The Perceived Value and Potential Contribution of Project Management Practices to Project Success

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ABSTRACT

This paper contributes to the ongoing work and debate on the value of project management, accomplishing this through an empirical investigation of practitioner perceptions on the relative value of different project management practices and their potential to contribute to improved project performance. This investigation is based on a large-scale survey of 753 project management practitioners. This paper aims to answer four questions relating to the value of project management. By identifying the most valued practices, practitioners and organizations can identify their priorities when developing their project management competencies. This can also guide the profession in selecting priorities for future development. When choosing priorities to develop and implement, organizations can look to the tools that practitioners identify as most valuable, as having the most potential for increased contribution to project performance, and as presently under-utilized. In order to fully understand the nature of project management practices, and the mechanisms through which these create value, researchers must better clarify the distinction between the project phases and project processes. These findings can help project management professionals in selecting priorities for future development.

Keywords: project management practices; tools and techniques; project success

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Introduction

The organizational value of practicing project management is a central theme comprising much of the field's current research and debate (Thomas & Mullaly, 2005). Such value, however, particularly in terms of return on investment (ROI), is one that researchers and practitioners cannot easily calculate for every aspect of professional practice. Investigating which practices have the potential to enhance project performance—and identifying which are perceived as the most valuable—is an alternative method for gauging this value in day-to-day professional practice. Many studies analyzing the most valued practices have focused on investigating one aspect of practice: the use of tools and techniques. The significance of this one aspect of practice, albeit an important one, is readily observable.

This paper presents and discusses the results of a large-scale survey on project management practices. The results of the first part of the survey were presented at the third Project Management Institute (PMI) Research Conference (Besner & Hobbs, 2004). These results showed the extent of tools and techniques use. The results presented and discussed in the present paper are based on the survey's second part, which investigated practitioner perceptions of the potential contribution of tools and techniques to project success. More precisely, it examined which tools and techniques possess the greatest potential for improving performance through more extensive or better use. The measurement of the potential for improvement was then integrated in a construct to measure the value of each tool. Identification of the most valued practices can identify priorities for individual practitioners and individual firms in the development of their project management competencies. This finding can guide project management professionals in selecting priorities for future development. The paper aims to answer four questions:

1. Which set of tools and techniques—and therefore, which practices—do professionals consider as having the greatest potential and the least potential, as possessing the most value and the least value?
2. How does this perceived value vary in different contexts and in relation to the different phases in the project life cycle?
3. What priorities should practitioners and organizations set when they are choosing to invest in developing project management practices?
4. What future developments in project management practice and theory do these results suggest?

PMI's *PMBOK® Guide* (Project Management Institute, 2004) identifies an extensive set of project management tools and techniques, all of which are generally considered valuable and applicable to most projects most of the time (p. vii). This publication does not, however, outline the relative importance of the many tools and techniques in the project manager's toolbox. The *PMBOK® Guide* states that it is necessary to adapt practice to the particular situation by choosing which tools and techniques to employ, but does not provide guidance as to which tools are most valuable in different contexts (p. vii). These considerations are outside the *PMBOK® Guide*'s scope.

At an operational level, information on the relative value of tools and techniques and on the variations of this value in different situations can have very practical implications. Examining the differences in value of tools and techniques and the variations in different contexts and phases is also a way to reflect on professional practice at a higher level. Project management is usually primarily associated with the planning and the controlling of project execution. This operational view contrasts with the strategic view of project management, as conceptualized in organizational project management (Dinsmore, 1999; Project Management Institute, 2003). The present investigation on the current practice and the perceived value of project management tools and techniques can shed light on both the operational and the strategic roles of practicing project management.

The Literature on Project Management Tools

Many project management tools are inherently value-oriented. The practice of value analysis (VA) is devoted to minimizing the cost and optimizing the performance of projects and deliverables. Earned value management (EVM) uses value as a metric for gauging cost and schedule performance during project implementation. Financial measurement tools—such as cost/benefits analysis (CBA)—are also used to measure organizational value. These tools provide useful information for implementing rational decision-making processes.

Besides these value-oriented tools, there are other tools in the practitioner's toolbox that have the potential to improve projects' success and contribute to value creation. For example, Raz and Michael (2001) examined the use of risk management tools in Israeli high-tech industries investigating the frequency of use, the perceived contribution of use to project success, and the extent to which use was associated with high performance. Thamhain (1998) studied the use and the perceived value of 29 project management tools and techniques. He concluded that the contribution of project management tools and techniques to project performance is conditional: Contribution is based on the way project managers integrate these into the project management process and the way project teams accept these processes. White and Fortune (2002) examined tool-and-technique use in relation to project outcomes and project success. Their study brought to light many details concerning the varying levels of usage of project management tools and techniques.

The specific contribution of tools to different contexts is another important part of the relation to value creation. Besner and Hobbs (2004) examined the complex reality of the varying use of different sets of tools in relation to context and provide detail on the variation in project management practice by project type. Milosevic and Iewwongcharoen (2004) explored the contingent use of project management tools and techniques and the affect of this use on project success. Hargrave and Singley (1998) surveyed project managers in the United States Army Corps of Engineers on the use of the 37 processes and 116 techniques and tools. McMahon and Lane (2001) studied the use of tools in the specific in relation to the phases of the project life cycle; they classified the tools by phase to underline the variation in use throughout the project life cycle.

Research on the Value of Project Management Practice

Over the last 30 years, several noteworthy studies have identified project success factors. Cooke-Davis (2004) summarized these and proposed a distinction among three levels of project success: Doing projects right, doing the right projects, and doing the right projects right, time after time. Most of the literature focuses on doing projects right. But as Cooke-Davis demonstrated, the practices that are associated with success are different at each level. The research on success factors has shown that the question of what constitutes success is complex and multifaceted. Although these studies have identified some significant and consistent results, the factors only partially explain project success. The dynamics leading to project success remain largely undisclosed.

Demonstrating the business value of practicing project management is one of the major issues in project management today. Because of this, it is a high-priority concern for PMI's Research Department and the subject of several research efforts recently initiated by PMI (Hobbs, Thuillier, & Aubry, 2005; Thomas & Mullaly, 2005). But attempts to find a simple and direct relationship between project management practice and ROI have failed to find a statistically significant link (Ibbs, Reginato, & Kwak, 2004). Such a failure, however, may have resulted from an insufficient sample size. Researchers have argued that the benefits of project management practice are not all captured by ROI metrics; because of this, the field may underestimate the discipline's impact on innovation (Turner & Keegan, 2004), on process improvements (Winch, 2004), and on personnel (Thamhain, 2004). It is also possible that past research has failed to identify the factors that truly determine project success. Although this issue is certainly complex, current research efforts should help clarify this issue.

The present paper aims to contribute to the study of the value of project management practice. Successful projects provide value to organizations; project management practices provide organizations with a strategic and valuable asset. Value is created when good project management practices and good measurement tools improve project success. Studying tools and techniques is a tangible way to research project management practices because tools and techniques

are directly related to the things practitioners do. These are the means through which project managers execute project management processes. These are also the means project managers can use to measure dimensions of project performance and success: cost, time, quality, progress, satisfaction, and other dimensions of success.

A project manager's practical know-how—those skills used to execute processes and practices—is an important part of the organization's tacit knowledge asset (Koskinen, Pihlanto, & Vanharanta, 2003; Nonaka, 1994). The operational complexity associated with the integrated use of a specific set of tools and techniques represents an intricate subsystem of tacit knowledge that is hard to replicate. Therefore, organizations can consider the underlying practical knowledge associated with a set of tools as a strategic asset. In order to implement its strategies, organizations must possess the capabilities needed to execute projects. Jugdev and Thomas (2002) found that these "capabilities are combinations of proprietary resources, knowledge, and skills that become institutionalized into operating routines and tacit knowledge" (p. 281).

Organizations and their project managers must choose the sets of tools that comprise their toolbox. They must integrate these tools to practice project management as a means for building a strategic asset. They should align these tools with the project context. Milosevic and Ozbay (2001) found that when organizations use a set of context-compatible project management tools, they enhance their project delivery capability. Milosevic (2003) proposed a model in which an organization's project management toolbox stands as the foundation for its strategic project management process. In this model, organizations align their toolbox and their choice of project management tools and techniques with the organization's strategy and with the project environment and context. The study of the value of project management tools can thus contribute both to immediate practical concerns of tool selection and to higher-level concerns of the organizational value of project management practice.

Variations Throughout the Life Cycle

The project life cycle can be defined as a sequence of major phases through which the project evolves from beginning to end, a sequence in which each phase is separated by approval gates. The practice of managing by phase has occupied a prominent position in the project management literature and practice for a very long time. The phase in which the project stands at any moment in its life is an important part of its context. The *PMBOK® Guide* (Project Management Institute, 2004), however, does not identify management-by-phase as a fundamental project management process The *PMBOK® Guide* (Project Management Institute, 2004) does introduce the concept of process group and the idea that processes from these groups are repeated during each phase. The process groups of initiating, planning, executing, and closing have names and definitions that are very close to those used to identify project phases. It is, therefore, not always easy to maintain the distinction between the phase and the process group. Furthermore, the treatment by process group rather than by phase begs the question as to whether there are significant differences among the phases. This study addresses this issue.

The front-end of the project has received less attention in the project management literature than the subsequent phases that deal with detailed planning and execution. Wideman (2002) reviewed the literature on the project life cycle and its importance. Morris (1998) argued that "The decisions made at the early definition stages set the strategic framework within which the project will subsequently develop. Get it wrong here, and the project will be wrong for a long time" (p. 5). The role of the initiation phase in defining the project—and its influence on project success or project failure—poses a strong argument for integrating the initiation phase into the project management domain.

In many organizational contexts, however, a project only becomes a project after it has been authorized for execution, which takes place after the front-end phase has been completed. For example, the front-end often takes place in a customer organization before a request for proposals is made. In this case, the customer front-end is not part of the mandate to the supplier's project management team. In the case of in-house projects, non-project personnel often do the front-end. And project management personnel are typically given the project mandate only after it has been approved. Thus, the front-end is not part of the project management personnel's mandate. The project management literature in general—and the PMBOK® Guide (Project Management Institute, 2004) in particular—downplay the importance of the initiation phase. PMI's argument for doing so is that most project personnel are not involved in this phase (p. vii & p. 43). Data from the present study is analyzed to address this issue.

Methodology

A description of project management practice has been built based on a survey focused on tools and techniques that are specific to project management. In contrast with previous research, general concepts and processes (e.g., training programs, performance measurement) have been excluded from the study. The tools and techniques selected are more specific and closer to day-to-day practice, closer to the things people regularly do. Although this involves a partial view of project management practice, it restricts the investigation to those well-know tools and techniques that are specific to project management. Doing so ensured that the practitioners participating in the study easily understood the questionnaire.

Figure 1 lists the 70 tools and techniques that were included in the survey questionnaire. Use levels vary considerably, from 1.4 to 4.1, based on a scale ranging from 1 (*not used*) to 5 (*very extensive use*). Figure 1 shows decreasing levels from left to right and from top to bottom.

Many analyses were performed on the different data subsets, but the lists for most often used tools and least often used tools produced results very similar to most of the subsamples. Thus, the basic toolbox is more or less the same

for everybody. But there are significant differences between specific groups of users. This allowed us to identify distinct sets of specialized tools. A previous paper (Besner & Hobbs, 2004) discussed the data on the use of tools and techniques.

The questionnaire also collected contextual data on respondents (position, education, experience, etc.), their organizations (size, industry, project management maturity, etc.), and their projects (more than 10 variables). This information allows for segmentation of the data to determine how project management practices varied among the different respondents, organizations, and project contexts. The fact that the sample is split evenly for many of these variables renders the analysis easier and more reliable.

The Web-based questionnaire was completed by 753 experienced project practitioners, most of whom were PMPs. The respondents had the following demographics:

- Age: 30–50 (74%)
- Gender: Male (67%); Female (33%)
- Current primary role:
  - Team member (8%)
  - Project manager (51%)
  - Program manager/director (24%)
  - Other (17%)

More than half (58%) are currently working on projects in information technology and telecommunications. This percentage is approximately 5% higher than in PMI membership. About 12% of the participants reported working on engineering and construction projects and another 12% reported working on business services projects. The respon-

From Limited to Extensive Use	From Very Limited to Limited Use	Less Than Very Limited Use
Progress report	Contingency plans	Life cycle cost (LCC)
Kick-off meeting	Re-baselining	Database of contractual commitment data
PM software for task scheduling	Cost/benefit analysis	Probabilistic duration estimate (PERT)
Gantt chart	Critical path method and analysis	Quality function deployment
Scope statement	Bottom-up estimating	Value analysis
Milestone planning	Team member performance appraisal	Database of risks
Change request	Team-building event	Trend chart or S-curve
Requirements analysis	Work authorization	Control charts
Work breakdown structure	Self-directed work teams	Decision tree
Statement of work	Ranking of risks	Cause and effect diagram
Activity list	Financial measurement tools	Critical chain method and analysis
PM software for monitoring of schedule	Quality plan	Pareto diagram
Lesson learned/post-mortem	Bid documents	PM software for simulation
Baseline plan	Feasibility study	Monte-Carlo analysis
Client acceptance form	Configuration review	
Quality inspection	Stakeholders analysis	
PM software for resources scheduling	PM software for resources leveling	
Project charter	PM software for monitoring of cost	
Responsibility assignment matrix	Network diagram	
Customer satisfaction surveys	Project communication room (war room)	
Communication plan	Project Web site	
Top-down estimating	Bid/seller evaluation	
Risk management documents	Database of historical data	
	PM software multiproject scheduling/leveling	
	Earned value	
	PM software for cost estimating	
	Database for cost estimating	
	Database of lessons learned	
	Product breakdown structure	
	Bidders conferences	
	Learning curve	
	Parametric estimating	
	Graphic presentation of risk information	

Figure 1: The 70 tools in decreasing order of average use

dents were specifically asked to indicate the phase(s) of projects during which they are most often involved. Many respondents indicated involvement in more than one phase.

Initiation/Concept	52%
Planning/Development	83%
Execution/Implementation	77%
Finalization/Commissioning/Handover	54%

Statistical significance reported in this paper is from the results of t-tests used to verify differences between means and chi-square for contextual differences. More complete information on the survey and methodology can be found in Besner and Hobbs (2004).

The Potential Contribution to Improved Project Performance

The survey questionnaire makes a distinction between the usefulness of present practices and the potential impact of improved practice on project performance. The left-hand column of Figure 2 presents a summary of the results for the potential impact of improved practice.

There are four databases among the tools with the greatest potential to improve project performance. These four databases comprise lessons learned, historical data, risks, and cost estimating data. Besner and Hobbs (2004) showed that database tools have low use rates and that this low use rate seems related to the project manager's need for organizational support. It is very difficult for individual practitioners to create and use such databases without organizational support.

The first three tools in this list are related to organizational learning and memory: database of lessons learned, lessons learned/post mortem, and database of historical data. The databases for lessons learned and historical data have very limited current use; but practitioners considered these the tools with the greatest potential to increase project success rates. Lessons learned/post-mortems are already among the most extensively used tools but still have the potential for contributing significantly to improved performance.

The use of the concept of the learning organization has become widespread in management. Sense and Antoni (2003) established a useful distinction about learning from projects: A lesson learned can be about learning between projects or within a project. The databases mentioned here are potentially part of the organizational infrastructures identified by Sense and Antoni, as those resulting from learning between projects. The post-mortem—during which lessons learned are established—is most often completed at a project's end; it is potentially a means for learning between projects.

The list of tools with the greatest unexploited potential contains four tools related to risk management: risk management documents, ranking of risks, database of risks, and contingency plans. Practitioners responding to this survey indicated that there is much potential for increasing project performance through more or better use of risk management tools and techniques.

Although it is a little surprising to see tools that already have high use levels appear in the list of the tools with the greatest potential for increased contribution to project performance, this is indeed the case. There are seven tools that appear in both the list of the most often used tools and the list of the tools with the greatest potential to contribute to improved project performance.

- Lessons learned/post-mortems
- Requirements analysis
- Scope statement
- Work breakdown structure (WBS)
- Project management software for monitoring of schedule
- Project management software for task scheduling
- Project management software for resource scheduling.

It is also worthy to note that six of the eight project management software functions proposed in the questionnaire are listed in the top 20 tools with the greatest potential for increased contributions to project performance.

There are two potential explanations for this phenomenon of highly used tools having significant potential for increased contribution to performance. The unexploited potential may involve the possibility of increasing use or of better use. One possible explanation is that some tools are used often enough but not well enough. This is the case for lessons learned, which are often accumulated without further application for guiding future projects. It is difficult to imagine more frequent use of scope statements than what this study showed. The potential may well involve better—not more frequent—use.

An examination of the tools with the least potential for increased contribution to project performance also yielded some interesting results. An examination of the list of the tools with the least potential reveals two types of tools: Tools with low use levels and tools with moderate use levels. In both cases, the respondents reported that their present use enabled them to adequately complete their projects. For tools such as the three tools associated with contractual bidding and the war room, the results indicate that present use levels are moderate and satisfactory.

Many of the other tools identified as possessing the least potential contribution were also among the least used. Monte-Carlo analysis is at the very bottom of the list. The practitioners surveyed did not value such tools. One could argue that the cause for this very poor perception is ignorance, but the data suggests otherwise. The respondents were invited to indicate when they had insufficient knowledge of the tool or technique, when they were unable to offer an opinion about more extensive or better use. The tools and techniques identified in this survey are all very well known. The survey results indicate that the respondents were familiar with these tools.

The Intrinsic Value of Tools

A variable was developed to measure the intrinsic value of tools, as perceived by respondents. This variable was created by adding the present extent of use to the potential contribution to project performance of more or better use. This

		Potential	Intrinsic Value
Highest	1	Database of lessons learned	PM software for task scheduling
	2	Lesson learned/post-mortem	Progress report
	3	Database of historical data	Scope statement
	4	Risk management documents	Requirements analysis
	5	Requirements analysis	Kick-off meeting
	6	Ranking of risks	Gantt chart
	7	Database of risks	Lesson learned/post-mortem
	8	Scope statement	Change request
	9	Database for cost estimating	PM software monitoring schedule
	10	PM software monitoring schedule	Work breakdown structure
	11	Work breakdown structure	Milestone planning
	12	PM software for multiproject	Statement of work
	13	Contingency plans	PM software resources scheduling
	14	PM software resources scheduling	Risk management documents
	15	PM software for task scheduling	Activity list
	16	Team-building event	Quality inspection
	17	PM software for monitoring cost	Baseline plan
	18	Stakeholders analysis	Contingency plans
	19	Communication plan	Ranking of risks
	20	PM software for cost estimating	Client acceptance form
	⋮	⋮	⋮
Lowest	56	Top-down estimating	Life cycle cost (LCC)
	57	Self-directed work teams	Graphic of risk information
	58	Learning curve	Parametric estimating
	59	Work authorization	Learning curve
	60	Trend chart or S-curve	Quality function deployment
	61	Network diagram	Value analysis
	62	PERT analysis	Trend chart or S-curve
	63	Control charts	Critical chain method and analysis
	64	Bid documents	Control charts
	65	Bid/seller evaluation	PERT analysis
	66	Decision tree	Cause-and-effect diagram
	67	Cause-and-effect diagram	PM software for simulation
	68	Pareto diagram	Pareto diagram
	69	Bidders conferences	Decision tree
	70	Monte-Carlo analysis	Monte-Carlo analysis

Figure 2: Unexploited potential and intrinsic value in decreasing order

yielded a measure of the tool's overall potential to contribute to project success or its intrinsic value. The result of this measure is presented in the right-hand column of Figure 2. It is expressed as follows:

Present extent of use + Potential improvement = Intrinsic value

From an examination of Figure 2 and the lists of tools with the highest and lowest intrinsic values come two categories of tools: super tools and discredited tools.

Super Tools

Tools with high intrinsic value could be called super tools. These are divisible into two groups. The first group contains the most extensively used and those with the greatest potential for increased contribution to project performance. These, therefore, score very high on value. Despite extensive use, these tools still have the potential of contributing to increased performance if more or better use is made of these. Their high value is attributable to the combination of these two factors. The following are this group's four most valued tools:

- Software for task scheduling
- Scope statement
- Requirements analysis
- Lessons learned/post-mortem.

Another group of super tools also shows very high scores for use, but does not show high scores for potential improvement. Theses tools are very valuable but are usually used at levels close to their full potential. The following are this group's four most valued tools:

- Progress report
- Kick-off meeting
- Gantt chart
- Change request.

Discredited Tools

Most of the tools with the least intrinsic value are tools that are rarely used and are perceived as having very little potential. Next are this group's four least valued tools:

- Monte-Carlo
- Decision tree analysis
- Pareto diagram
- Cause and effect diagram.

This evaluation underscores the need to reconsider the position of these tools in the project management literature and training as well as in the *PMBOK® Guide* (Project Management Institute, 2004). However, practitioners consider some tools with very low intrinsic value to have some potential, even if they infrequently use these tools, these include the following:

- Project management software for simulation
- Critical chain method and analysis
- Value analysis
- Quality function deployment.

Caution should be exercised in interpreting these previously-mentioned lists because the cut-off in Figure 2 and the selection of just the four tools for presentation in each group were selected arbitrarily.

Adequately Utilized Tools

From the previous discussion, one can see that some tools are important to practitioners and the present use is adequate. In other words, some tools are creating considerable value at their present level of use but increased use is neither necessary nor desirable. The following tools showed a higher than average level of use and a lower than average level of potential for contributing to improved performance:

- Activity list
- Gantt chart
- Work authorization
- Self-directed work teams
- Top-down estimating
- Bid documents
- Client acceptance form.

The first three tools are among the most extensively used. The others are in the middle range with respect to actual application. All are well understood and present use was reported as satisfactory. Organizations already using these tools should probably continue doing so. Others not using these tools regularly might consider adopting these.

Underutilized Tools

From the previous discussion, one can see that some tools possessing a considerable potential to contribute to improved performance are underused. The following tools presently show a higher than average level of potential and a lower than average level of use:

- Database of lessons learned
- Database of historical data
- Database of risks
- Database for cost estimating
- Database or spreadsheet of contractual commitment data
- Project management software for multiproject scheduling/leveling
- Project management software for monitoring of cost
- Project management software for cost estimating
- Project management software for resources leveling
- Earned value
- Feasibility study
- Stakeholders analysis
- Configuration review
- Graphic presentation of risk information.

Organizations can consider these underutilized tools as potential investment and development opportunities. The list contains five different types of databases. To implement and use these tools, project managers would require organizational commitment and support. The survey results suggested that such investments are worth considering because

the practitioners believe that these tools will contribute to improved project performance.

As shown in Figure 1, project managers already use three project management software tools extensively. These tools are all related to scheduling. The survey participants identified four additional project management software tools that are underutilized; these involve relatively complex or sophisticated application of project management software with significant potential to contribute to improved performance. These underutilized tools include earned value, stakeholder analysis, and feasibility study.

A word search in the *PMBOK® Guide* (Project Management Institute, 2004) reveals several references to these underutilized tools. PMI even has the College of Performance Management that promotes the use of earned value; it also publishes a standard on the subject. Identifying earned value and stakeholder analysis as important and underutilized tools validates the already significant status of these tools within PMI standards. The *PMBOK® Guide*'s references to feasibility studies place it outside the scope of project management. Identifying the feasibility study as an important but underutilized tool reinforces the need to increase its importance in the project management literature and practice. Moreover, the feasibility study is related to the strategic front-end phase, as discussed in the next section. The list of underutilized tools with significant potential also includes the configuration review and the graphic representation of risks.

Setting Priorities for Development and Implementation

The most valued tools and the most underutilized tools can provide organizations with the guidance they need in developing and implementing project management tool and techniques. The survey respondents identified the tools and techniques that organizations should develop and implement to improve project performance. Inversely, participants believe that the least valuable tools and the tools with the least potential are poor investment choices. The *PMBOK® Guide* states that organizations must adapt their choice of appropriate tools and techniques to match their specific projects and contexts (2004, p. 3). Next, this paper address the variations involved when practicing project management in different contexts, focusing on the differences among the project life cycle's phases.

Variations in the Value of Tools and Techniques in Different Contexts

Besner and Hobbs (2004) showed that the basic project management toolbox is very similar across different contexts. The common pattern that exists across the project management community constitutes the generic pattern of practice that is applicable to almost all projects in almost all contexts. This generic practice is the basis of the *PMBOK® Guide* (Project Management Institute, 2004). The authors also found significant and important differences in relation to working in a different context. The same is true of the perceived value of tools and techniques in different contexts. The set of most valued tools (Figure 2) is consistent across most contexts. At the same time, systematic significant differences exist. For example, almost all tools and techniques are more valued by practitioners working on large projects and in organizations with high levels of project management maturity. About half of the tools are more valued for external projects and for long-duration projects. Practically none are significantly more valued in the opposite contexts (small projects, low maturity organizations, internal or short duration projects). A discussion of one important aspect of context, the generic phases of the project life cycle, focusing on the initiation phase follows.

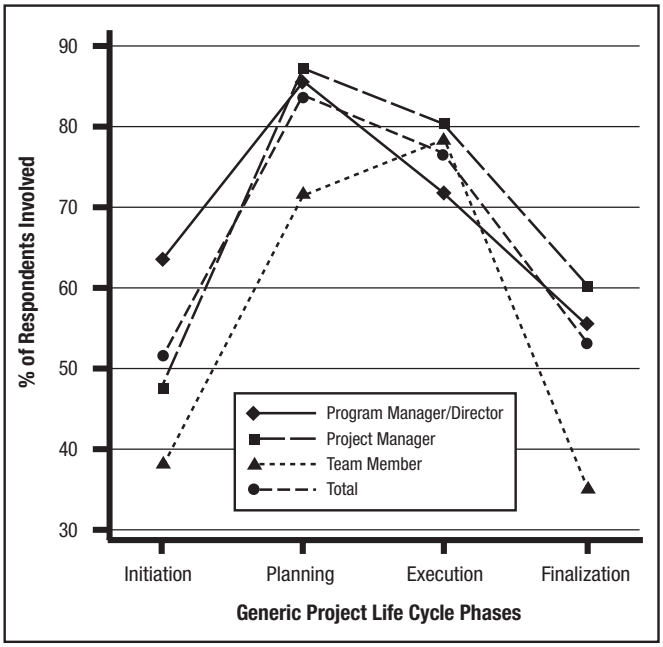

Figure 3: Involvement of different project management roles in different project phases

Involvement in Different Phases

The survey questionnaire reports data on the respondents' project management positions and their involvement in different phases of the project life cycle. This information is presented in Figure 3.

As one would expect, participant involvement is highest in the planning and execution phases. However, practitioners demonstrated significant involvement in both the initiation (52% of respondents) and closing phases (54% of respondents). Although participant involvement in the initiation phase is high for the entire sample, it is the program managers/directors who are particularly active during this phase. It is during this phase when organizations align the project with their needs and strategy. The high percentage of senior personnel involvement reflects this. Further analysis showed that program and project managers do not use different sets of tools during the initiation phase, indicating that there is a similarity in the nature of these roles during initiation.

An analysis of the socio-demographic data revealed that the respondents and the characteristics of their organizations and projects showed no significant relationships between their involvement in the different phases, their per-

sonnel characteristics (sex, age, or education level), the project's size or complexity, their organizational maturity level or overall size—or the fact that the projects have internal or external customers.

There is a significant relationship, however, between respondents' involvement in the initiation phase, their hierarchic level (as measured by level of authority ($p < 0.000$), and their project role, as shown in Figure 3 ($p < 0.000$). There is also a significant relationship between one's involvement in the initiation phase and the presence of both a multiproject environment ($p = 0.003$) and multidisciplinary teams ($p = 0.003$). Further analysis revealed that one's involvement in this phase is associated with the business development function ($p < 0.000$), with formal training in business ($p = 0.006$), and less strongly, with involvement in business services projects ($p = 0.038$). The relationship with business development is natural given that business development takes place during the early front-end of project initiation. The relationship with formal education in business is indicative of the skill set required in project initiation.

Most Valued Tools by Phase

The comparisons between most and least valued tools for groups of respondents participating in different phases produce almost identical lists to those shown in Figure 2. This is in part due to the fact that most of those reporting involvement in the initiation phase also report involvement in other phases. It is also because even in the initiation phase, the typical processes of planning and control are applied to the phase's specific activity. Nevertheless, statistically significant differences were also revealed. Figure 4 shows the tools that are significantly more valued in each phase; the plus sign in the columns shows that those tools are significantly more valued by those participating in the specified phase as compared to those not participating in this phase ($p \leq 0.01$).

Tools Value	Init.	Plan.	Exec.	Final.
Cost/benefit analysis	+		–	–
Feasibility study	+			
Financial measurement tools	+			
Scope statement	+			
Work breakdown structure	+			
PM software for cost estimating	+			
Responsibility assignment matrix	+			
PM software for resources scheduling	+			
PM software for resources leveling	+			
Stakeholders analysis	+			+
Requirements analysis	+	+		+
Team-building event		+		
PM software for task scheduling		+		

Figure 4: Tools showing significant differences in values in each phase

The greater value of these tools in a particular phase does not mean that these are not valued during the other phases. Four of these tools are included in both the list of the ten most used and the list of the ten most valued tools. Despite the generally recognized value in the overall sample, the four tools in the following list show statistically significant variations in value by phase:

- Project management software for task scheduling
- Scope statement
- Requirements analysis
- Work breakdown structure.

The kick-off meeting is among the five most used and valued tools, but it did not show statistically significant variation in value by phase. As a result, it is not listed in Figure 4. The kick-off meeting is clearly associated with the initiation process; it is repeatable for each new set of activities throughout the project life cycle. The initial project kick-off often plays a very important role during the initiation phase. However, some aspects of the initiation phase are specific to this phase and are not typical of the initiation process in other phases. It is easy to understand why cost/benefit analysis and feasibility studies are important during the initiation phase. It is not, however, easy to see these as important tools during other phases.

The most obvious observation from Figure 4 is that the initiation phase is very different from the other phases. The activities of this phase are quite specific. To say that the initiation phase and the initiation processes in each phase are the same is to underestimate these differences. The use of the same term—initiation—for both the phase and the process, as is the case in the *PMBOK® Guide* (Project Management Institute, 2004) underestimates the specific nature of the initiation phase and can generate confusion.

The list's first three tools are directly related to choosing the best project or finding the best solution to the project mission. These refer to the strategic role of the front-end phase of the project. The feasibility study has been identified above as an underutilized tool. Because the *PMBOK® Guide* (Project Management Institute, 2004) excludes project initiation from the scope of most projects, it is not surprising that this publication does not highlight cost-benefit analysis and feasibility studies.

The set of tools identified as being valued during the initiation phase appears very well integrated. The general scope of the project is first determined during the initiation phase. The first scope statement and the corresponding higher levels of the WBS—for which responsibility is then assigned to key project resources—are crucial output decisions made during the front-end phase. The responsibility assignment matrix is a structure that relates the project organization structure (more specifically, all project stakeholders) to the WBS. This ensures that responsibility is assigned for each element of the project's scope of work. The responsibility assignment matrix can be directly linked to the theory of management-as-organizing, as

opposed to management-as-planning, as discussed by Koskela and Howell (2002). According to Koskela and Howell, managing-as-organizing helps bring together management and action, which are often disconnected, in the management-as-planning view. The higher level of authority of the practitioners participating in this phase confirms the phase's more strategic nature.

Practitioners participating in the initiation phase apparently recognize that the major goals of the strategic front-end phase are planning the right allocation of resources and finding the right people to manage the key deliverables identified in the WBS. Resource scheduling and leveling in this phase are, therefore, related to the "rough-cut-capacity-planning" as described by Hendricks, Voeten, and Kroep (1999). As previously mentioned, respondents' involvement in the initiation phase is significantly related to their presence on multidisciplinary teams and in multiproject environments. In this context, long- or medium-term resource allocation is an important function of program and portfolio management. Cost concerns suggested by attributing greater value to project management software for cost estimating are related to allocating resources and to evaluating the project's cost and benefits, possibly in terms of ROI.

Requirements and stakeholder analysis are highly valued during both the initiation and the finalization phases. During project initiation, identifying requirements is very closely related to identifying stakeholder expectations. Because two key and related closeout activities involve verifying that the project meets its requirements and the stakeholder expectations, it is not surprising to see that these two tools are valuable elements during both closeout and initiation. Requirements analysis is also highly valued during the planning and development phase. The work on requirements during the planning and development phase is more focused on technical elaboration and is less tightly related to stakeholder expectations.

An element often related to commissioning, handover, implementation, and ramp-up of operations is project termination. At commissioning, a new group of stakeholders gets involved in the project. These individuals will take charge of project deliverables. This may also explain the importance of stakeholder analysis at this stage of the project.

A Further Examination of "Requirement Analysis"

Koskela and Howell (2002) challenged the traditional theoretical view of project management. They proposed the "value generation" view as part of a new enlarged theory of project management that includes the fundamental aspect of customer requirements and therefore of business propose. The findings from the present study provide detailed empirical evidence supporting Koskela and Howell's assumptions.

Requirement analysis may be used to different ends in the different phases. The list of requirements is an important output of the initiation phase. The use of requirement analysis during initiation focuses attention on the production and validation of the project's requirements. During the planning and development phase, the requirements are analyzed to clarify their meaning, to elaborate upon—and to develop—detailed technical specifications, and to plan the tasks necessary to meet requirements. During termination, the deliverables are analyzed to determine if the requirements have been met.

Requirement analysis is one of the "super tools" previously identified. It is among the most used and the most valued tools. The very definition of project management is centered on meeting requirements: "The application of knowledge, skills, tools and techniques to project activities to meet project requirements" (Project Management Institute, 2004, pp. 8 & 368). A word search in The *PMBOK® Guide* reveals that the expression "requirement analysis" is not used in the Guide. Rather, the *PMBOK® Guide* identifies requirements as one of the important elements of the project charter that is issued by the project sponsor, by the project initiator that operates outside the project organization (pp. 81–82). The *PMBOK® Guide* identifies requirements as existing prior to and outside of the project: It does not identify these as the object of analysis. This survey's results indicate that requirement analysis is a very important activity for project practitioners to perform. This evidence demonstrates that requirements analysis is within the scope of the project and that PMI should include it within future versions of the *PMBOK® Guide.*

Conclusions

Setting Priorities for Development and Implementation

Both individual organizations and practitioners—and the field of project management as a whole—can identify ways to develop and enhance their project management practices by examining the tools identified in this study as most valuable, as having the most potential for increased contribution to project performance, and as presently under-utilized. For example, this study identified those tools related to organizational learning and memory as among the tools showing the greatest potential for improving project performance. The results of this survey also indicate that the current set of well-known project management tools and techniques is more highly valued in the context of large projects for external customers and less highly valued for smaller projects for internal customers. Given the very large number of these latter types of projects, the field should focus its efforts on developing a new set of project management tools and techniques, one that focuses on small and internal projects. The development of a project management tool set for a specific organization will, of course, need to be based on an analysis of the current state of practice in the organization and the specific characteristics of the projects being managed and the organizational context.

The Specific Characteristics of Project Initiation

One purpose of this paper has been to investigate project practice through each phase. Slightly more than half of the survey respondents reported substantial involvement

in the initiation phase. This brings into question the argument that this phase is outside the scope of most practitioners' project work. If the initiation phase is as critical as some of the literature claims, then downplaying this phase reduces the emphasis on a subject that is critical to project success and value creation.

The analysis has shown that the front-end phase has some very specific characteristics. It draws upon business skills to make greater use of tools directly associated with the strategic front-end, such as choosing the right project and managing the organizational interfaces—stakeholder analysis, cost/benefit analysis, feasibility studies, responsibility matrix, and resources oriented tools, among others.

The authors conclude that the initiation phase is important and specific: In order to adequately portray project initiation, both the initiation phase and the initiation processes occurring during each project phase must be taken into account. The distinction between the two needs to be made explicit and to be used consistently, otherwise confusion is likely. Downplaying one at the expense of the other leads to an incomplete view of project management practice.

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