent and ongoing, with projects condensing out of the mix rather than being instigated at a specific time.

Two extremes were seen in terms of drivers:

- Either to have a technology ready for when a need in the market arose (cases 2 and 3).
- Or to create market need through innovation (cases 7 and 9).

Finally, in the majority of cases we found that:

- In only one case (case 4) was any sense of agile project management established (Cobb, 2011), and even here it was accepted that it was not fully deployed.
- The term 'VM' was not well understood. However, when explained most of those interviewed felt that while specific VM exercises were not undertaken, a background of continual and pervasive VM existed. Some felt that this was so ingrained that additional VM initiatives would provide little additional benefit.

Conclusions

This paper has examined what the management of the project front-end entails from within the context of project management. It did so from examination of nine organizations, some very large, none unsophisticated: all can be considered as either world-class or otherwise highly successful in their area. The justification for such an enquiry is that the empirical evidence of project performance has consistently demonstrated that ultimate project success and failure can often be traced back to what happens at the early part of the project life cycle but that our knowledge of how to manage this stage of a project's development cycle is often poor.

The research yielded data that has been considered and refined by a research team that comprises academic staff who have significant project practitioner experience. Building upon these results and reflecting over

the research data a series of conclusions and recommendations can be drawn.

As a general finding, it is imperative for organizations that deal with projects as a core or a substantive part of their operations to appreciate the importance of the front-end and the potential contribution that its considered management can make to performance. They should be particularly sensitive to opportunities to better shape the project, to assess its viability, and to review the quality of its development, not least its management. Many studies have confirmed that the front-end is where there is the greatest chance of errors and faults becoming built-in, or value being enhanced.

Within this context, we have a series of findings, first related to process, second to actors.

First, the research confirms that, across a wide spectrum of industry sectors, there is evidence of a management process—in effect a project management methodology—that is applied to the front-end, albeit that that process is individual to the sector, possibly to the parent organization, and potentially even to the project. We see this in all cases. This may be an obvious finding to many but is extremely important to those who follow the Project Management Institute's view of project management, as espoused in its *Guide to the Project Management Body of Knowledge*® that, au contraire, project management begins after the identification and collection of the project requirements. This research proves categorically that project management has an important role prior to that point.

We also observed differing degrees of formalizing this process. We shall discuss this further below.

We noted the potentially quite large differences in definition of the front-end and were surprised that the question 'what does one mean by the front-end?' does not yet appear to have been discussed in the literature. Sanction approval may occur significantly later than the elicitation of the project's requirements.

Second, the ethos of management is seen to be different in the front-end compared with Execution. In Execution, the ethos is typically very much about completion on time and budget to a given set of specifications and scope. In the front-end, however, we may not even be sure we have a viable project. Seen from the perspective of those, such as people working in R&D, who are the parents so to speak of the project (the originator of the proposition), the aim may be not so much to champion the putative project as to service the professional needs of the sponsor, and other stakeholders. Project management in the front-end is not necessarily about hurrying the project along within budget. It may well be more about providing advice from a 'management of projects' perspective, even to the point of recommending that the project may need to be aborted.

We found that the job of the project manager at the front-end appears to be, de minimus, to provide professional support to the sponsor, advising on potential technical solutions, schedules, risks, estimates, contingencies, organization, procurement, people (staffing) and so on. Rather than to be slavishly progressing the project, the project manager needs to be constantly challenging its proposed viability. And in so doing to be building up value in the scheme being worked up.

In general, the range of differentiation between the groups found working in the front-end, and the type, scope and nature of the work to be performed, is much greater, in intellectual terms, time horizons, types of personalities involved, surety of data and so on, than that typically found down-stream. Thus, therefore, so is the integration similarly broader than what is typically brought to bear in the execution phases of the project. This means almost certainly that the types of personality and behaviours of project personnel will be different in the front-end from those typically associated with execution-orientated project management. (Though an interesting research opportunity might be to compare front-end project management competencies, as here described, with the attributes of programme managers who are usually painted as being more strategic).

Third, the research emphasizes the absolute centrality of the sponsor and of other key stakeholders, at least in the front-end, and particularly in large, complex, urgent ones. In all cases, economic and commercial considerations dominated project governance. While not unreasonable, neither of these two fields come from a project management discipline. We might hope therefore that as and when project management develops into a robust discipline for managing projects, these functions will be embodied into it.

Fourth, most project management functions are seen to apply to front-end management.

- The more formally organized companies had whole-life project strategies, that is, covering the front-end and execution. A few only really worked in any detail on an Execution strategy. A few had no explicit strategies.
- Requirements were managed with a range of formalization. Some organizations/projects employed Technology-Readiness Reviews.
- Most projects—but not all—performed some form of implicit VM. The international oil company did this very systematically; the international R&D organization did it instinctively; the complex/advanced manufacturing supplier claimed not to do at all.
- Formal risk management was used in most cases. Contingencies were not allocated to budgets in a proportional or algorithmic way, however.

- Learning and Knowledge Management is widely acknowledged as important, not least in the front-end learning from others; its effectiveness is questionable, however, and there is considerable potential for improvement.

Following these four areas that provide comments on processes and functions, some findings relating to ‘Actors’ can be made:

Fifth, following the observations about the increased breadth of integration that is required in the front-end, we should note that the competencies formally required for managers of the front-end will be different—essentially a bigger set: broader and more challenging than for down-stream execution. (One interviewee said that this was not a role for project managers because their horizons are short term—maybe, but this is a case of the tail wagging the dog: the person should fit the competency and should fit the project role.)

Sixth, we saw how the articulation of management methodology may be quite formal and explicit, or informal and implied. Similarly, we saw how some actors preferred to apply such methodology bureaucratically and mechanistically while others preferred a more instinctive approach. When this is mapped we found that the case organizations sat broadly along a linear relationship that linked the informal to intuitive and the explicit to the mechanistic as shown in Figure 2. The suggested conformity to a linear relationship between the type of project management methodology in play and its application makes intuitive sense and this can be hypothesized as

demonstrating the relationship between the approach taken to project management and the organization’s culture. In extremis, we observed organizations that were part of the creative industries where fluidity and informality were key considerations both of the approach to project management and the way that the organization operated more generally. Size may be an important limiter on this freedom as the organization was also relatively small. In much larger organizations, there is likely to be less freedom for individuals to ‘do their own thing’ and so compliance with more formal sets of rules and procedures is to be expected, but there is also the issue of the dominant paradigm where, for example, those from traditional engineering backgrounds would be expected to follow clearly set out protocols and, similarly, in public sector organizations there would be expectations of multiple layering of both process and approvals. Thus, the observed tendency to follow a line from implicit project management methodologies applied informally to explicit methodologies applied rigidly is rational. An interesting question that arises from this static observation is the question of how fixed organizations are over time as they both reflect internal alterations such as change in size and as to the individuals holding key roles, as well as how external influences such as the role of new project management approaches affect the way that project management of the front end is handled.

Seventh, in general we saw that the application of project management processes, the articulation of preferred methodology, and the definition of desired

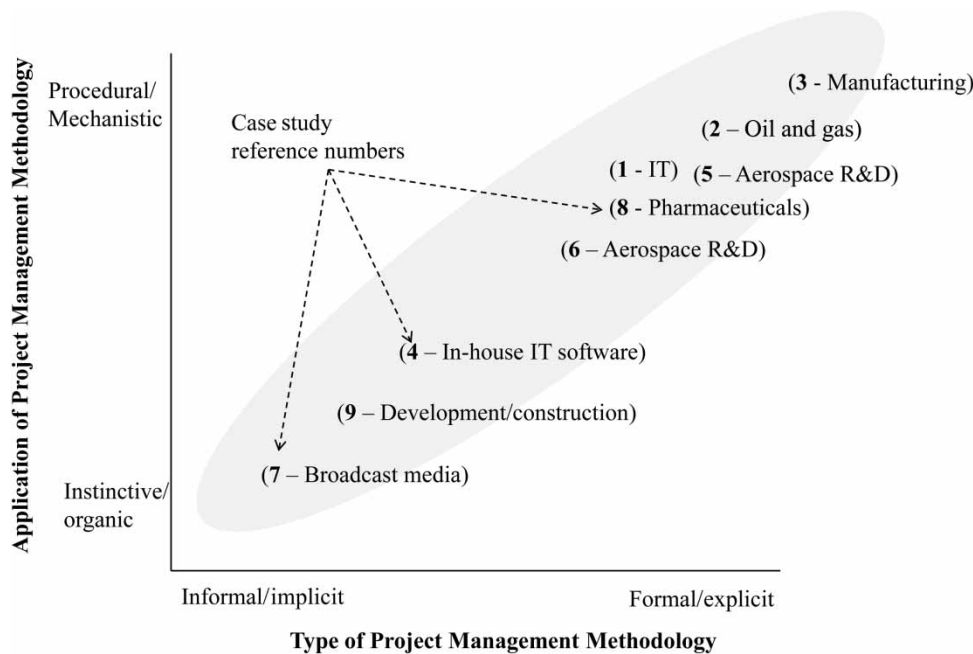


Figure 2 Relationship between the type of front-end project management methodology and its application

competencies was contingent on: (a) the characteristics of the project; (b) the characteristics of the environment the project is to operate in and (c) to some extent, the characteristics of the parent organization and the sponsor.

Recommendations

The exploratory nature of this research has revealed seven conclusions as noted above. The project management research community is encouraged to pursue the various topics identified to both broaden the dataset and deepen the enquiry. Of the many possible areas that can be taken forward the following are suggested as being examples of tractable research enquiries to further our understanding of the front-end:

- The nature of front-end management for major projects that are unpredictable such as disaster recovery following both natural and manmade events.
- The roles, attributes and competencies of project sponsors.
- The attributes and competencies of the front-end project director and project manager.
- The particular tools and techniques used to 'manage' both internal and external stakeholders.
- How estimates are developed and the degree of inherent contingency that is taken into account when proposing both the benefits to be delivered and the classic project metrics of project schedule, project budget and scope and quality-related specifications.
- How management of the front-end changes within organizations over time.

In conclusion, this research has suggested various opportunities for understanding better, and for improving, the management of the front-end of projects. Given the significance of the front-end, anything which makes its management more effective should be considered important.

Note

1. The NASA project academy is formally known as APPEL—Academy of Program/Project and Engineering Leadership: <http://www.nasa.gov/offices/oce/appel/home/index.html>

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