An Engineering Management Framework for Information Technology Projects in South Africa.

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ABSTRACT

Globally, the art and the science of project management (PM) have contributed in no small measure to the advances in the delivery of Information Technology (IT) based solutions. In South Africa, it has been shown that IT projects are currently, generally performed in a basic, but rapidly maturing, project management environment.

In order for the organization (or project environment) to mature, certain processes must first be institutionalised. These processes are identifiable by inspection of the standards that relate to PM in general (and to IT PM in particular) and by excluding the activities that relate to specific technologies and products. The remaining processes should therefore be applied to most (if not all) IT projects in SA most (if not all) of the time. These processes were identified and used to iteratively create a Project Management Framework that assists its target market in the following ways:

- Simplify and facilitate project managers' access to a common set of PM processes and tools;
- Promote the usage of best practices for PM for all projects, both simple and complex;
- Increase the level of assured competence project managers bring to PM endeavours;
- Establish a commonality of process and standardization of terminology within PM; and
- Provide a common method of project progress tracking across the enterprise.

The baseline version of this Framework is presented as a web tool, based on a body of research consisting of (1) the PMBOK® Guide processes, (2) some CMMI℠ process areas and (3) other authoritative, non-conflicting resources. The PMBOK® Guide is tailored for a sector, time and place, resulting in a unique approach to project management. This approach aims to benefit a community and open a new focus area for research within the profession.

The target market for this product are those enterprises that are seeing the need for the benefits outlined above or who realise that the first step towards process improvement is a focus on project management. These range from organizations now commencing on the project management path to those who consider “management by projects” to be a strategic option for the organizational design of the company. The case study sites where the product has been implemented include banking / retail operation, a large mining company and a financial services consultancy.

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ABBREVIATIONS and ACRONYMS

A Guide to the Project Management Body of Knowledge	PMBOK® Guide
Action Research	AR
American National Standards Institute	ANSI
Business Process Engineering	BPE
Business Process Improvement Initiative	BPI
Business Process Reengineering	BPR
Capability Maturity Model Integration	CMMI
Critical Path Method	CPM
Earned Value Management	EVM
Engineering and Physical Sciences Research Council	EPSRC
Hypertext mark-up language	HTML
Generic Goal	GG
Generic Practice	GP
Graphical User Interface	GUI
Information Systems	IS
Information Technology	IT
Initiating, Diagnosing, Establishing, Acting & Learning	IDEAL
Integrated Definition	IDEF
Integrated Product and Process Development	IPPD
Integrated Project Management	IPM
International Organization for Standardization	ISO
Management Information systems	MIS
Managing Successful Programs (part of OGC)	MSP
Object Oriented	OO
Office of Government Commerce (United Kingdom)	OGC
Operations Management	OM
Organizational Project Management Maturity Model	OPM3
Process Area	PA
Program Evaluation and Review Technique	PERT
Project Management or Project Manager	PM
Project Management Association of Japan	PMAJ
Project Management Office	PMO
Project Management Professional	PMP®
Project Support Office	PSO
Software Development Lifecycle	SDLC
Supplier Agreement Management	SAM
Software Engineering Body of Knowledge	SWEBoK
Rapid Application Development	RAD

Rational Unified Process	RUP
Return on Investment	ROI
Specific Goal	SG
Specific Practice	SP
Unified Modelling Language	UML
Value Engineering	VE
Work Breakdown Structure	WBS
What-you-see-is-what-you-get	WYSIWYG

1 INTRODUCTION

Burbridge (1998) said that project management (PM), like politics, is very much the art of the impossible. He conceded however, that it is "some art, some science and a lot of feedback." He said that PM skills, like morals, must be 'caught, not taught' and they must be experienced to be understood, although education can undoubtedly help this understanding.

Echoing this sentiment is Drucker (2001) who, in his eighties, concluded that knowledge is not impersonal in the way that money is impersonal. Knowledge does not reside in a book, a database, a software program – they contain only information. Knowledge is always embodied in a person; carried by a person; created, augmented or improved by a person.

To the author these two distinguished men have emphasized a common truth: knowledge (or skill, or art) is internalised in the very being (or heart) of a man, not just in his faculties of reason. Of course this truth is not new, as Verma (1996) credits Somerset Maugham with noting that: "Basic truths are too important to be new."

A practical example of this observation is the difference between an apprentice and a university student. An electrician's apprenticeship takes around 4 years in South Africa, as does the completion of a degree in electrical engineering. At the end of four years the electrician can do something. At the end of four years the graduate engineer is not trusted to do anything on his own, but has to spend at least three more years to obtain a professional engineer's status before he can "do something" on his own. To the author, knowledge has been imparted to the apprentice and information dispersed during the degree course. The student has to internalise the information and make it his own before the information becomes knowledge and thereby empowers him to act.

Andriessen (2004), when writing on knowledge, said that he was generating knowledge by making sense of the (his) world by making distinctions – interpreting phenomena based on previously gained knowledge and experiences embedded in his frame of reference. The process of sense-making is unique for every individual, because every person is unique with regard to the knowledge and experiences gained in life. It would therefore seem fair to warn the reader that if he or she has no project management frame of reference, that this research could be nothing more than mere information.

For those with an interest in the subject, it is the author's aim to impart project management information in such a way, that the reader internalises and uses it to become knowledge, allowing him or her to do something with it. The author has set out to enjoy the research and

to keep things as simple as possible (as advocated by Einstein, “Things should be as simple as possible, but not simpler.”)

In deciding to develop this thesis, the author also considered the words of Dr Coleman (1993), who said that research that is never written up, might just as well never have been done in the first place. If it is not written up, there is no record of its findings, and without any record of the findings, the research cannot make any enduring contribution to knowledge.

According to chatna.com (2006), Benjamin Jowett, a vice-chancellor at Oxford during the previous century, uttered the following comments on the type of activities that lead to the production of a dissertation: “Research! A mere excuse for idleness; it has never achieved, and will never achieve any results of the slightest value.” The author includes Mr Jowett’s opinion as a motivator to ensure that the research is based on something he values and believes can add value to other people’s lives.

In terms of deciding how to commence the research, the author considered Lowenthal and Wason’s (1977) survey of the writing habits of academics. They discovered that academics that plan their writing in detail before they begin, generally dislike writing but, those who develop their ideas in the process of writing, generally enjoy it. In following their approach, the author has therefore set out on a journey that he hopes will be a joy for himself and the reader.

El que con lobos anda a aullar aprende!

1.1 A contextual history of Project Management

Berkun (2005) noted that project management goes back a long way in history: from all the things that have been built in the history of civilization, there are thousands of years of project experience to learn from. He also notes that the history of engineering projects reveals that most projects have strong similarities (e.g. requirements, designs, and constraints.) He feels that the most important commonality is that projects combine the activities of different people into a single coherent whole that is useful to stakeholders. In order to provide a contextual point of departure for the current research this section documents a history of project management spanning from the 19th century to the 21st, ending with a focus on the current, local state of the practice.

1.1.1 1870 – 1980’s

Archibald (2004), in “The State of the Art in Project Management” writes that the practice of project management (PM) has evolved over half a century and now permeates all industries,

institutions and governments throughout the world. It will not be attempted to investigate so large a field in so small a space but the limit in this study will be to a subsection of this greater picture, namely projects performed in the Information Technology (IT) industry in the country of South Africa. In most cases, the greater picture will be considered and its specific application sought in the focused view.

In reading about the worldwide history of Project Management, the author consulted various sources, from the PMI website (2006) to the introduction of almost all PM source books (Burbridge, 1988) (Burnett, 1998) (Cleland, 1999) (Kerzner, 2003) (PMForum, 2006a) (Lientz, 1998) (Meredith and Mantel, 1995) (Mikheev and Pells, 2005) (Morris and Pinto, 2004) (Sisk, 2004.) From these one finds that during the latter half of the 19th century, the rising complexities of the business world (due mostly to large-scale USA government projects) were the impetus for making those important decisions now known as *management decisions*. Kerzner (2003) notes that the first truly large organization was the transcontinental railroad in America, which began construction in the early 1870s. All of a sudden, business leaders found themselves faced with the daunting task of organizing the manual labour of thousands of workers and the manufacturing and assembly of unprecedented quantities of raw material.

New challenges leads to new thinking and near the turn of the century, Kanigel (1997) notes that Frederick Taylor (known as the father of scientific management) *applied scientific reasoning to work* by showing that labour can be analysed and improved by focusing on its elementary parts. Kerzner (2003) showed that Taylor's associate, Henry Gantt, studied the *order of operations in work*. His focus was on Navy ship construction during the First World War and his Gantt charts (complete with task bars and milestone markers) outlined the sequence and duration of all tasks in a process. (These diagrams proved to be such a powerful analytical tool for managers that Gantt charts remained almost unchanged for nearly a century. It was not until the early 1990s that the addition of link lines was made to these task bars, depicting more precise dependencies between tasks.)

Management was evolving into a distinct business function that requires study and discipline, and project management in its modern form began to take root a few decades ago. Meredith and Mantel (2002) note that it was used as an isolated concept before the Sputnik crisis of the Cold War, after which the United States Department of Defence needed to speed up its military project process. Kerzner (2003) documented that new tools for achieving this goal were developed and in 1958 the Program Evaluation and Review Technique (PERT) was developed as part of the Polaris missile submarine program. Concurrently, the DuPont Corporation and Rand Remington invented the similar Critical Path Method (CPM.)

PERT was later extended with a work breakdown structure (WBS.) The process flow and structure of military undertakings quickly spread into many private enterprises. Businesses

and other organizations began to see the benefit of organizing work around projects and to understand the critical need to communicate and integrate work across multiple departments and professions.

Dr Kerzner (2003) noted the following changes over the period from 1940 to the late1980s.

- During the 1940s, line managers were using an "over-the-fence" approach to manage projects. A line manager, temporarily wearing the hat of a project manager, would perform the project work that was required by their line organization, and once completed, would throw the "ball" over the fence to the next line manager, in the hope that someone would catch it. Once thrown over the fence the line managers would disown any responsibility for the project because the ball was no longer in their area. Should a project fail, the blame invariably fell on whichever line manager had the ball last!
- Through the 1950s and early 1960s, the American aerospace and defence industries used PM on virtually all projects, and they were pressuring their suppliers to use it as well. Because the number of contractors and subcontractors was vast, the government needed standardization, especially in the planning process and the reporting of information. To this end, the government established a life cycle planning, control model, and a cost monitoring system, and created a group of project management auditors to make sure that the government's money was being spent as planned. These practices were enforced on all government programs above a certain value. Initially, private enterprise saw these practices as an over-management cost with no practical value.
- From the middle to late 1960s, more and more company executives sought for new management techniques and organizational structures suited to a changing environment.
- By the 1970s and early 1980s, the PM process was formalized in the sense that a move away from the informal method of handling projects was taking place. This was mainly because the size and complexity of enterprise activities had grown to a point where they were unmanageable within the existing structures.

1.1.2 1990s – today

Hammer (1996) notes that understanding gradually dawned on American managers: They were struggling because *they were applying task solutions to process problems*. He describes the difference between a task and a process as the difference between a part and a whole:

- A task is a unit of work, a business activity normally performed by one person; while
- A process, in contrast, is a related group of tasks that together create a result of value to a customer.

He concludes that the problems that afflict modern organizations are not task problems but rather process problems. It is worth noting that, according to the Project Management Institute's PMBOK® Guide (2004), project management is accomplished through the application and integration of the *project management processes.*

By the 1990s, companies had begun to realize that implementing project management processes was a necessity, not a choice. The question was not how to implement project management, but how fast could it be done? Dr Kerzner (2003) noted six driving forces that led executives to recognize the need for project management:

- Capital Projects;
- Customer expectations;
- Competitiveness;
- Executive understanding;
- New project development; and
- Efficiency and effectiveness.

He concluded that the speed at which enterprises reach some degree of maturity in PM is very often based upon how important they perceive these driving forces to be.

In 1994, Levine predicted that:

- In many organisations, project management will no longer be a separately identified function, but will be embedded in the overall management of the business;
- The emphasis will be shifting from a single project focus to managing the efforts on multiple projects. The typical project management environment will therefore, be multiple-project which means that most of the project decisions will require consideration of schedule, resource and cost concerns on other project work, necessitating the review and evaluation of multiple-project data.
- Consequently, functional managers, supporting multiple projects with shared and limited resources, will need to know the demands on their resources and the impact of new project loads and changing priorities.

Few will now argue with the accuracy of Mr Levine's predictions of the previous century. More recently, Baker and Merrick (2002) noted that since PERT and CPM, some practitioners are of the opinion that the biggest breakthrough in terms of PM, is the Critical Chain concept presented by Eliyahu Goldratt in 1997. Goldratt (1997) suggested that ALL tasks that affect the project end date be called Critical Chain tasks (including non-critical path tasks that use key resources, thus drawing the resource away from critical tasks.) In other words, Critical Chain is based not only on network links, but also on resource availability. Retief (2004) notes that Critical Chain promises significant reduction in project duration and better morale

but that practical implementations are not always successful due to the significant cultural adjustments that are needed.

In 2001, Thomas, Delisle and Jugdev published their finding that a "knowing-doing" gap exists in the implementation of project management in today's organizations. This implies that responsible parties could explain what their company needed to do strategically but they could not actually implement these strategic plans through projects successfully.

John C Goodpasture (2001), seeking value and perhaps being of a more scientific disposition than most, recently postulated that the PM's mission and project equation may be expressed mathematically:

- The PM's mission is to manage project resource capability and capacity to deliver expected scope, taking measured risks to do so.
- He gives the project equation as: Value delivered from resources committed is equal to capability and capacity plus risks taken.

He calls it the new math for the project manager: this equation must be satisfied for the project to be successful.

In 2004, Sisk noted that, while various business models had evolved over time, they all shared a common underlying structure (especially for larger businesses): namely that the project is managed by a project manager, who puts together a team and ensures the integration and communication of the workflow horizontally across different departments. To the author this means that the same *basic* project management applies to all projects.

In 2005, in a Russian / American collaboration, Mikheev and Pells noted the following trends in Project Management:

- In terms of industry trends there are now widespread awareness and usage of "basic" PM in most industries, and increasing usage of advanced and strategic PM in some cases with some organizations and industries now approaching PM "maturity" e.g. American aerospace, defence and construction industries (noting that there is still room for higher quality, better performance, new technologies and process improvements);
- PM is maturing in energy, oil and gas, petrochemicals, pharmaceuticals, automotive and various heavy industries;
- Basic PM is maturing rapidly in IT, telecomm, manufacturing, software and product development organizations, although in many cases only newly introduced in many organizations during the last ten years or so; and
- They also noted that, geographically most industries have a consistent level of PM maturity worldwide due to the globalisation of economies and trade during the last 20 years. However, PM maturity parallels economic development and therefore, PM is

generally more mature in Australia/New Zealand, Japan, Korea, North America, South Africa and Western Europe.

1.1.3 Within South Africa

Extracting for our focus area, namely the South African IT industry, it can be concluded that *South African IT projects are currently, generally, performed in a basic (but maturing) project management environment*.

Mikheev and Pells (2005) define "basic" PM as follows:
"Basic project management includes the understanding of the quantitative and behavioural tools of PM, those methods, principles and tools that have been developed over the last 35 years around the world of PM."

They state that many of the tools and methods considered "strategic" just a few decades ago, are now quite basic to any fundamental PM approach or implementation. These methods and tools have been promoted and adopted widely and receive a majority of the emphasis by those new to PM, both individuals and organizations. To the author this implies that *in order to mature, there are some basic methods and tools that must be embedded (institutionalised) in the organization before a successful maturation process can commence.*

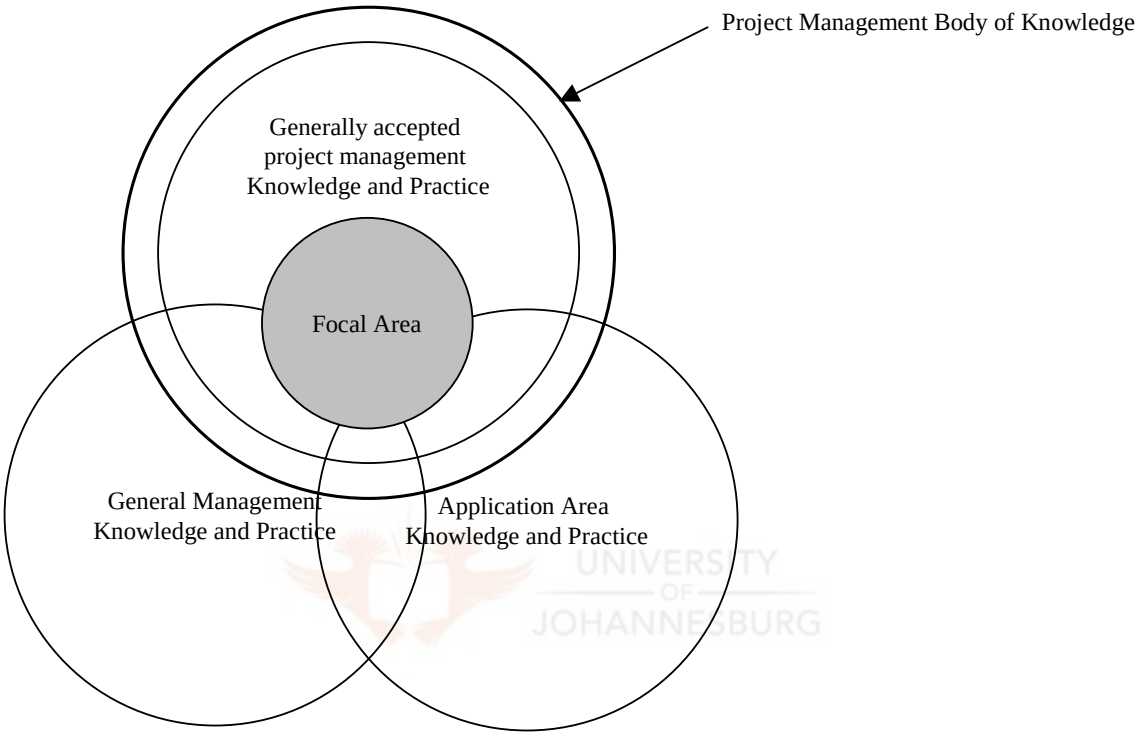
The above conclusion is amply supported by research performed by the Software Engineering Institute (SEI) (2001) at Carnegie Melon University, who have found that basic project management is the foundation for process improvement, according to the Staged Representation of their Capability Maturity Model – Integration (CMMI.) For them, basic PM is the following process areas:

- Project Planning;
- Project Monitoring and Control; and
- Supplier Agreement Management.

These PM process areas address the basic activities related to establishing and maintaining the project plan, establishing and maintaining commitments, monitoring progress against the plan, taking corrective action, and managing supplier agreements.

In the CMMI, the above process areas contain practices, which may be mapped to processes in the de facto standard for project management, namely the Guide to the Project Management Body of Knowledge (PMBOK® Guide). This mapping is done as part of the current research, but in a later chapter. At this introductory stage, it should be sufficient to note that the two standards (CMMI and PMBOK® Guide) overlap but are not equivalent.

The final product (the Project Management Framework) developed as part of the current research is based on PMBOK® Guide (2000) processes, some CMMI process areas and other related inputs and aims to support the South African IT project environment in its maturation process. Figure 1.1 presents a contextual focus area for the current research. Portions of the three components of Project Management, General Management and the IT



Application Area combine to form an area of focus for the current research.

Figure 1.1. Research Focus Area in Terms of Project Management and Other Management Disciplines

1.2 Problem Statement for the Current Research

Stephen Covey (1990) advises us to spend more time on important things so that fewer urgent things result. An interpretation of Mr Covey's advice is that by helping someone focus on important issues, one is in fact assisting in at least two ways:

- Firstly, one is helping the person to focus now, as the important things are known and do not need to be sought out; and
- Secondly, one is helping the person in the future, by lessening the occurrence of those disturbing "urgent" things that crop up every so often.

Green and Stellman (2005) have said that a project manager attempting to change an organization to run better IT projects, should make changes to the way that the project work is

performed. What with evolving technologies, shrinking software development cycle times and a shortage of software development professionals, the issues associated with IT project management are complex. For this reason, it is doubly important to identify those important issues that prevent the practitioners from stumbling over the “urgent” things that would steal their time.

Born from the need, to identify those things that are important to a South African IT project manager, the problem statement for the current research aims to address a perceived need at client level (and the author’s own needs at consulting level.) As will be demonstrated, the accuracy of the identification of this need has been confirmed for the product’s current target market and is in line with similar development in the rest of the international project management community.

As a contextual point of departure, the Third Edition of the PMBOK® Guide (2004) states that, “project management exists in a broader context that includes program management, portfolio management and (the) project management office (PMO.)”

The question that arose in the mind of the author’ client was:

- If projects are performed within the context of a PMO, how does such a PMO ensure that it is delivering value to the parent organization?

The question at the consulting house was:

- How does a consulting house differentiate its project management offering to its current and potential clients?

The above questions were distilled by the author to provide a common problem statement. How may a solution:

- Simplify and facilitate the project managers' access to a common set of project management processes and tools?
- Promote the usage of best practices for project management for all projects, both simple and complex?
- Increase the level of assured competence project managers bring to project management endeavours?
- Establish a commonality of process and standardization of terminology within project management?
- Provide a common method of project progress tracking across the enterprise?
- Use the results of the above questions to create a flexible product (solution) to the organization?

The process of coming up with and answering these questions are essentially what makes up this research document. The research design, according to Mouton (2004), is mainly one of Field or Natural experimental design. This type of research design is often used to test hypotheses or models (or frameworks as in the case of the current research.) Mouton (2004) recommends observation in the form of questionnaires and interviews, both of which types are included within the current research. He notes that this type of research model increases generalisability of results and decreases the likelihood of laboratory effects (such as experimenter effects.) Another major type of research method used in the current research, according to Mouton (2004) is that of Methodological studies, wherein a method is validated using a newly developed instrument (framework) through a pilot study. Secondary research methods, such as Literature Review, are used where appropriate (in Chapter 2 for instance, to evaluate the compiled body of research.) In chapter 4, a technique similar to Action Research as defined by Greenwood and Levin (1998) was utilized to develop the product Idea and Concept.

The culmination of all this work has been the iterative specification, development, evaluation and rollout at three case study sites, of a product that satisfies the requirements raised by the above questions. The current baseline version of the product is now market-ready and is known as the Project Management Framework (or just Framework.)

The need for this research is collaborated by the Winter and Smith's (2006) work for the EPSRC (Engineering and Physical Sciences Research Council) in the United Kingdom. They have, through the Rethinking Project Management research network identified 7 first-cut topics for research, of which two falls within the scope of the current research.

- Project management capability in organisations (specifically chapter 8 of the current research); and
- The management of projects in practice (the balance of the current research).

For the funding body, the objective of this research network is not simply to define new research topics, but as stated by Winter and Smith (2006), also to "facilitate the transfer of knowledge to a broader community". This latter aim is also in line with the author's previously stated aims.

1.3 Research Objectives

According to Turner (1999) the three dimensions of project based management are:

- The Project;
- The Management Process; and
- The levels.

According to him there are three fundamental levels over which the project is managed, namely the integrative, strategic (or administrative) and tactical (or operational) levels. For the purposes of the current research, the focus is on the management process, for every project and at all three of the levels discussed above.

Some Motivators

Kerzner (2003) states that applying proven project management principles in organisations that have adopted integrated processes, together with a culture based on trust, cooperation, teamwork and open communications, increases the probability of successful project delivery that has "value" to the organisation. This, according to him, is the ultimate criterion for a successful project.

Hunter (1997) showed that "as the project rigour increases the probability of project disaster drops."

GartnerGroup (2000) noted that "by using moderate PM rigor (using standard processes with some auditing) there is a 30% improvement in productivity."

In 2001, Smith reported that the failure rate of large IT projects in South Africa is reported as being between 50%-80%, but concluded that it could be even higher.

Cooper (1998) documented four major reasons for project failure:

- Failure to know what to expect (or Great Expectations);
- Failure to know what to watch (or Half-Blank Tape Measures);
- Failure to know what to do; and
- Failure to know what's what (or Lessons not Learned.)

Whitty (2005) found that "PM knowledge may pass from person to person by explicit means such as books, the internet, narratives, or academics teaching in university programmes. All these products and services are created by people to make our business lives easier and our organisations more productive."

Burnett (1998) found that "many managers fail to recognize that applying and following a process is important to success. In the rush to get something done, standards are ignored in order to meet impossible deadlines. Inexperience leads to seat-of-the-pants management and disregarding tried and proven methods."

Mochal (2004) states that in general, the value of a common project management process includes:

- Reduced cycle time

- Reduced delivery costs
- Improved quality of project deliverables
- Early identification and proactive management of project issues and risks
- Better containment and management of project scope
- More opportunities to leverage and reuse knowledge
- Improved accuracy of estimates
- Better communication with clients and stakeholders
- Improved perceptions of your organization by your clients
- Improved people and resource management
- Reduced time to get up to speed on new projects

Conclusion

The wise project manager adopts the Scouts motto, "Be prepared." To the author this implies having the correct tools, processes, skills, etc. available to pre-empt situations that may arise. It is, of course, impossible to predict everything that could go wrong and it would be foolish to attempt to do so. The opposite approach, that of managing by exceptions, is not recommended by the PMBOK® Guide (2004.)

In line with the above thinking, and in answer to the questions raised in the previous section, the objectives of the current research are therefore to:

- Identify the sources of the PM, IT and related information that the research will be based upon;
- Develop a body of research to base the Framework product upon;
- Determine the required product features for the Framework;
- Decide on an appropriate context within which to present the Framework;
- Develop successive baselines of a Framework that can contain the various methodologies required by IT projects and that meets the needs documented in the problem statement, concluding with a continuously improving baseline version.

In short, the end result of the research is a product that should be usable at consulting and client level, meeting such requirements as are determined as part of the research and within the problem statement.

1.4 Strategy and Roadmap

Strategy

Messrs Cadle and Yeates (2001) say that strategy is not an exact science, as it has been stated that "there is no single, universally accepted definition of strategy." However, Quinn (1995) made the following observation about strategy:

"Strategy is the pattern or plan that integrates an organization's major goals, policies and actions into a cohesive whole. In other words, it pulls together and gives meaning to everything an organization does. A well-formulated strategy helps to organize resources into a unique and viable force based on the competencies and shortcomings of the organization, on anticipated changes in the environment and activities by competitors."

A good strategy is:

- Clear
- Keeps the initiative
- Concentrated
- Flexible
- Well led; and
- Full of surprises (advantage may be gained out of proportion to the effort expended by doing the unexpected.)

Cadle and Yeates (2001) conclude that strategy is the result of a careful analysis, and that it is purposeful. In the author's words, it is *a well thought-through plan for achieving an objective*.

At each stage of this research, the author sought to strategize (analyse and plan forward) at two levels:

- How to get to the eventual purpose of the research; and
- What are the detail steps of the immediate goals.

The way chosen to graphically present this context to the reader is that of a roadmap, as discussed in next section.

Roadmap

At the start of each chapter, a high level roadmap is shown (similar to that presented by Riehl and Sterin (2002) and Arlow and Neustadt (2005)) to give the reader insight into:

- The level of clarity with which the roadmap has become known;
- The context of the chapter;
- The progress made to date; and
- The road forward.

The roadmap idea is also in line with the conclusions of Rautiainen, Nissinen and Lassenius (2000), who found that Visualizations are a powerful way of communicating the overall picture during product development. If the roadmap shows context at a high level, then the accompanying passages of writing will provide context at a more detailed level, painting a

verbal picture of the steps that will be taken within the chapter to get to the next high-level goal.

At the very outset of the research, Figure 1.2 presented the roadmap. The final product was not clear and nor, therefore, was the road of getting to it. The roadmap became increasingly lucid and clear as the research continued.

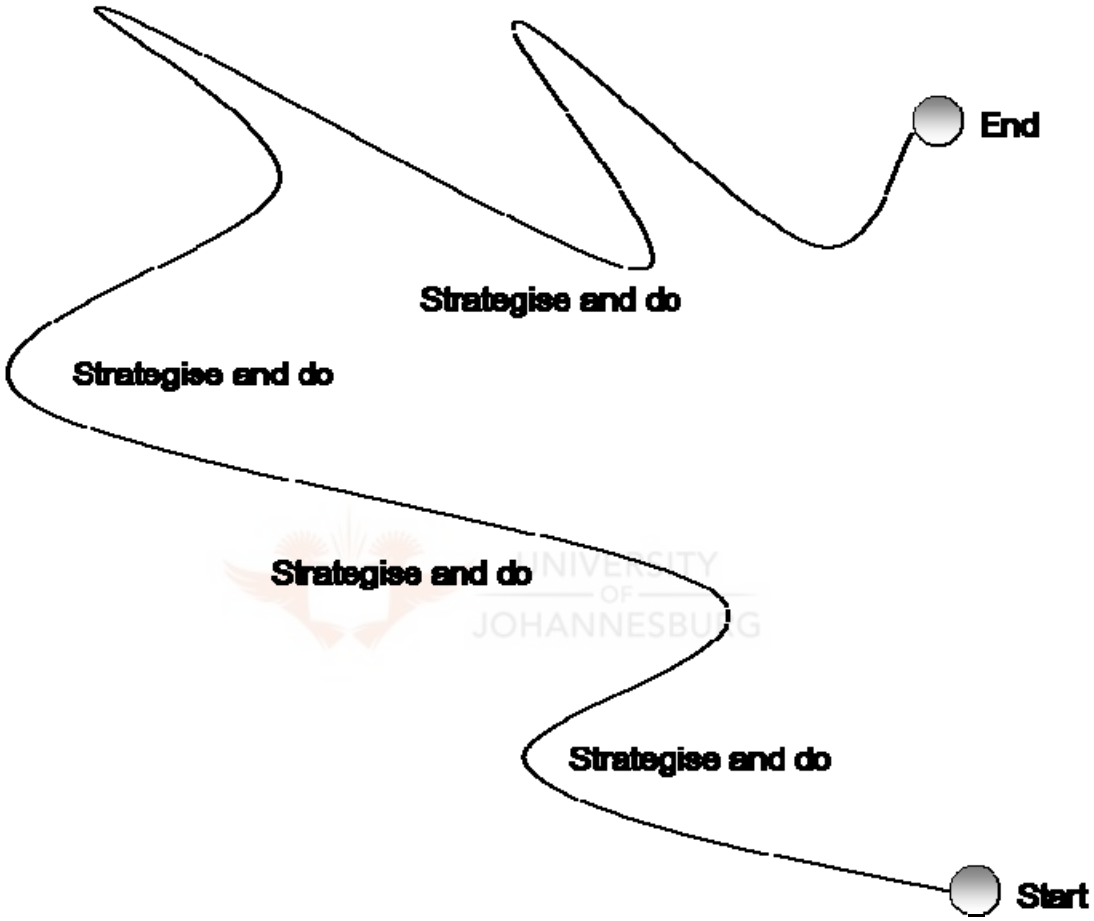


Figure 1.2. The Roadmap at the Start of an Uncertain Journey.

1.5 Conclusion

Kerrigan and Anderson (2004) have noted that project management is often referred to as *an art that is informed by a science.* This author and others (Kerzner, 2003) (GartnerGroup, 2000) (Hunter, 1997) (Smith, 2001) (Burnett, 1998) have found that within South African IT projects there is a need for the first principles of the *science* of project management to be firmly implemented prior to allowing the artistic side of project management to be encouraged. To the author this would be akin to restricting an artist to paint on a white canvas, using pastels. There are many other ways to express art, but restricting the artists in this way allows comparison between artists and allows for certain practical and commercial aspects to be embedded (e.g. you cannot sell a sidewalk artist or graffiti artist's work or take it home.)

As noted by Green and Stellman (2006), few good software projects can survive bad management. In line with this observation, the author perceived a need at almost each client site he worked at and within the consulting house he represents, for an easily implemented, basic Project Management Framework with the benefits listed in the problem statement above. These client sites include IT projects at financial institutions, banks and other service related industries. This perceived need has been confirmed by research performed by others (Mikheev and Pells (2004); Winter and Smith (2006)). It also provides a starting point for the specification of a product that satisfies the perceived need. This specification is grounded on the Research Approach discussed in chapter 2 and the Body of Research developed in chapter 3.

Patti chiari, amicizia lunga.

2 RESEARCH APPROACH

In Chapter 1, a contextual history of project management was presented, from which the author concluded the general state of the South African IT project management arena. Based on this state, a need identified by the author has been voiced and clarified by way of a problem statement and research objectives. This chapter will build on these two devices and aims to elucidate the research approach followed, in order to satisfy the perceived need.

Figure 2.1 shows a pictorial view of the state of the research at this point in time. The author knew he had started and knew he had to finish. The context had been discussed and the objectives documented. An approach had to be developed that would yield the required results.

Ne pas y aller par quatre chemins.

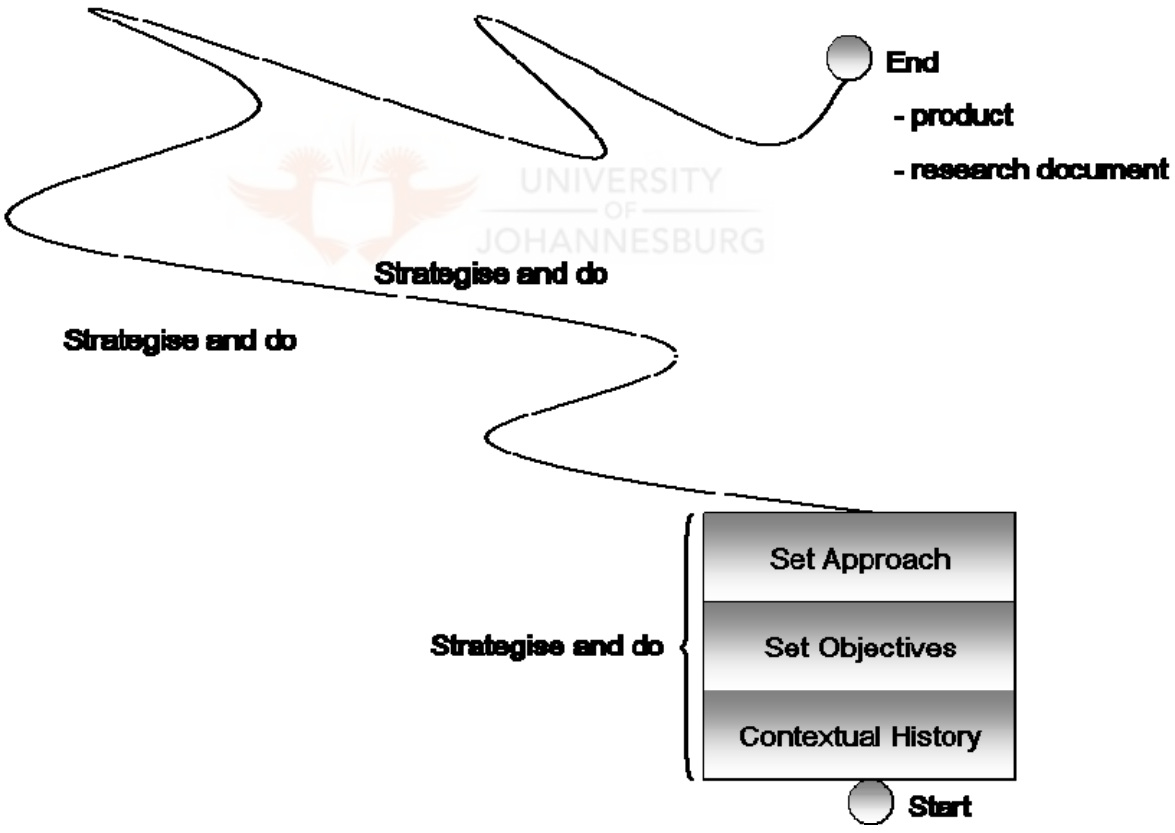


Figure 2.1. Chapter Focus in Roadmap during an Uncertain Journey.

2.1 Introduction

Meredith and Mantel (1995) have said that any way chosen to organize knowledge carries with it an implication of neatness and order that rarely occurs in reality. To the author, this means that there could be an implied precision in the documentation of the research, which does not correspond to the reality of what had transpired. An item that took hours or weeks of drafting and reflection to develop is tidily reflected in a paragraph or summarized in a formula.

The author agrees that this neatness should be achieved within the confines of the research document, but more importantly, should be sought within the product that is being developed, based on the requirements documented within the research document. To this end, the research approach used in this document is based on appropriate management area principles, such as knowledge management principles or product development management principles, as may be applicable for the relevant chapter or section. In each case, the author has sought to bear in mind that the end goal is a product augmented by a research document, not the other way around.

2.2 Objectives

The research objectives identified in chapter 1 are:

1. Identify the sources of the PM, IT and related information that the research will be based upon;
2. Develop a body of research to base the Framework product upon;
3. Determine the required product features for the Framework;
4. Decide on an appropriate context within which to present the Framework;
5. Develop successive baselines of a Framework that can contain the various methodologies required by IT projects and that meets the needs documented in the problem statement, concluding with a continuously improving baseline version.

The balance of this chapter contains the foundation for achieving each objective as well as the *research approach for each of the above objectives*. The overall research approach has been that of 3 case studies where the product has been implemented, but more of that in chapters 4, 5 and 6. Falconer and MacKay's research (1999, p8) on Information Systems research methods concluded that "combining qualitative and quantitative research methods within a positivist paradigm can be sound, but that cross-paradigmatic research designs incorporating interpretive and positivist research to investigate a single phenomenon are ill-conceived."

The author considers this work to be positivist according to definition provided by Denzin and Lincoln in 1998 and have therefore not hesitated to combine the two research methods within the current research.

2.3 Sources for the Body of Research

2.3.1 Project Management Standards

Project management standards and practices may vary in complexity and application, but the goals are usually the same - to produce desired project results within the boundaries of time, costs and available resources. There have been several attempts to develop project management standards, such as:

- PMForum (2006b) refers to the Global Working Group on Project Management Standards;
- The APM Group Ltd (2006) publishes the APM Body of Knowledge;
- International Organization for Standardization (ISO, 2003) publishes ISO 10006, containing guidelines for quality management in projects;
- The PMI publishes A Guide to the Project Management Body of Knowledge (PMBOK® Guide, 2004);
- Ohara (2005) is the representative author of PMAJ's Guidebook of Project & Program Management for Enterprise Innovation;
- The APM Group Ltd (2001) publishes the British standard, PRINCE2 (PRojects IN a Controlled Environment);
- Kuhrmann, Niebuhr & Rausch (2005) refers to the V-Modell, a German IT project standard.
- Caupin, Knöpfel and Morris (1999) discuss the IPMA Competence Baseline, which identifies 42 key competencies for knowledge and experience in project management; and
- The British Standards Board (2002) publishes BS6079, the British Standard guide to project management.

The Global Working Group on Standards, formed by International Project Management Association (IPMA), has accepted a framework for their work that identifies those areas in which they consider project management standards to be relevant, namely:

- Projects: knowledge and practices for management of individual projects
- Organisations: enterprise project management knowledge and practices
- People: development, assessment and registration / certification of people

The IPMA is the world's oldest project management organisation: an international network of national project management societies. It is a non-profit, Swiss registered organisation, with a Secretarial office based in the United Kingdom. National societies (such as PMSA) serve the specific project management development needs of each country, while the IPMA acts as an umbrella organisation, representing them at the international level.

Crawford (2004) found that the most widely known, distributed and used guides and standards for project management may be presented as in Figure 2.2, indicating their general focus: projects, organisations or people.

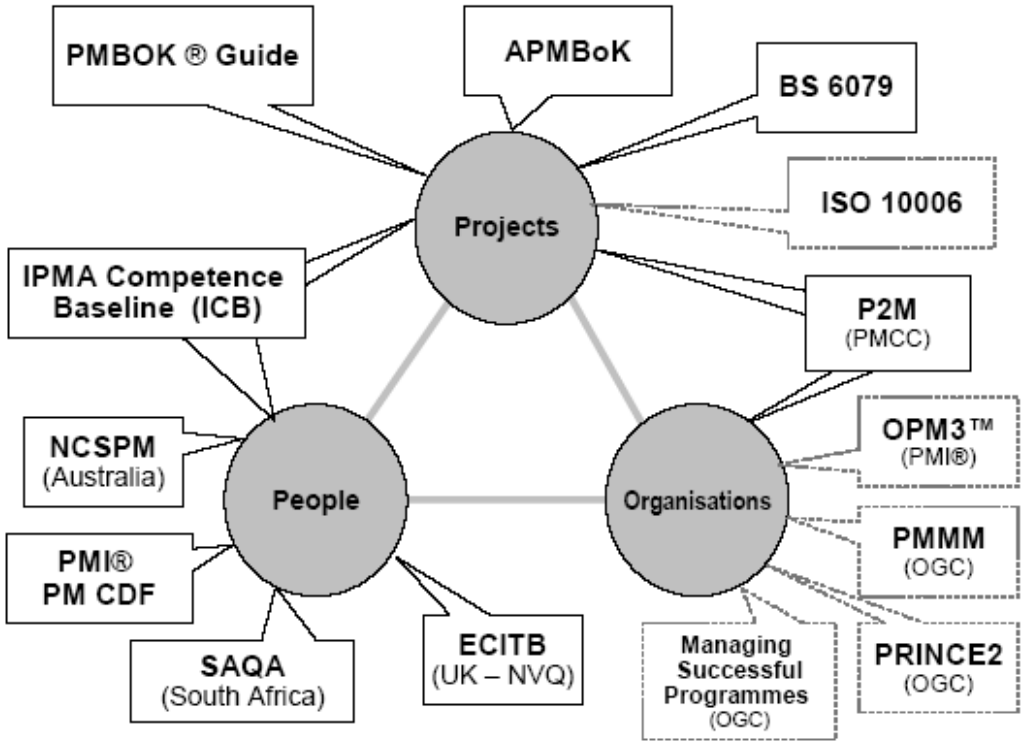


Figure 2.2. Most Widely Recognised, Distributed And Used Project Management Guides And Standards (Crawford, 2004).

David Whelbourne (2003) noted that in the PM profession there are two key public domain knowledge sources that concentrate project management knowledge: the PMBOK® Guide and Prince2. He notes that they should not be viewed as competitors in the global market vying for project management attention, as they provide a view on different aspects of what a project manager needs to know. By its own admission, PRINCE2 is an implementation methodology, rather than a whole project management methodology.

Upon closer inspection of the two standards, one finds that both has been developed over the last 16 years and provides a substantial depth of knowledge in their respective areas:

PRINCE2 was developed in the UK and the PMBOK® Guide in the USA. In the UK, the focus was on of how to improve the chance of successfully delivering projects, whereas in North America the focus was on developing and defining the body of knowledge (BoK) that a successful project manager should understand and be able to practice.

Within the APM Group Ltd (2001) book "Managing Successful Projects with PRINCE2" it may be noted that PRINCE2 is more focused on project assurance and organizational structure than the PMBOK® Guide and is business case driven (the PMBOK® Guide falls short here in the author's opinion.) Some fundamental differences are listed in table 2.1.

PMBOK® Guide	**Prince2**
Projects may include a feasibility study.	The approach to be taken by a project and its final deliverables are known at the start. If the approach is not clear, then there may be a preliminary project with a deliverable of a feasibility report.
A Work Breakdown Structure is used. The focus on activities occurs at the start.	The Product Based Planning Technique of PRINCE2 is used to define project outcomes as 'products'. Activities are derived from the product flow. The focus is on the project's deliverables.
No assumption is made on the organisation in which the project manager sits.	A Customer/Supplier environment is assumed with the focus on the customer's Business Case. It is the customer's Business Case which drives the project.
Steering Committees tend to be larger and meet on a regular basis.	Projects are controlled by a small Board representing the interests of the Customer, Supplier and End-user of the project's products. The Board is a decision making body chaired by an 'Executive' who is ultimately responsible for the delivery of the business benefit.
Projects are seen as following certain pre-defined phases aligned to the project life-cycle. The project manager is responsible for delivering the project and reports regularly at meetings of the Steering Committee. Recent articles in the PMI journal have referred to an Adaptive Project Framework which in some part incorporates the PRINCE2 idea of	In the initial planning for the project, it is divided into 'Stages' based on management reviews or decision points. Approval to proceed is given on a stage-by-stage basis. During a stage, the project manager has full authority for the day-to-day management of the project. The Board requires only short reports provided the stage remains within

'Stages'.	agreed tolerances. A review of viability occurs at the end of each stage or if the tolerances are forecast to be exceeded. This is the concept of 'management by exception'

Table 2.1 High-level Comparison between PMBOK® Guide and Prince2 (Bentley, 2006)

From the author's point of view, it is clear that both standards are based on best practice in project management. There are no contradictions in the two approaches but there are different emphases. For example, the PMBOK® offers the project manager a considerable amount of information about proven practises in this field and invites the project manager to apply these where they deem appropriate. In contrast, PRINCE2 provides a more prescriptive set of steps for the project manager and teams to follow. Wideman (2002) found that "PRINCE2 and the Guide take very different approaches to the presentation of their material. Indeed, they really serve different purposes and are therefore not directly comparable. We believe that the Guide takes the best approach for purposes of teaching the subject content of each knowledge area, but is not so affective when it comes to providing guidance for running a particular project."

Of these two, the author believes that the one most applicable to the South African arena is the PMBOK® Guide. The Project Management Institute (PMI) is a global institute servicing more than 200,000 professionals (as at 2006,) representing 150 countries, with a variety of offerings. The institute, which started in 1969 with 71 members, continues to grow at a phenomenal rate with a 23.4% increase in membership in 2001 over 2000. Project Management South Africa (PMI SA Chapter) is the oldest chapter of PMI outside North America, proving that the SA link to the PMI is very strong. PMSA has a co-operative agreement with PMI® to facilitate the (Project Management Professional) PMP® certification programme locally. At the time of commencement of the research, PRINCE2 did not have a strategic presence in South Africa.

Marnewick and Labuschagne (2004) have stated that: "The standard that is used in the Americas, South Africa and Australasia is the Project Management Institutes' Guide to the Project Management Body of Knowledge (PMBOK® Guide.)"

Furthermore, Elmar Roberg (2002) (past President of the Computer Society of South Africa) notes that: "the PMI have gained acceptance to the point where its influential PMBOK® Guide has become the de facto standard for describing project management, to the extent where standards setting organisations such as ISO and IEEE/ANSI have adopted PMBOK® as overprints."

The primary source for PM information, processes and knowledge in general, for the purpose of this research, is therefore “A Guide to the Project Management Body of Knowledge, 2000 edition *and* Third edition.) The reason for the duality of edition is that the current research germinated in 2001 and that the third edition was made available in South Africa during 2005. One of the most pronounced changes from the 2000 edition to the third edition is the structure. Unless otherwise indicated, all references refer to the 2000 edition.

2.3.2 Information Technology Standards

The American National Institute of Standards and Technology (NIST, 2004) state that:
“Standards are essential elements of information technology -hardware, software, and networks. Standard interfaces, for example, permit disparate devices and applications to communicate and work together. Standards also underpin computer security and information privacy, and they are critical to realizing many widespread benefits that advances in electronic and mobile commerce are anticipated to deliver.”

The IT standards that this thesis requires, however, relate more to the processes followed to perform IT projects. Even narrowed down in this manner, various IT standards exist worldwide. PMForum (2006a) found the most prominent of these to be :

- SEI Capability Maturity Models (including CMM Integration)
- OGC’s PRINCE2 Project Management Standard (for IT project management in the United Kingdom)
- IEEE’s SWEBoK: a Guide to the Software Engineering Body of Knowledge.

Having already determined the appropriate standard for project management, however, assists in making the choice for the appropriate IT standard. The reason for this is that the PMI provides some guidance in respect to other, parallel standards and the fact that the PMBOK® Guide is an ANSI standard, originally sponsored by the U. S. Department of Defence and therefore not containing bias in terms of vendor or technology. A standard with a similar background would therefore be preferred by the author and was in fact found in the CMMI (2002).

The Capability Maturity Model Integration (CMMI) (2002) is a framework for generating integrated products to support product and process improvement. This implies that when an organization decides to use a CMMI model, it acknowledges a business need to improve management processes and place the focus on both process and product. A CMMI model provides a structured way to do process improvement. It can help by setting process improvement goals and priorities, providing guidance for establishing quality processes and it provides a yardstick for assessing current practices.

The SEI (2002) states that:

"Capability Maturity Models (CMMs) contain the essential elements of effective processes for one or more bodies of knowledge. These elements are based on the concepts developed by Crosby, Deming, Juran, and Humphrey. The CMMI Product Suite contains and is produced from a framework that provides the ability to generate multiple models and associated training and appraisal materials. These models may reflect content from bodies of knowledge (e. g., systems engineering, software engineering, Integrated Product and Process Development)."

Of these three bodies of knowledge, software engineering and systems engineering are the two most appropriate for the current research. The only distinction between the models for each of these disciplines is the type of discipline amplifications included and for this reason, the CMMI product team suggests using both when selecting either of the two disciplines.

The alternative (which was not chosen) is PRINCE2 (PRojects IN a Controlled Environment), which was developed as a UK Government standard for IT project management. Since its launch, PRINCE has become widely used in both the public and private sectors and is now the UK's de facto standard for project management (Bentley, 2006.). PRINCE2 is a non-proprietary method of managing projects but is not widely used or supported in South Africa and while not contradicting the chosen PM standard, does not support it in a way that would benefit the current research.

2.3.3 Other sources

Sheakley (2002) noted that the CMMI and PMBOK® Guide are not equivalent but may be used within the same space. Not incidentally, both are ANSI standards; moreover, they are both based on work originally sponsored by the U. S. Department of Defence. The PMBOK® Guide focuses on a project and provides process definitions to organizations in all disciplines (from construction to events organization to software implementations.) It is a standard in the form of a guide whereas the CMMI is a standard in the form of a specification. The latter extends to multiple projects and products, providing preventative definitions to specific disciplines.

These two standards are the primary sources for the body of research used to construct the research product, but where appropriate, other authoritative resources were used (Kerzner, 2003) (Brooks, 1987) (Wideman 2002) (Meredith and Mantel, 2002.) These include published and unpublished literary works that refer to the primary sources or that do not conflict with the views held in the primary sources.

2.4 Product Features

As discussed within the "Research Objectives" chapter, the required end result is a product that should be usable at consulting and client level, meeting such requirements as are

determined as part of the research and within the problem statement. These were summarized as the product's ability to:

1. Simplify and facilitate project managers' access to a common set of project management processes and tools;
2. Promote the usage of best practices for project management for all projects, both simple and complex;
3. Increase the level of assured competence project managers bring to project management endeavours;
4. Establish a commonality of process and standardization of terminology within project management;
5. Provide a common foundation for the management of all projects above a certain size, across the enterprise;
6. Provide a common method of project progress tracking across the enterprise; and
7. Use the results of the above questions to create a flexible and continuously improving solution to the organization.

In line with the approach suggested by Greenwood and Levin (1998) the determination of the product features was jointly done by the author and the potential clients, by:

- Studying the compiled body of research; and
- Interviews with peers and clients.

The two specific focus areas are discussed in the following sections and the results of the peer and client interviews are contained within the Product Idea, Concept and Specification chapter.

2.4.1 Project Management Focus

Retief (2004) in "Architecture of Modern Project Management Software Tools" found that when asked to think of project management software, most people would think of a Gantt chart. However, Gantt charts, PERT charts and Critical Path Method (CPM) solutions are widely available in commercial project scheduling tools and the Framework aims do not include this type of functionality. Rather, in terms of the focus on "basic" PM the aim is to extract those "things" (whether processes, methods, tools, etc) from the body of research which was required on most (if not all) projects most (if not all) of the time.

A further result of aiming for the "basic" segment from the body of research is that the product (framework) will be mostly static in many regards, as the basics of the science are unlikely to change in any great way.

2.4.2 Information Technology Focus

In their combined work, Cai, Ghali, Giannelia, Hughes, Johnson and Khoo (2004) performed research to identify and document project management Best Practices specific to the Information Technology sector. The research team gathered information through an extensive global interview process that involved PM professionals from various countries and industries within the IT sector at various levels of management. The purpose of their research was to communicate PM practices in use today, the advantages and consequences of such practices, and the skills sets that should be explored in an effort to contribute to the progressive evolution of project management.

They present the results of this research within the following classification scheme:

- Organizational – This involves practices that have a positive impact at the Corporate level;
- Team – This contains practices that have a positive impact at Group or Tribe level; and
- Individual – This contains personal practices that a single individual can perform to make a positive impact to the Project.

In their research the best practices for Organizational Practices are split into:

- Knowledge Management;
- Continuous Improvement;
- Corporate Policies and Governance;
- Scalability of Practices;
- Cross Functional Teams; and
- Edification.

From a current research point of view, the practices contained within the Team and Individual portions of their research were not easily included in the envisaged Framework. The research approach in the case of applying IT best practices will therefore be done by focusing on organizational practices that dovetail with the known Framework requirements and product features.

2.4.2.1 Continuous Improvement

Mikheev and Pells (2005) noted that as the quantity of saved up PM knowledge, experience, people and organizations increase, "suddenly" a new quality occurs. They postulate that this law of transition (quantity leads to quality) is ultimately the basis for most models of PM maturity around the world.

Within the current research, the continuous improvement benefit of the CMMI is investigated in chapter 9, “Process Improvement and Capability.” This aspect was not initially chosen as

an important aspect of the product, but has become increasingly attractive to the clients and the author as time passed. The idea of a framework that matures with its organization is not unique and has piqued the interest of others in the international community.

The PMI (2002) announced that OPM3, or the "Organizational Project Management Maturity Model", is a standards development project of the PMI, active through a globally representative team of volunteers. The declared purpose of the OPM3 project has been to develop a global standard for organizational project management and the vision was to create a widely and enthusiastically endorsed maturity model that is recognized worldwide as the standard for developing and assessing project management capabilities within any organization. The author has noted that OPM3 was not published at the time of commencement of research and has some parallels with the current research.

A choice between the representation (staged and continuous) and body of knowledge must be made for the application of a CMMI model. To this end, process groups were established at the consulting house pilot site but not at the other two pilot sites. The reason for this is that the other two pilot sites are not currently interested in process improvement per se, but rather in the results that process improvement could bring to the Framework that they are using.

2.5 Product Context

The product produced as part of the current research has to comply with the potential market's requirements for accessing it in terms of portability (via Internet or local installation) and remote access. These aspects were determined as part of the product planning phase and led to unilateral agreement of a client-independent website held by the author, developed in such a way that the client specific tailoring could be done with a minimum of effort. The specific requirements are documented in the Product Idea, Concept And Specification chapter of this document; suffice to say that a website style presentation layer, accessible over local and wide area networks, but preferably also downloadable for portability, was mooted and chosen.

2.5.1 Project Management as part of Management

Within the greater field of study of Management, Armstrong (1996) places Project Management under Operations Management (OM), although this context may be different, depending upon the organizational structure. In his mind, operations management encompasses the production, distribution and project management activities carried out within an organization. The aims of OM are to create value for the organization and to help achieve sustainable competitive advantage by satisfying the demands and needs of customers for the company's products.

OM can also be described as part of an integrated process that is involved with all the other aspects of the business in question. The author notes that PM involves the customer and the supplier and therefore stretches across the enterprise supply chain, end-to-end.

2.6 Product Management

It is generally agreed that at a high level, Product Management consists of:

1. Product Planning (including concept generation and pre-technical evaluation);
2. Product Development (technical development and the major body of effort); and
3. Product Commercialisation (Marketing, Manufacturing and Business Analysis.)

Supported by:

1. Product Data Management (PDM)
2. Product Lifecycle Management (PLM)

For the purposes of the current research product commercialisation and the support management activities were largely ignored. This does not mean that these are unimportant activities but rather that they were addressed outside the scope of this document. Where such support activities influence the current research, it is noted in the relevant chapters.

The product category that this product development belongs to is New Category Entries, i.e. a product that takes a firm into a new category, though not a product that is new to the world (Crawford, 2004.) Knowing that other such products either existed or were being developed meant that differentiation had to be sought as part of the specification / planning cycle.

2.6.1 Product Planning

Product Planning, according to the fifth edition of Crawford's "New Products Management" is a term of many meanings. He concedes, however, that it is generally used to designate a staff position charged with part of all of the tasks of managing product innovation (Crawford, 2004).

Essentially, the product planning portion happened by default, as the author discovered a perceived need of what is desirable under the (then) current circumstances. The outline of a solution to satisfy this need was presented and immediately found favour with his employer and clients. The combined enthusiasm was the fuel for the research and development process. The features that were agreed to be desirable were then found to be desirable to others in the same market space and after some time spent using the product development funnel (expanded upon later in this document) a firm scope for the product was available for

the development cycle to be spent upon. This approach is not unique. Labrich (1988) noted that the microwave, NutraSweet (aspartame) and ScotchGard products were not planned as such, but that "their managers knew them when they saw them."

Crawford (2004) says that a Product Innovation Charter (PIC) is essentially the summary statement of strategy that will guide a project team in their efforts to generate new product volume. It specifies the arena within which the people will operate, their goals and objectives and the general approaches they will use. A formal PIC was not developed, but the agreement on these key issues meant that a rose by a different name had been created, that yet remained a rose.

The requirements of Crawford's (2004) definition was amply met during the brainstorming sessions (as suggested by Baumgartner (2005)) that came up with the project Charter and project scope, as the following agreements was reached in the combined case:

- Direction – where the project should go and where it should not go, what technologies it will capitalize on and what markets it will serve;
- Goals and Objectives – why it exists, what its role is and what its purpose is; and
- How to play the game – what the rules are, what the quality, time and cost constraints are, etc.

It should be noted that some advised steps were missed during product planning, which are mentioned under the "Conclusions and Recommendations" chapter. These include, but are not limited to:

- Failure to develop an augmented product concept; and
- Failure to use Crawford's Triple Stream Process of Product, Evaluation and Marketing.

2.6.2 Product Development

Lientz and Rea (1998) encourage a product orientation in project management, especially where there will be multiple versions of the project's product. The value of this is that the planning, developing and management of the project will be done more carefully than if it was a one-time effort. To this end the various versions of the product, the augmented product and their specifications were placed under configuration management from the start of the product innovation process.

In terms of development, Crawford (2004) makes it clear that there are at least four requirements in the technical (product) development activity. These are:

- Commitment to Four Principles:
    - Focus,

    - End User Drive (AM and Continuous Stakeholder Involvement),
    - Productivity and
    - The quadriad of Speed, Quality, Cost and Value;
- A clear and accepted product innovation Charter (as a result of project planning);
- Leadership; and
- Ownership ("bad products are developed by committees.")

The application of these four requirements is demonstrated as part of the "Product Idea, Concept and Specification" chapter. The agreed product development cycle is unique in at least one respect: the project to develop the product was its own pilot. What this meant was that the project progressed as fast as the development progressed and that, in turn, was dependant on the project's relative importance at the various sites.

2.7 Conclusion

Goldstein (2001) reported what the consulting group KPMG found in its 1995 study of projects deemed to have failed by the study respondents:

- 75% exceeded their schedule by 30% or more; and
- More than 50% exceeded their budgets by a substantial margin.

As early as 1978, Myers (1978) noted that practitioners try to solve the (software) problem by rushing through the design process so that enough time will be left at the end of the project to uncover errors that were made because of the rush through the design process. This approach will certainly not work in a civil engineering environment (imagine the costs of building and then rebuilding bridges, dams and the like due to insufficient design!) and to the author it is almost bizarre to admit that this is an approach that he has sometimes found himself following in real life. Thankfully there is the option to strategise, take aim and then fire!

The research approach outlined in the above sections of the chapter is applied in the later chapters up to the point where final conclusions and recommendations are developed. These final comments will allow the next round of development to strategise, take aim and then fire. At a high level then, the chosen research approach may be summarized as a modified product innovation approach:

- The Body of Research is required to develop a product specification (Chapter 3);
- The Product Specification is used to enter a Development Cycle (a modified iterative development cycle from that proposed in the Rational Unified Process) resulting in a baseline version of the product (Chapter 4, 5 and 6);
- An approach to implementing the product is proposed in Chapter 7;

- An approach to applying the CMMI to the baseline product is mapped and planned, to ensure that continuous improvement within the product is realized (Chapter 8); and
- Conclusions and recommendations are developed to provide strategy to the next round of work in this regard (Chapter 9.)

Figure 2.3 provides a pictorial view of the chosen approach described above. It shows the body of research as the basis for product specification, which in turn leads to product development and product evaluation that, in turn, culminates in a baseline product. Further horizontal work in the form of the application of CMMI concepts is intended to lead to a continuously improving version of the same product.

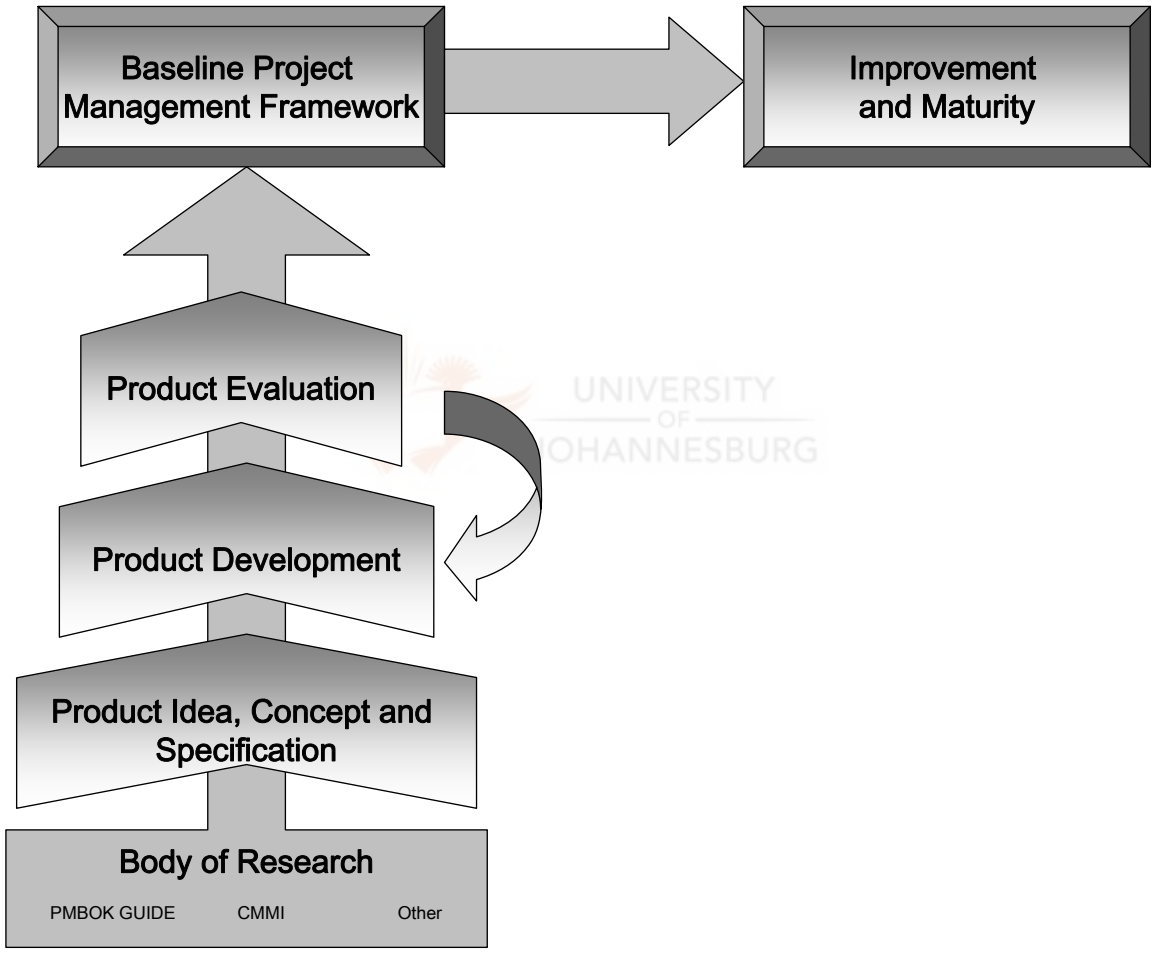


Figure 2.3. Research Approach Shown as a Modified Product Innovation Approach.

Van Niekerk and Sevenster (2002) noted the difference between the science and art of PM by defining the science as the mechanical portion of PM; the procedures and tools required to complete the project. It is at this part of PM that the research is aiming, ignoring the soft issues and "gut-feel" which comes with experience. This is not to discount the art side of PM, but reiterating the need to master the science prior to focusing on the art.

3 The Body of Research

With the stated aim of remaining within the domain of "basic" PM as defined by the two primary sources, a discussion of the compilation of the body of research commences in this chapter. Figure 3.1 presents a pictorial view of the road that the author had begun to travel:

- The Body of Research is required to develop a product specification (current focus.);
- The product specification is used to enter a development cycle (a modification of the iterative development cycle proposed in the Rational Unified Process) resulting in a baseline version of the product;
- An approach to applying the CMMI to the baseline product is mapped and planned, to ensure that continuous improvement within the product is realized; and
- Conclusions and recommendations are developed to provide strategy to the next round of work in this regard.

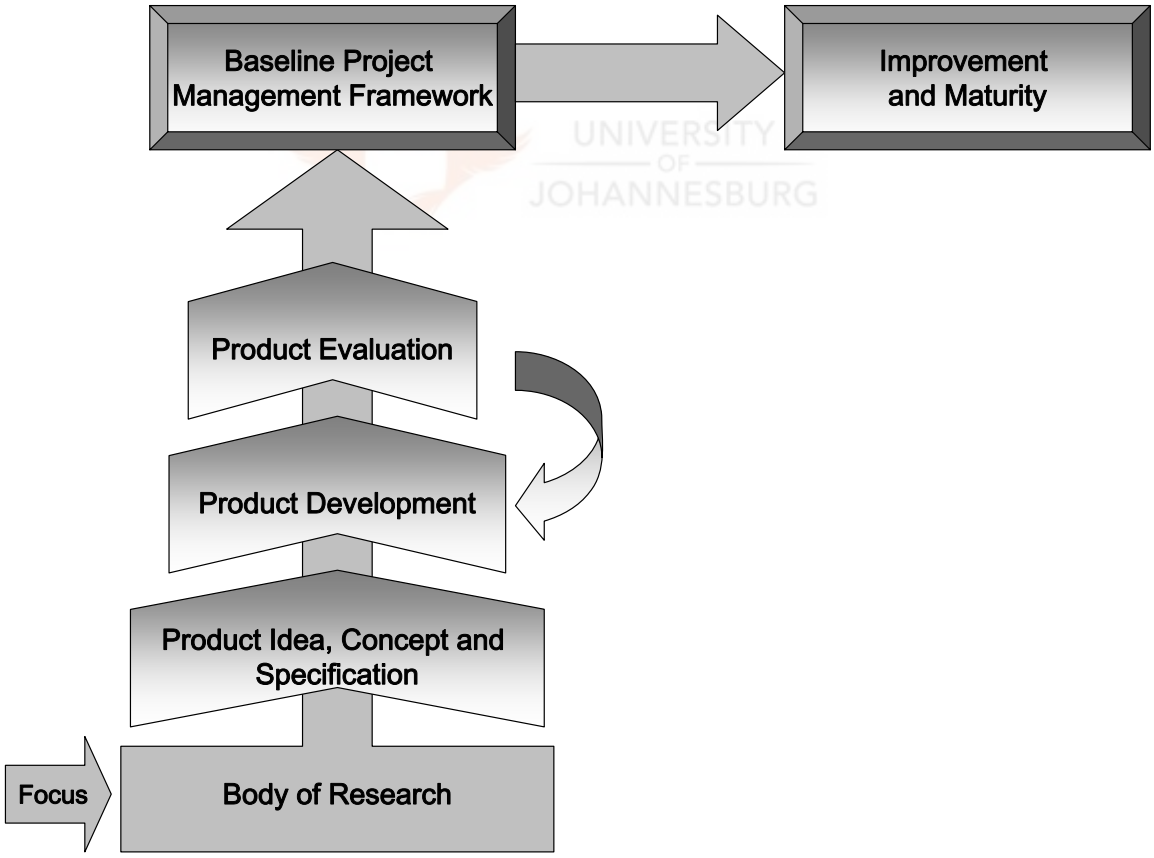


Figure 3.1. Chapter Focus in Product Innovation Approach.

The construction of a Body of Research is not a Literature Review in the traditional sense but serves the same purpose as defined by Webster and Watson (2002), namely a review of prior, relevant literature in order to create a firm foundation for advancing knowledge.

3.1 Introduction

According to the results of the previous chapter the body of research used to construct the research product is based on two ANSI Standards, namely:

- The PMI (2000 & 2004) publication, A Guide to the Project Management Body of Knowledge; and
- SEI's (2002) publication, The Capability Maturity Model® Integration (CMMI℠), Version 1. 1 for Systems Engineering and Software Engineering (CMMI-SE/SW, V1. 1 or just CMMI.)

These two standards are *the primary sources* for the body of research, used to construct the research product, but where appropriate, other authoritative resources are used, e.g. Aalders (2002), Booch (1998), Crawford (2004) Goodpasture (2001), Sheakley (2002). These include published and unpublished literary works that refer to the primary sources or that do not conflict with the views held in the primary sources. The complete body of research can be found in the Bibliography section of this document. Relatively more focus is placed on PM than on IT (or IS) as it is the primary focus of the research and a mature body of knowledge exists, whereas Webster and Watson (2002) have found that relatively few theoretical articles relating to IT (or IS) exists due to the youth of the field.

Two sources of special interest are the Rational Unified Process (RUP) (2002) and Kerzner's (2003) widely accepted thoughts on PM. Their application is discussed in greater detail than that of the other sources due to their general acceptance and the high regard they are held by the three pilot sites. Especially in the ninth edition of his seminal work, Dr Kerzner has moved the content closer to the third edition of the PMBOK® Guide.

3.2 Understanding the PMBOK® Guide

(The information in this chapter is sourced from the PMBOK® Guide itself and from the PMI website.)

The Project Management Body of Knowledge (PMBOK®) describes the sum of knowledge available within the profession of project management. Within this body of knowledge, there are Knowledge Areas that describe project management knowledge and practice in terms of their component processes. The PMBOK® is not a Maturity Model or a specification, but it is a key reference used by over 200,000 project management professionals worldwide.

The Project Management Institute's (PMI) premiere standards document, A Guide to the Project Management Body of Knowledge (PMBOK® Guide, 2000 and 2004), has been approved as an American National Standard (ANS) by the American National Standards Institute (ANSI.) It has also been widely adopted by foreign countries and consists of a discussion of the project management Framework as well as nine project management Knowledge Areas. Because one document could not contain the entire Body of Knowledge, the concept of a "Guide" is used, with the primary purpose of identifying and describing that subset of the PMBOK® that is generally accepted. This implies that the knowledge and practices described "are applicable to most projects most of the time, and that there is widespread consensus about their value and usefulness." Because it is a body of knowledge, the PMBOK® Guide (2000 and 2004) *requires tailoring to the business needs of the organization*.

Chapter 3 of the PMBOK® Guide (2000), Project Management Processes, describes a generalized view of how the various project management processes commonly interact. It introduces the concept of project management as a number of interlinked processes, where a process is "a series of actions bringing about a result." PM processes are organized into five groups of one or more processes each:

1. Initiating processes — authorizing the project or phase.
2. Planning processes — defining and refining objectives and selecting the best of the alternative courses of action to attain the objectives that the project has been undertaken to address.
3. Executing processes — coordinating people and other resources to carry out the plan.
4. Controlling processes — ensuring that monitoring and measuring progress regularly to identify variances from plan so that corrective action can be taken when necessary meet project objectives.
5. Closing processes — formalizing acceptance of the project or phase and bringing it to an orderly end.

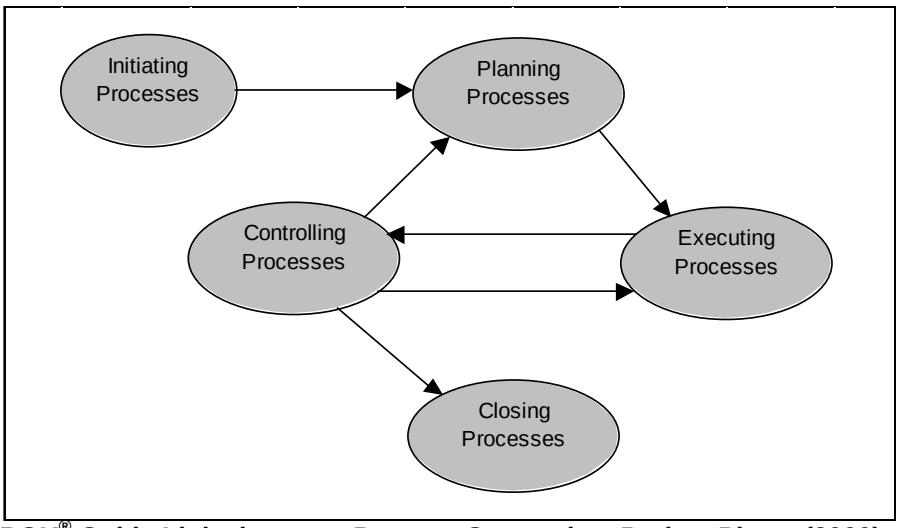


Figure 3.2. PMBOK® Guide Links between Process Groups in a Project Phase (2000)

The process groups are linked by the results they produce—the result or outcome of one often becomes an input to another. It could therefore be said that the PMBOK® Guide provides *a system of processes* linked together by inputs, techniques, and outputs. The process group interactions also cross phases such that closing one phase provides an input to initiating the next, as shown in Figure 3.3.

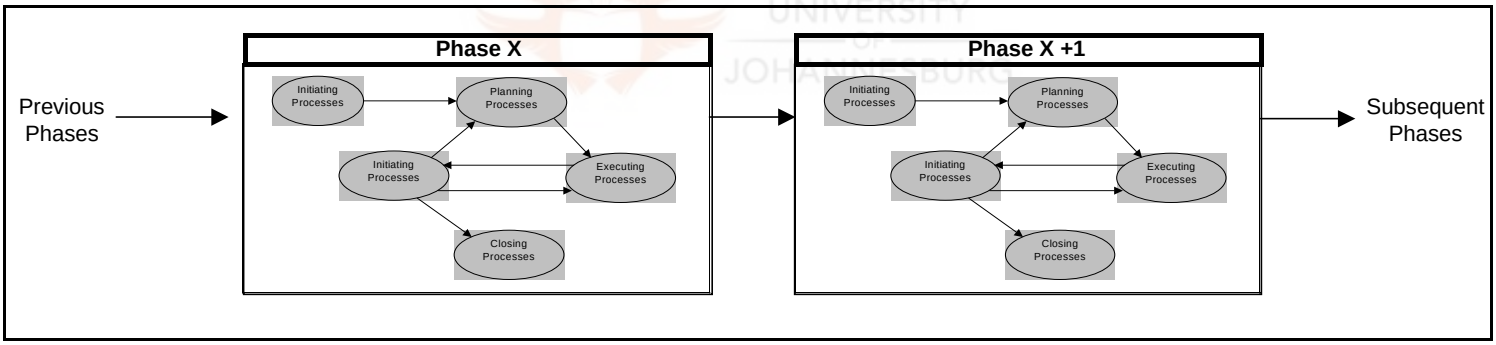


Figure 3.3. PMBOK® Process Group Interaction Between Phases (2000).

The nine Project Management **Knowledge Areas** (chapters 4 to 13 of the Guide), describe project management knowledge and practice in terms of their component processes. They are:

a) Project Integration Management — the processes required to ensure that the various elements of the project are properly coordinated.

b) Project Scope Management — the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.

c) Project Time Management — the processes required to ensure timely completion of the project

d) Project Cost Management — the processes required to ensure that the project is completed within the approved budget.

e) Project Quality Management — the processes required to ensure that the project will satisfy the needs for which it has been undertaken.

f) Project Human Resources Management — the processes required to make the most effective use of the people involved with the project

g) Project Communications Management — the processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information.

h) Project Risk Management — the processes concerned with identifying, analyzing, and responding to project risk.

i) Project Procurement Management — the processes required to acquire goods and services from outside the performing organization.

3.3 Understanding the CMMI

(The information in this chapter is sourced from the CMMI (2002) itself and from the SEI (2006) website).

Capability Maturity Models (CMMs) have been developed for a many disciplines since 1991. The formation of the Capability Maturity Model® Integration (CMMI) project was initiated to sort out the problem of using multiple CMM's. CMMI models contain Process Areas that have Capability Levels and belong to Maturity Levels. Process Areas map to Generic and Specific Goals, which in turn map to Specific Practices and Generic Practices. Note that CMMI models are not processes or process descriptions. Rather, an organization can use a CMMI model to help set process-improvement objectives and priorities, improve processes, and provide guidance for ensuring stable, capable, and mature processes.

The CMMI is a framework for generating integrated products to support product *and* process improvement. This implies that when an organization decides to use a CMMI model, it acknowledges a business need to improve management processes and place the focus on both process and product. A CMMI model provides a structured way to do process improvement. It can help by setting process improvement goals and priorities, providing guidance for establishing quality processes and it provides a yardstick for assessing current practices.

A CMMI model contains the essential elements of effective processes for one or more disciplines: Systems Engineering, Software Engineering, Integrated Product and Process Development, and Supplier Sourcing. A CMMI model is structured using one of two representation schemes: Staged and Continuous where each approach is complementary to

the other. The representation schemes are not mutually exclusive, but the choice affects the schedule and needs of the organization for training and appraisal. The material in both is the same but organized differently, analogous to a view into a database: The data viewed is the same for both of the representations, but the organization and the presentation of the data differ. An organization may choose an approach to process improvement from either of the following:

- The Continuous Representation supports the continuous improvement of individual process areas that are critical to the organization's business needs,
- The Staged Representation supports Organizational Maturity. Here Processes are grouped and ordered based on important, pre-defined organizational maturity relationships that address the business needs of many organizations.

For the purposes of this research, a continuous representation is assumed, although the difference in applying it to a staged representation model would be negligible. The continuous representation uses six capability levels, capability profiles, target staging, and equivalent staging as organizing principles for the model components. The continuous representation groups process areas by affinity categories and designates capability levels for process improvement within each process area.

In the continuous representation, capability levels provide a recommended order for approaching process improvement within each process area. At the same time, the continuous representation allows some flexibility for the order in which the process areas are addressed.

3.3.1 Model Components

A **Capability level** consists of related specific and generic practices for a process area that can improve the organization's processes associated with that process area. As one satisfies the generic and specific goals for a process area at a particular capability level, and that capability level is achieved, one reaps the benefits of process improvement. Capability levels focus on growing the organization's ability to perform, control, and improve its performance in a process area. Capability levels enable the organization to track, evaluate, and demonstrate its progress as it improves processes associated with a process area. Capability levels build on each other, providing a recommended order for approaching process improvement.

Compared to the continuous representation, in the staged representation a **Maturity Level** is a defined evolutionary plateau of process improvement and there are five in the CMMI. The maturity level of an organization provides a way to predict the future performance of an organization within a given discipline or set of disciplines. Each level is a layer in the foundation for continuous process improvement using a proven sequence of improvements, beginning with basic management practices and progressing through a predefined and

proven path of successive levels. Level 2 focuses on project management and level 3 on process standardization.

A **Process Area** (PA) is a cluster of related practices in an area that, when performed collectively, satisfy a set of goals considered important for making significant improvement in that area. **Practices** are actions to be performed to achieve the goals of a process area. All CMMI process areas are common to both continuous and staged representations.
A **Specific Goal** (SG) applies to a process area and addresses the unique characteristics that describe what must be implemented to satisfy the process area. A **Specific Practice** (SP) is an activity that is considered important in achieving the associated specific goal. **Generic Goals** (GG) are called "generic" because the same goal statement appears in multiple process areas. Each process area has only one generic goal. **Generic Practices** (GP) are activities that ensure that the processes associated with the process area will be effective, repeatable and lasting. Generic practices contribute to the achievement of the generic goal when applied to a particular process area.

Specific goals and generic goals are required model components. Practices are the major building blocks in establishing the process maturity of an organization and are expected model components. Everything else is informative. Refer to Figure 3.4 for a pictorial view of the CMMI model components.

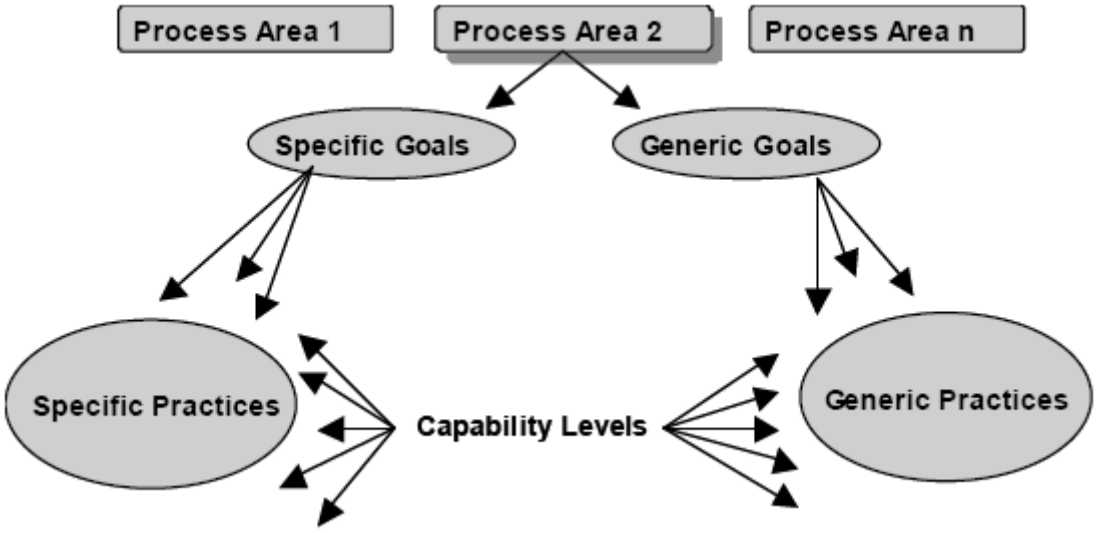


Figure 3.4. A View of CMMI Model Components, CMMI (2002).

3.3.2 Project Management in the CMMI

To describe the interactions among the CMMI (2002) Project Management process areas, it is most useful to address them in two process area groups:

- The basic Project Management process areas are Project Planning, Project Monitoring and Control, and Supplier Agreement Management.
- The advanced Project Management process areas are Integrated Project Management for IPPD, Risk Management, Integrated Teaming, and Quantitative Project Management (these are not discussed as part of the current research.)

3.3.3 Basic Project Management Process Areas

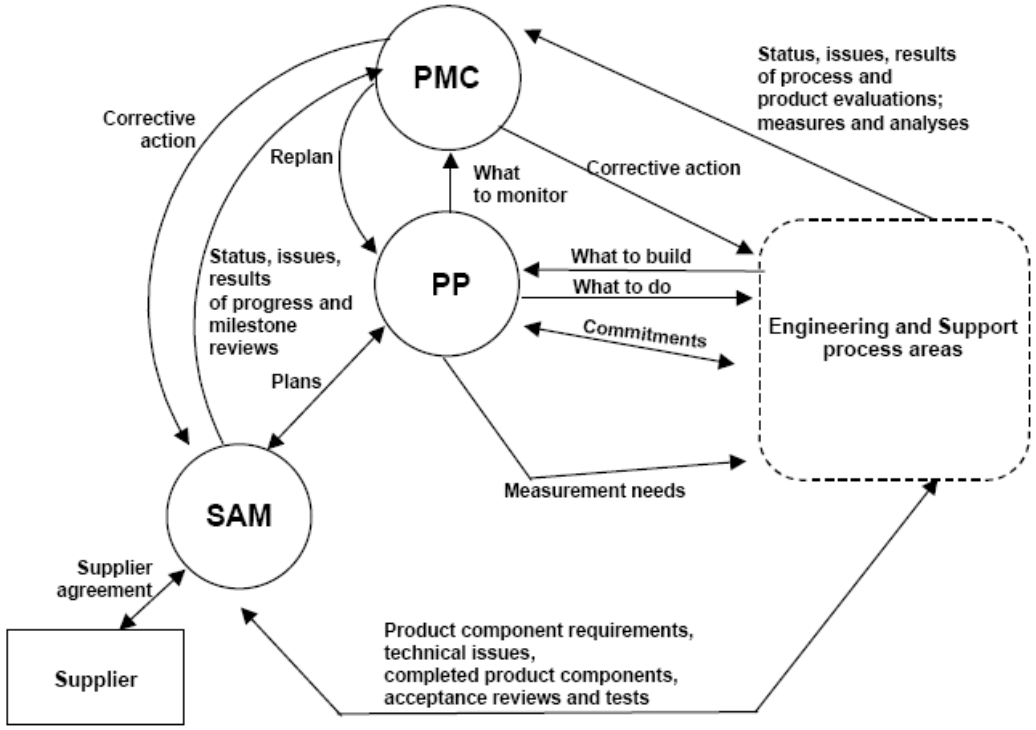


Figure 3.5. CMMI Basic Project Management Process Areas, CMMI (2002).

As illustrated in figure 3.5, the CMMI (2002) Project Planning process area includes developing the project plan, involving stakeholders appropriately, obtaining commitment to the plan, and maintaining the plan.

Project Planning begins with requirements that define the product and project ("What to Build" in the figure). The project plan covers the various project management and engineering activities that will be performed by the project.

The **Project Monitoring and Control** process area includes monitoring activities and taking corrective action. The project plan specifies the appropriate level of project monitoring, the frequency of progress reviews, and the measures used to monitor progress. Progress is primarily determined by comparing progress to the plan. When actual status deviates

significantly from the expected values, corrective actions are taken as appropriate. These actions may include re-planning.

The **Supplier Agreement Management** process area addresses the need of the project to effectively acquire those portions of work that are produced by suppliers. Once a product component is identified and the supplier who will produce it is selected, a supplier agreement is established and maintained that will be used to manage the supplier. The supplier's progress and performance are monitored. Acceptance reviews and tests are conducted on the supplier-produced product

Note: Although risk identification and monitoring are covered in the basic process areas of Project Planning and Project Monitoring and Control, the advanced process area of Risk Management takes a more continuing, forward-looking approach to managing risks with activities that include identification of risk parameters, risk assessments, and risk handling.

3.4 Application and Comparison of PMBOK® Guide and the CMMI

The PMBOK® Guide (2004) focuses on *a project* and provides *process definitions* to organizations in *all disciplines* (from construction to events organization to software implementations.) It is a standard in the form of a guide whereas the CMMI (2002) is a standard in the form of a specification. The latter extends to *multiple projects and products*, providing *preventative definitions* to *specific disciplines*.

A duality in terms of application of the two standards, one within the context on the other, exists. The most obvious application of the PMBOK® Guide to CMMI is to see that all process improvement activities are undertaken as projects within a specific life cycle. Figure 3.5 illustrates this point by showing the PMBOK® Guide process groups within two distinct sub-projects of the process improvement initiative relating to Supplier Agreement Management.

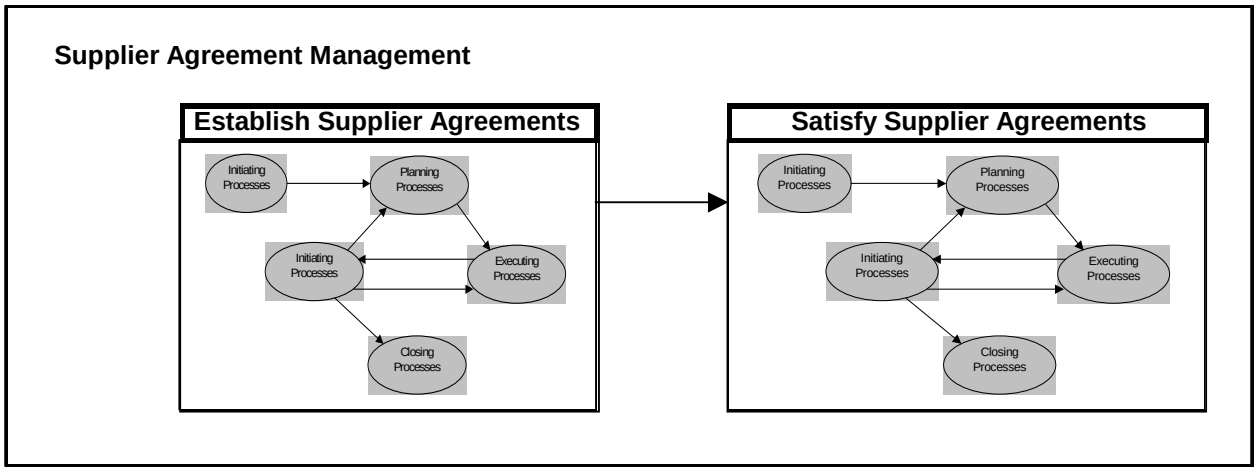


Figure 3.6. PMBOK® Guide Processes Used Within SAM Process Area.

The initial work done to determine whether to use the CMMI or some other process improvement standard would have been a project. On the other hand, the CMMI addresses a larger picture: projects and products. I.e. the PMBOK® Guide could have been used prior to CMMI process improvement but it forms a part of the latter's scope.

Because the CMMI extends to a wider target than project management, the view that the author has taken is to apply the PMBOK® Guide within the context of CMMI levels 2 and 3 (see chapter 6.5). Here the Project Management process areas at level two are shown with their direct mappings to PMBOK® Guide processes followed by an application example. In the case where the PMBOK® Guide will be applied to the Process Management process areas of a level, it will then be seen that tailoring the PMBOK® Guide forms part of the CMMI level three activities.

The CMMI defines an alternative practice as "A practice that is a substitute for one or more generic or specific practices contained in CMMI models, that achieves an equivalent effect toward satisfying the generic or specific goal associated with model practices. Alternative practices are not necessarily one-for-one replacements for the generic or specific practices. " When reading later chapters this should be born in mind. Specifically, the PMBOK® Guide process should not be seen as one-for-one replacements for the specific practices that it is mapped to. The specific application of the PMBOK® Guide in support of the CMMI practices at various levels is demonstrated in later chapters.

3.5 The Rational Unified Process (RUP)

Unless otherwise stated, all the information in this chapter is sourced from the Rational Unified Process (Version 2001A. 04. 00) and the second edition of Kruchten's (2000) "The Rational Unified Process, An Introduction." The Rational Unified Process (RUP) is a registered trademark of the Rational Software Corporation in the USA.

3.5.1 Introduction

The RUP is a *software engineering process,* marketed as a web-enabled software engineering process that enhances team productivity and delivers software best practices to all team members. The RUP claims to provide a disciplined approach to assigning tasks and responsibilities within a software development organization. Its goal is to "ensure the production of high-quality software that meets the needs of its end users within a predictable schedule and budget."

The RUP is a *process product*. It is developed and maintained by Rational Software and integrated with its suite of software development tools. The RUP is also a *process framework*

that can be adapted and extended to suit the needs of an adopting organization. The RUP can therefore be seen as a software development process covering the entire software development lifecycle, supported by a palette of tools developed by Rational Software.

Due to the focus of the current research, only that portion of the RUP that applies to "most (if not all) IT projects in South Africa most (if not all) of the time" will be considered. To this end, the Best Practices and Process Essentials will be considered before considering how to implement the Process.

3.5.2 The Ten Essentials of RUP

Probasco (2000) lists what he believes to be the minimal set of items a project should have in place if they are truly following the "essence" of the RUP:

1. Vision
2. Plan
3. Risks
4. Issues
5. Business Case
6. Architecture
7. Product
8. Evaluation
9. Change Requests
10. User Support

Probasco (2000) notes that these ten essentials allow focus on the most important aspects and that these same aspects can be accomplished with no specialized tool support and are therefore ideal for inclusion in the current research.

3.5.3 The RUP Project Management Discipline

In the RUP, a discipline shows all activities you may go through to produce a particular set of artefacts. Each discipline is described in terms of concepts, workflow, activities, artefact and guidelines.

Software Project Management is defined as "the art of balancing competing objectives, managing risk, and overcoming constraints to successfully deliver a product which meets the needs of both customers (the payers of bills) and the users. The fact that so few projects are unarguably successful is comment enough on the difficulty of the task." The author notes that in the RUP, PM is defined as an art rather than a science, as opposed to the PMBOK® Guide (2004) that focuses on the science of the subject.

Rational Software Corporation (2002) admits that the RUP does not attempt to cover all aspects of project management. For example, it does not cover issues such as

- Managing people: hiring, training, coaching;
- Managing budget: defining, allocating, etc; and
- Managing contracts, with suppliers and customers.

Instead, this discipline focuses mainly on the important aspects of an iterative development process:

- Risk management;
- Planning an iterative project, through the lifecycle and for a particular iteration; and
- Monitoring progress of an iterative project, metrics.

As all IT projects do not necessarily require development, the portion that applies to most (if not all) IT projects in South Africa most (if not all) of the time are risk management and metrics. However, because a great many IT projects do require (and even focus on) software development, some focus on software development best practices (including iterative development and its importance) is allowed in the framework. The RUP Project Management Workflow is presented in Figure 3.7.

Two aspects of the RUP that affect the project management heavily and apply to most projects most of the time are Risk Management and the use of Metrics, where risk is seen as a driver for planning and measurement is seen as a key technique used project control.

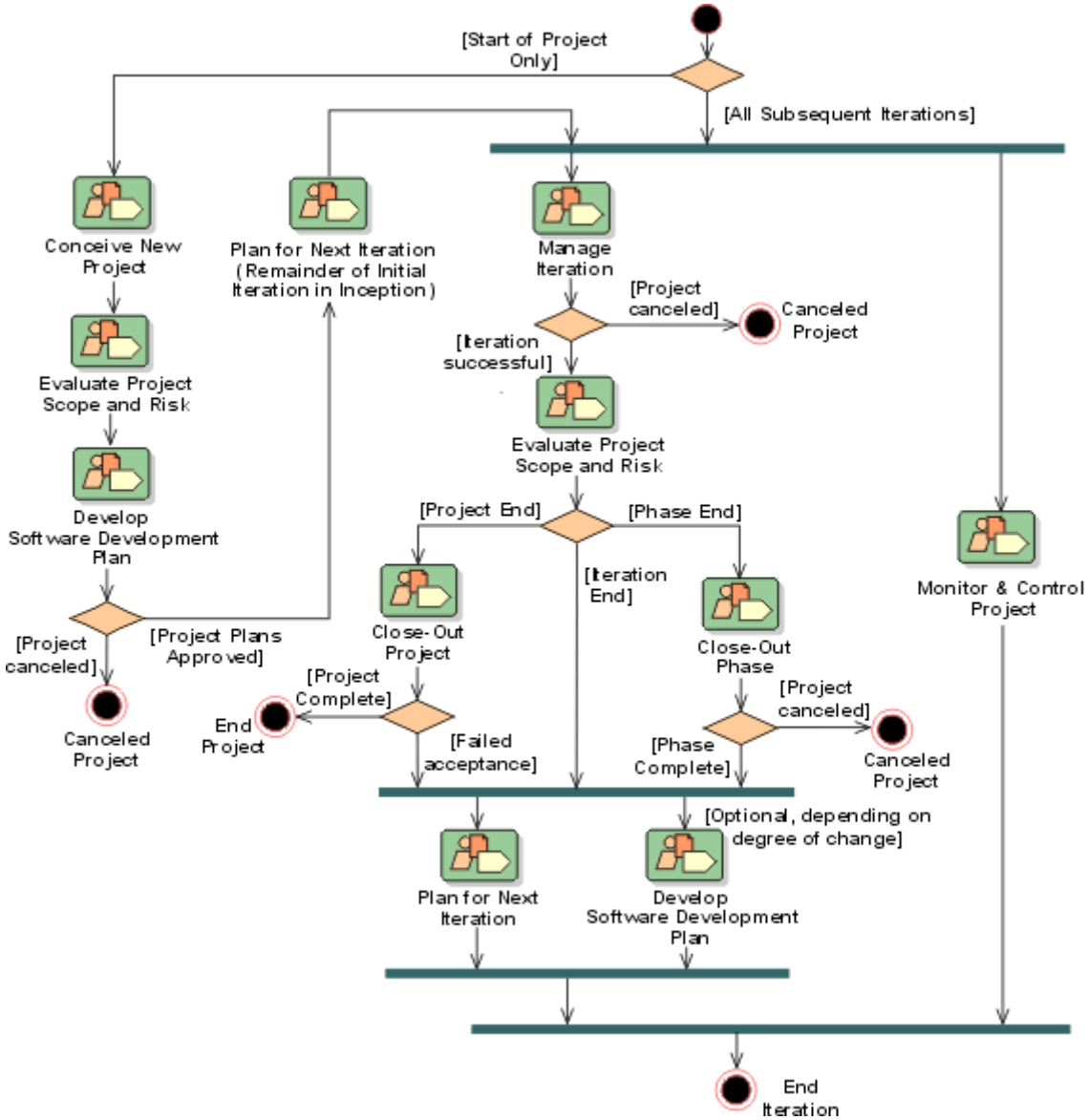


Figure 3.7. RUP Project Management Workflow, RUP (2002)

3.5.3.1 Risk Management in RUP

The software development process primarily takes care of the *known* aspects of software development. One can precisely describe, schedule, assign or review only that which one knows must be done. Risk management attempts to take care of the *unknown* aspects in the project. Kruchten (2000) notes that many companies work in a risk-denial mode: estimating and planning activities proceed as if all variables were known and as if the work were mechanical and the personnel interchangeable. He argues that in order to make effective decisions, one needs a good grasp of the risks the project faces and clear strategies for mitigating or dealing with them. Risk in software development is a variable that, within its normal distribution, can take a value that endangers or eliminates success for a project.

In RUP (2002) planning terms, a risk is that which stands in the way of success and is currently unknown or uncertain. A direct risk is a risk over which the project has a large degree of control and an indirect risk a risk over which the project has little or no control. It has two attributes, namely:

- The probability of occurrence.
- The impact on the project (severity.)

Boehm (1991) says there are three main routes for coping with risk:

- Risk avoidance: reorganize the project so that it cannot be affected by the risk.
- Risk transfer: reorganize the project so that someone or something else bears the risk (customer, vendor, bank or another element.)
- Risk acceptance: decide to live with the risk as a contingency, Monitor the risk symptoms and determine what to do if the risk materializes.

When accepting a risk, you should do two things:

- Mitigate the risk: take immediate, proactive steps to reduce the probability or the impact of the risk.
- Define a contingency plan: determine the course of action to take if the risk becomes an actual problem; in other words create a plan B.

3.5.3.2 Measuring and metrics

The reasons for measuring are:

- Primarily to gain control of a project, in other words to manage it (evaluation of how close or far the progress has deviated from the plan's objectives in terms of completion, quality, and compliance with requirements);
- To better plan a new project's effort, cost and quality based on experience; and
- To evaluate the effects of changes and assess improvement over time on key aspects of the process's performance

Measuring key aspects of a project adds a non-negligible cost, so, measurement is not done something simply because it is possible. Precise goals should be set for a measurement effort and only metrics that allow satisfaction of these goals should be collected.

Now, Pulford, Kuntzmann-Combelles and Shirlaw (1995) say that there are two types of goals:

- Knowledge Goals: expressed by the use of verbs such as *evaluate, predict,* and *monitor.* They express a desire to understand your process better, e. g. you may want to assess product quality, obtain data to predict testing effort, or monitor test coverage or requirements changes.

- Change or achievement goals: expressed by the use of verbs such as *increase, reduce, improve,* and *achieve.* These express an interest in seeing how things change or improve over time, for example from on project to another.

The following are examples of goals that might be set in a software development effort:

- Monitor progress relative to the plan.
- Improve customer satisfaction.
- Improve productivity.
- Improve predictability.
- Increase reuse.

Such generic management goals do not translate readily into metrics; one should translate them into sub-goals (or action goals,) identifying the actions that project members should take to achieve the goal. One should also ensure that the people involved understand the benefits. For example, the goal "improve customer satisfaction" could break down into the following action goals:

- Define customer satisfaction.
- Measure customer satisfaction over several releases.
- Verify that satisfaction improves.

The goal "improve productivity" would include these sub-goals:

- Measure effort
- Measure progress
- Calculate productivity over several iterations or projects.
- Compare the results.

3.5.3.3 What is a metric?

In the RUP (2002) there are two types of metrics:

- A *metric* is a measurable attribute of an entity. E. g., project effort is a measure (that is, a metric) of project size. To calculate this metric you would need to sum all the timesheet bookings for the project.
- A *primitive metric* is an item of raw data that is used to calculate a metric. In the preceding example, the timesheet bookings are the primitive metrics.

Each metric comprises one or more collected metrics. Consequently, each primitive metric must be clearly identified and its collection procedure must be defined. Metrics to support change or achievement goals are often *first-derivative* over time (or iterations or project.) There is a greater interest in a trend than in the absolute value. If the goal is to "Improve quality," it must be checked that the residual level of known defects diminishes over time.

3.5.4 Software Development Best Practices

This section describes the history of arriving at the software development best practices as used in the RUP. The following sections expand upon iterative development, risk and metrics as handled in the RUP.

3.5.4.1 The value of Software

Grady Booch (1998) says that "Software is the fuel on which modern businesses are run, governments rule, and societies become better connected. Software has helped us create, access and visualize information in previously inconceivable ways and forms. Globally, the breathtaking pace of progress in software has helped drive the growth of the world's economy. On a more human scale, software-intensive products have helped cure the sick and have given voice to the speechless, mobility to the impaired, and opportunity to the less able. From all perspectives, software is an indispensable part of our modern world."

The limits of the software industry's ability to develop systems of increasing size, complexity and distribution is still being pushed by what society demands and technology makes possible. Furthermore, attempting to advance legacy systems to newer technologies brings its own set of technical and organizational problems. This problem is compounded by businesses that continue to demand increased productivity and improved quality with faster development and deployment. To top it off, the supply of qualified development personnel is not keeping pace with the demand. This results in increasing difficulty in building and maintaining software; moreover, building quality software in a repeatable and predictable fashion is harder still.

3.5.4.2 Symptoms and root causes of software development problems

Jones (1996) determined that:

"Different software development projects fail in different ways – and unfortunately too, many of them fail – but it is possible to identify a number of common symptoms that characterize these kinds of projects:

- Inaccurate understanding of end-user needs;
- Inability to deal with changing requirements;
- Modules that do not fit together;
- Software that is hard to maintain or extend;
- Late discovery of serious project flaws;
- Poor software quality;
- Unacceptable software performance;
- Team members in each other's way, making it impossible to reconstruct who changed what, when, where and why; and
- An untrustworthy build and release process."

Treating these symptoms, however, does not treat the disease. Although different projects fail in different ways, their research has shown that most fail because of a mixture of the following root causes:

- Ad-hoc requirements management;
- Ambiguous and imprecise communication;
- Brittle architectures;
- Overwhelming complexity;
- Undetected inconsistencies in requirements, design, and implementations;
- Insufficient testing;
- Subjective assessment of project status;
- Failure to attack risk;
- Uncontrolled change propagation; and
- Insufficient automation.

3.5.4.3 Software Best Practices

The theory behind software best practices states that treating these root causes will eliminate the symptoms, but also place one in a much better position to develop and maintain quality software in a repeatable and predictable fashion (Jones, 1996) (RUP, 2002). They are commercially proven approaches to software development that, when used in combination, strike at the root causes of software development problems. They are 'best practices' not so much because you can precisely quantify their value but rather because they are commonly used in industry by successful organizations. These best practices are as follows:

1. Develop software iteratively.
2. Manage Requirements.
3. Use component-based architectures.
4. Visually model software.
5. Continuously verify software quality.
6. Control changes to software.

Of these six, the author has included the one that in his mind and experience is the most important and most likely to benefit most IT projects, namely iterative software development.

3.5.5 Develop Iteratively

For small projects that have few risks and use a well-known technology and domain the sequential, or waterfall, process is fine, but it cannot be stretched to fit projects that are long or involve a high degree of novelty or risk (RUP, 2002). Laplante and Neill (2004) confirmed the popularity of the Waterfall model in that one third of respondents in their survey used the Waterfall model over other, more progressive models.

Opposed to a Waterfall model, an iterative process breaks a development cycle into a succession of iterations. Each iteration looks like a mini waterfall and involves the activities of requirements, design, implementation and assessment. To control the project and to give the appropriate focus to each iteration, a development cycle in the RUP is divided into a sequence of four phases that partition the sequence of iterations. The phases are inception, elaboration, construction and transition.

The iterative approach accommodates changes in requirements and an implementation strategy. It confronts and mitigates risks as early as possible. It allows the development organization to grow, to learn, and to improve. It focuses on real, tangible objectives.

The RUP notes that project managers often resist the iterative approach. In the RUP this is mitigated by an interactive approach, which is claimed to be very controlled in the following ways:

- Iterations are planned in number, duration, and objective.
- The tasks and responsibilities of the participants are defined.
- Objective measures of progress are captured.
- Some rework does take place from one iteration to the next, but this, too, is carefully controlled.

Figure 3.8. Iterative Development Cycle, RUP (2002).

In an iterative process, the development should be based on a phase plan and a series of iteration plans. When the PM builds a phase plan, trade-offs between staff, schedule and project scope should be assessed. The criteria to define the scope of an iteration may vary from phase to phase.

3.5.6 Conclusion

The manner chosen to implement the sections of the RUP that are most applicable to the current research have been identified and will be measured as follows:

- The level of success with which the PM Framework satisfies the 10 essentials of RUP is assessed in a later chapter.
- The RUP project management workflow is not represented in the Framework, except when the sample methodology (for iterative development) is chosen as outlined below.
- The RUP approach to Risk and Metrics are included in the Framework, as an overlay to that extracted from the PMBOK® Guide and CMMI.

3.6 A systems approach to Planning, Scheduling and Controlling

This section contains an extract of the approach to project management that Kerzner (2003) advocates in the 8th and 9th editions of his book: "Project Management: A systems approach to Planning, Scheduling and controlling."

He views of the current benefits of Project Management as follows:

- PM allows the accomplishment of more work in less time, with fewer people;
- Profitability will increase;
- PM will provide better control of scope changes;
- PM makes the organization more efficient and effective through better organizational behaviour principles;
- PM will allow closer work with customers;
- PM provides a means for solving problems;
- All project will benefit from PM;
- PM increases quality;
- PM will reduce power struggles;
- PM allows people to make good company decisions;
- PM delivers solutions; and
- PM will increase business.

3.6.1 Maturity and Excellence

Kerzner (2003) notes that historically, PM resided only in the project-driven sectors of the marketplace. In these sectors, the project managers were given the responsibility for profit and loss, forcing these companies to treat project management as a profession. In the non-project-driven market sector, corporate survival is seen to be based on products and services, rather than upon projects. Profitability is identified through marketing and sales, with very few

projects having an identifiable profit or loss. PM, in these firms was therefore never viewed as a profession. According to his research, most firms that believed that they were non-project-driven were actually hybrids. Hybrid organizations are typically non-project-driven firms with one or two divisions that are project driven.

Independent of the organizational structure, Kerzner (2003) defines maturity in project management as "the implementation of a standard methodology and accompanying processes such that there exists a high likelihood of repeated successes."

He says that organizations seeking excellence in project management are those that create an environment in which there exists a *continuous* stream of successfully managed projects and where success is measured by what is in the best interest of *both* the company and the project. This implies that excellence goes well beyond maturity. Maturity is required to achieve excellence and it may take two years or more to reach some initial levels of maturity. Excellence, if achievable at all, may take an additional five years or more.

Kerzner's (2003) 16 points to PM Maturity:

- Adopt a PM methodology and use it consistently.
- Implement a philosophy that drives the company toward PM maturity and communicate it to everyone.
- Commit to developing effective plans at the beginning of each project.
- Minimize scope changes by committing to realistic objectives.
- Recognize that cost and schedule management are inseparable.
- Select the right person as project manager.
- Provide executives with project sponsor information, not PM information.
- Strengthen involvement and support of line management.
- Focus on deliverables rather than resources.
- Cultivate effective communication, cooperation and trust to achieve rapid PM maturity.
- Share recognition for project success with the entire project team and line management.
- Eliminate non-productive meetings.
- Focus on identifying and solving problems early, quickly and cost effectively.
- Measure progress periodically.
- Use PM as a tool – not as a substitute for effective planning or interpersonal skills.
- Institute an all-employee training program with periodic updates based upon documented lessons learnt.

3.6.2 Performance measures for project managers

The first question that Kerzner (2003) answers is: “Who performs appraisal?” His answer is that it should always be the functional superior of the PM (versus the programme manager, portfolio manager, etc.) The source of performance data should be the functional superior, resource managers, general managers, portfolio managers, etc.

Primary Measures

1. Project Manager’s success in leading the project toward pre-established global objectives
    a. Target costs
    b. Key milestones
    c. Profit, net income, return on investment, contributions margin
    d. Quality
    e. Technical accomplishments
    f. Market measures, new business, follow-on contract.
2. Project Manager’s effectiveness in overall project direction and leadership during all phases, including establishing:
    a. Objective and customer requirements
    b. Budgets and schedules
    c. Policies
    d. Performance measures and controls
    e. Reporting and review system.

Secondary Measures

1. Ability to utilize organizational resources
    a. Overhead cost reduction
    b. Working with existing personnel
    c. Cost-effective make-buy decisions
2. Ability to build effective project teams
    a. Project staffing
    b. Inter-functional communications
    c. Low team conflict complaints and hassles
    d. Professionally satisfied team members
    e. Work with support groups
3. Effective project planning and plan implementation
    a. Plan detail and measurability
    b. Commitment by key personnel and management
    c. Contingency provisions
    d. Reports and reviews
4. Customer / client satisfaction

a. Perception of overall project performance by sponsor
b. Communication / liaison
c. Responsiveness to changes

5. Participation in business management
   a. Keeping management informed of new project / product / business opportunities
   b. Bid proposal work
   c. Business planning, policy development

Additional Considerations

1. Difficulty of tasks involved
   a. Technical tasks
   b. Administrative and organizational complexity
   c. Multi disciplinary nature
   d. Staffing and start-up
2. Scope of the project
   a. Total project budget
   b. Number of personnel involved
   c. Number of organizations and subcontractors involved
3. Changing work environment
   a. Nature and degree of customer changes and re-directions
   b. Contingencies

3.6.3 Informal Project Management

An interesting observation by Kerzner (2003) is that companies today are managing projects more informally than before. Informal project management does have some degree of formality but emphasizes managing the project with a minimum amount of paperwork. Furthermore, informal project management is *based upon guidelines rather than policies and procedures* that are the basis for formal project management (a characteristic of a good project management methodology.) Informal project management mandates:

- Effective communications
- Effective cooperation
- Effective teamwork
- Trust

These four elements are absolutely essential for effective informal project management. He notes that not all companies have the luxury of using informal project management as customers often have a strong voice in whether formal or informal project management will be used.

3.6.4 Conclusion

For the purposes of the current research the aim is to assist enterprises to achieve the basic level of PM maturity as quickly as possible. For this reason,

- The aim of achieving excellence as defined by Kerzner (2003) falls outside the scope of the current product and research.
- The level of success with which the PM Framework satisfies Kerzner's (2003) 16 points to PM maturity is assessed in a later chapter.
- Kerzner's (2003) performance measures for project managers are used as the primary source for this activity in the PM Framework.
- The move towards informal PM is noted and applied as a strategy in the Framework development.

3.7 Other sources

3.7.1 Fred Brooks

Brooks (2000) discusses the mistakes made and lessons learned during the development of IBM's OS/360 operating system. One of these has been the attempt to add more workers to a project falling behind schedule, in the hope of speeding up development. His observation, known as Brooks' Law, states that: "Adding manpower to a late software project makes it later." This law has been shown by others, including Graham and Englund (1997) to apply to all projects with creative parts.

About.com (2006) relates that John Drummond explains the law as follows: "Brooks' Law states that programming work performed increases with direct proportion to the number of programmers (N), but the complexity of a project increases by the square of the number of programmers (N^2). Therefore, it should follow that thousands of programmers working on a single project should become mired in a nightmare of human communication and version control."

Some consequences of Brooks' Law are also noted by About.com (2006) to be:

- "Hire few talented programmers with higher pay instead of many average programmers (but do not starve the project)
- Segment the problem into smaller sub-problems, each of which can then be solved by a smaller team (but done wrong it can make communication matters worse)."

Brooks (1987) argues that there will be no more silver bullets, i.e., there will be no more technologies (or practices) that will create a 10-fold improvement in software engineering productivity within 10 years. The central argument has been interpreted to mean that *there will be no more easy answers to software engineering problems.*

Brooks advocates a number ways of doing certain things within the software engineering domain. One of these is the use of a Pilot System: “When designing a new kind of system, a team will design a throw-away system (whether it likes it or not). This system acts as a pilot plant that will reveal techniques, which will subsequently cause a complete redesign of the system. This second smarter system should be the one delivered to the customer, since delivery of the pilot system would cause nothing but agony to the customer and possibly ruin the system's reputation and maybe even the company's.” The author has used this specific approach for the first versions of the product developed as part of the current research.

He also advocates various other techniques and methods, such as

- Conceptual Integrity – In order to make a user-friendly system, the system should have conceptual integrity, which can only be achieved by separating architecture from implementation. A single chief architect (or a small number of architects), acting on the user's behalf, decides what goes in the system and what stays out. A super cool idea by someone, may NOT be included if it does not fit with the overall system design seamlessly. In fact, to ensure a user-friendly system, a system may deliberately provide fewer features than it is capable of. The point is that if a system is too complicated to use, then many of its features will go unused because no one has the time to learn how to use them
- Formal Documents - Every project manager should create a small core set of formal documents which acts as the roadmap as to what the project objectives are, how are they to be achieved, who is going to achieve them, when are they going to achieved and how much are they going to cost. These documents may also reveal inconsistencies, which are otherwise hard to see.
- Project Estimation – When estimating project times, remember that compilers are three times as hard to write as application programs. In addition, systems programs are three times as hard to write as compilers. In addition, the use of a suitable high-level language may dramatically improve programmer productivity. Also, keep in mind how much of the workweek will actually be spent on technical issues rather than administrative ones or other non-technical ones, such as meetings or sick leaves.
- Code Freeze and System Versioning, Specialized Tools, etc.

3.7.2 Project Management For Information Systems

Cadle and Yeates (2001) provide the Framework’s primary source information for managing change, organizational change and business strategy for information systems. They state that all new information technology systems bring a range of associated changes with them, e.g. changes to business processes and procedures, new roles and responsibilities, organizational restructuring, new equipment or facilities, or new skills to learn. All of these

involve people, and they argue that it is the people within any organization, who are the key to the success of any implementation.

Cadle and Yeates (2001) feel that information systems are only tools to enable people to take better decisions, so getting the commitment of the people who will use the system is central to the success of the IT project. As an example of how their work affected the Framework, the first deliverable within the Initiation phase of the Framework is discussed in a later chapter. This template is mandatory when rolling out the product at a client site, but optional to the client internal project manager.

3.7.3 Goal Directed Project Management

Andersen, Grude & Haug (1995) have developed a method and philosophy regarding PM all their own, called "Goal Directed Project Management." The author has not included their philosophy and methods within the ambit of the Framework product but has included their thoughts on ISO 9000 certification for project work. They note that ISO 9000 is a multiple-element standard for quality management and quality assurance and that ISO 9001 and 9003 describe the bases upon which a company may be certified. When including project management as part of an organization's certificated quality systems (e.g. in the case where project work forms a key part of producing results for the customers) the following matters must be documented in project work:

- Project description and justification (with goals and results requirements);
- Project divisions (with descriptions and estimates);
- Milestone plans and responsibility charts;
- Phase Evaluation; and
- Project Evaluation.

The certification agency will not assess the quality of these plans and charts, but rather whether the documentation exists at all. These deliverables are included as part of the Framework in order to facilitate ISO 9000 certification for the implementing organization.

3.8 Conclusion

In this chapter, the author introduced the body of research that underpins the product under development. The two key standards and their interrelations were discussed at a high level and the two other major sources of information and inspiration were introduced. The former two are the PMBOK® Guide (2004) and the CMMI (2002) and the latter two are Rational's Unified Process (2002) and Kerzner's (2003) work in regard to Project Management. The former two forms the foundation of the body of research and the latter two, along with others such as Fred Brooks (2000 and 1987) and Messrs Cadle and Yeates (2001), provide valuable

detail and structure to ensure that the body of research covers the relevant areas within basic project management.

Vannevar Bush (1945) said that “If scientific reasoning were limited to the logical processes of arithmetic, we should not get very far in our understanding of the physical world. One might as well attempt to grasp the game of poker entirely by the use of the mathematics of probability.” The author likens Mr Bush’s opinion to project management in the following manner: no body of knowledge completely covers every aspect of the field and even basic project management includes too many “soft” issues to be able to fit nicely into a box such as this chapter provides. However, the author believes that the information compiled within this chapter serves as a basis for developing a product that addresses those aims documented in chapter 2. The growth of this product, based upon the body of research, is documented within chapter 4, where the product idea, concept and specification are discussed.

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4 Product Idea, Concept and Specification

Having laid the foundation for the product innovation process by compiling the body of research in Chapter 3, the focus of this chapter is to define and document those attributes that makes the Framework what it is. The product development and evaluation processes are discussed in Chapter 5. These three focus areas are not physically or logically split in the current research as every product specification, from idea through to product specification, resulted in some form of development and evaluation.

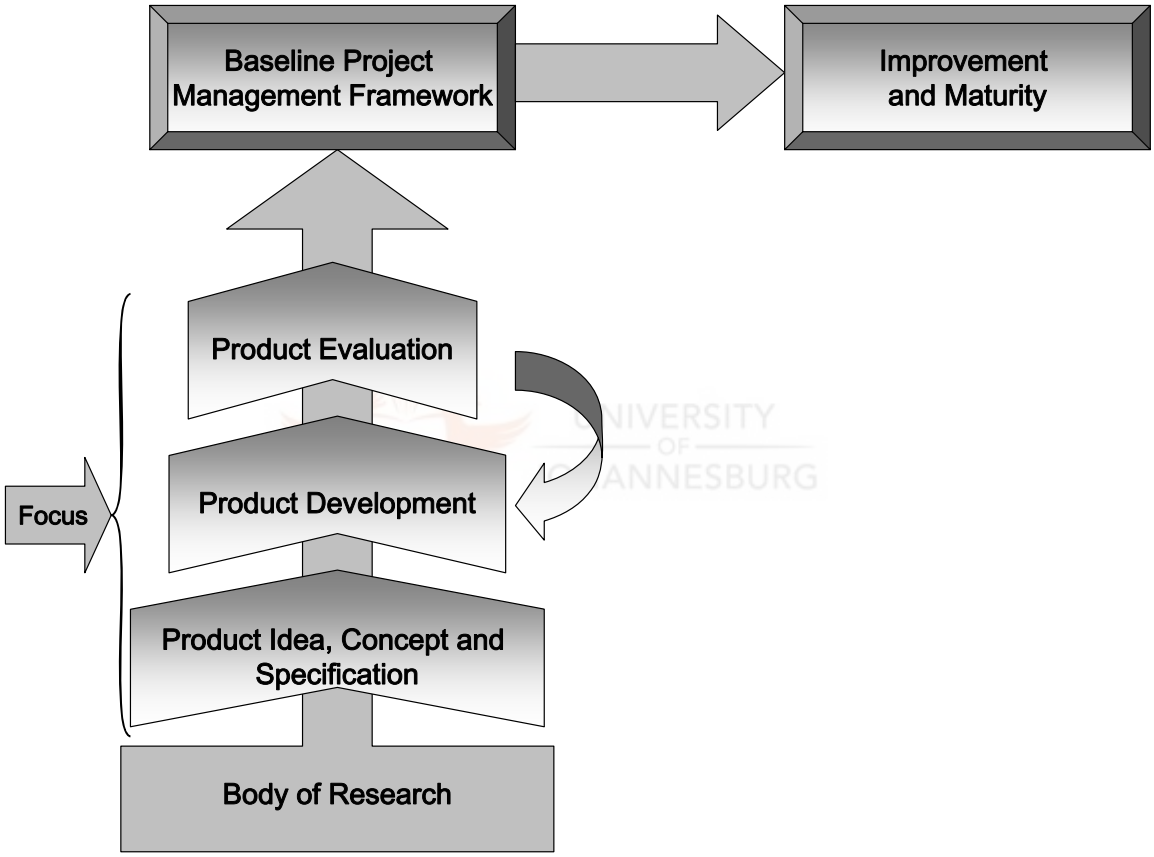


Figure 4.1. Chapter Focus in Product Innovation Approach.

The process followed for the development of the product Idea and Concept, is similar to that described as Action Research (AR) by Greenwood and Levin (1998). This type of research is done by a professional researcher and members of a community, both seeking to improve the latter's situation. Together they define the problems being experience, compile knowledge relevant to the situation and take actions to alleviate the situation and interpret the results of such actions. They note that AR is a research practice aimed at social change, but involving a review of current academic practice in the relevant area.

As noted by Bittner and Spence (2006) linear, predictive (and even prescriptive) planning / management techniques are not suitable for IT project delivery or other creative endeavours. To this end the author allowed himself and the various teams working on the product (at various stages of the product development cycle) to utilize what was seen to be the most appropriate planning / management technique. These techniques are not necessarily noted within the current research as it does not form part of the research focus.

4.1 Introduction

Unless otherwise stated, all definitions in this chapter are sourced from Crawford's New Product Management, the fifth edition (2004).

As van Zyl and Walker (2000) have said, "Product innovation must take place in order to create products and services that potential customers do not yet know they need." The product development process begins with an idea and ends with the production of a physical artefact. Ulrich and Eppinger (1995) have rightfully noted that that whether viewed from its entirety or from individual activity level, the product development process is intensely creative.

Products

A product may be defined as "a bundle of attributes (features, functions, benefits and uses) capable of exchange or use; usually a mix of tangible and intangible forms." This implies that a product may be an idea, a service rendered, a physical entity (a good) or any combination of the forgoing three. A product exists for the purpose of commercial trade – an exchange in the satisfaction of individual and organizational objectives.

Requirements

Functional requirements are the fundamental or essential subject matter of the product. They describe what the product has to do or what processing actions it is to take. Non-functional requirements are the properties that the functions must have, such as performance and usability. The reader should not be deterred by the unfortunate type name (used because it is the most common way of referring to these types of requirements)—these requirements are as important as the functional requirements for the product's success.

The author likes Spolsky's (2000) "informal" definitions of the difference between functional and technical specifications:

- The functional specification describes how a product will work entirely from the user's perspective. It doesn't care how it is implemented, but talks about features. It specifies screens, menus, dialogs, and so on.

- A technical specification describes the internal implementation of the program. It talks about data structures, relational database models, choice of programming languages and tools, algorithms, etc.

He insists that, during the design of a product, inside and out, the most important thing is to accurately document the "user experience." What are the screens, how do they work, what do they do. "There's no use arguing about what programming language to use before you've decided what your product is going to do." This statement mirrors the author's experience in this regard. Development of the functional specification is largely included in the current research, although the entire specification will not be included due to space constraints.

Users

Each product may have many eventual users, but there are certain key users that are of great worth to the specification team. Herstatt and von Hippel (1992) developed the Lead User method as built around the idea that just a few "Lead Users" hold the richest understanding of the needs in a new product or service. These users should be identified and drawn into a process of joint development of new product or service concepts with manufacturer personnel. Von Hippel (1986) defined Lead Users of a novel or enhanced product, process, or service as those who display two characteristics with respect to it:

- They face needs that will be general in a marketplace – but face them months or years before the bulk of that marketplace encounters them; and
- They expect to benefit significantly by obtaining a solution to those needs.

At each pilot site, the project lead users were identified with the help of the sponsor and their input and comments greatly shaped each implementation. Von Hippel (1986) advises that a Lead User market research study involves four major steps, which are in brief:

- Specify the characteristics a Lead User will have in the product/market segment of interest;
- Identify a sample of Lead Users who fit these Lead User criteria;
- Bring the sample of Lead Users together with other relevant roles (e. g. company engineering and marketing) to engage in group problem-solving;
- Test whether concepts found valuable by Lead Users will also be valued by the more typical users in the target market.

A modified approach was used by the author:

- Specify the characteristics a Lead User will have in the product/market segment of interest;
- Present characteristics of the Lead User to the sponsor to allow his input in selection of Lead Users from his / her environment;
- Group problem solving was done under leadership of the author; and

- Test whether concepts found valuable by Lead Users will also be valued by the more typical users in the target market – in this case existing users and other, less senior users at the same pilot site.

The Lead Users for each of the pilot projects are tabled in Chapter 5.

The IT Project

Smyrk (2002) notes that the IT project ranges from infrastructure (such as hardware upgrades) through to applications systems for business. He notes two key characteristics of an "IT" project:

- Its objective is to implement a system; and
- Its project structure is based on the systems development methodology.

For the purposes of the current research, the term "IT project" includes mainly (1) implementation projects (which may require some development or configuration to ensure "fit") and (2) development projects (which require mainly system development.) Development projects are focussed on product development rather than production. That is, in a development project, the product needs significant design and development as well as production. Unlike production projects, development projects therefore entail potentially a larger amount of risk.

Stakeholder Involvement

The relevant stakeholders, during the various phases of product innovation, were involved by employing the project management concept of a sponsor. Referring to figure 4.6, there was one sponsor for the project up to the end of the Evaluation of the Operations Process, and two sponsors for each of project 2 and 3, which followed one another as iterations of evolutionary development of the product delivered in project 1.

Each sponsor appointed users and super users (from which the author chose lead users) to assist in the product development and evaluation cycle. At each of the activities pictured in figure 4.4, stakeholder involvement was required to obtain signoff in order to progress to the next phase of development. The inputs from the lead users were included in the functional specification, where relevant and in line with the body of research.

4.2 The Product Idea

Afuah (1998) calls innovation the use of (new) "knowledge to offer a new product or service that customers want." It is a combination of invention and commercialization. More in line with the current research, is prefers Afuah's (1998) reference to Porter's (1990) definition,

namely, “a new way of doings things that is commercialized.” The development of this new way of doing things commenced with an idea, the germination of which is discussed below.

Having partaken of a number of engineering projects while in the high voltage distribution industry, the author moved to the IT industry in 1998. An immediate observation in the new environment was that a wide disparity in application of the basic PM concepts existed from project to project. It ranged from down-to-the-letter applications of a strict delivery methodology to a very ad-hoc, trench-coat style used by a certain software practitioner. Highly successful developers were elevated up the ladder of success by making them project managers, a job for which they had not been properly prepared or skilled in advance.

The power reticulation projects that the author had managed since graduation have been done many times before and a paint-by-numbers approach could be utilized for many aspects of its management. There were estimators, planners, designers, and a clear picture of where the project manager was going. Not so in the IT industry at the time. Despite (or maybe because of) brand new technologies and novel approaches, many projects were failing and those that succeeded in one environment were failing in another. Some project managers used a hands-off, white-coat approach while others micro-managed a similar project. Some projects were run according to best practices and failed; others were run in a by-the-skin-of-the-teeth manner and succeeded.

It was a real eye-opener: some of those blue-chip consulting, insurance and banking firms with rock-solid advertising campaigns were changing from centralized to distributed systems, only to centralize again at great cost. The project approaches that facilitated this great distribution of funds, were not standardized but rather enforced by the technology vendors (Peoplesoft (2006), (Rubico (2002), SAP (2006) and others) making for some interesting programs in cases where many software vendors were involved.

The author developed his own approach to managing IT projects, based on the popular delivery methodologies of the time. This often meant educating the client as to what a Charter and Scope Statement were and why it is so important if no one else was asking for them. Pointing out the difference between a schedule and a plan often resulted in great confusion, as there was very little in terms of standardization of terminology. Once the author’s project team left a site, the sponsor would phone some time later and ask for templates in order to try and standardize their IT projects. The above state of affairs led the author to develop the product concept discussed below.

At that time, the single biggest need was to develop a strategic vision of where this work was going. This question was partly answered by:

- A GartnerGroup (2000) document, estimating that by using moderate PM rigor (using standard processes with some auditing) there is a 30% improvement in productivity;
- Robert Simplot's introduction for Jason Charvat's (2003) work titled, "Project Management Methodologies." He said "When all projects in the enterprise follow a standardized template, then and only then will project management evolve gradually into an everyday way of life"; and
- Drucker (2001), who says that successful innovators are conservative, and that they have to be. However, they are not risk focused, they are opportunity focused.

The combination of moderate rigour and a standardized template for projects in an enterprise was in line with the author's thoughts at the time. The work on a concept could begin.

4.3 The Product Concept

Crawford (2004) found that the idea of concept development is to increase market value of the product, by increasing the clarity of the concept. He says that the product concept is that verbal or pictorial version of a proposed new product, consisting of

- One or more of the benefits the product will yield;
- Its general form; and
- The technology used to achieve the form.

Crawford (2004) says that a new product idea becomes a concept when it has at least one benefit and either the form or the technology. Further work in the development process gradually clarifies and confirms those two and adds a third. A concept becomes a product when it is sold successfully in the marketplace; before that, it is still undergoing development, even if marketed.

Ulrich (1995) feels that a concept is a concise description of how the product will satisfy the customer needs: concept generation should consume less than 5 percent of the budget and less than 15 percent of the development time.

The concept lifecycle that was followed is a modified simplification of that proposed by Crawford (2004) and Ulrich & Eppinger (1995) respectively. The concept development change was necessitated by the informality of the approach at the time. The ideation process involved the stakeholders identifying problems and the author suggesting solutions for them. As Whitehead (1978) is quoted as saying: "It is a short step from a careless phrase to a flash of insight." The original concept was developed along the above lines and shortly the concept was summarized as follows:

- A tool that standardized IT project delivery at the basic level;

- Presented as processes, guidelines and templates to all project managers in a given environment; and
- Built using a common technology such as MS FrontPage or a similar web development product.

External and internal searches yielded the conclusion that such a product did not exist at the time. The concept definition found favour with the author's employer and work immediately began to find a way to present the concept as part of a standardized method for IT projects delivery for IZAZI Solutions. The Business Case had been approved in principle and a process had to be proposed, which could be used for developing a pilot version of the concept. The agreed process, used for moving from concept to pilot to product, is discussed in the following section. It is worth noting that the concept was not pitted against hundreds of other concepts to determine its desirability. Instead, it was developed as a means of convincing a Services company to develop a product that could be sold to its existing client base. This approach to using product development is recognized by Thomas (2002) in that he realizes that "very often one cannot measure a need until a new product and its marketing have defined that need."

4.4 The Product Innovation Process

According to the definitions used by Afuah (1998), the current research relates more to technical innovation (improved processes or completely new ones) and less to that of administrative innovation (pertaining to organizational structure and administrative processes.) In terms of the impact that it has on the sponsoring organization, it appears to the author to fall into the category of *incremental* innovation (vs. radical innovation which pertains to how *new* the new knowledge or product is.) This is in line with the author's view that the product is an incumbent in an existing market space. The newness of the current research is not that it's the first product to offer a project management process as a web application. Rather, it is later shown to be contained in the following aspects.

- The PMBOK Guide makes it clear that it should be tailored to be effective: this research tailors the Guide for a sector, a time and a place (not just for an organization);
- The above tailoring resulted in a unique approach to implementing IT project management in SA;
- It was not done for financial gain, but to contribute to the Project Management body of knowledge and to even push the frontier of this body of knowledge, thereby:
    - Benefiting a community, and
    - Opening up a new focus area for research within the profession.

- The combination of research, experience and observation was documented to provide a substantial body of high quality work, available for future research in this regard;
- The research has experimentally (and experientially) validated the author's theory in regard to improving the state of IT project management in SA; and
- The combined application of two ANSI standards to provide access to both project management and process improvement in the same product.

Cadle and Yeates (2001) have noted that, in general, the system development lifecycle (SDLC) covers the whole life of the system. I.e. it will not only cover feasibility study, analysis, specification, design and development but also the operation, maintenance and enhancement aspects which take place after the system has been accepted by the end-users. With this in mind the author attempted to find a product innovation path that does not create redundant documentation, e.g. a concept specification that gets left behind when the prototype specification is developed etc. As discussed in chapter 4.5, the author sought for and found a single document that could accompany the product as a specification throughout the product innovation process. The steps below paint a picture of how the author progressed from a specification as a bundle of attributes to a document called the Pre-Technical Specification, which satisfies the need seen above.

4.4.1 The Product Development Funnel

The high level product specification process, flows from Crawford's (2004) definition of a product as "a bundle of attributes (features, functions, benefits and uses.)" To facilitate this process, a concept that the author had used before, was employed. The concept is that of the Product Development Funnel proposed by van Zyl and Walker (2000), but in a modified form. The reasons for modifying the funnel are manifold and fall outside the scope of the current research; suffice to say that the modified funnel suited the specific product and the product development maturity of the sponsoring organization. The major modification was from the "idea to *project to concept* to product" chain, to an "idea to *concept to project* to product" chain. The strategy works because it allows an informal flow to get to the concept stage, quickly and without restricting creative impetus.

Inputs were accepted from existing customers, (Harmony Gold, South African Post Office Bank) the body of research and the strategic intent of the sponsoring organization (IZAZI Solutions). The filters were used to determine the inputs into the concept and eventual product. Typically, the commercial impact is assessed on an ongoing basis, but because this project has been deemed desirable at the highest level of the sponsoring organization, this aspect of the funnel is not included in the current research.

Van Zyl and Walker (2000) have aimed their product development funnel at the microenvironment and they note that there are a number of facets in this environment that should be considered to set direction and implement the funnel effectively. Figure 4.2 contains a graphical representation of their proposed product development funnel. Figure 4.3 contains the modified funnel, indicating the differentiating approach of concept to project, rather than the other way around.

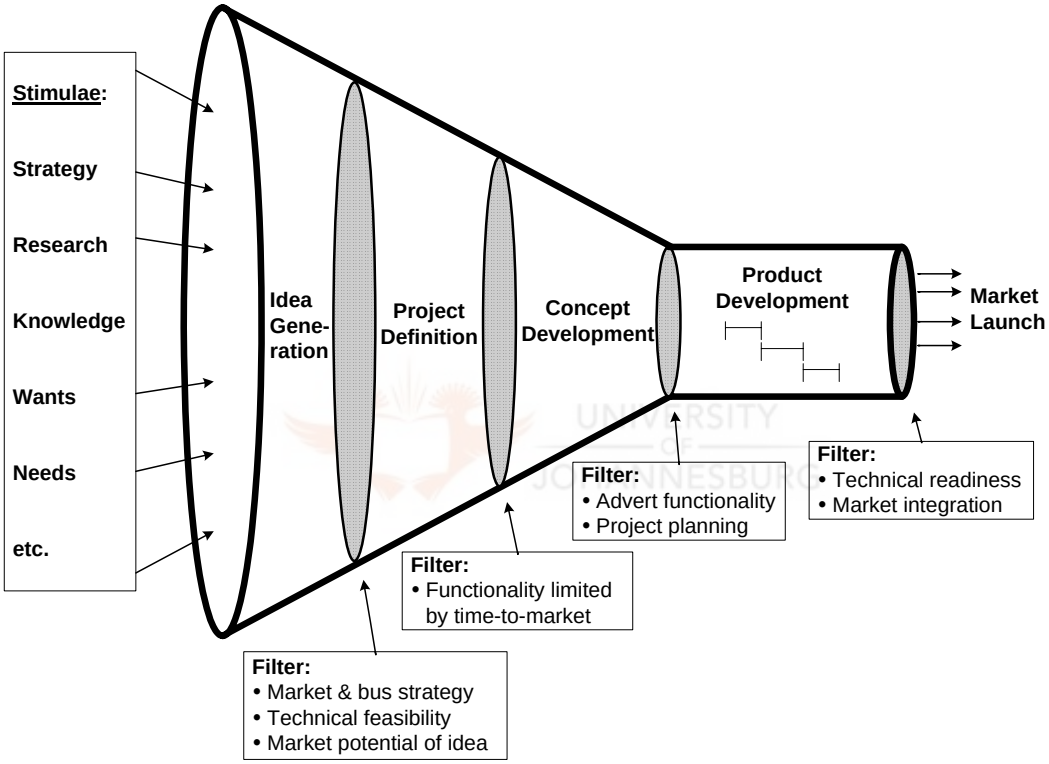


Figure 4.2. Product Development Funnel Proposed by Van Zyl and Walker (2000).

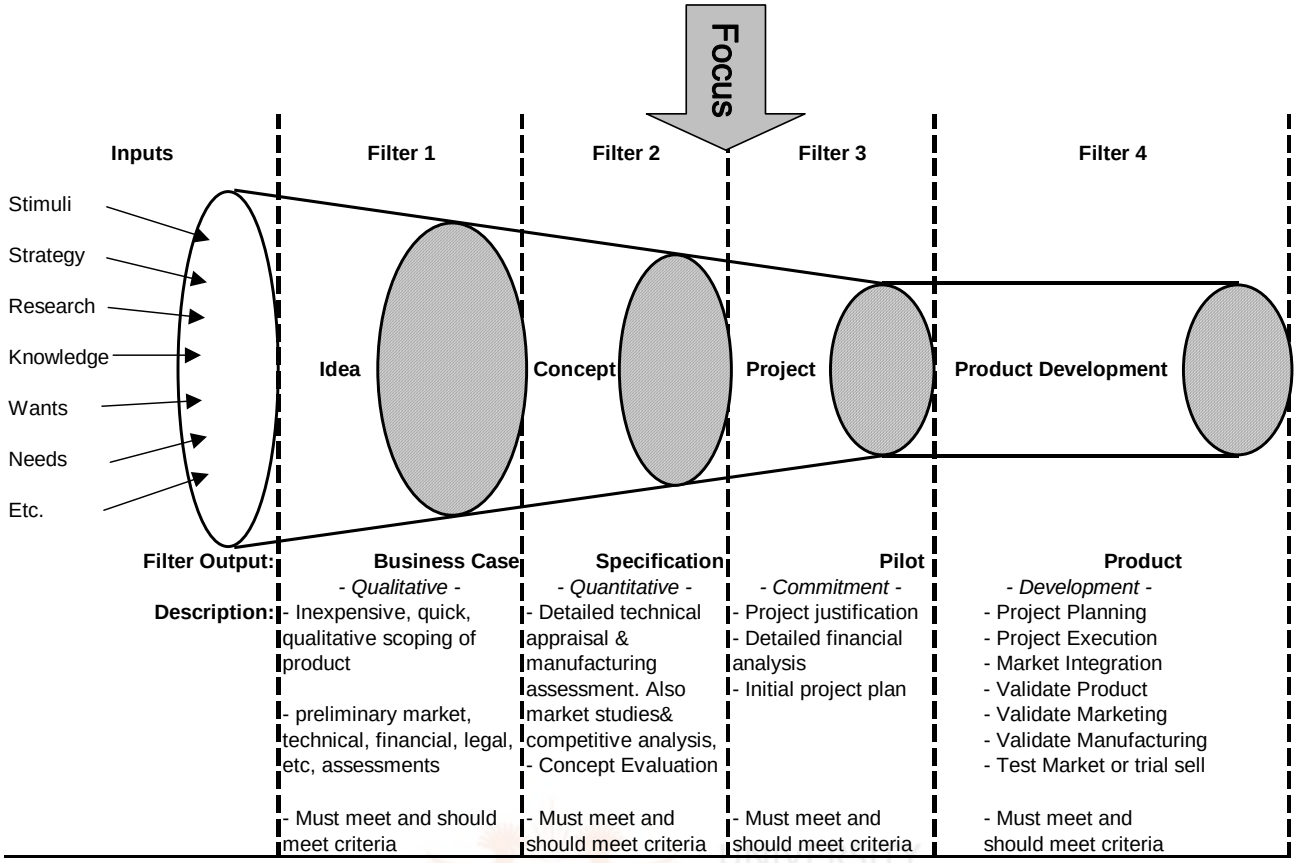


Figure 4.3. Modified Product Development Funnel as Used in Product Innovation Process.

4.4.2 Dual Stream Process (vs. Triple Stream)

As per discussions under:

- Conclusions and Recommendations in Chapter 9; and
- the Product Planning discussion in Chapter 2,

Crawford's (2004) Triple Stream process (of Product, Evaluation and Marketing) was not followed. Due to the circumstances at the various sites and the resources required in this regard, a modified dual stream was followed, resulting in the process shown visually in Figure 4.4.

The marketing stream is not shown as part of the current research, as it has followed a separate and ad-hoc process. This has led to a product that is ready for marketing but a marketing plan that has not kept in step with development. The impact thereof is severe from a corporate and marketing point of view but does not influence the current research in terms of its objectives. Instead, the product development funnel used to progress the project from idea to concept and from concept to project, is shown as a third column in Figure 4.6. This places the product and evaluation streams in the context of the funnel, allowing a phased view of an otherwise continuous process. The implication thereof, to van Zyl and Walker

(2000) is that the filters of the funnel provide stage gates during the development process, but not necessarily representing the phases of a project.

In order to move from concept to product, the process as outlined in figure 4.6 has been found to be appropriate and acceptable to the stakeholders. The Idea, Concept and Pre-technical Product Specification form part of this chapter from a Product point of view. The Idea and Concept Evaluation and Comparison with Definition activities make up the Evaluation activities discussed in this chapter (the greyed-out area in the figure indicates the chapter focus.) The balance of the development and evaluation activities is discussed in Chapter 5.

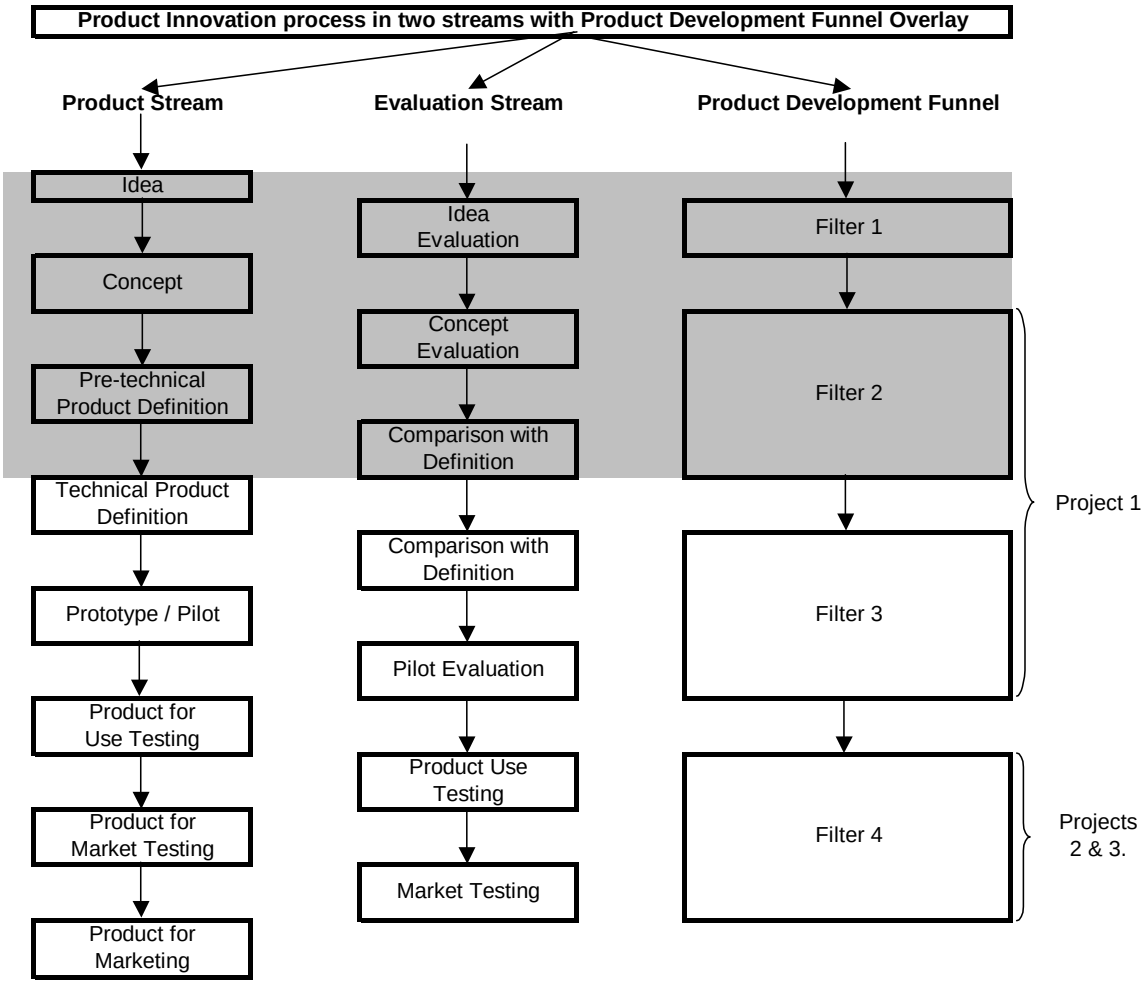


Figure 4.4. Dual Stream Process Followed As Part Of Product Innovation.

4.5 Pre-Technical Specification (Product Definition)

The basis of the IT project, according to Smyrk (2002), is the *Functional Specification*. The implication here is that each project that produces a product should have such a document.

However, the author favours the product development term of *Pre-Technical Product Definition,* because it envelopes the functional and non-functional requirements so well, while making it clear that the document is not dictating technology. Typically, while performing the product development, one could have a number of documents that specify the product at the various level of its maturity, but the pre-technical product definition contains the key functional and non-functional attributes that make the product what it is.

The idea of a *Pre-Technical Specification* is the marriage of these two documents: one from a product development and the other from a project management perspective, and in this case, it accompanies the product from its first (pilot) version until its retirement (one day.) The first version of the Pre-Technical Specification was created after the concept was approved and the author knew that a project would be launched – knowing that the project would require a functional specification spurred the author on to devise this document.

The Pre-Technical Specification for the baseline version of the product grew over 3 iterations: mainly in terms of content but also in terms maturity. The version of the document that accompanies the baseline product is a modification of the Requirements Specification Template from Volere (11th Edition) developed by The Atlantic Systems Guild, Inc. (2006). The entire document would be too large to include in the current research, but instead, the most important headings with sample requirements and expansions are included to provide the reader with an indication of the content and thinking that led to its creation.

The following requirement types are defined in the Volere Requirements Specification:

- Functional requirements are the fundamental or essential subject matter of the product. They describe what the product has to do or what processing actions it is to take.
- Non-functional requirements are the properties that the functions must have, such as performance and usability.
- Project constraints are restrictions on the product due to the budget or the time available to build the product.
- Design constraints impose restrictions on how the product must be designed. For example, it might have to be implemented in the hand-held device being given to major customers, or it might have to use the existing servers and desktop computers, or any other hardware, software, or business practice.
- Project drivers are the business-related forces. For example, the purpose of the project is a project driver, as are all of the stakeholders – each for different reasons.
- Project issues define the conditions under which the project will be done. The reason for including them as part of the requirements is to present a coherent picture of all factors that contribute to the success or failure of the project (product) and to illustrate how managers can use requirements as input when managing a project.

The main modification from the Atlantic Systems Guild, Inc. (2006) document is the manner in which the document is applied. In the current research, it is used as:

- The Pre-Technical Specification for the product under development;
- The Product Definition for the baseline product; and
- Requirements Specification for each future client implementation.

The multiple role performed by this document means that one core version of the document exists for the baseline product as it evolves over time, and another version for each implementation of the product. This is discussed in more detail in the Product Implementation chapter.

4.6 Functional Requirements

In line with Crawford's (2004) thinking, Probasco (2000) earlier noted a common problem in many projects:

"The focus is often placed heavily in one particular area, to the extent that the team gets bogged down with the details of that particular area before making sure that they have a good idea of the "key" elements involved in the whole process lifecycle of producing a quality product."

These disparate sources agree that it is much more effective to take a more systematic and holistic approach, making sure that the key elements of a process is in place (an architecture, so to speak) before determining to focus on any one particular problem area. Prior to undertaking the major body of technical work, then, there should be agreement on just what benefits the new item is to bring to the end users. At the current level of the product specification, this approach was deemed appropriate and work began to determine the key product elements as "must", "should" and "could" attributes.

The initial KEY product attributes, based on interviews with 2 peers at IZAZI and the initial clients (Harmony and SAPO), were that the product:

- Must be applicable to most (if not all) IT projects in South Africa, most (if not all) of the time – including deployment, development and technical architecture projects;
- Must be based on agreed best practice (international standards preferred);
- Must make provision for any methodology (XP, RUP, Business Analysis, etc.);
- Must be easily accessible over the Internet or a LAN;
- Must be easily customisable for quick client rollout;
- Must be scalable in terms on project size / risk / strategic importance;
- Must be developed on the basis of progressive elaboration, with client reviews between iterative builds;

- Must contain a glossary of definitions and abbreviations, based on the agreed best practice standard;
- Must contain a document control standard, amendable for document naming, configuration control and folder structures;
- Must cater for a template creation process, to be handed over to the client for future growth and possible amendments in the standards that the product is based upon;
- Must contain very basic Project Support Office support.
- Should be downloadable for portability;
- Should have training material built on a train-the-trainer model to empower the client as quickly as possible;
- Should be developed around OO concepts where possible;
- Should be provided with sample methodologies for every key type of IT project; and
- Could provide a facility for the move to informal project management for a mature organization.

During these sessions it was also determined what the product is not:

- The product is not a paint-by-numbers approach that negates PM experience and skills; on the contrary it aims to complement PM skills and experience;
- The product is not a project scheduling tool (such as MS Project); and
- The baseline version of the product is not an advanced project management tool

Each of these attributes, in turn, was developed in detail over a period, resulting in a full Pre-Technical specification for the product. An example of such an expansion is provided in chapter 4.6.1.

4.6.1 Sample attribute expansions

The current research does not include the expansion of each product attribute, but contains a sample expansion in chapter 4.6.1.1. The reason for this approach is to ensure that the focus remains on the research objectives while ensuring that the reader remains privy to the thinking process followed to obtain the research results. The expansion of the sample attribute has an impact at organizational structure level, which is also discussed in this chapter.

4.6.1.1 Must be applicable to most IT projects most of the time.

The above requirement was progressively developed to read:

From the totality that makes up IT project management, extract the core PM part and leave behind the delivery and development methodologies that relate to specific technologies and products. The portion that one is left with, are those project management processes that are

technology and product independent and are therefore applied to most (if not all) IT projects in South Africa most (if not all) of the time.

In order to perform this extraction, John Smyrk (2002) uses a two-layered management model of a project. One is the Control Layer or 'above the line', the other is the Work Layer, or 'below the line,' as shown in figure 4.5. This is a useful distinction for the Project Manager as it provides the distinction between the management of the project and the management of the work of the project required to produce the outputs. He notes that project managers should be spending up to 15% of their time on 'above the line' activities in order to achieve the project's stated outcomes.

Control Layer	Project Management processes	Describe and organize the work of the project (Business area).
Work Layer	Product / service / results-oriented processes	Specify and create the project product (Technical area).

It is almost exclusively to this 15% of the project manager's time that the author is applying effort in the current research, with one exception: those work layer activities that occur on most IT projects most of the time. The author has therefore modified the split as is indicated in figure 4.5 to be in line with that required by the current research.

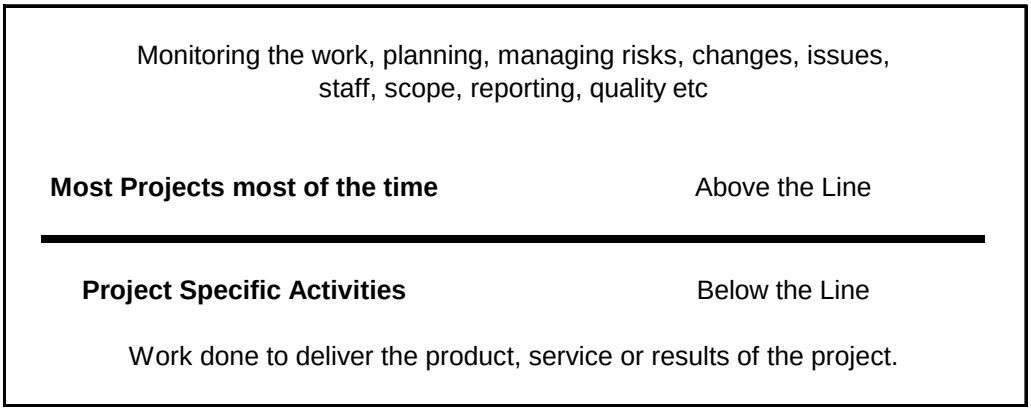
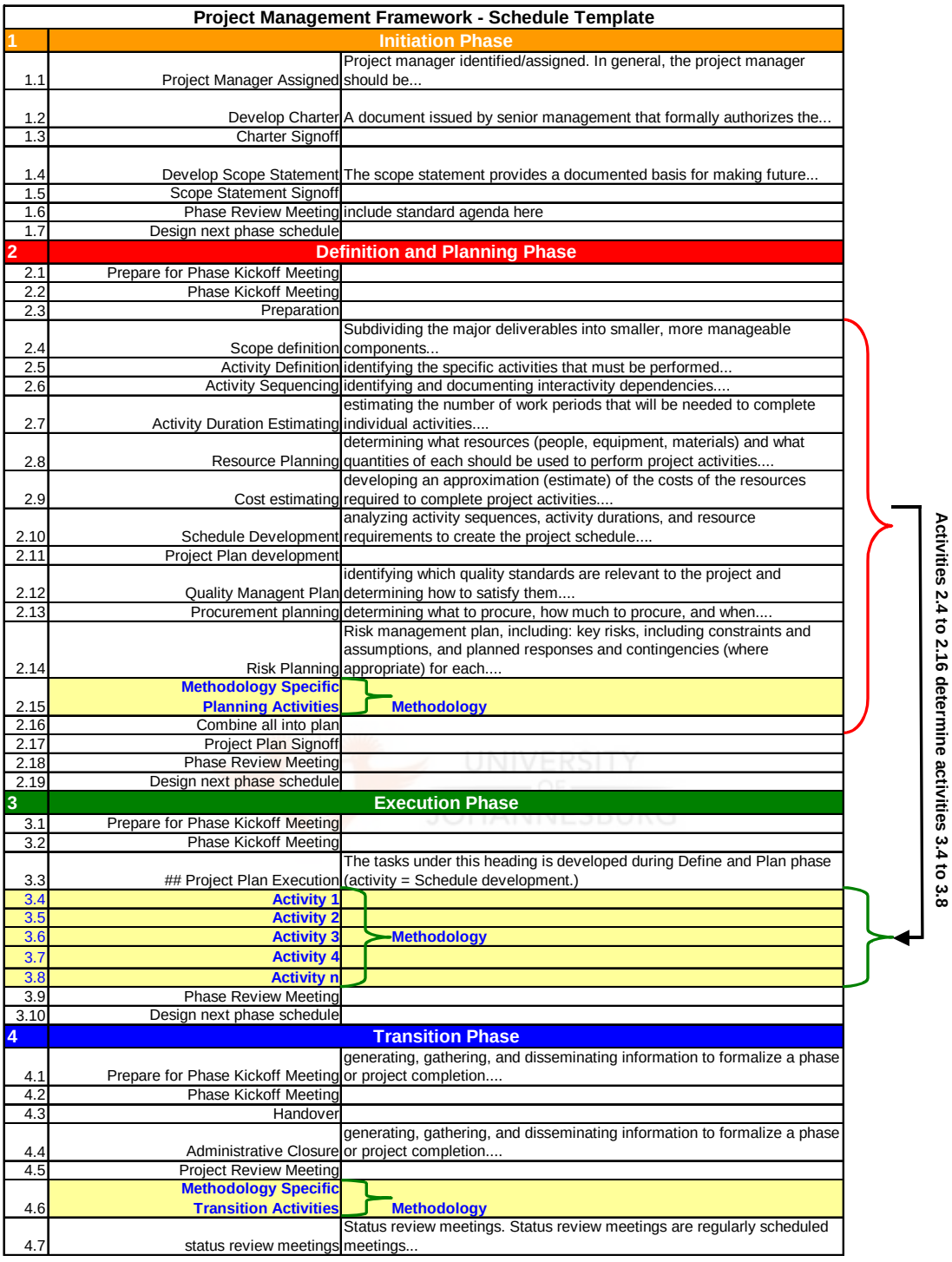


Figure 4.5. Modification Of Smyrk's Two-Layered Model Of A Project.

The way in which the product allows for customisation in the Work Layer, is that in the development of templates for planning and scheduling purposes, the product allows for various approaches / methodologies to be applied. For example, in the project schedule, all Control Layer activities are included in the template, and Work Layer activities are added as required by the specific project type (methodology.)

In terms of the list of templates, those that are required to perform the control layer are supplied as part of the Framework (Charter, Scope Statement, etc.) but those that are required by a specific project type are not (for instance the design template used for developing in Visual Basic in the .Net framework.)



Project Management Framework - Schedule Template		
1	Initiation Phase	
1.1	Project Manager Assigned	Project manager identified/assigned. In general, the project manager should be...
1.2	Develop Charter	A document issued by senior management that formally authorizes the...
1.3	Charter Signoff	
1.4	Develop Scope Statement	The scope statement provides a documented basis for making future...
1.5	Scope Statement Signoff	
1.6	Phase Review Meeting	include standard agenda here
1.7	Design next phase schedule	
2	Definition and Planning Phase	
2.1	Prepare for Phase Kickoff Meeting	
2.2	Phase Kickoff Meeting	
2.3	Preparation	
2.4	Scope definition	Subdividing the major deliverables into smaller, more manageable components...
2.5	Activity Definition	identifying the specific activities that must be performed...
2.6	Activity Sequencing	identifying and documenting interactivity dependencies....
2.7	Activity Duration Estimating	estimating the number of work periods that will be needed to complete individual activities....
2.8	Resource Planning	determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities....
2.9	Cost estimating	developing an approximation (estimate) of the costs of the resources required to complete project activities....
2.10	Schedule Development	analyzing activity sequences, activity durations, and resource requirements to create the project schedule....
2.11	Project Plan development	
2.12	Quality Managent Plan	identifying which quality standards are relevant to the project and determining how to satisfy them....
2.13	Procurement planning	determining what to procure, how much to procure, and when....
2.14	Risk Planning	Risk management plan, including: key risks, including constraints and assumptions, and planned responses and contingencies (where appropriate) for each....
2.15	Methodology Specific Planning Activities	Methodology
2.16	Combine all into plan	
2.17	Project Plan Signoff	
2.18	Phase Review Meeting	
2.19	Design next phase schedule	
3	Execution Phase	
3.1	Prepare for Phase Kickoff Meeting	
3.2	Phase Kickoff Meeting	
3.3	## Project Plan Execution	The tasks under this heading is developed during Define and Plan phase (activity = Schedule development.)
3.4	Activity 1	
3.5	Activity 2	
3.6	Activity 3	Methodology
3.7	Activity 4	
3.8	Activity n	
3.9	Phase Review Meeting	
3.10	Design next phase schedule	
4	Transition Phase	
4.1	Prepare for Phase Kickoff Meeting	generating, gathering, and disseminating information to formalize a phase or project completion....
4.2	Phase Kickoff Meeting	
4.3	Handover	
4.4	Administrative Closure	generating, gathering, and disseminating information to formalize a phase or project completion....
4.5	Project Review Meeting	
4.6	Methodology Specific Transition Activities	Methodology
4.7	status review meetings	Status review meetings. Status review meetings are regularly scheduled meetings...

Figure 4.6. Schedule Template Allowing for Work Layer (Methodology) Modification.

The PMBOK® Guide (2000) makes provision for application area extensions, which become necessary when "there are generally accepted knowledge and practices for a category of projects in one application area that are not generally accepted across the full range of project types in most application areas." In the case of the current research, the "above the line" processes that relate to IT and not to PM processes, qualify based on the above definition.

Application area extensions reflect:

- Unique or unusual aspects of the project environment that PM must be aware of, in order to manage the project more efficiently and effectively.
- Common knowledge and practices that, may improve the efficiency and effectiveness of the project (e. g., standard work breakdown structures and methodologies).

4.6.1.2 Organizational Structure

The Framework has to allow for most (if not all) IT projects in South Africa most (if not all) of the time. By implication, this means that it has to work and be deployable in most (if not all) organizations that perform IT projects in South Africa. Furthermore, a question that must be answered at every implementation site will be: where does the Framework fit into the organization and who will manage it?

The above two "rambling" functional requirements were taken up into the product specification as follows. The product:

- Must not be prescriptive in terms of organizational structure;
- Must allow for a project size / importance rating schema (under the scalability requirement) but should not be prescriptive in terms of the schema (i.e. not dictate what constitutes a large / medium / small project and which artefacts apply to each type of project); and
- Must enforce a project registration process but should not be prescriptive in terms of the exact process.

4.7 Other (Non-Functional) Requirements

4.7.1 Constraints

The Atlantic Systems Guild, Inc. (2006) defines mandated constraints as constraints on the eventual design of the product, mandated at the beginning of the project. Some samples of these include.

4.7.1.1 Sample Solution Constraints

Description: The product must operate on Microsoft NT based operating systems later than 2000 (for example Windows XP), Microsoft Office 2000 and later and Microsoft Project 2000 and later.

Rationale: All clients to date use these operating systems and applications as standard.

Fit criterion: The product shall be approved as Microsoft XP, Office 2000 and later and Project 2000 and later compliant by the testing team.

This is included in the product as recommended software version combinations:

O/S	Win 2000	Win XP
MS Office	Office 2000	Office XP / 2003
MS Project	Project 2000	Project 2003
MS Internet Explorer	IE 5. x	IE 6. x

Table 4.1 Recommended Software Version Combinations

4.7.1.2 Other constraints

Per client implementation, the Implementation Environment, Collaborative Applications, Anticipated Workplace Environment, Schedule and Budget Constraints must be documented. These categories are not expected to vary greatly though, as the Framework is built primarily for web access through LAN or Internet.

4.7.2 Naming Conventions and Definitions

A glossary of all relevant terms and acronyms is included within the Framework, based on the PMBOK® Guide common abbreviations and definitions. The glossary is not included within the research document as it requires a substantial amount of page space.

4.7.3 Facts and Assumptions

Sample facts and assumptions are:

- That basic project management is highly unlikely to change.
- All potential clients provide their project managers with personal computers and the software applications required to access and utilize the Framework.
- Microsoft, as the provider of all the development and run-time environments, is unlikely to withdraw from the market.
- All potential clients own (or are willing to procure) the necessary software licences and environments to host a simple web application, with the ability to centrally store and distribute the required templates.
- All potential users of the product have English as their first or second language, specifically in the business environment.
- Not all potential clients have document control and therefore this functionality must be catered for in the product.

4.7.4 Look and Feel requirements

Sample requirements for the appearance of the product are:

- Client demands for the product, such as corporate branding, colours to be used, etc on must be allowed. For these reasons the baseline version must be client independent but customisable in terms of colour and branding.
- In order to become part of the client's process artefacts, templates must make provision for the client logo at the top left corner.

Sample style requirements are:

- The product must create a feeling of being authoritative without overawing the user
- After their first 20 minute encounter with the product, 50 percent of representative potential users should agree they feel they can trust the product content to be correct and to provide guidance without taking away their creativity.

4.7.5 Usability and Humanity requirements

Sample Ease of Use requirements:

- The product shall help the user select the correct template at the relevant point in the project.
- The product shall make the users want to use it.
- The product shall be used by IT project managers, not developers; therefore it should appeal to a mature and analytical type of personality, i.e. not frivolous colours.

Sample personalization and Internationalisation requirements:

- The product must be personalizable in terms branding and client logos only.
- The product is not required for any other language than English, using American English (not UK English.)
- Currency symbols are South African Rands.
- All measurements will be metric (not imperial.)

Sample learning requirements:

- The product should have training material built on a train-the-trainer model to empower the client as quickly as possible.
- It must be made clear that the product is not necessarily a project management primer but a tool for practicing project managers. However, because the product present basic concepts, zero knowledge of project management must be assumed.

4.7.6 Performance requirements

Sample speed and latency requirements:

- The product is reliant on network speed, however, assuming a ping to server total turnaround time of less than 500ms on a 100kB/s network connection:

- Any interface between a user and the system shall have a maximum response time of 2 seconds; and
- Any download requested from the system shall have a maximum response time of 30 seconds.

4.7.7 Operational and Environmental Requirements

The expected physical environment is that of a corporation with some IT infrastructure (expand.)

A sample requirement for interfacing with adjacent systems is:

- The product must work on the last three releases of the Microsoft Internet browser.

Sample productization requirements are:

- The product must be published from the web development tool to the relevant server and folder; and
- The client must provide links to the product on its LAN or Intranet.

Sample release requirements are:

- Each release shall not cause previous features to fail; and
- Maintenance releases will be offered to end users as they become available, but at least annually.

4.7.8 Maintainability and Support Requirements

A sample maintenance requirement is:

- The product must be updated within 3 months, to reflect later releases of the standards which underpin its body of research.

A sample supportability requirement is:

- The support of the product must be designed such that the client organization will own and manage it.

A sample adaptability requirement is:

- The product should run under Linux using a web browser other than Microsoft Internet Explorer.

4.7.9 Other requirements

Precision or Accuracy Requirements are not applicable, nor are Safety-Critical Requirements. Reliability and availability requirements are dependant on the client servers and LANs where the product is to be installed. Robustness or fault-tolerance requirements, security requirements, cultural and political requirements, capacity requirements and scalability or extensibility requirements are all determined by the client site, where it is highly unlikely that the product will run on its own web server. If the client organization is already using a product that fulfils some of the functionality provided by this product, a strategy for migration to the Framework must be completed too. To date this has involved re-training only.

4.8 Conclusion

Afuah (1998) makes it clear that the importance of how *new* the new knowledge is underpins the innovation to some respect, but this is augmented by how *much* of it there is as well as the *quality of its composition*. The author notes that while the knowledge utilized as a basis for the current research is not new, the way that is composed, structured and packaged certainly is new within the market that it is aimed at.

Afuah (1998) also stresses that the generation of good ideas or adoption of a new one is merely the start of the innovation process. An idea must be converted into a product or service that clients want or need. Championing and nurturing the idea into an innovative product is a process quite distinct from idea development. Innovation requires both invention and commercialization.

For the current research, the document that drives the development and evaluation cycle is the Pre-Technical Specification – based largely on the Requirements Specification as defined by the Atlantic Systems Guild, Inc. (2006) and contains drivers, constraints, requirements and issues. At the end of the development and evaluation cycle, it evolves into a Product Definition for the baseline version of the product. This Product Definition again evolves into a Requirements Specification template for each client implementation.

In other words:

- The Pre-Technical Specification becomes the Product Definition for the baseline version of the product as it evolves over time and
- The Product Definition, in turn, becomes the Requirements Specification for each pilot and client implementation.

By implication then, the Product Definition is the template for the Requirements Specification and a client implementation consists of a completed Requirements Specification and a customized version of the product that matches this specification.

A stated earlier in this chapter, the entire document would be too large to include in the current research. Instead, the most important headings with sample requirements and expansions have been included to provide the reader with a basis for understanding the content and for the thinking that led to its development.

Creative Quotations (2005) credits Thomas Edison with saying: “Keep on the lookout for novel ideas that others have used successfully. Your idea has to be original only in its adaptation to the problem you are working on.” The author assumes that this was said in jest to some degree, but notes that there is some truth in the case of the current research. The idea is not to re-invent the science of project management but rather to extract and package that portion of it as it applies to the author’s milieu and target environment.

Scopa nuova scopa bene.

5 Product Development and Evaluation

Having laid the foundation for the product innovation process by compiling the body of research in Chapter 3, and compiling the Pre-Technical Specification in Chapter 4, the focus of this chapter is to document:

- The design and development of a product, such that it satisfies these attribute requirements;
- To evaluate the success with which it has been achieved; and
- Repeat the process until a baseline version of the product has been established.

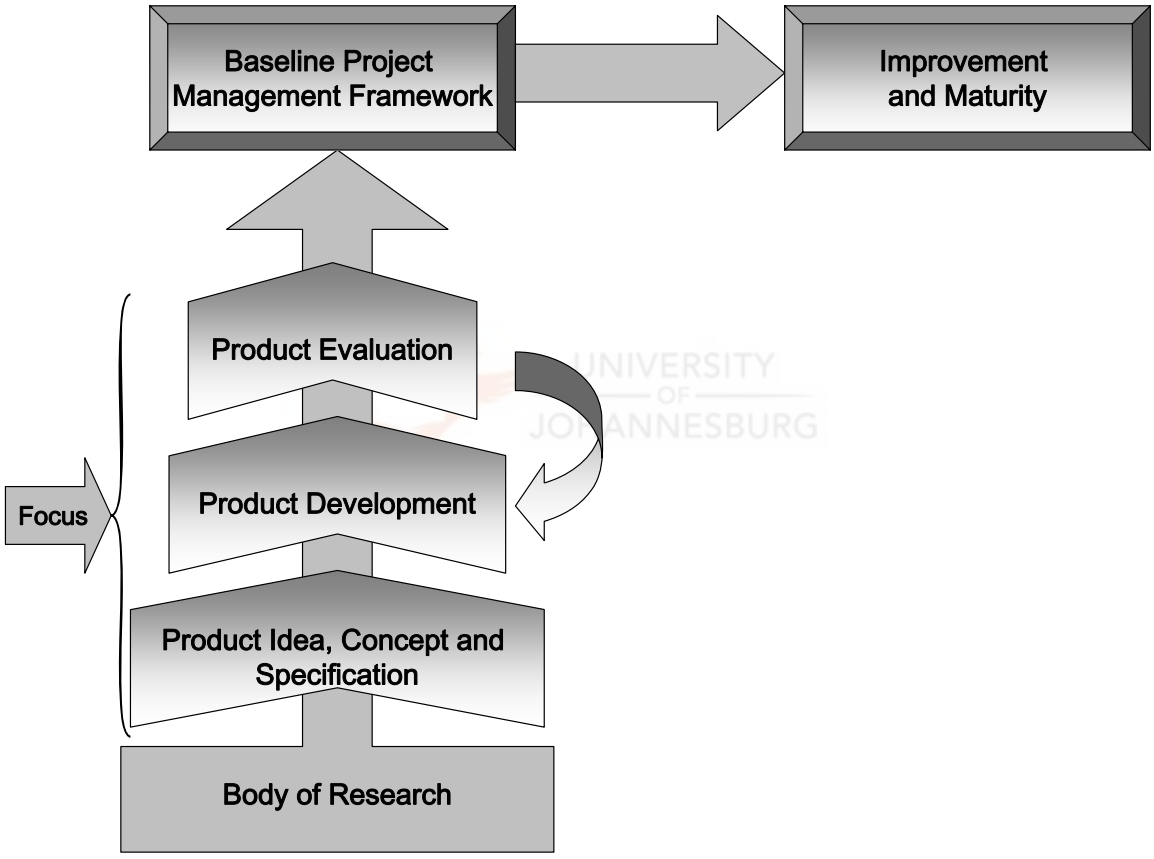


Figure 5.1. Chapter Focus in Product Innovation Approach.

During the course of the current research and in line with the methodological studies research method discussed by Mouton (2004), the development and evaluation cycle is iterated three times and at three different sites. This has allowed a wealth of experience and inputs to be worked into the baseline version of the product. This approach also allowed for two client implementations of the product at two disparate client sites, which in turn assisted with the ability to estimate implementation requirements and timelines.

5.1 Introduction

Afuah (1998) says that in order to deliver a differentiated product, the sponsoring firm should perform a series of activities within its different functional areas, called its value chain. He notes that the *ability* of an organization to perform any of the activities in its value chain is a competence. Competences vary in the extent that to which they are at the centre of a firm's ability to offer differentiated products or services. Competences at the periphery of a of a firm's long-term success are termed non-core, as is the case for the current research. As discussed in chapter 4, the product development cycle followed commenced via a selection model that convinced the sponsoring organization to sponsor work that falls outside of its core competence. The impact of this situation has been felt mostly in the lack of support that the author could expect and therefore contributed towards a longer time-frame than the development of such a product may otherwise have required.

Lientz and Rea (1998) have noted that while a project concludes and ends, a product continues after it has been developed. The author follows their approach of seeing product management from a project point of view. The lifecycle of the Framework product, from idea to retirement, is lived out through a number of projects. Certain of these projects are discussed in more detail in this chapter.

5.1.1 Iterative Development and Evaluation Model

Bittner and Spence (2006) have noted that the need for iteration arises out of the need to predictably deliver results in an uncertain world. This iterative approach of "develop and evaluate until a baseline version of the Project Management Framework, ready for marketing, is available", is loosely based on the RUP iteration model, but differs mainly because each iteration is a separate project. In contrast, in the RUP, one project contains many iterations. Each cycle also led to an update of the Pre-Technical requirements, meaning that a more accurate representation of the iterative approach (than that of Figure 5.1) is visually modelled in Figure 5.2.

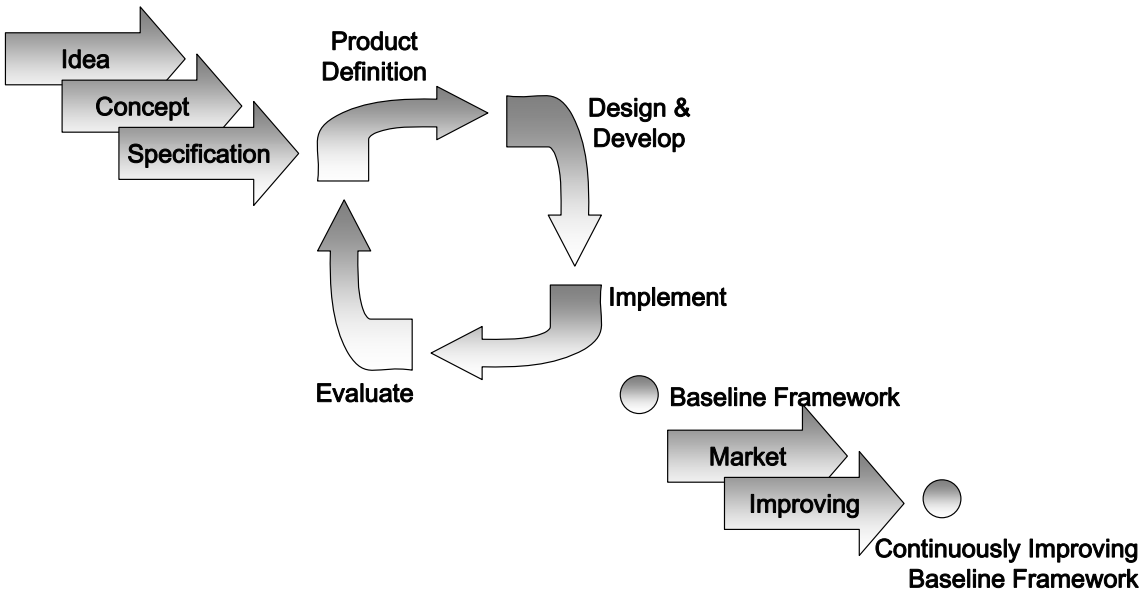


Figure 5.2. Iterative Development and Evaluation model (modified RUP iteration.)

As shown in Chapter 4, the Idea led to the development of a Concept, which led to the development of a Pre-Technical Specification. The author had no way of knowing that the product will satisfy the market demand based on this specification and therefore decided to follow the advice of Brooks (1987). As per his suggestion, the first pilot was discarded and two more pilots were done at client sites until some satisfaction could be obtained that the product satisfied an actual need and not just the perceived need of the author.

The baseline version of the project management Framework is to be marketed in parallel with the development of its process improvement evolution. Once that project is complete, the resultant product will become the baseline product to be marketed.

5.1.2 3 Projects, 1 Lifecycle

Cadle and Yeates (2001) have said that a project may be defined as "a management environment set up to ensure the delivery of a specified business product to meet a defined business case." In terms of systems development, this may be taken to mean the delivery of the specified IT system within the given constraints of time, cost, resource and quality.

However, projects do not always cover all stages of the systems life cycle. The current research is a case in point: the systems life cycle used to develop the Baseline Project Management Framework required three distinct projects:

- One throw-away pilot project; and
- Two client-site pilot projects.

In each case, the project life cycle covers the delivery of whatever has been defined as constituting the product of that project and all aspects leading up to the delivery of the project's objectives. An iteration of the Pre-Technical Requirements (called the Product Definition) was required for each project i.e. for each implementation of the product at a client site.

In Figure 5.3, the greyed-out section contains the content of the current chapter:

- From a product point of view: iterative development of the product, from prototype through to a baseline version, ready for market testing;
- From an evaluation point of view: from comparison with definition through to market testing; and
- From a project point of view: the completion of project 1 and the entirety of projects 2 and 3.

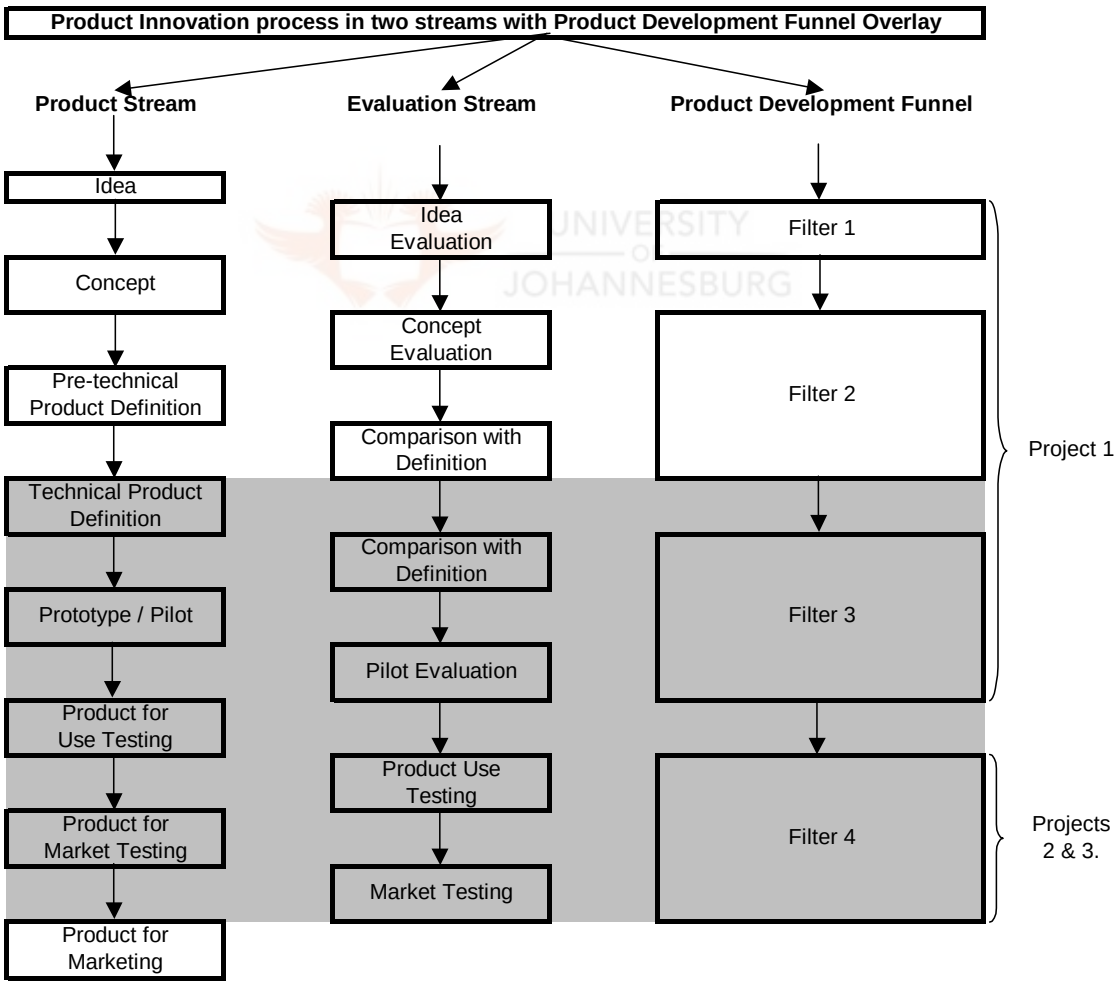


Figure 5.3. Development and Evaluation in Relation to Projects.

5.1.3 Product Versions

5.1.3.1 Strategy

As per Brooks' (1987) recommendations, when designing a new kind of system, a team should design a throwaway system (whether it likes it or not) acting as a pilot that will reveal techniques, which will subsequently cause a complete redesign of the system. The second, smarter, system should be the one delivered to the customer, since delivery of the pilot system would cause nothing but agony to the customer and possibly ruin the system's reputation and maybe even the company's. The pilot project sired a product which was duly installed and put to use at IZAZI Solutions, the author's employer. The lessons learnt during its use and installation led to the development of the first product for use testing. Two consecutive Product Use Test projects were launched to provide a stable baseline version of the product.

The development of each version of the product as discussed below, was run as a separate product with own sponsor, client and users. The commonality is the author as product owner and IZAZI as the *product sponsor* over the projects.

5.1.3.2 Version 1

The first version of the product was a throwaway version developed in Microsoft Visio and exported as web pages for publication. The reason for this is that the initial focus was on capturing the macro and micro processes accurately. Various process-modelling methodologies were investigated and tested, including the Integrated DEFinition (IDEF) methodology (a family of methods that supports a paradigm capable of addressing the modelling needs of an enterprise and its business areas.) Exporting the Visio drawings to web pages did not work very well visually and it has been found that a copy and paste to a web development tool would present a much friendlier graphical user interface (GUI). The first pilot was developed using the input from two specialist project managers – the author and Mr Brendon Smith who is also a PMP and with extensive IT project and program management experience.

An effort was made to investigate the option of an object-oriented approach using a database to store objects and then calling them up as links. On review, this approach was discarded as an unnecessary overhead in terms of the time it would take to implement successfully. Figure 5.4 contains an overview of the Version 1 Framework processes and figure 5.5 shows the processes used within the Definition and Planning phase for version 1 of the product.

Client	IZAZI Solutions
Timeframe	2003/06 – 2003/07
Number of people trained:	> 8
Project Sponsor	Jay Pather
Lead User	Brendon Smith

Table 5.1. Project Summary for Version 1 of Product.

5.1.3.3 Version 2

The second version of the product was built using the lessons learnt from the first version and using Microsoft FrontPage 2000, a WYSIWYG (what-you-see-is-what-you-get) type web development tool. It was also developed as a pilot, including a refinement of the body of research, including Kerzner's (2003) work on the subject for the first time. Three specialist project managers were involved in the reworking of the Framework: the author and Messrs. Pierre Kotze and Warren Morris. At the client's request, emphasis was placed on:

- Change management as part of project management; and
- Including Project Selection as part of the Framework.

The change component was subsequently removed (but may be included in later versions) and the project selection portion made optional in the later versions.

Client	Harmony Gold
Timeframe	2004/08 – 2004/10.
Number of people trained:	> 10
Project Sponsor	Yusuf Jardien
Lead Users	Pierre Kotze and Warren Morris

Table 5.2 Project Detail for Version 2 of Product.

Figure 5.6 shows the version 2 phase overview and figure 5.7 provides the overview of the Framework for the same version. Figure 5.8 contains the Framework high-level processes including the Project Selection processes which were dropped in version 3 of the product. Version 2 also contained a framework for change management as depicted in figure 5.9.

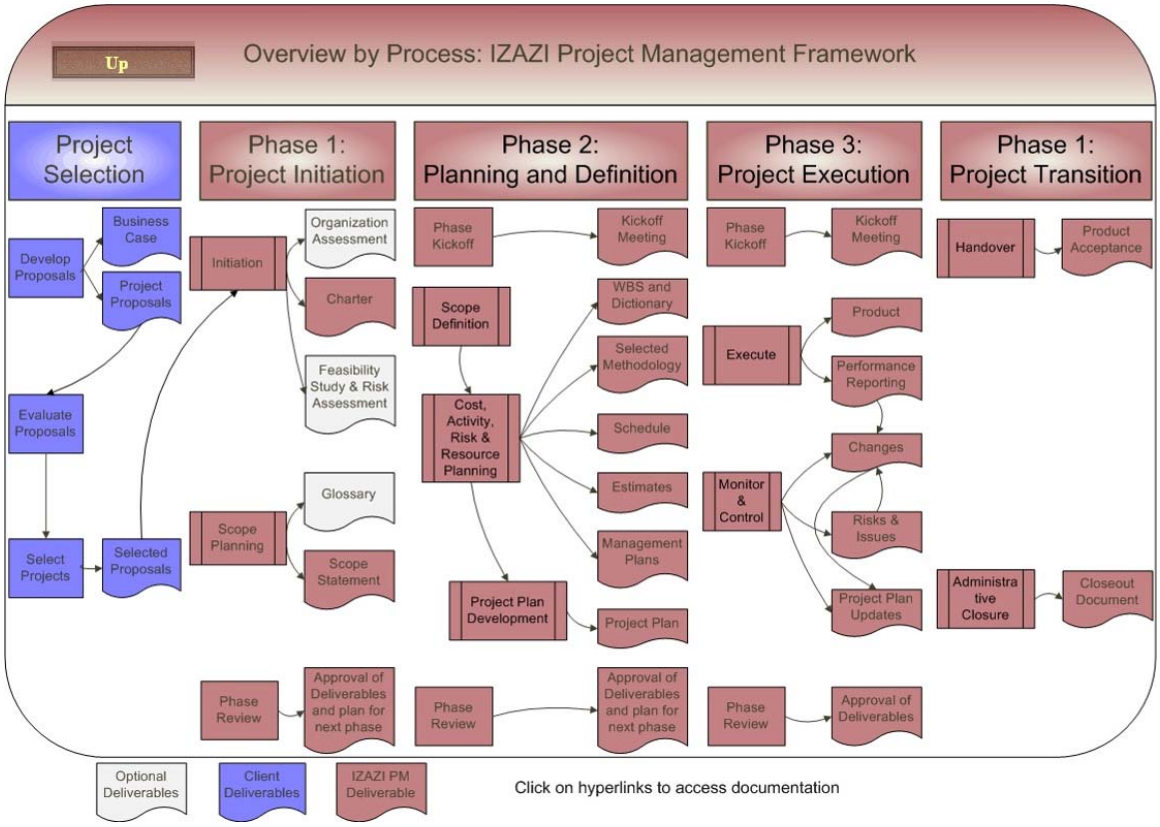


Figure 5.4. Version 1 Project Management Framework Process Overview.

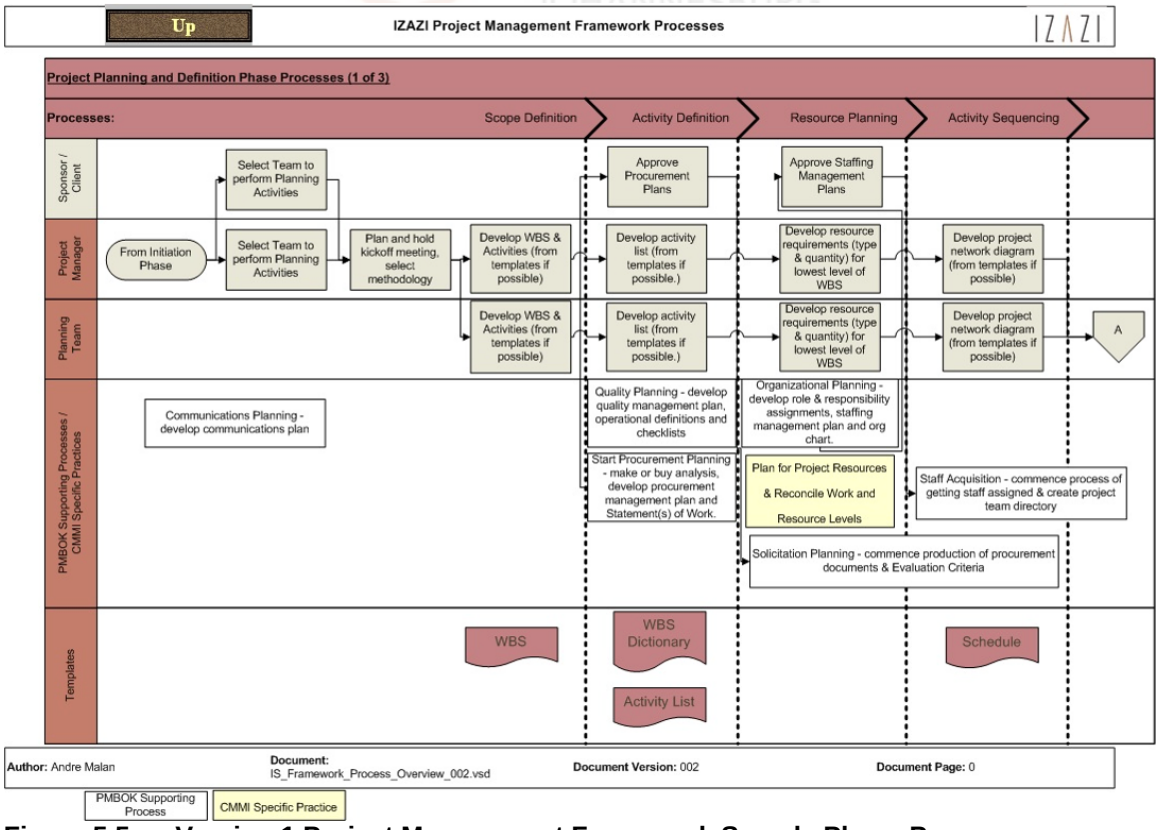


Figure 5.5. Version 1 Project Management Framework Sample Phase Processes.

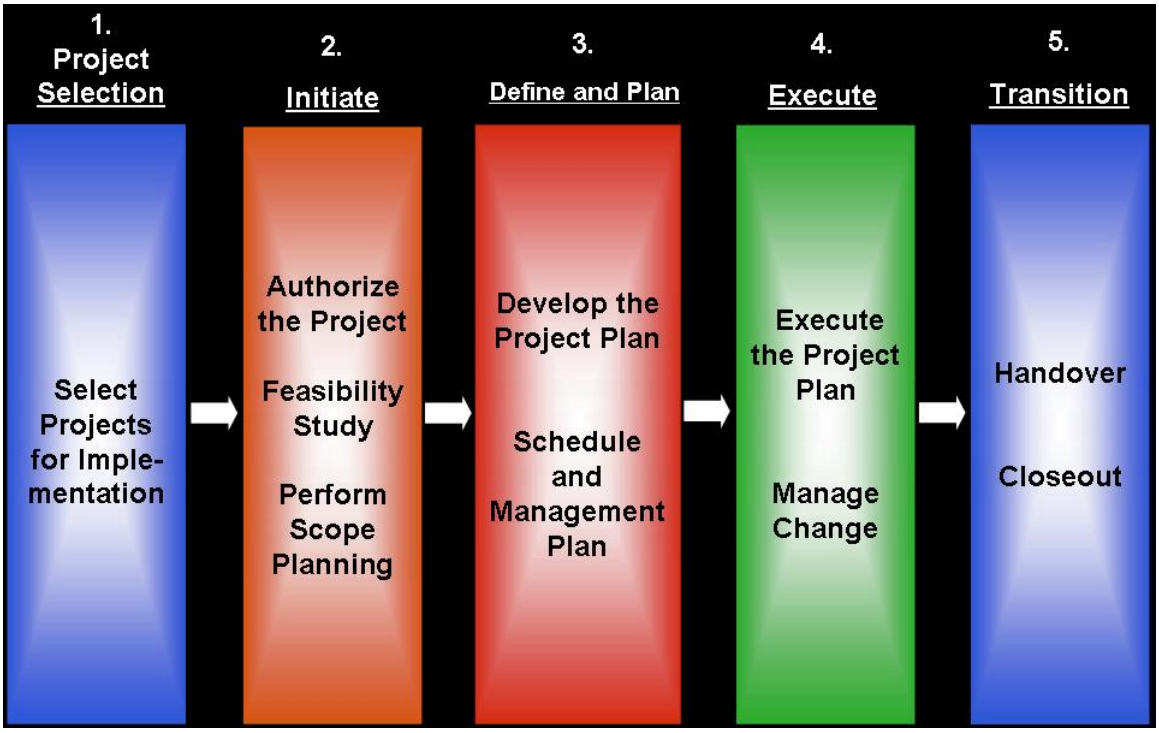


Figure 5.6. Version 2 Project Management Framework Phase Overview.

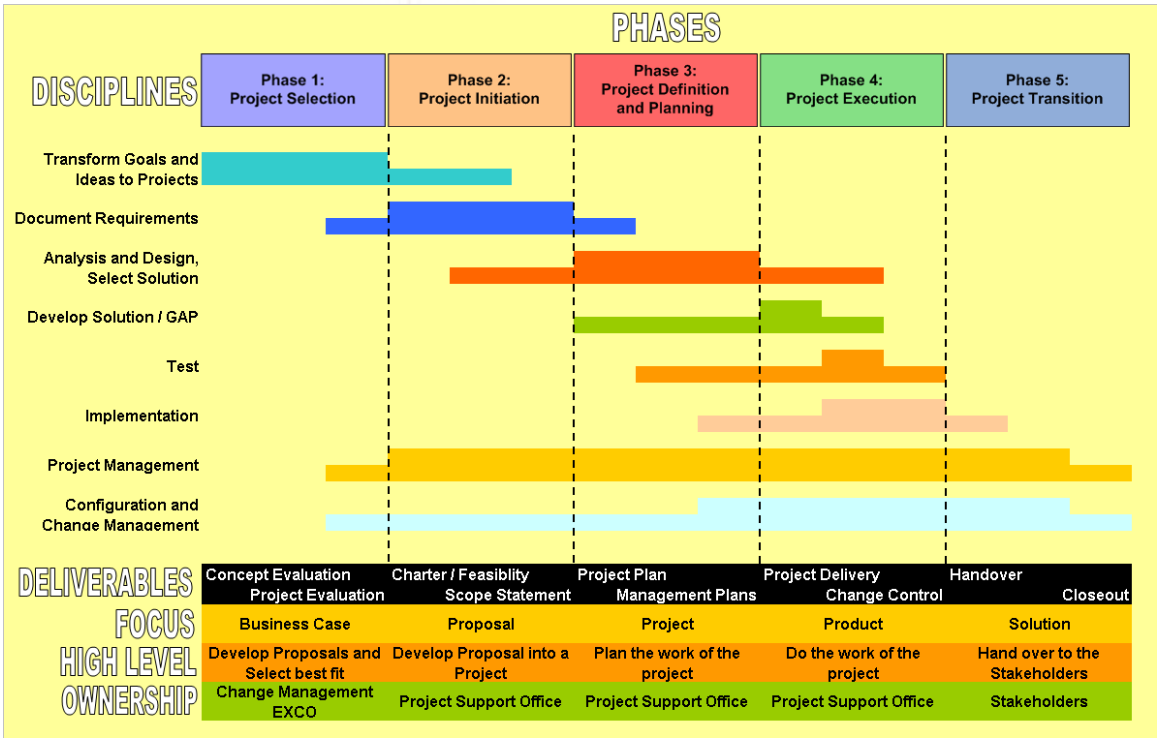


Figure 5.7. Version 2 Project Management Framework Overview.

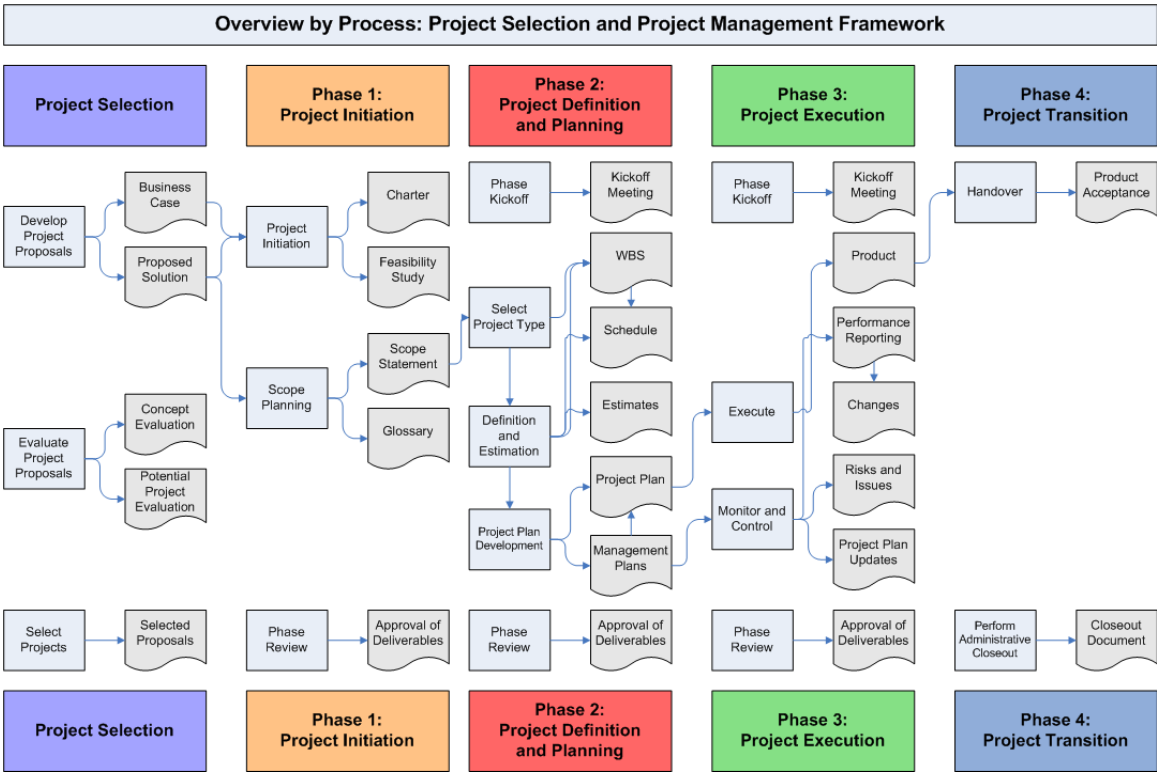


Figure 5.8. Version 2 Project Management Framework and Project Selection Processes.

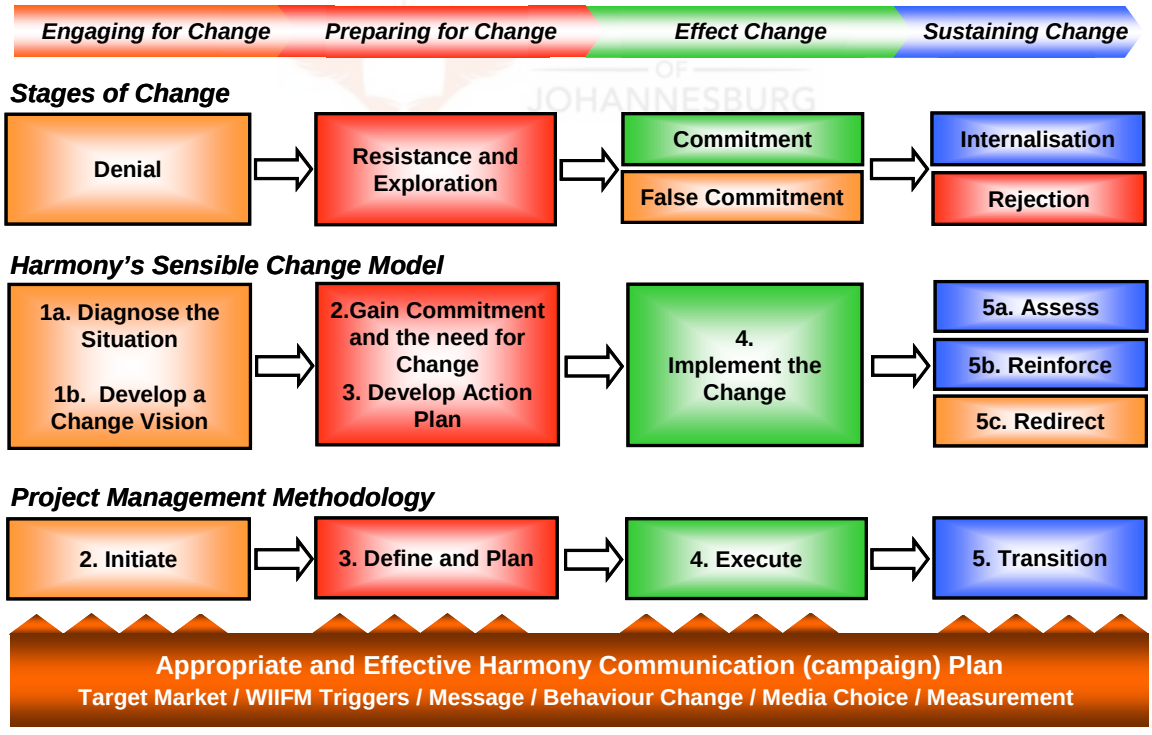


Figure 5.9. Version 2 PM Framework Change Management Overview.

5.1.3.4 Version 3

The third version was built to compete in the same space with two other products, (neither of which were accepted organization-wide) specifically for the IT division of this third pilot site.

The third iteration was developed by one specialist project manager but with input from at least 16 practitioners during a one-day review session and during the entire review period of over 2 months. At the client's request, the emphasis was placed on getting the basics right and thereby creating a solid foundation for their own further development in this regard. The most important change from Version 2 is that Project Selection was removed as being too controversial (it varies too much from client to client with many potential toes to step on.) It remains available as a value-add to the baseline product, but does not form part of the phase layout as it does not form part of the project manager's scope of work.

The implementation of the Project Management Framework at the third client site formed part of the rollout of a Project Support Office for their IT projects. The Framework was chosen over the two other competing commercial products and successfully implemented within a matter of weeks. The project was extended to assist with the development of further templates and support processes.

The key lesson learnt from the third pilot implementation is the importance of a process champion and high-level buy-in and enforcement of the process. The results of this lesson have been worked into the product implementation plan.

The baseline version was developed based on evaluation of Version 3; combining the lessons learnt from iterations one through three. The structure and content of the baseline Framework is discussed in chapter 6.

Client	South African Post Office: Banking and Retail: IT
Timeframe	2005/02 – 2005/05.
Number of people trained:	> 20
Project Sponsor	Domingos Dias
Lead Users	Japie van Pletzen and Yvonne Schröder

Table 5.3 Project Detail for Version 3 of Product.

5.2 Structure of the Framework

According to Housel and Bell (2001), knowledge spawners equip their organizations to confront change successfully. Examples are biomedical formulas, computer chip algorithms for faster computing, etc. Increasingly, this may involve a combination of human cognition and machine-based intelligence. They feel that any plan for knowledge management should *make provision for both direct human knowledge and indirect human knowledge, as mediated by machines*, which extend or enhance the powers of the mind. For this point of view, it

seemed appropriate to the author to utilize the field of knowledge management in defining the basic structure of the product (project management Framework.)

They also define the following four types of knowledge:

- *"Label knowledge* is the vast catalogue of names attached to the fauna and flora that make up the jungle of a particular organization;
- *Process knowledge* involves knowing how things work, even if one cannot name all components active within the process (i.e. label knowledge.) Business environments value process knowledge on the micro level – engineers who know how a heating system operates, for example – but often fail to recognize the importance of process at the macro level. This has occurred, and still occurs, in spite of nearly a decade of Business Process Reengineering that explicitly focused management attention on gaining knowledge about processes. *Knowledge management should pay attention to both the micro- and macro-levels of process knowledge*;
- *Skill knowledge* is knowing how to do something of value to the organization. Companies through job descriptions, training programs, performance evaluations and other means have long managed this level of knowledge devotedly. These skill sets become the basis of most hiring, and hence define the overall core competencies of the organization. The coming era requires a much more fluid view of skills knowledge, i.e. an employees ability to learn quickly and well is infinitely more valuable in software development than a more vocational skill; and
- *People knowledge*. It comprises all the insights, intuitions and relational information used to work with other people. Knowledge management brings people knowledge to visibility and to a position of prominence in a framework for understanding and using knowledge within the corporation.

Of these four, only label and process knowledge are addressed in the Framework as skill and people knowledge fall outside the scope of the current research. The way in which the product provides for direct human knowledge and indirect human knowledge, is by combining the label and process knowledge from the Body of Research in a way that graphically presents the user with utilizable information. This graphical user interface (GUI) is the "look and feel" with which the process and label knowledge, obtained in the body of research, is displayed to the end user.

Following Smyrk's (2002) lead, the project has been centred on the determined processes, ensuring that the process determines the system – not the other way around. The front-end of the chosen GUI is hypertext mark-up language (HTML) website and the structure of the Framework is based on a typical website layout:

- A Home page, containing information on the goals, basis and structure of the Framework, along with client specific notes that depend on the site at which it has been rolled out. It provides access to the Framework through the following links:
    - The News and Downloads page contains product or organizational news relating to the product and downloads that are new or not specifically phase related;
    - The Phases page contains a Framework Overview and access to each of the four phases, which in turn contain Phase objectives, essentials, downloads and discussions;
    - The Processes page contains the macro process and access to the micro processes and document templates as it relates to processes within the four phases; and
    - The Feedback, Content and Search pages containing such information as their names imply.

During an implementation of the product, the content is managed by the implementation team until such time as the website is given over to the client to manage.

Hensell (2004) noted that makers of web development products once assumed that content providers would use their products to update pages that had been created by their firms' web development teams. He noted that any movement toward spreading development tools throughout the organization "seemed to be evaporating." For this reason and because developers differ in their approach to web site creation, tools and maintenance, the complete web that make up the product is handed to the relevant persons, who may then take it into the organization's web development tools and manage it using the organization's standard web maintenance tools.

5.3 Framework Phases (Life Cycle Model.)

The Goals of the Framework are to:

- Simplify and facilitate project managers' access to a common set of PM processes and tools;
- Promote the usage of best practices for PM for all projects, both simple and complex;
- Increase the level of assured competence project managers bring to PM endeavours;
- Establish a commonality of process and standardization of terminology within PM; and
- Provide a common method of project progress tracking across the enterprise.

For the purpose of consistency in explaining the workings of the product, the following definitions are important.

5.3.1 Definitions

Framework: For the purpose of the current research, the author defines the Framework as that subset of the total project management processes that is independent of the type of project being implemented. Or, that part of the project lifecycle that is independent of the type of project being implemented. All delivery and development methodologies should fit into this Framework and all projects are to be delivered utilizing this Framework.

Methodology: For the purpose of the current research, the author defines a methodology as a body of practices, procedures, and rules used by those who work in a discipline (or, a set of working methods.) Methodologies should be a living set of entities, based on deemed international best practice that enforces firstly repeatability and eventually continuous improvement. Methodologies are typically used / contained within the logical boundaries of an appropriate framework.

IT Project: For the purpose of the current research, information technology project management (IT project management) relates to the project management of projects involving large-scale use of information technology and communications and information systems. Like all forms of project, an information technology project can be very small or large. Regardless of size, it is essential that good information technology project management processes are applied to an IT project. Project management in IT projects can be significantly more complex than other form of projects, particularly when the incorporation of large amounts of software requires the use of strong software engineering skills. Alternatively, IT project management is the process whereby a centralised authority (the project manager) manages project activities to meet the overall project goals and objectives for IT-based projects. IT projects are actually business projects that involve IT, not vice versa.

Context of the Definitions

Contextually, the Framework provides a standardized means of performing many different types of IT projects i.e. projects that use different methodologies.

5.3.2 Framework Phase Explanations

The PMBOK® Guide (2000) states that because of the uniqueness of each project, there is necessarily a degree of uncertainty. Performing organizations will usually divide each project into several project phases to improve management control and provide for links to the ongoing operations of the performing organization. Collectively, the project phases are

known as the project life cycle. Each project phase is marked by completion of one or more deliverables and is generally marked by a review of both key deliverables and project performance to date, to:

- Determine if the project should continue into its next phase; and
- Detect and correct errors cost effectively.

The Framework consists of four phases, as set out in table 5.4.

Phase Name	**Objectives**
Initiation Phase	• Authorize the project (develop the proposed project into a project.) • Assign ownership to a project manager. • Progressively elaborate and document the project work (project scope) that produces the product of the project.
Definition and Planning Phase	• Subdivide the project deliverables into smaller, more manageable components. • Develop estimates, make assignments and define baselines. • Plan the Project's work and management (select methodology and develop a project plan.)
Execution Phase	• Perform the work of the project. • Monitor and measure project performance • Manage changes in project
Transition Phase	• Hand projects' product over to Stakeholders • Close the project

Table 5.4 Framework Phase Objectives

During the **Initiation phase,** the project manager is appointed, receives a Charter from the sponsor, may perform a feasibility study (if not done during selection) and initiates the project.

The **Definition and Planning phase** determines the content of the Execution phase:

During the Definition and Planning Phase, a Project Plan is generated that contains the schedule and management plans that will be guide the Execution phase (this includes selecting the correct methodology.)

The **Execution phase** has as goal the delivery of the products / goals benefits that are agreed to during the Definition and Planning Phase.

I.e. this document provides a project framework consisting of four phases, but the project will need to use a delivery methodology (whether Systems Development Lifecycle, Process Re-engineering, etc) in the Execution Phase, that is applicable to the specific project needs.

During the **Transition phase**, responsibility for the project deliverables are handed to the organization and further projects / issues handed to the client / project office for consideration.

Figure 5.10 provides a graphical explanation of the paragraphs above. In this figure, the activities found in a schedule template are shown:

- Those with white background are for all projects all of the time; while
- Those with yellow background are determined by the project type (i.e. methodology specific.)

During the Definition and Planning, Execution and Transition phases, activities and tasks from the specific methodologies should be incorporated into the baseline Work Breakdown Structure (WBS) and Schedule.

Project Management Framework - Schedule Template		
1	Initiation Phase	
1.1	Project Manager Assigned	Project manager identified/assigned. In general, the project manager should be...
1.2	Develop Charter	A document issued by senior management that formally authorizes the...
1.3	Charter Signoff	
1.4	Develop Scope Statement	The scope statement provides a documented basis for making future...
1.5	Scope Statement Signoff	
1.6	Phase Review Meeting	include standard agenda here
1.7	Design next phase schedule	
2	Definition and Planning Phase	
2.1	Prepare for Phase Kickoff Meeting	
2.2	Phase Kickoff Meeting	
2.3	Preparation	
2.4	Scope definition	Subdividing the major deliverables into smaller, more manageable components...
2.5	Activity Definition	identifying the specific activities that must be performed...
2.6	Activity Sequencing	identifying and documenting interactivity dependencies....
2.7	Activity Duration Estimating	estimating the number of work periods that will be needed to complete individual activities....
2.8	Resource Planning	determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities....
2.9	Cost estimating	developing an approximation (estimate) of the costs of the resources required to complete project activities....
2.10	Schedule Development	analyzing activity sequences, activity durations, and resource requirements to create the project schedule....
2.11	Project Plan development	
2.12	Quality Managent Plan	identifying which quality standards are relevant to the project and determining how to satisfy them....
2.13	Procurement planning	determining what to procure, how much to procure, and when....
2.14	Risk Planning	Risk management plan, including: key risks, including constraints and assumptions, and planned responses and contingencies (where appropriate) for each....
2.15	Methodology Specific Planning Activities	Methodology
2.16	Combine all into plan	
2.17	Project Plan Signoff	
2.18	Phase Review Meeting	
2.19	Design next phase schedule	
3	Execution Phase	
3.1	Prepare for Phase Kickoff Meeting	
3.2	Phase Kickoff Meeting	
3.3	## Project Plan Execution	The tasks under this heading is developed during Define and Plan phase (activity = Schedule development.)
3.4	Activity 1	
3.5	Activity 2	
3.6	Activity 3	Methodology
3.7	Activity 4	
3.8	Activity n	
3.9	Phase Review Meeting	
3.10	Design next phase schedule	
4	Transition Phase	
4.1	Prepare for Phase Kickoff Meeting	generating, gathering, and disseminating information to formalize a phase or project completion....
4.2	Phase Kickoff Meeting	
4.3	Handover	
4.4	Administrative Closure	generating, gathering, and disseminating information to formalize a phase or project completion....
4.5	Project Review Meeting	
4.6	Methodology Specific Transition Activities	Methodology
4.7	status review meetings	Status review meetings. Status review meetings are regularly scheduled meetings...

Activities 2.4 to 2.16 determine activities 3.4 to 3.8

Figure 5.10. How Methodology Fits Into Framework

5.4 Framework Content

The content of the Framework varied from version to version, based on focus and client requirements. Table 5.5 summarizes the Framework content by version, indicating its growth at feature level.

Framework version	Features Implemented per version
Version 1. June 2004.	• Framework Definition; • Process Overview (Macro process) based on PMBOK® Guide; • Phase level (micro) processes based on PMBOK® Guide; • Addition of selected CMMI specific practices; • Template Creation Process; • Document Control Process; • Creation of templates based on micro processes (required, recommend and optional classification); • 4 Session Training module; and • Addressing project failure.
Version 2:	• Addition of Project Selection as integral part of Framework; • Addition of Earned Value Management; • Refinement of all processes and templates; • Kerzner overlay on PMBOK® Guide; and • Focus on Change Management as part of Framework.
Version 3:	• Removal of Project Selection as integral part of Framework; • Refinement of all processes and templates; • Addition of News and Downloads, Search and Feedback Sections; • Change in customisation per client site; • Addition of Project Registration Process; • Definition of project size and optional / mandatory options; and • Expansion of Training material.
Baseline 1:	• Refinement of all processes and templates; and • Ready for marketing.

Table 5.5. Framework Features Implemented per Version

5.5 Research Surveys

As part of the current research and in order to ensure a product development path that remains aligned to its clients, a research survey was performed among the users of the Frameworks at the various sites. Responses for 35 projects were received and all interviewing on this project has been conducted between 11 and 31 July 2006, at client sites, over the telephone and electronically via e-mail. As intimated by Wilson (1985), effective interviewing demands respondents who are cooperative. Due to the fact that almost all of the

respondents knew the author through training sessions for using the Framework, the author believes that a good degree of cooperation has been obtained.

Now, Busha and Harter (1980) define a population as “any set of persons or objects that possesses at least one common characteristic." For the current research, the sample universe (entire population) consists of those people who have used the Framework, either as project manager or as project sponsor. The author’s aim has been to complete a census study (100% of the population interviewed) but this proved difficult due to some people having left the employ of the pilot sites, prior to such research being made available to them. Over 80% of the entire population under consideration has been surveyed, which is in line with Mouton’s (2004) requirement for this type of research design. Simple sampling (all elements of the frame are treated equally and it is not subdivided or partitioned) as defined by Cochran (1977) has been employed due to the large percentage of the population surveyed. The form of sampling used has been convenience sampling, and as confirmed by Cochran (1977), it is the method most commonly employed in many practical situations.

The questionnaire used in the survey has been designed by the author and pre-tested against the most successful project sponsor using the Framework, to the author’s knowledge. This first step is in line with that recommended by Oppenheim (1966), whereby the pilot work is exploratory and involves unstructured interviews and talks with key informants. The question wording, sequencing and physical design (layout) has been finalized after the discussion noted above.

The research survey interviews were administered by the author. This method has the advantages as listed by Ornstein (1998), who found that the advantages of researcher administered interviews include:

- Fewer misunderstood questions and inappropriate responses;
- Fewer incomplete responses;
- Higher response rates; and
- Greater control over the environment that the survey is administered in.

The first question established the number of projects that the person completing the questionnaire has managed or sponsored using the Framework. The balance of the questions was answered by entering a value relating to the weightings as laid out below. Using this five-point scale, the mid-point, three, is considered to be a "natural indifference" point; i.e. if the respondent does NOT have a strong opinion.

- 1 = Strongly Agree;
- 2 = Agree;
- 3 = Neutral;

- 4 = Disagree; and
- 5 = Strongly Disagree.

Parten (1965) defines coding of data as the activities related to assigning a number or symbol to each answer in the research survey. Coding has been done in two places for the research surveys: (1) pre-coded on the schedules as discussed above and (2) by calculation of the totals for each question asked. Parten (1965) feels that the essential element of tabulation of data is summarization of results in the form of statistical table. The results of each answer have been aggregated to attain an average value over the total number of projects for which the survey has been done. The tabulation, due to relatively low number of surveys issued (less than 50) has been done electronically in a spreadsheet application. The results of the research survey are discussed in chapter 5.6, chapter 9.2 and Appendix C.

5.6 Some Important Lessons Learnt

By virtue of the three pilot implementations, the author has been able to understand some of the inner machinations of three disparate organizations (a financial services consulting house, a gold mine and the IT department for a retail and a banking environment.) With a degree of trepidation the author extracted some important lessons learnt about these sites, (and most of the other client sites he has worked at over the last 10 years) as being typical of the South African IT environment. Of the lessons learnt, some are more readily addressed than others. At the risk then, of generalising, the author (and confirmed by the research questionnaires as discussed in Chapter 9.2 and Appendix C) suggests that *the following two aspects are addressable problems in the South African IT project management arena*:

- Insufficient knowledge and technique in developing a WBS (essential for project planning); and
- Insufficient use of applicable project performance measurement techniques (such as Earned Value Management.)

These two issues were included in the research survey in order to determine the accuracy of the author's observations. The results of the research survey, included as Appendix C, showed that on average, these two issues were not well understood and used within the organizations (a value approaching 4 indicates disagreement.)

Section 3: Are the following aspects well understood and used within your organization?	
Sufficient knowledge and technique in developing a WBS from scratch?	3.74
Sufficient use of applicable project performance measurement techniques, such as EVM?	3.94

Table 5.6. Sample Result of Research Survey.

The reason why the author feels that these two issues, more than the potentially many others, are addressable is that:

- Both issues are well addressed within the PMBOK® Guide and like standards;
- Both are training issues that can be readily included within the Framework training modules; and
- Both form part of basic project management.

In order to provide the reader with a sense of how such issues are addressed within the Framework, the following two sections provide an explanation and the actual guides are included in Appendix C.

5.6.1 Developing a Work Breakdown Structure (WBS)

As Young (1999) stated, the WBS is a means of graphically presenting the work of the project in a readily understandable format. The document that addresses this need is presented to the user as a Work Guideline and is included in Appendix C. Its content is sourced from the PMBOK® Guide (2004) and Haugan's (2002) work in this regard. Haugan (2002) noted that there are tools, which include the work breakdown structure (WBS), network planning algorithms known as PERT, CPM and PDM, and project management software, which can all significantly improve the ability to develop effective plans and schedules, which in turn, is essential for excellence in project management. His work focuses on how to effectively create work breakdown structures.

In the context of the Framework, Scope Definition leads to the Preparation group of activities, which starts with WBS development and leads to Resource Planning, Cost Estimating, etc. Within the Framework, this guideline is used in tandem with the WBS Dictionary template and the MS Project Schedule template.

The "Developing the Work Breakdown Structure" work guideline contains a background discussion, presents the 100% rule, discusses work breakdown for products, services, results and cross cutting elements. The project management breakdown is presented as part of the standard framework schedule template. A discussion of the WBS dictionary is followed by a chapter on how to develop the WBS through scope definition and activity definition, providing a method for determining whether a work package should be further decomposed or not. The document concludes with a brief glossary of related terms to ensure standardisation of terminology in the environment. As noted by Young (1999), it should be kept in mind that the WBS itself does not show dependencies and is not time-based.

5.6.2 Performance Measurement using Earned Value Management

5.6.2.1 Importance of Earned Value Management (EVM)

Webb (2003) explains the importance of EVM along the following lines. If a project can be clearly seen as:

- The work to be done;
- The value associated with the work; and
- The order and duration of events,

it is possible to generate a time-phased schedule and a time-phased statement of the value to be created or the costs to be incurred (for planning purposes the costs and value can be treated as the same thing.)

He says that any project with a structured plan of work, a cost structure and a suitable data-gathering system can make use of EVM, but he warns that the approach is not equally suitable for all types of projects. In general, he says that EVM is most suited to projects that have most or all of the following characteristics:

- a clearly defined objective;
- a clearly perceived route to the goal;
- work taking place over an extended period of time;
- a high labour content;
- tasks of a creative nature;
- a formalized management structure; and
- cost and time limitations.

Its importance appears in a number of ways:

- early warning of a deteriorating situation creates an opportunity to do something about it before it is too late;
- accurate forecasting allows better decisions to be made about the course of the project;
- Accurate forecasting allows better decisions to be made about matters outside the project which may be influenced by the progress of the project; and
- An open and verifiable view of progress improves sponsor confidence.

Webb (2003) notes that EVM also assists by preventing "Rubber Baselining," when a contractor takes far-term budget and moves it into the current period, in an attempt to disguise cost problems. This approach tries to move budget, but without a corresponding value of work, to mask cost difficulties and is an indicator of a likely cost overrun condition.

As part of Project Integration Management, the PMBOK® Guide (2004) uses EVM as a technique for integrating the project's scope, schedule, and resources and to measure and report project performance from initiation to closeout. It appears as part of:

- Project Plan Development (all of the defined work must be planned, estimated and scheduled, and authorized with the use of detailed integrated management control plans sometimes called Control Account Plans, or CAPs, in the EVM process);
- Cost Control (an important part of cost control is to determine what is causing the variance and to decide if the variance requires corrective action); and
- Performance Reporting (here earned value analysis is seen as the most commonly used method of performance reporting.)

Webb (2003) notes that another name for EVM is integrated cost and schedule control, because it brings together a way of measuring achievement against both time and cost goals.

5.6.2.2 Using EVM

Performance measurement demands a planning, a monitoring and a data-gathering process. EVM compares **the amount of work that was planned**, *with what was actually earned* WITH WHAT WAS ACTUALLY SPENT, to determine if cost and schedule performance are as planned. This is the PMBOK® Guide definition and the author suggests that the reader re-reads this sentence until it makes sense, whereafter the rest of the paragraph should be easily understandable.

All EVM Control Account Plans (CAPs) must continuously measure project performance by relating three independent variables:

1. The Planned Value (PV), that portion of the approved cost estimate planned to be spent on the activity during a given period (previously called the Budgeted Costs for Work Scheduled [BCWS]), as compared against
2. The Earned Value (EV), the value of the work actually completed (previously called the Budgeted Costs for Work Performed [BCWP]), and to the
3. Actual Costs (AC) incurred to accomplish the Earned Value, in other words, the total of costs incurred in accomplishing work on the activity during a given period. This AC must correspond to whatever was budgeted for the PV and the EV, e. g. direct hours only, direct costs only, or all costs including indirect costs).

The relationship of Earned Value less Planned Value constitutes the Schedule Variance (SV):

- $SV = EV - PV$ (5.1)

The relationship of Earned Value less Actual Costs constitutes the Cost Variance (CV) for the project:

- $CV = EV - AC$ (5.2)

These two values, the CV and SV, can be converted to efficiency indicators to reflect the cost and schedule performance of any project.

- The cost performance index (CPI = EV/AC) is the most commonly used cost-efficiency indicator.
- The cumulative CPI (the sum of all individual EV budgets divided by the sum of all individual ACs) is widely used to forecast project costs at completion; &
- The schedule performance index (SPI = EV/PV) is sometimes used in conjunction with the CPI to forecast the project completion estimates.

The PMBOK® Guide (2004) notes that when the cumulative cost (value) associated with the project's activities are plotted against time, an S-shaped curve results (the steepness of the curve indicates the level of expenditure, being the steepest at about its centre.) This S curve results from the EVM template as supplied within the Framework.

5.6.2.3 Framework Application

The Framework provides an EVM Calculation template spreadsheet for calculation of the necessary performance reporting figures and a Project Performance Report document template that utilises and presents the performance figures to the stakeholders in a consistent manner.

5.7 Product Evaluation

Crawford (2004) states that three tests are critical in product innovation:

- The Concept Test (to determine if the intended user really needs the proposed item);
- The Product Use Test (to see if the item actually developed meets that need); and
- The Market Test (to see if one has an effective marketing plan.)

Of these three, the first two fall within the context of the current research. Concept testing is when the concept statement is presented to potential buyers or users for their reactions. In both cases where the concept has been presented to existing clients, they have reacted favourably to the extent that they allowed their environments to be used as pilot sites for the current product development. This meant that they believed in the concept to the extent that they were willing to commit resources to the refinement, training, utilization and eventual ownership of the product. It also implies that the product concept addresses known shortages at the client environments.

The product use test involves giving the new product to potential clients and users and asking them to use it for a time and report their reactions to it. The purposes of a use test are to:

- See if the item developed by the organization has the attributes prescribed for it;
- Learn whether it satisfies the market needs identified during the ideation process; and
- Disclose information about how and by whom the item is used.

The product use test was conducted at two pilot sites, first at Harmony Gold and thereafter at the South African Post Office's Retail and Banking: IT division. In both cases, the relevant sponsor signed off the project as that the product has been delivered, training has taken place and that the product was used in production. At both sites the product has been used in production for 18 and 12 months respectively.

5.8 Conclusion

In developing this product, such that it meets the requirements documented within the Pre-Technical Specification, the author's desire has been to focus on a model that demonstrates how the component processes of business, project and information technology management integrate. For this reason both the PMBOK® Guide (2000) processes and CMMI (2002) practices were to be included and interwoven within the product. However, due to the clear need for a focus on project management basics, the resultant product versions have instead focused on a model that establishes such basics through project management processes, document templates, checklists, guidelines, tools and training. This focus was achieved by raising the focus on the PMBOK® Guide (2000) processes and not placing additional focus on CMMI (2002) process areas.

Through iteration and successful Use Testing at two client sites, a version that is ready for marketing has resulted over a (longer than desired) period of time. The baseline product is the result of a third iteration of the development and evaluation cycle, packaged to be marketed and rolled out at client sites. The baseline Project Management Framework is presented in chapter 6.

Charles Franklin Kettering is credited by Simanek (2001) with saying that: "Every honest researcher I know admits he's just a professional amateur. He is doing whatever he is doing for the first time. That makes him an amateur. He has sense enough to know that he's going to have a lot of trouble, so that makes him a professional." The author, by his own admission an amateur during the first implementation, appears then to be working his way towards becoming a professional: The current research has shown that each project, regardless of similarity of the product being rolled out, remains challenging and essentially different from the previous one.

Sbagliando s'impara.

6 A Baseline Project Management Framework

The product innovation road travelled so far has been to compile a body of research, determining the requirements for a Pre-Technical Specification and to iteratively design, develop and evaluate a framework that satisfies this said specification. Three pilots were rolled out: a throwaway version and two client versions. Evaluation of the third pilot has led to the current version of the product: a baseline version of the Project Management Framework, applicable to the South African IT environment. The product has taken the form of a web-enabled project management process, accessible via Internet or intranet with the option of local installation on a client personal computer.

This chapter presents the Framework as a summary of the work documented so far, within a context that allows the reader to understand:

1. The product scope in terms of those portions of the ANSI standards that it is built upon;
2. How the two standards interrelate in the product; and
3. What the components of the implemented product are.

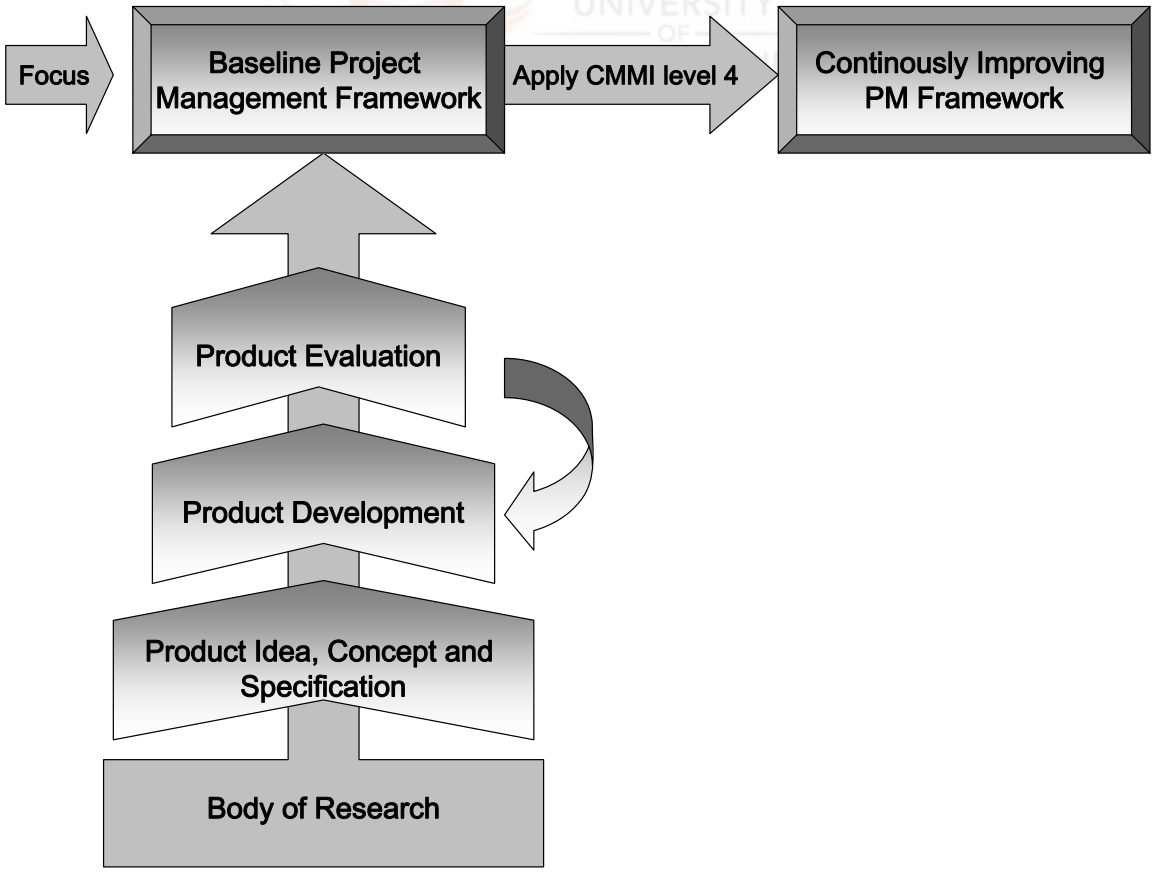


Figure 6.1. Chapter Focus in Product Innovation Approach.

6.1 Introduction

Afuah (1998) says that an innovator faces three kinds of uncertainty:

- Technological;
- Market; and
- Business.

The author believes that the technological and business uncertainties were largely addressed by the innovation process's containment of pilot implementations and the careful composition of the body of research. The product presented in this chapter has withstood the initial market uncertainties through the pilot process and the final test will be the commercial saleability at the conclusion of the last pilot project.

Retief (2004) found that when asked to think of project management software, most people (including project managers,) thought of a Gantt chart. The author is in sincere agreement that using a Gantt chart makes project planning, execution and controlling much easier. However, without the correct process being followed the Gantt chart could be quite useless (as Hammer (1996) noted, this is a process domain.) The software product that the author presents is not in competition with the typical software tools that project managers use (word processors, spreadsheets, scheduling software and even the new generation Project Portfolio Management [PPM] tools.) Instead, the Project Management Framework aims to empower the project manager to do more with what he already has, by providing a product that addresses the needs of project managers in the South African IT industry. It does this by:

1. Simplifying and facilitating the project managers' access to a common set of project management processes, tools and templates;
2. Providing focus on those processes that will prevent emergency situations from arising;
3. Establishing a commonality of process and standardization of terminology within project management;
4. Promoting the usage of best practices for project management for all projects, both simple and complex;
5. Providing a common method of project progress tracking across the enterprise;
6. Providing a common foundation for the management of all projects above a certain size, across the enterprise; and
7. Increasing the level of assured competence project managers bring to project management endeavours.

6.2 Product Scope

In terms of the Y model shown in Figure 6.2 and presented by van Zyl (2000), the system boundaries may be presented in a System Diagram. The system diagram, as depicted in Figure 6.3, is the highest level of abstraction, from whence the Use Case, Class Diagram (system structure) and Activity Diagrams (system behaviour) are derived. The latter types of diagram are not presented as part of current research, but a list of Use Case diagrams are given to provide the reader with an overview of product functionality from a process point of view. A use case must always deliver some value to an actor, the value being what the actor wants from the system and is always drawn from the actor's perspective. The reader unfamiliar with the Unified Modelling Language (UML) may think of the black box concept, where the actor puts something into the black box and gets a result out. In almost all cases, for this system, the actor is the project manager who is using the system. There are some processes reserved for a super user and these are indicated as such.

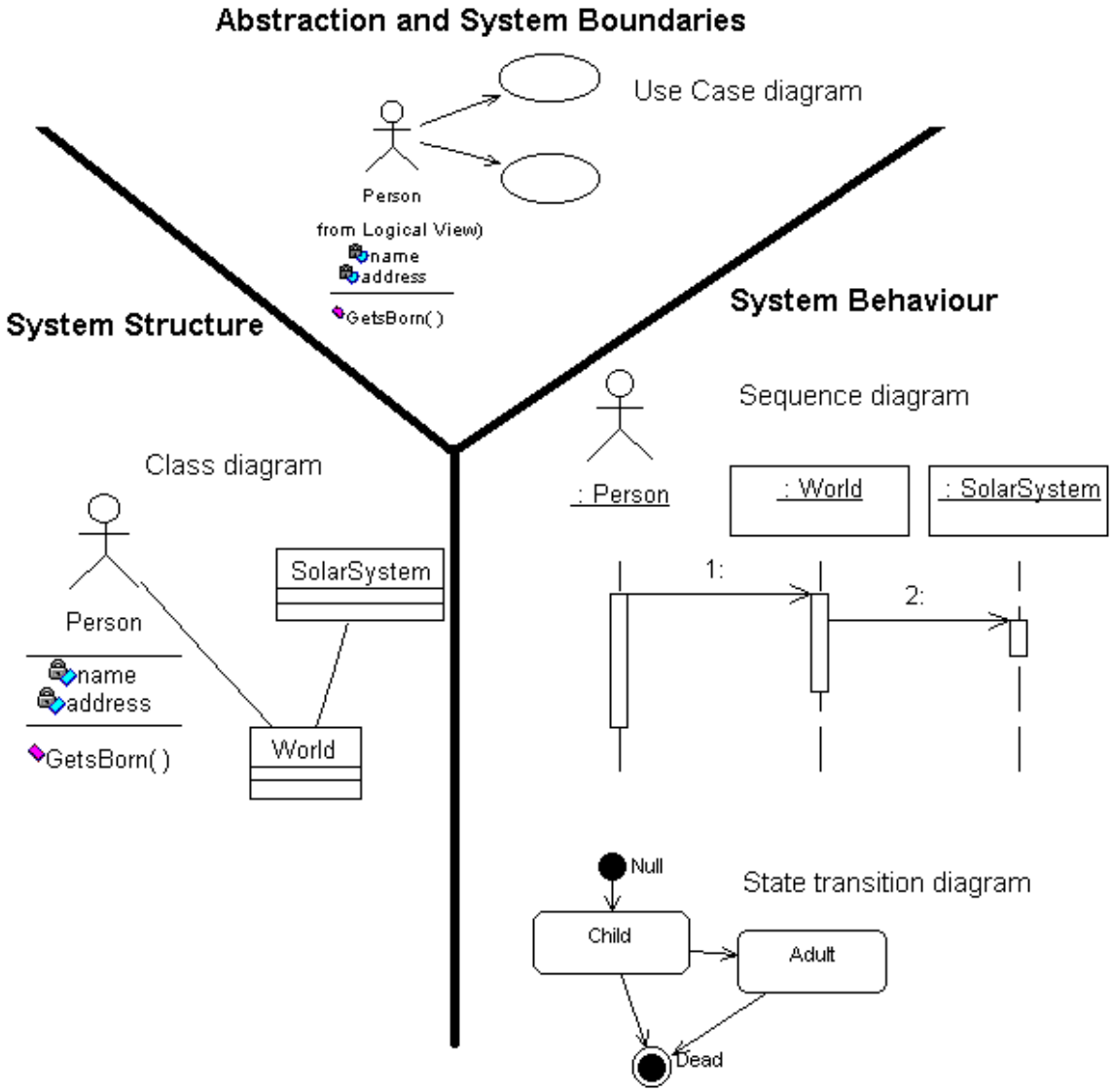


Figure 6.2. The Y Model Concept, van Zyl and Walker (2000).

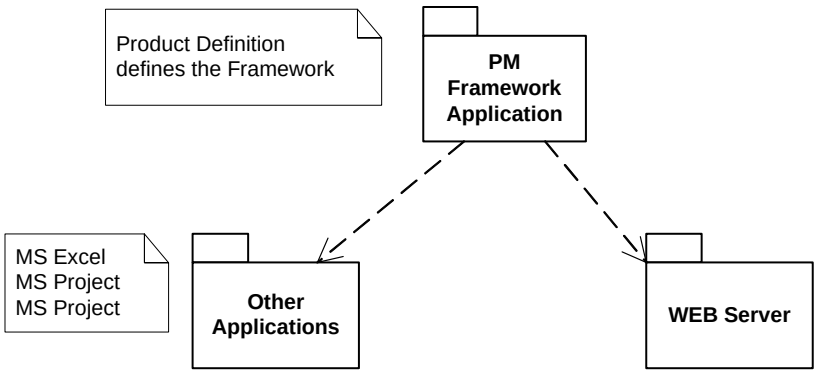


Figure 6.3. System Diagram for the Project Management Framework.

In a Use Case diagram, Actors are external entities to the system which is being modelled, but who participate in the story of the use case. Actors are identified by the role they play. The use case describes the events of the actor, bearing in mind that an event is to complete a process. Use cases are always described with a verb. The product Use Case List is as follows:

- Download guidelines for navigating the process;
- View phase overview;
- View phase detail;
- View macro processes for the Framework;
- View micro processes for the Framework;
- View tools to assist with key tasks / processes;
- Download templates per phase;
- Download general templates;
- View compatible software versions;
- Register a project;
- Provide feedback to webmaster;
- Perform search;
- View content;
- View news relating to the product;
- Review process for developing further templates (for the super user);
- Develop further templates (for the super user);

The above list is not exhaustive and some detail may change per implementation of the Framework due to a client requirement identified in the Product Definition.

6.3 PMBOK® Guide Processes Covered in the Framework

One document could not contain the entire project management body of knowledge, hence the concept of a "Guide" with a primary purpose of identifying and describing that subset of the PMBOK® (2000) that is generally accepted. This may be construed as implying that the knowledge and practices described are applicable to most projects most of the time, and that there is widespread consensus about their value and usefulness. The processes may be grouped within 9 knowledge areas or within the 5 process groups of Initiating, Planning, Executing, Monitoring & Controlling and Closing.

In determining a phased approach that would:

- apply to most (if not all) IT projects in South Africa most (if not all) of the time; and
- focus on basic project management,

the author and the lead users (over time) gradually agreed that 4 phases should be used (by including monitoring and controlling processes in the other phases, as applicable.) The four phases use the names of the remaining process groups for clarity's sake and focus on those processes within the process groups. It was also gradually agreed that the project management deliverables without which it was not worth continuing are the Charter, scope statement, project plan (NOT just the schedule), risk and issues register, change requests, performance reports and closeout document. To some extent then, the development of the Framework happened by specifically excluding activities that are not project-type independent and furthermore by including those processes required to generate the identified deliverables.

In moving from the 2000 edition to the Third edition, the authors of the PMBOK® Guide (2000 and 2004) have decided to do away with the classification of "core" and facilitating processes. However, because the current research started before the third edition's release, these were used by the author as a starting point. They are:

- Initiation – authorizing the project or phase;
- Scope Planning – developing a written scope statement as the basis for future project decisions;
- Scope definition – subdividing the major project deliverables into smaller, more manageable components;
- Activity Definition - identifying the specific activities that must be performed to produce the various project deliverables;
- Activity Sequencing – identifying and documenting interactivity dependencies
- Activity Duration Estimating – estimating the number of work periods that will be needed to complete individual activities.
- Schedule development – analysing activity sequences, activity durations, and resource requirements to create the project schedule;

- Risk Management Planning - deciding how to approach and plan for risk management in a project;
- Resource Planning - determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities;
- Cost Estimating - developing an approximation (estimate) of the costs of the resources required to complete project activities;
- Cost Budgeting – allocating the overall cost estimate to individual work activities;
- Project plan Development - taking the results of other planning processes and putting them into a consistent, coherent document;
- Project Plan Execution – carrying out the project plan by performing the activities included therein.
- Performance Reporting – collecting and disseminating performance information. This includes status reporting, progress measurement, and forecasting;
- Integrated Change Control – coordinating changes across the entire project;
- Contract Closeout – completion and settlement of the contract, including resolution of any open items; and
- Administrative Closure – generating, gathering, and disseminating information to formalize phase or project completion, including evaluating the project and compiling the lessons learned for use in planning future projects or phases.

The 22 facilitating processes are used as and when required, but have not formally been made a part of the baseline version of the product, as the Guide clearly states: “not all of the processes will be needed on all projects, and not all of the interactions will apply to all projects.” This approach is in line with the requirement to provide basic project management processes, to be used as foundation for future development.

6.4 CMMI Process Areas Covered in the Framework

A CMMI (2002) model provides a structured way to do process improvement. It can help by setting process improvement goals and priorities, providing guidance for establishing quality processes and it provides a yardstick for assessing current practices. The basic (level 2) Project Management *process areas* are Project Planning, Project Monitoring and Control, and Supplier Agreement Management. In tailoring the CMMI model to suit the needs of the application, the first two have been included in the baseline version of the Framework. As an example, the manner in which the CMMI Project Planning process area is addressed within the Framework will be considered.

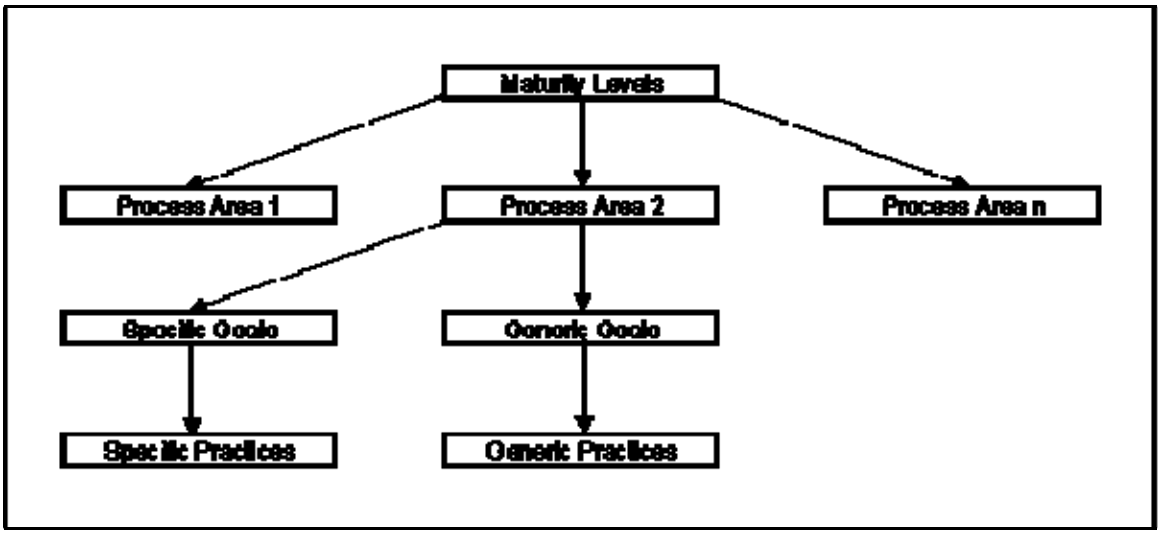


Figure 6.4. A Simplified View of CMMI Model Components.

6.4.1 Project Planning

The CMMI Project Planning process area involves the following:

- Developing the project plan
- Interacting with stakeholders appropriately
- Getting commitment to the plan
- Maintaining the plan

Planning begins with requirements that define the product and project. Planning includes estimating the attributes of the work products and tasks, determining the resources needed, negotiating commitments, producing a schedule, and identifying and analyzing project risks. Iterating through these activities may be necessary to establish the project plan. The project plan provides the basis for performing and controlling the project's activities that address the commitments with the project's customer.

The project plan will usually need to be revised as the project progresses to address changes in requirements and commitments, inaccurate estimates, corrective actions, and process changes. Specific practices describing both planning and re-planning are contained in this process area. The term "project plan" is used throughout the generic and specific practices in this process area to refer to the overall plan for controlling the project.

Project Planning Specific Goals

SG 1 Establish Estimates: Estimates of project planning parameters are established and maintained.

- SP 1. 1-1 Estimate the Scope of the Project
- SP 1. 2-1 Establish Estimates of Work Product and Task Attributes
- SP 1. 3-1 Define Project Life Cycle

- SP 1. 4-1 Determine Estimates of Effort and Cost

SG 2 Develop a Project Plan: A project plan is established and maintained as the basis for managing the project.

- SP 2. 1-1 Establish the Budget and Schedule
- SP 2. 2-1 Identify Project Risks
- SP 2. 3-1 Plan for Data Management
- SP 2. 4-1 Plan for Project Resources
- SP 2. 5-1 Plan for Needed Knowledge and Skills
- SP 2. 6-1 Plan Stakeholder Involvement
- SP 2. 7-1 Establish the Project Plan

SG 3 Obtain Commitment to the Plan: Commitments to the project plan are established and maintained.

- SP 3. 1-1 Review Plans that Affect the Project
- SP 3. 2-1 Reconcile Work and Resource Levels
- SP 3. 3-1 Obtain Plan Commitment

Project Planning Generic Goals

The continuous representation uses the generic goals to organize the generic practices. The generic practices provide institutionalisation to ensure that the processes associated with the process area will be effective, repeatable, and lasting. The reader should take note that the generic goals and practices are applied to the Framework and not the client organization. If it were to be applied to the client organization it would require a process improvement initiative, not an implementation of the product under discussion.

In table 6.1, SG means “specific goal” and “SP means “specific practice.” In the Addressed column, Y means it has been addressed as part of the PMBOK® Guide processes & “Added” means it has been added specifically as part of addressing CMMI process areas. An explanation of the way in which the CMMI and PMBOK® Guide standards were implemented appears elsewhere in this chapter.

SG	SP	Description	Addressed in Framework	Work Products	Addressed
1		Establish Estimates			
	1. 1	Estimate the Scope of the Project	The establishment of a top-level work breakdown structure (WBS) to estimate the scope of the project is done in the Planning and Definition Phase as part of the Scope Definition process. The Activity List is generated in the same phase as part of the Activity Definition process. The Identification of work products (or components of work products) that will be externally acquired is performed as part of Procurement planning, which is done in parallel to Activity Definition. Outstanding: Identify work products that will be reused. This was included in WBS development process.	WBS, Activity List & Descriptions of all WBS elements contained in the schedule, maintained in MS Project.	Added
	1. 2	Establish Estimates of Work Product and Task Attributes	Work Product estimation is done for Project Management elements in the WBS by the Project Manager, based on expert judgement and templates. For product / service / result elements in the WBS, estimating is included in the methodology and is therefore excluded.		Y

SG	SP	Description	Addressed in Framework	Work Products	Addressed
	1. 3	Define Project Life Cycle	The Project Management Framework provides an overall, re-usable and flexible life cycle model for the project as a whole. The detail of the product / service / results lifecycle is included in the methodology and is therefore excluded.	Framework phases and forcing the project manager to choose / develop a methodology over the phases.	Y
	1. 4	Determine Estimates of Effort and Cost	Estimates of the project effort and cost for the work products and tasks are determined during the Resource Planning, Activity Duration Estimating and Cost Estimating processes.	Basis of Estimates (rationale) Project resource estimates Project cost estimates	Y
2		Develop a Project Plan			
	2. 1	Establish the Budget and Schedule	The project's budget is developed during the Cost Budgeting process and the schedule is developed during the Schedule Development process.	Cost baseline Project Schedules (incl. milestones and dependencies.)	Y
	2. 2	Identify Project Risks	Risks are identified, qualified and quantified during the Risk Management Planning, Risk Identification, Qualitative Risk Analysis, Quantified Risk Analysis and Risk Response Planning processes.	Risks and triggers Risk impacts and probability. Prioritized risks	Y
	2. 3	Plan for Data Management	Currently not catered for. Included in Project Plan template.	P122 of CMMI Staged	Added
	2. 4	Plan for Project	WBS work packages and task dictionary contained in project		Added

SG	SP	Description	Addressed in Framework	Work Products	Addressed
		Resources	schedule. Only done for staffing currently, should be expanded to include labour, machinery/equipment, materials, and methods. Added to project plan template.		
	2. 5	Plan for Needed Knowledge and Skills	Resource requirements for lowest level of WBS is developed during the Resource Planning process. The Staffing Management Plan is developed as part of Organizational Planning. Planning for procurement of external staff is done as part of Solicitation Planning.	Inventory of Skills requirements Staffing Management Plan	Y
	2. 6	Plan Stakeholder Involvement	Was not explicitly done. Added to Organizational Assessment Finalized and also added to Project Plan.	Stakeholder involvement plan	Added
	2. 7	Establish the Project Plan	The development of an overall project plan is performed within the Project Plan Development process, including all required management plans	Overall Project Plan	Y
3		Obtain Commitment to the Plan			
	3. 1	Review Plans that Affect the Project	Added to Project Plan Development process and added to minutes template. Work review of plans into review meeting template and	Record of the reviews of plans that affect the project	Added

SG	SP	Description	Addressed in Framework	Work Products	Addressed
			minutes template – Do 2 things: (1) add process to review meeting template and add item to regular minutes template that allows noting of review / acceptance of plans.		
	3. 2	Reconcile Work and Resource Levels	Reconcile any differences between the estimates and the available resources. Reconciliation is typically accomplished by lowering or deferring technical performance requirements, negotiating more resources, finding ways to increase productivity, outsourcing, adjusting the staff skill mix, or revising all plans that affect the project or schedules. Added to Resource Planning process	Revised methods and corresponding estimating parameters (e. g. , better tools, use of off-the-shelf components) Renegotiated budgets Revised schedules Revised requirements list Renegotiated stakeholder agreements	Added
	3. 3	Obtain Plan Commitment	Commitment to the plan is obtained during Project Plan Development process, where the Sponsor and other relevant stakeholders are expected to sign the baseline project plan prior to the commencement of the Execution Phase.	Documented requests for commitments Documented commitments	Y

Table 6.1. CMMI Project Planning Process Area As Addressed Within the Framework

6.5 Applying the CMMI in the PMBOK® Guide Context

The PMBOK® Guide (2000) focuses on a project and provides process definitions to organizations in all disciplines (from construction to events organization to software implementations.) It is an ANSI standard in the form of a guide whereas the CMMI (2002) is a standard in the form of a specification. The latter extends to multiple projects and products, providing preventative definitions to specific disciplines.

Interestingly, PMBOK® Guide (2000) defines a project manager simply as "An individual responsible for managing a project." The CMMI (2002) goes much further and defines it as "the role with total business responsibility for an entire project; the individual who directs, controls, administers, and regulates a project . . . [and] is the individual ultimately responsible to the end user."

Because the CMMI extends to a wider target than project management, the author's view has been to apply the PMBOK® Guide within the context of levels 2 and 3 of the CMMI (focus on project management and process standardization respectively.) In chapter 6.5.1, the Project Management process areas at level 2 are shown with their direct mappings to PMBOK® Guide processes followed by an application example. In chapter 8 the PMBOK® Guide (2000) will be applied to the Process Management process areas of level 3. It will then be seen that tailoring the PMBOK® Guide (2000) forms part of the CMMI level 3 activities.

6.5.1 PMBOK® Guide Support Of The CMMI Level 2 Practices

At CMMI level 1, processes are performed, i.e. they satisfy all the specific goals of the process area. At level 2, processes are managed, i.e. planned, measured against the plan and corrective action taken when necessary. In choosing example process areas from level 2, the most applicable were those contained under Project Management process areas (listed in table 6. 2) The basic (level 2) Project Management process areas are Project Planning, Project Monitoring and Control, and Supplier Agreement Management.

Process Area	Maturity Level
Project Planning	2
Project Monitoring and Control	2
Supplier Agreement Management	2
Integrated Project Management for IPPD (or Integrated Project Management)	3

Process Area	Maturity Level
Risk Management	3
Integrated Teaming	3
Integrated Supplier Management	3
Quantitative Project Management	4

Table 6.2. Project Management Process Areas and Maturity Levels

Two specific process areas will be used to show possible mappings from the PMBOK® Guide processes to CMMI specific practices. It should be noted that these are just examples of an approach; for instance, the PMBOK® Guide processes belonging to the Project Procurement Management knowledge area would contain many such mappings to the CMMI Supplier Agreement Management process area, which process area is not discussed as part of this document.

Initially, the temptation may be to document processes by specifying all items in great detail as if to satisfy an auditing process. However, the CMMI (200) is clear that one should not build rigidity into a documented process if the business needs it to be flexible.

6.5.1.1 Project Planning

The CMMI Project Planning process area aims to establish and maintain plans that define project activities and has the following specific goals:

- SG 1 Establish Estimates (Estimates of project planning parameters are established and maintained.);
- SG 2 Develop a Project Plan; and
- SG 3 Obtain Commitment to the Plan (Commitments to the project plan are established and maintained)

The Project Planning process area involves the following: the development of the project plan, appropriate interaction with stakeholders, obtaining commitment to the plan and then maintaining the plan. For Project Planning, a mapping of CMMI specific practices to PMBOK® Guide (2000) processes may be summarized in the table 6.3.

Specific Goal	CMMI Specific Practice	PMBOK® Guide Processes
SG1: Establish Estimates	SP 1. 1 Estimate the Scope of the Project	5. 1 Initiation, 5. 2 Scope Planning and 5. 3 Scope Definition

Specific Goal	CMMI Specific Practice	PMBOK® Guide Processes
	SP 1. 4 Determine Estimates of Effort and Cost	6. 1 Activity Definition, 6. 3 Activity Duration Estimating, 7. 1 Resource Planning and 7. 2 Cost Estimating.
SG2: Develop a Project Plan	SP 2. 1-1: Establish and maintain the budget & schedule	11. 1 Risk Management Planning, 7. 3 Cost Budgeting and 6. 4 Schedule Development
	SP 2. 2-1: Identify and analyze risks	11. 1 Risk Management Planning, 11. 2 Risk Identification, 11. 3 Qualitative Risk Analysis, 11. 4 Quantitative Risk Analysis and 11. 5 Risk Response Planning.
	SP 2. 3-1: Plan for the management of project data	4. 2 Project Plan Execution and 4. 3 Integrated Change Control.
	SP 2. 4-1: Plan for resources	7. 1 Resource Planning
	SP 2. 5-1: Plan for knowledge and skills needed to perform the project	7. 1 Resource Planning and 9. 1 Organizational Planning
	SP 2. 6-1: Plan the involvement of the stakeholders	10. 1 Communications Planning
	SP 2. 7-1: Establish and maintain project plans	4. 1 Project Plan Development
SG3: Obtain Commitment to the Plan	SP 3. 3-1: Obtain commitment from stakeholders	4. 1 Project Plan Development and 10. 1 Communications Planning.

Table 6.3. Project Planning Specific Practices Map to PMBOK® Guide Processes

When reading the two standards according to the mapping above it immediately becomes clear that there is overlap in terms of project planning: the emphasis on the Work Breakdown Structure (WBS,) focus on obtaining the necessary knowledge and skills, identification and involvement of stakeholders and estimation techniques. In terms of outputs and typical work products the similarity is extended: tasks, WBS, risks, work packages, attribute estimates and project life-cycle are all common to both standards, even if the terminology is slightly different. Using the tools and techniques and outputs as laid out in the PMBOK® Guide as input is adequate for the purposes of level 2 process areas. The major differences here are that the CMMI is aimed at certain disciplines whereas the PMBOK® Guide is not.

6.5.1.2 Project Monitoring And Control

The purpose of the Project Monitoring and Control process area is to provide an understanding of the project's progress so that appropriate corrective actions can be taken if required. This will be necessary when actual status deviates significantly from the expected values. Project Monitoring and Control has the following specific goals:

- SG 1 Monitor Project Against Plan
- SG 2 Manage Corrective Action to Closure

A mapping of CMMI specific practices to PMBOK® Guide Processes may then be summarized as in table 6.4.

Specific Goal	CMMI Specific Practice	**PMBOK® Guide Processes**
SG1: Monitor Project Against Plan	SP 1.1 Monitor Project Planning Parameters	4.3 Integrated Change Control 10.3 Performance Reporting 4.2 Project Plan Execution
	SP 1.2 Monitor Commitments	6.5 Schedule Control 4.2 Project Plan Execution
	SP 1.3 Monitor Project Risks	11.6 Risk Monitoring and Control
	SP 1.4 Monitor Data Management	8.3 Quality Control
	SP 1.5 Monitor Stakeholder Involvement	9.3 Team Development
	SP 1.6 Conduct Progress Reviews	10.3 Performance Reporting 4.2 Project Plan Execution
	SP 1.7 Conduct Milestone Reviews	10.3 Performance Reporting
SG2: Manage Corrective Action to Closure	SP 2.1 Analyze Issues	4.2 Project Plan Execution
	SP 2.2 Take Corrective Action	11.6 Risk Monitoring and Control
	SP 2.3 Manage Corrective Action	11.6 Risk Monitoring and Control

Table 6.4. Project Monitoring and Control Specific Practices map to PMBOK® Guide Processes.

6.5.1.3 An Example

Using SP 2.7.1 from table 6.3, Establish and Maintain Project Plans, it can be seen that the typical work product that would result from this practice is an overall project plan. The SEI (2002) elaboration for this practice is:

"A documented plan that addresses all relevant planning items is necessary to achieve the mutual understanding, commitment, and performance of individuals, groups, and

organizations that must execute or support the plans. The plan generated for the project defines all aspects of the effort, tying together in a logical manner: project lifecycle considerations; technical and management tasks; budgets and schedules; milestones; data management, risk identification, resource and skill requirements; and stakeholder identification and interaction. Infrastructure descriptions include responsibility and authority relationships for project staff, management, and support organizations. ”

The way in which the PMBOK® Guide organizes its major processes are by an elaboration, inputs, tools & techniques and outputs. For Project Plan Development:

Inputs	Tools & Techniques	Outputs
Other planning outputs	Project Planning Methodology	Project Plan
Historical Information	Stakeholder skills and knowledge	Supporting Detail
Organizational Policies	Project Management Information System	
Constraints	Earned Value Management (EVM)	
Assumptions		

Table 6.5. Project Plan Development Inputs, Tools, Techniques and Outputs

The PMBOK® Guide (2004) provides a process whereby a consolidated project plan is developed, providing a formal, approved document used to manage project execution. Depending on the process modelling convention and the availability of organizational templates, this process can then be very quickly documented and prepared for institutionalisation. The introduction of EVM also brings a new dimension to project planning in the CMMI. EVM is a tool to integrate a project’s technical, schedule and cost objectives. As Solomon (2002) notes, it does not address risk or QA but does have the following key principles that relate to the CMMI:

- Break down and assign work scope to control project objectives.
- Integrate project work objectives into performance measurement baselines for:
  - Work scope,
  - Schedule and
  - Cost.
- Objectively assess accomplishments at work package level.

EVM is discussed in greater detail in chapter 5.

6.5.1.4 Alternative Practices

The SEI (2002) defines an alternative practice as “A practice that is a substitute for one or more generic or specific practices contained in CMMI models that achieves an equivalent effect toward satisfying the generic or specific goal associated with model practices. Alternative practices are not necessarily one-for-one replacements for the generic or specific practices. ” The reader should note that specifically, the PMBOK® Guide processes should not be seen as one-for-one replacements for the specific practices that they are mapped to.

6.6 Product Components

The PM Framework has taken the form of a web-enabled project management process, containing phases, processes, roles and activities, templates, training material, checklists and work guidelines. The entire product cannot be discussed in any detail due to space constraints, but the author hopes to introduce sample processes, templates and guidelines in this chapter and have included such samples as appendices to the research document.

6.6.1 Sample Phase Discussion

The Framework consists of four phases: Project Initiation, Definition and Planning, Project Execution and Project Transition. Each phase is presented as component processes, but also in terms of:

- Phase Objectives;
- Phase Essentials; and a
- Phase Discussion.

As a sample, the Project Initiation Phase consists primarily of two PMBOK® Guide processes, namely Initiation and Scope Planning, of which the first is discussed in the “Sample Process Discussion” section. The Initiation Phase follows from the Project Selection process (which is excluded from the Framework, but shown to provide a contextual view and also to ensure that the PM understands that such a process is very much a requirement.)

The Framework macro process view provides the context of the phases, indicating process inclusion / exclusions and mandatory / optional deliverables. For the Initiation Phase:

6.6.1.1 Initiation Phase Objectives

The primary objectives of the Initiation Phase are:

- Perform an organizational assessment;
- Authorize the project (develop the proposed project into a project);
- Assign ownership to a project manager; and

- Progressively elaborate and document the project work (project scope) that produces the product of the project.

6.6.1.2 Phase Essentials

The two essential phase documents are the Charter and the Scope Statement. The Framework provides templates, including checklists and per-paragraph instructions for completing these two documents, ready for signoff.

6.6.1.3 Phase Discussion

The project Charter formally authorizes a project. It mandates the project manager to commence scope-planning activities. Changes to the Charter after signoff will require invocation of the change management process. Signoff of the Charter document allows the project manager to perform a Feasibility Study (if required) and develop a baseline Scope Statement. The Scope Statement provides a documented basis for making future project decisions and for confirming or developing common understanding of project scope among the stakeholders.

The project manager should provide evidence to the project office that the following issues have been satisfactorily addressed in the Initiation phase.

- **Organizational Assessment:** This activity may be done over the course of the phase and not as a standalone activity at the beginning of the phase. The outcome is a strategy for project and change management within the project environment.
- **Business sponsorship:** Every project should have a nominated business sponsor with a stake in the outcome. This role must be documented, along with the nature of the involvement. The sponsor must be a signatory required for the project to gain approval, to denote his or her acceptance of the role. Should the sponsor move on, there must be a process to find a replacement and to review the future of the project.
- **Project Manager assigned:** A Project Manager must be uniquely identified and assigned to the project, whether full or part time.
- **Feasibility Study:** Ensure the project feasibility is communicated to sponsor if this was not done during Project Selection.
- **Charter and Scope Statement:** It includes the Project Boundaries, Project Statement, Constraints, Assumptions and Dependencies, Stakeholders, Initial Risks, Deliverables and Objectives and a plan for managing the project scope.
- **Requirements:** There should be a concise vision and specification of requirements and deliverables.

- **Planning:** The Project Manager should be able to convey to the Sponsor an estimate of how long the Definition and Planning Phase will take, as well as a Rough Order of Magnitude estimate for the Execution Phase.

6.6.2 Sample Process Discussion

As previously discussed, the Framework contains a macro process and several micro-processes, mainly sourced from the PMBOK® Guide (2000) core processes. The author chose the first process as a random sample for illustration purposes.

The Project Initiation process falls within the Initiation phase, contains hyperlinks to two templates and is followed by the Scope Planning process. This process is based on the PMBOK® Guide (2000) Initiation process but placed within the Framework context as follows:

- It follows from the Project Selection process;
- It includes the organizational assessment template as an option; and
- It includes the Charter as a mandatory document if its scope is not covered in a contract or similar document.

The major deviation from the PMBOK® Guide process is the inclusion of the Organizational Assessment. This sub-process and template was included based on the requirements of the Lead Users and the author, based on a need to gauge the client organization in order to develop a suitable strategy for the specific client on a per-project basis. It is an optional deliverable but one that can assist the PM by providing insight into the environment within which the project is being performed.

6.6.3 Sample templates Discussion

The Framework contains over 20 basic project management templates and it is therefore not feasible to discuss all of these as part of the current research. The author chose the first two templates in the Framework as a sample for discussion purposes. The Organizational Assessment template is recommended for use at the commencement of the project and for review at each stage gate, if change management forms a large part of the project. The Charter is a mandatory template. Both templates are included in Appendix C.

6.6.3.1 The Organizational Assessment

This document is a template in the form of a work guideline, resulting in a table of assessment results which the project manager uses to help him manage the change brought about by the project. It contains some theoretical background and guides the user to plan the management of the project, by documenting:

- The reason for change;

- Identified Type D stakeholders and some advice on how to handle them;
- Organizational Culture and how best to operate within the environment;
- Appointed Change Manager; and
- Audience and Actions per phase to ensure that change happens as planned.

6.6.3.2 The Charter

This document is a template in the form of a contract that must be agreed to and signed by the project manager and sponsor to authorise the project. It contains background information, guidelines and checklists to ensure that all sections are completed appropriately. The major content is derived from the PMBOK® Guide and consists of:

- Project Background / Business Drivers;
- Boundaries (in terms of Deliverables, Lifecycle, Data & sources, organization and major functionality);
- The Project Statement;
- Constraints, Assumptions and Dependencies.
    - Mandatory Dependencies;
    - Discretionary Dependencies; and
    - External Dependencies.

In the case where the project is performed under contract, the Charter becomes superfluous. The project manager should still satisfy himself (and the PMO) that the content of the Charter is sufficiently covered in the contract and if not, the required content should be moved to the Scope Statement.

6.7 Conclusion

A baseline version of the Framework, ready for implementation at client sites and for the continuous improvement efforts to be based upon, has been presented as:

- The components of the standards it has been derived from;
- An interrelation between the standards; and
- Samples of these components.

At client level, the Framework consists of a completed Product Definition, rolled out as a web-enabled project management process, accessible via Internet or intranet with the option of local installation on a client personal computer. The rolled-out product consists of phases, processes, roles and activities, templates, training material, checklists and work guidelines, samples of which have been presented in this chapter. The following chapters document the process of client site implementation and achieving continuous improvement.

Simanek (2001) credits Henri Poincare with stating that: “Science is facts; just as houses are made of stone, so is science made of facts; but a pile of stones is not a house, and a collection of facts is not necessarily science." The author is therefore relieved to report that the facts accumulated in chapter 3 of the current research, through the innovation process of chapters 4 and 5, has been structured in a way which appears to make sense to himself and, more importantly, to others. Chapter 7 contains the practicalities of implementing the product as client sites.

O mangiar questa minestra o saltar questa finestra.

7 Product Implementation

Having presented a baseline version of the Project Management Framework in a previous chapter, this chapter presents an approach for implementing the product at client sites. This approach is based on the approach used in developing the baseline version of the product from a Pre-Technical Specification, but in this case a client-version of the document, called a Requirements Specification, underlies the client-specific rollout of the product.

This chapter furthermore presents the methodology used to roll out the product at a client site as an application of the PM Framework. It is done through a per-phase discussion of the methodology, attempting to expose:

- The process focus of the methodology; and
- The ease with which the Framework allows for customization.

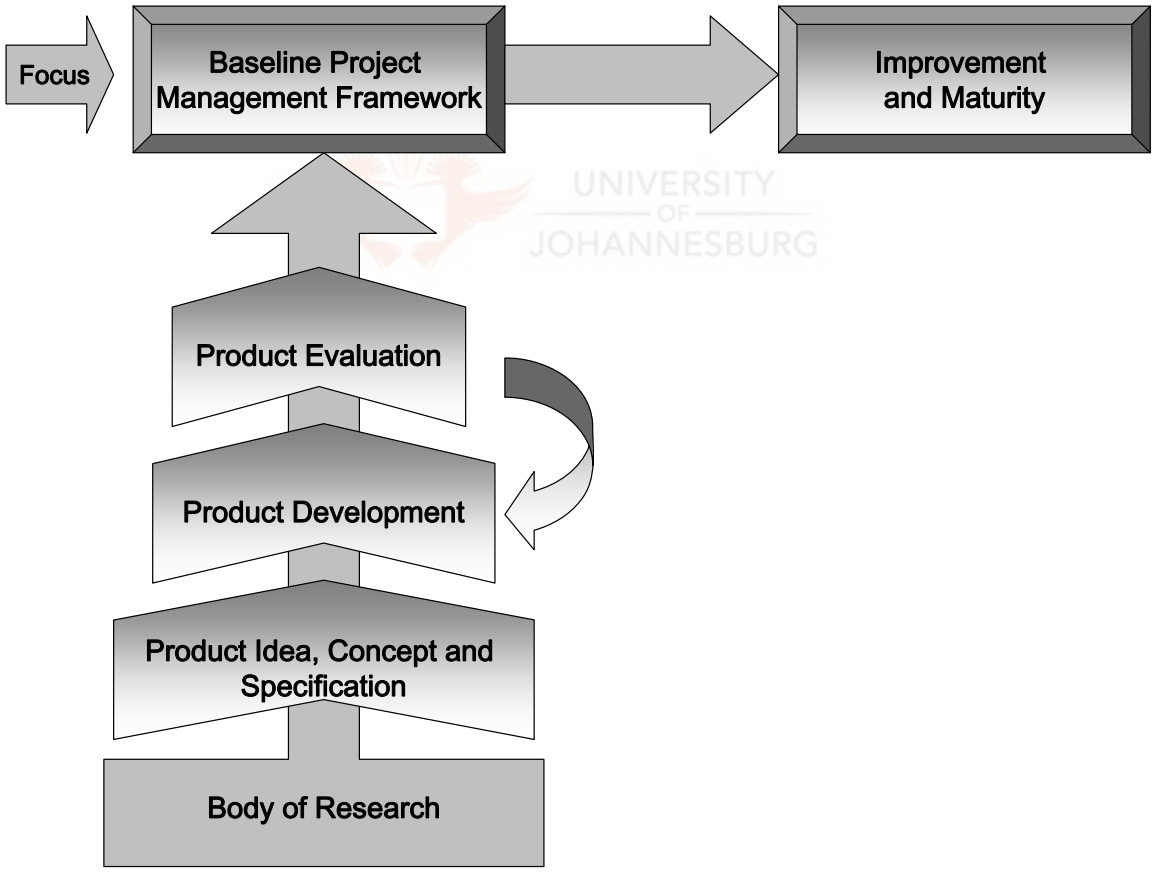


Figure 7.1. Chapter Focus in Product Innovation Process.

During the course of this chapter, the author hopes to convey the high-level flow of the process as depicted in Table 7.1. This table is very much a simplification of the process, but useful in that it focuses on the interaction between the sponsor and the project manager.

Initiation Phase	Project Manager	Plan the planning
	Sponsor	Authorise planning to commence
Definition and Planning	Project Manager	Planning happens and a plan is presented
	Sponsor	Authorise the plan
Execution Phase	Project Manager	Execute and manage change
	Sponsor	Authorise changes and completion
Transition Phase	Project Manager	Close out the project
	Sponsor	Authorise that the project is now closed out

Table 7.1. High-level Phase View of Framework

As per Graham and Englund (1997), the successful, complete senior manager has as at least these characteristics. He or she:

- Understands the need for better PM;
- Understands that the role of upper management is critical in developing successful PM practices throughout the enterprise; and
- Acts with other upper managers as a team of change agents to create an environment that supports PM in the organization.

Implementing the Framework in an environment where the sponsor does not have this approach will require the PM to carefully manage this relationship to ensure that the benefits offered by the Framework are realized. Documenting a process and enforcing it are two different matters; if the sponsor does not ensure that project managers follow the Framework processes it may as well not be rolled out.

7.1 Introduction

Burnett (1998) says that, complementary to the use of a process or method, is the appointment of a skilled and competent PM, an "important individual who is essential to the success of any project." Drucker (2001) likewise, says that the shift to a knowledge society puts the person in the centre. The educated person matters and the knowledge society must have at its core the concept of the educated person. Morris (1998) also notes that the skills demanded of top project managers are now much more than what has been traditionally required. The author, taking his lead from such fine scholars as these aforementioned, would like to stress that the Framework does not replace skill or experience, but that it can and does raise the level of assured competence from zero to ensuring that the basic project management processes are followed.

The marketing activities that lead up to the implementation is not part of the current research but suffice to say that great care is taken by the marketing department to ensure that the potential client understands where the product is positioned, what to expect and what not to expect. Specifically, the client must understand that the product implementation entails analysis to compile a Requirements Specification, which is used to configure a customized version of the product that matches the specification. The client also must agree to provide commitment in the form of resources (specifically a sponsor and a process champion) and high-level project support to ensure success of the endeavour.

Smyrk (2002) proposed that a major cause of IT related project failure is the use of software engineering-based methodologies for projects whose objective is actually enhanced process performance. The author has taken a leaf from his book and biased the implementation away from "user" thinking but rather towards the process agent, while retaining the word user in order to avoid the change management implications of the term "process agent." Smyrk's (2002) thinking is that staff who facilitate and execute business processes are *agents* of those processes. To him, the user role is incidental and subordinate to the process agent role. Based on his thinking, the product is implemented as a Business Process Improvement (BPI) project, where

- The goal is to realize target business outcomes – rather than a "solution";
- The core deliverable is new processes – rather than an application.

Quintas (2002) acknowledges that 'knowledge management' is an aspiration more than a reality for the majority of organizations. To the author, the Framework provides a method of managing an organization's PM knowledge and may be the first step towards an organization's recognition of the value associated with the management and presentment of knowledge relating to a certain functional area. To this end, the author prefers linking the Framework via access from a company intranet if one is available. This approach is confirmed by Brown and Duguid (2002) who feel that knowledge management should be more than the protection of intellectual property but also the ready presentment thereof, in an effort to weave all organizational knowledge together.

7.2 Phase Discussions

The implementation methodology is designed to be the first project implemented via the PM Framework at a particular client site. The sponsor for the implementation project will therefore experience the process as it is to be used in production, and the project is used as a training model for the user community. In other words, during a Framework Implementation project the Framework is applied, along with the processes and documentation that makes up the methodology peculiar to the implementation. A specific methodology does exist for this

type of Implementation, but it is “redeveloped” at each site as part of the training, in hand with the user community.

During Project Initiation, the tasks that must be done over and above those contained in the Framework are the Organizational Assessment and Preparation for Apprenticeship activities. The former is mandatory for this type of project and may already be largely done by the marketing department. The same is true for the Charter as part of client education, where it’s known that the sponsor very seldom prepares the Charter. The Framework phases are depicted in Figure 7.1 and, apart from Marketing, make up the sub-headings for the balance of the chapter.

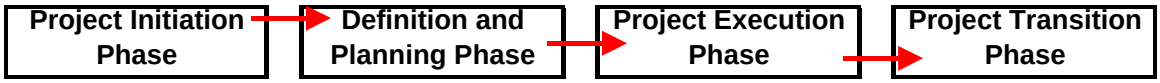


Figure 7.2. Phases in the Framework.

7.2.1 Marketing (Pre-project)

Over and above what the author considers standard marketing activities and in order to lessen risk, the marketer is also expected to:

- Commence documentation of the Charter (drivers, stakeholder, users);
- Commence the organizational assessment (culture and receptiveness to change);
- Commence high-level Requirements Specification information gathering (such as environmental readiness, whether apprenticing is required, etc.)

The author favours this approach because in his experience it has created a smooth handover, accompanied by non-anecdotal information that will help the project manager achieve the project goals.

7.2.2 Project Initiation

The Framework implementation project follows from the marketing lifecycle and the information that the marketing department typically provides to the project manager is as follows:

- Information relating to Charter, scope and organizational assessment;
- Perceived client project management maturity; and
- Assurance that the benefits that the client can expect are understood and agreed to.

In figure 7.2 the methodology specific activities are indicated in maroon (the Framework activities are indicated in black.) Of specific interest is the option of apprenticing, whereby the client makes a resource available to shadow the implementing PM for the course of the project. Typically, the resource thus allocated becomes the product owner in the production environment.

Chronologically, the first activity is when the marketing department hands the project over, including the information relating to Charter and Organizational Assessment compilation. The PM starts engaging the sponsor and other stakeholders and completes the necessary documentation for signoff. More often than not, some of the Definition and Planning activities may begin in parallel to the Initiation Phase activities. The reason for this is that certain stakeholders may not be available at short notice while some others, who are involved in answering questions required in the Definition and Planning Phase, often are.

To the author, the Initiation phase provides an outline for the planning to commence. In the case of a Framework Implementation, the key questions are known in advance and asking them early provides the PM with a good basis for estimates in order to manage stakeholder expectations.

ID	Predecessors	% Complete	Task Name	Duration	Start	Finish	Resource Initials
1		0%	**## Project Name**	**59.5 days**	**Mon 06/04/03**	**Fri 06/06/23**	
2		0%	**Initiation Phase**	**5.75 days**	**Mon 06/04/03**	**Mon 06/04/10**	
3		0%	Project Manager Assigned	0 days	Mon 06/04/03	Mon 06/04/03	PS
4	9	0%	Develop / complete Charter	1 day	Mon 06/04/03	Tue 06/04/04	PM
5	4	0%	Charter Signoff	0 days	Tue 06/04/04	Tue 06/04/04	PM,PS
6	9	0%	Develop Scope Statement	2 days	Mon 06/04/03	Wed 06/04/05	PM
7	6	0%	Scope Statement Signoff	0 days	Wed 06/04/05	Wed 06/04/05	PM,PS
8		0%	**Methodology Specific Initiation Activities**	**5.25 days**	**Mon 06/04/03**	**Mon 06/04/10**	
9	3SS	0%	Handover meeting: marketing to PM	0.5 days	Mon 06/04/03	Mon 06/04/03	PM,Marke
10	9	0%	Perform / complete Organizational Assessment	2 days	Mon 06/04/03	Wed 06/04/05	PM
11	6SS	0%	Preparation for Apprenticeship activities	1 day	Mon 06/04/03	Tue 06/04/04	PM
12	10FS+2 days	0%	Information Session with user Community	0.5 days	Fri 06/04/07	Fri 06/04/07	PM
13	12	0%	Estimation session based on knowledge to date	0.25 days	Mon 06/04/10	Mon 06/04/10	PM,Analyst
14	15	0%	Phase Review Meeting	0.25 days	Mon 06/04/10	Mon 06/04/10	PM,PS
15	8	0%	Design next phase schedule	0.25 days	Mon 06/04/10	Mon 06/04/10	PM
16	**7**	**0%**	**Definition and Planning Phase**	**15 days**	**Wed 06/04/05**	**Wed 06/04/26**	
39	**36**	**0%**	**Execution Phase**	**33 days**	**Wed 06/04/26**	**Mon 06/06/12**	
60		**0%**	**Transition Phase**	**9 days**	**Mon 06/06/12**	**Fri 06/06/23**	
70		**0%**	**Other (including progress meetings)**	**0.5 days**	**Mon 06/04/03**	**Mon 06/04/03**	

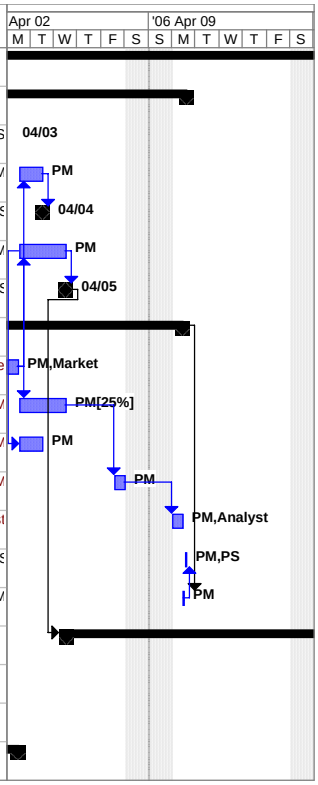


Figure 7.3. Project Initiation Phase High Level Schedule.

According to the implementation methodology developed for the PM Framework, during the first meeting between the PM and the sponsor, they:

- Confirm Charter content and sign the document off, confirming:
  - Project (Framework) phases and current status.
  - Project Background / Business Drivers,
  - Boundaries

    - The Project Statement
    - Constraints, Assumptions And Dependencies
- Confirm project scope:
    - Product features to be delivered;
    - Project deliverables (what will be delivered and when – at a high level.);
    - Project Objectives in terms of cost, schedule and quality (specifically, the target process outcomes);
    - How the scope will be managed;
    - Confirm stakeholders;
    - Identify end users, super users and potential lead users; and
    - Date for first information session (whether before or after scope signoff.)

In this phase, much effort is made to ensure that stakeholders know that the implementation team is targeting process outcomes and to this end it is included under the project objectives. This is done by documenting:

- How the (process) improvement will be measured?
- What are the target levels of the (process) improvement?
- By when will these improvements be realized?
- Who is to be held accountable for the target improvements?

7.2.3 Definition and Planning

Effectively, the first phase obtains commitment from the sponsor to begin planning, in that the PM must be able to produce an estimate for the duration of the Definition and Planning Phase, as well as a Rough Order of Magnitude estimate for the Execution Phase. This is an example of Rolling Wave Planning as defined by Wideman (2004), where schedule (and cost) planning is developed for the near term and general allocations are made for the out periods. Detail is developed for the out periods as information becomes available to do so.

Each client that the product gets rolled out to must have a version of the Pre-Technical Requirements completed for it. This client-specific version of the document is known as the Requirements Specification and forms the basis of the Planning activities. The document contains Project Drivers, Constraints, Functional Requirements, Non-functional Requirements and Issues, which may be translated into a WBS. From the WBS the balance of the planning activities (Activity Definition, Activity Resource Estimation, Cost Estimation, Risk Management Planning, etc) are performed and presented to the sponsor as a coherent document containing all the necessary plans (including a time phased schedule and budget.)

The basic Framework is augmented by value added services and products, the in- or exclusion of which largely determines the time and cost for rolling the product out. These

include reports development, a project selection model, a template creation process, basic document management systems, documentation standards, etc. Client branding is a standard feature of every implementation, the requirements of which are included in the Requirements Specification. Figure 7.4 shows the high level activities performed within this phase.

ID	Predecessors	% Complete	Task Name	Duration	Start	Finish	Resource Initials
1		0%	**## Project Name**	**59.5 days**	**Mon 06/04/03**	**Fri 06/06/23**	
2		0%	**Initiation Phase**	**5.75 days**	**Mon 06/04/03**	**Mon 06/04/10**	
16	**7**	0%	**Definition and Planning Phase**	**15 days**	**Wed 06/04/05**	**Wed 06/04/26**	
17		0%	Prepare for Phase Kickoff Meeting	0.5 days	Wed 06/04/05	Wed 06/04/05	
18	17	0%	Phase Kickoff Meeting	0.5 days	Thu 06/04/06	Thu 06/04/06	
19		0%	**Preparation**	**2.5 days**	**Fri 06/04/14**	**Tue 06/04/18**	
27	**19**	0%	**Project Plan development**	**3.5 days**	**Wed 06/04/19**	**Mon 06/04/24**	
32		0%	**## Methodology Specific Planning Activities**	**10 days**	**Thu 06/04/06**	**Thu 06/04/20**	
33	18	0%	Complete Requirements Specification	5 days	Thu 06/04/06	Thu 06/04/13	Analyst
34	33FF	0%	Workshops with User Community	1 day	Fri 06/04/14	Fri 06/04/14	,PM,SP,Use
35	33FS+5 days	0%	Req Spec Signoff	0 days	Thu 06/04/20	Thu 06/04/20	
36	27FF+2 days	0%	Project Plan Signoff	0 days	Wed 06/04/26	Wed 06/04/26	
37	27	0%	Phase Review Meeting	0.5 days	Mon 06/04/24	Mon 06/04/24	
38	27	0%	Design next phase schedule	1 day	Mon 06/04/24	Tue 06/04/25	
39	**36**	0%	**Execution Phase**	**33 days**	**Wed 06/04/26**	**Mon 06/06/12**	
60		0%	**Transition Phase**	**9 days**	**Mon 06/06/12**	**Fri 06/06/23**	
70		0%	**Other (including progress meetings)**	**0.5 days**	**Mon 06/04/03**	**Mon 06/04/03**	

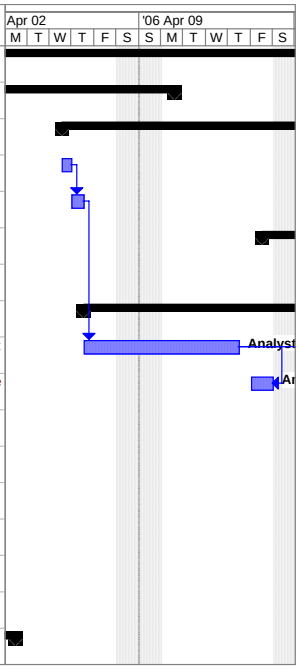


Figure 7.4. Definition and Planning Phase High Level Schedule.

Of interest in this phase are the workshops with the user community. In these workshops the WBS for the project is constructed and the skill, experience and knowledge of the user community is assessed to determine training requirements for the Execution Phase. During the first meeting with the stakeholders and users: (this meeting may take place after the scope signoff, depending on what is deemed appropriate between sponsor and team leader.)

- The stakeholders and clients are introduced and the Charter content reviewed;
- The stakeholders and users are sensitised to what is planned and how it will be achieved and over what time frame;
- Content of the proposed (or finalized) project scope statement and draft project plan is presented for discussion and input from the users;
- Framework literature and hyperlinks are provided;
- The WBS (up to and including Activity Sequencing) for the project is developed as a workshop to determine user community skill and experience; and
- The user community is assessed to determine training requirements.

In summary then, within this phase the work is defined and the planning of its execution happens. A baseline version of the Project Plan (the document used to guide both project execution and project control, including planning assumptions and decisions, approved

scope, cost, and schedule baselines) is presented to the sponsor (or steering committee) for approval. Once the plan has been approved the Execution Phase may commence, although it may commence in advance of signoff, depending on the project constraints.

7.2.4 Project Execution

The Definition and Planning Phase is when the detailed aspects of the project are determined, coordinated, and documented. The Execution phase is when these plans are carried out: the project finally gets under way in earnest, the project's plans are implemented, and the product is configured and implemented.

Each implementation of the Framework is configured for the client, based on the results of the Requirements Specification (client specific version of the Pre-Technical Specification.) The content of the Requirements Specification may vary vastly from client to client and by implication this means that the Execution Phase content will vary as a result.

The schedule shown in Figure 7.4 contains a typical schedule for a minimal scope rollout of the Framework into an environment with sufficient hardware and software capability and a maturing user community.

ID	Predecessors	% Complete	Task Name	Duration	Start	Finish	Resource Initials
1		0%	## Project Name	59.5 days	Mon 06/04/03	Fri 06/06/23	
2		0%	Initiation Phase	5.75 days	Mon 06/04/03	Mon 06/04/10	
16	7	0%	Definition and Planning Phase	15 days	Wed 06/04/05	Wed 06/04/26	
39	36	0%	Execution Phase	33 days	Wed 06/04/26	Mon 06/06/12	
40		0%	Prepare for Phase Kickoff Meeting	2 days	Wed 06/04/26	Fri 06/04/28	
41	40	0%	Phase Kickoff Meeting	0.5 days	Fri 06/04/28	Fri 06/04/28	
42	41	0%	Project Plan Execution (based on type of methodology	29.5 days	Mon 06/05/01	Fri 06/06/09	
43	35	0%	Configure a client specific version of the Framework	15 days	Mon 06/05/01	Fri 06/05/19	
44	43FF	0%	Configure Templates and Guides	5 days	Mon 06/05/15	Fri 06/05/19	
45	43	0%	Client Branding of Framework complete	2 days	Mon 06/05/22	Tue 06/05/23	
46	45	0%	Internal QA	1 day	Wed 06/05/24	Wed 06/05/24	
47	46	0%	Implement at Client Site	5 days	Thu 06/05/25	Wed 06/05/31	
48		0%	Training Sessions	25 days	Wed 06/05/03	Wed 06/06/07	
49	36FS+5 days	0%	Pre-Session 1	0.25 days	Wed 06/05/03	Wed 06/05/03	
50	49FS+5 days	0%	Pre-Session 2	0.25 days	Wed 06/05/10	Wed 06/05/10	
51	50FS+2 days	0%	Pre-Session 3	0.25 days	Mon 06/05/15	Mon 06/05/15	
52	51FS+3 days	0%	Pre-Session 4	0.25 days	Thu 06/05/18	Thu 06/05/18	
53	47FS+1 day	0%	Post-Session 1	0.25 days	Fri 06/06/02	Fri 06/06/02	
54	53FS+1 day	0%	Post-Session 2	0.25 days	Mon 06/06/05	Mon 06/06/05	
55	54FS+1 day	0%	Post-Session 3	1 day	Tue 06/06/06	Wed 06/06/07	
56	55	0%	Implementation Evaluation	2 days	Wed 06/06/07	Fri 06/06/09	Analyst
57	56,47FS+5 days	0%	Product Signoff	0 days	Fri 06/06/09	Fri 06/06/09	
58	57	0%	Phase Review Meeting	0.5 days	Fri 06/06/09	Fri 06/06/09	
59	42	0%	Design next phase schedule	1 day	Fri 06/06/09	Mon 06/06/12	
60		0%	Transition Phase	9 days	Mon 06/06/12	Fri 06/06/23	
70		0%	Other (including progress meetings)	0.5 days	Mon 06/04/03	Mon 06/04/03	

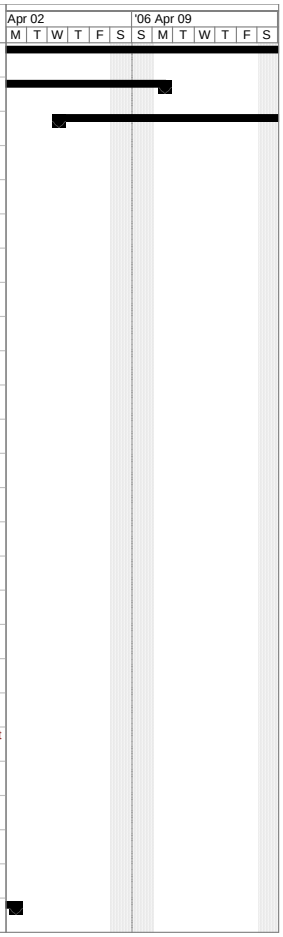


Figure 7.5. Execution Phase High Level Schedule.

The most important thing in this phase is to be disciplined in following the plans that have been developed in the planning phase and to use the Change Management process when they need to be modified. It is also important to recognize the practical truth that the plans will probably not survive the execution intact (i.e. without change), but disciplined execution of the plans will allow the project's challenges to be overcome.

Project plan execution is accompanied by performance reporting and integrated change control processes (which in turn may lead to re-planning exercises.) As it may be the first time that such performance reporting and change control is performed within the organization, for a Framework implementation it is often accompanied by training in this regard. According to the Framework, the project manager should provide evidence that the following issues have been satisfactorily addressed in the Execution Phase.

- Quality Assurance: has overall project performance been evaluated on a frequent basis to ensure that the project will satisfy the relevant quality standards?
- Team Development: have individual and group competencies been enhanced by the project?

- Information Distribution: has the correct information been distributed to the correct stakeholders in a timely manner?
- Sponsor involvement: has the relationship with the project sponsor been maintained and strengthened during this phase.
- Change Management: has the required changes in the project plan (scope, time, resources, quality) been done and approved prior to changing the execution of the project?
- Control: have the budget, scope, quality and time goals been achieved?
- Risk: have risks been tracked, new risks identified and risk plans executed?

The product acceptance signoff happens at the end of the training sessions and once the product and all its components have been successfully implemented and are in use.

7.2.5 Project Transition

The primary objectives of the Execution Phase are to:

- Hand the projects' product over to Stakeholders; and
- Close the project

In this phase, the Project Team assesses the outcome of the project by soliciting and evaluating feedback from users, team members, and other Stakeholders, and documenting best practices and lessons learned for use on future projects. Key project metrics are captured to enable the comparison and evaluation of success measures across projects.

ID	Predecessors	% Complete	Task Name	Duration	Start	Finish	Resource Initials
1		0%	**## Project Name**	**59.5 days**	**Mon 06/04/03**	**Fri 06/06/23**	
2		0%	**Initiation Phase**	**5.75 days**	**Mon 06/04/03**	**Mon 06/04/10**	
16	**7**	0%	**Definition and Planning Phase**	**15 days**	**Wed 06/04/05**	**Wed 06/04/26**	
39	**36**	0%	**Execution Phase**	**33 days**	**Wed 06/04/26**	**Mon 06/06/12**	
60		0%	**Transition Phase**	**9 days**	**Mon 06/06/12**	**Fri 06/06/23**	
61	39	0%	Prepare for Phase Kickoff Meeting	0.5 days	Mon 06/06/12	Mon 06/06/12	PM
62	61	0%	Phase Kickoff Meeting	0.25 days	Tue 06/06/13	Tue 06/06/13	PM
63		0%	**Methodology Specific Transition Activities**	**7.75 days**	**Tue 06/06/13**	**Thu 06/06/22**	
64	62	0%	Post-Live Issue Resolution Session 1	0.5 days	Tue 06/06/13	Tue 06/06/13	PM
65	64FS+5 days	0%	Post-Live Issue Resolution Session 2	0.25 days	Tue 06/06/20	Tue 06/06/20	
66	64,65FF+2 days	0%	Post-Live Issue Resolution Activities	5 days	Fri 06/06/16	Thu 06/06/22	PM
67	62SS	0%	Handover	8 days	Tue 06/06/13	Thu 06/06/22	PM
68	67FF	0%	Administrative Closure (including stakeholder sessions)	3 days	Tue 06/06/20	Thu 06/06/22	PM
69	68	0%	Project review Meeting	0.5 days	Fri 06/06/23	Fri 06/06/23	M,Analyst,PS
70		0%	**Other (including progress meetings)**	**0.5 days**	**Mon 06/04/03**	**Mon 06/04/03**	

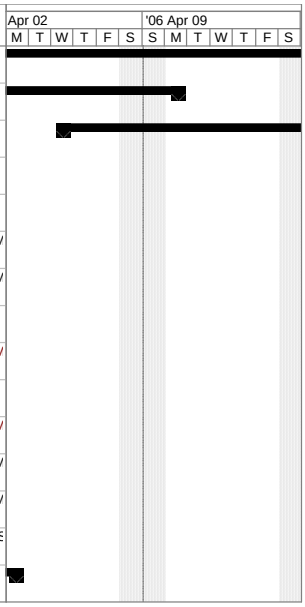


Figure 7.6. Project Transition Phase High Level Schedule.

The project manager should provide evidence that the following issues have been satisfactorily addressed in the Transition phase.

- Delivery of anticipated benefits: Are the sponsor / stakeholders convinced that the benefits contained in the (amended) scope statement have been delivered?
- Organizational adoption: have the target (users) organizational stakeholders adopted the project's product?
- Standards: have the relevant project standards in terms of communication, documentation, etc been used throughout the project?
- Resources: have all resources been released?
- Handover: has responsibility for the project's product (and other issues such as further projects) been handed over to the correct stakeholders?
- Closeout: have all activities necessary to complete the closeout document been done and the document distributed?

7.3 Conclusion

As recommended by Lientz and Rea (1999), when considering change to the PM process the following steps are followed:

- Evaluate the current PM process;
- Develop a project strategy;
- Determine improvements to the process; and
- Transition the current PM process to an improved one.

This chapter presented a per-phase discussion of a typical implementation of the Project Management Framework at a client site, conceptually based on the steps outlined above. Completing a client-specific Requirements Specification is the basis of the implemented product, namely a client-configured web-enabled project management process, containing phases, processes, roles and activities, templates, training material, checklists and work guidelines.

Over and above the basic Framework, the client may also request any of a number of value added services and products, the in- or exclusion of which largely determines the time and cost for rolling the product out (including reports development, a project selection model, a template creation process, basic document management systems, documentation standards, etc.)

Alderson (1969) is credited with stating that: "I have yet to see any problem, however complicated, which, when you looked at it the right way, did not become still more complicated." There are many aspects of an implementation of the Framework at a client site which are not covered by this chapter and that is in line with the very nature of project work. Each project is unique and the aim of the author is not to supply a paint-by-numbers

approach, but rather to ensure that the lessons learnt during the first implementations are not lost on subsequent implementations.

Chapter 8 builds upon the work done up to the end of chapter 6, in that it suggests a process improvement strategy based on the two major sources (PMBOK® Guide (2000) and CMMI (2002)) used to construct the PM Framework. In order to maintain a focus on the stated research aims, the subject matter of chapter 7, namely the implementation of the Framework, is excluded from this improvement exercise.

Uomo avvisato, mezzo salvato.

8 Process Improvement and Capability

Project Management is most often described in terms of its component processes (PMBOK® Guide, 2004) and certainly the current research is no exception, being based on two ANSI standards that both use processes to describe the "science" portion of project management. The processes in the Framework are discussed in some detail in earlier chapters and have been shown to consist of PMBOK® Guide processes augmented by other (primarily CMMI) processes where it has been found to be applicable.

The processes that make up the Framework, like any business process, are open to scrutiny for maturity and also for possible improvement and it is these two areas that the author wishes to explore as part of the current chapter. This chapter explores the application of the two standards that comprise the Framework and to provide an approach towards maturing (and thereby improving) the processes within the product.

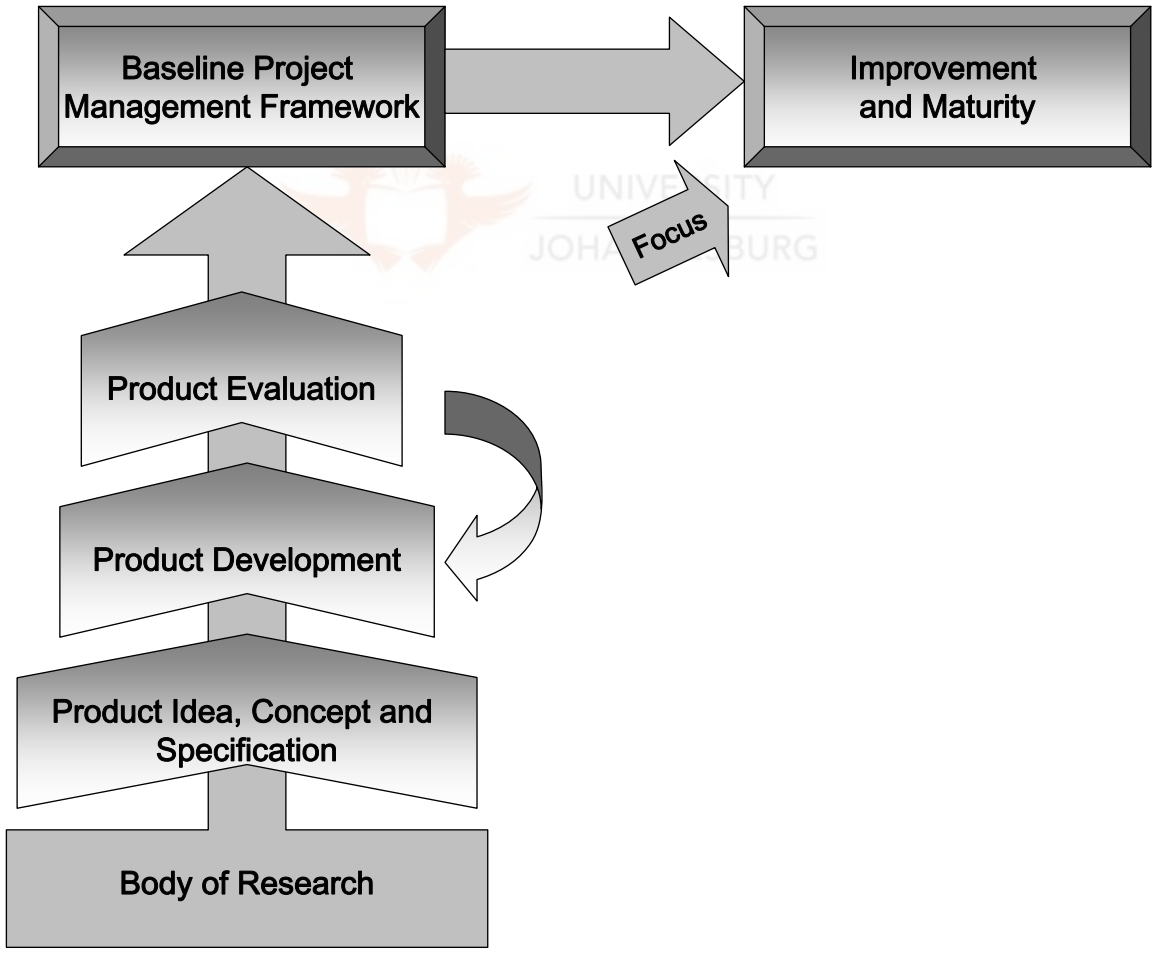


Figure 8.1. Chapter Focus in Product Innovation Process.

8.1 Introduction

In previous research (Malan, 2004) the author has noted that using multiple standards in an environment may lead to synergies and potential problems. In this previous research, for the case of the PMBOK® Guide and the CMMI, the author answered the following questions:

- How can the target organization use the PMBOK® Guide to improve its processes:
  - Certain PMBOK® Guide processes can be mapped to CMMI specific practices, providing a baseline from which the organization's needs may be tailored.
  - These mapped processes may be used to satisfy some of the specific goals of the process area to which it is mapped.
  - There is overlap in terms of the work products that are produced by the above mappings, but there is also enrichment (EVM as part of Project Planning for instance.)
  - Process improvement can also benefit from the PMBOK® Guide in terms of benchmarking as part of appraising the enterprise's processes in the Organizational Process Focus process area.
- What is in the PMBOK® Guide that can support the CMMI practices and how can it enhance / improve organizational maturity and process area capabilities?
  - The PMBOK® Guide can contribute to establishing the organization's set of standard processes.
  - The PMBOK® Guide provides further detail to the CMMI Project Management process areas at level 2 and Process Management process areas at level 3.
  - The PMBOK® Guide can help transform performed processes into managed processes for the Project Management process areas at level 2.
  - The PMBOK® Guide can help transform managed processes into defined processes for the Process Management process areas at level 3.

The author found that there is some overlap between the two standards, but that there is no direct mapping between them. The PMBOK® Guide must be tailored to suit the organization and within the realm of CMMI process improvement this happens naturally as the organizational maturity (or the process area capabilities) improves. These two standards can therefore be said to be complementary in many aspects. For Sheakley (2002), it is a question of buoyancy: the implementation of one within the other does bring synergies that may be exploited to the benefit of the target organization. In Chapter 6, the CMMI process areas within the Framework as well as the application of the CMMI within the PMBOK® Guide context were discussed. The following sections use these discussions as a starting point to develop a proposal for process improvement within the Framework processes.

8.2 Practical Implementation of the CMMI

(The information in this chapter is sourced from the CMMI itself and from the SEI website.)

A CMMI model contains the essential elements of effective processes for one or more disciplines, structured using one of two representation schemes, published as separate documents, namely Staged and Continuous. The SEI's (2002) experience to date has been that software engineering practitioners generally favour the Staged Representation while systems engineering practitioners favour the Continuous Representation of the CMMI.

8.2.1.1 Continuous Representation

The Continuous representation supports the continuous improvement of individual process areas that are critical to the organization's business needs. It provides an indicator of what improvement within a single process is – to answer, "What is a good order for approaching improvement of this process area?" The process areas may be grouped by category as shown in Table 8.1.

Category	Process Area
Process Management	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Innovation and Deployment
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management Risk Management Quantitative Project Management
Engineering	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Causal Analysis and Resolution Decision Analysis and Resolution

Table 8.1. CMMI Process Areas per Category

8.2.1.2 Staged Representation

In the Staged Representation, processes are grouped and ordered based on important, pre-defined organizational maturity relationships that address the business needs of many organizations. It provides an indicator of the maturity of a set of an organization's processes – to answer, "What will the most likely outcomes be of the next project that is undertaken?" This representation specifies a standard ordering of process area improvement.

Level	Focus	Process Areas
5 Optimizing	Continuous Process Improvement	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	Quantitative Management	Organizational Process Performance Quantitative Project Management
3 Defined	Process Standardization	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution
2 Managed	Basic Project Management	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		

Table 8.2. CMMI Process Areas per Maturity Level

8.2.2 Options in approach:

The SEI has noted that successful process improvement practitioners often borrow the strong aspects of both representations.

- Example 1: While generally following a staged approach, an organization establishes a Process Group (Maturity Level 3 concept) to guide the effort.
- Example 2: While generally following a continuous approach, Organizational Process Definition (OPD) should only be implemented after some other process area has been implemented, e.g., Configuration Management (CM), so that the standardization aspects of OPD may be applied to CM.

Some possible implementation approaches are discussed in chapters 8.2.2.1 and 8.2.2.1.

8.2.2.1 Project Management Implementation Approach

There are a number of Process Areas that interrelate if the goal is to establish basic project management Process Areas, as was the case when developing the Framework. An initial set of Process Areas might include:

- Project Planning;
- Project Monitoring and Control; and
- Supplier Agreement Management.

These may be followed by the rest of the Project Management process areas at a later time, namely:

- Integrated Project Management;
- Risk Management; and
- Quantitative Project Management.

8.2.2.2 Engineering Implementation Approach

Similarly, an Engineering Implementation approach may focus on the engineering activities as the implementation driver.

- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation

8.2.3 Choice of Approach:

In choosing an approach there are no right or wrong answers, but there are approaches that are more appropriate than others. The approach taken to develop the Framework to date has been to focus on the Project Management process areas, using the Continuous representation of the CMMI. It is the author's opinion that this approach continues to be used and that the model be tailored to be limited to Project Management process areas.

Now, tailoring a CMMI model is a process whereby only a subset of a model is used to suit the needs of a specific domain of application. The intent of tailoring is to assist an organization or project in aligning the CMMI products with its business needs and objectives, and thus focusing on those aspects of the products and services that are most beneficial to the organization. The SEI advises that "Tailoring of a model should focus on identifying the process areas and practices that support an organization's business needs and objectives."

Tailoring the CMMI model to focus on Project Management Process Areas and using a Continuous representation means that the road forward is to:

- Implement the remaining process area to complete the basic project management focus – Supplier Agreement Management;
- Implement selected advanced project management process areas; and
- Apply the CMMI in a continuous manner to the implemented process areas in order to be able to select the order of improvement that meets the product's business objectives and mitigates the product's areas of risk.

8.3 Process Improvement Road Forward.

Appleton (1997) found that Process change means culture change, replete with all the difficulties inherent in changing the perceptions, values, and normative behaviours of a community. He found the following process patterns (amongst others) apply to process improvement projects:

- A process is a product!
- The existing process is a legacy system;
- Process improvement is a legacy systems reengineering project;
- SPI projects should be planned and managed similarly to software development projects;
- SPI processes should closely resemble product development processes;
- Evolutionary and incremental/iterative development (improvement) seems to be most successful; and
- Engaging customers early and often in dialogues which regularly communicate status and feedback is a crucial element of success (and its absence is often a leading cause of project failure).

Bearing the above in mind, a project based on a tailoring of the SEI's IDEAL (Initiating, Diagnosing, Establishing, Acting & Learning) model as proposed by Casey and Richardson (2004) should be initiated to address the scope of the process improvement as discussed in the previous section.

8.3.1 Step 1: Basic Project Management Areas

Having implemented two of the Basic Project Management process areas as part of the baseline Framework, the remaining process area of Supplier Agreement Management (SAM) needs to be addressed (refer to figure 8.2.) The SAM process area addresses the need of the project to effectively acquire those portions of work that are produced by suppliers. Once a product component is identified and the supplier who will produce it is selected, a supplier agreement is established and maintained that will be used to manage the supplier. The supplier's progress and performance are monitored. Acceptance reviews and tests are conducted on the supplier-produced product component.

The author suggests a similar implementation method to that used for Project Planning in Chapter 6. This involves mapping the Specific Practices against the PMBOK® Guide processes to determine the alternative practices and the gap and performing such modifications to the Framework as is required ensure that the gap is addressed. The IDEAL model is the recommended model for implementing the CMMI practically and the portions that may be left out in this case are those of Initiating and Diagnosing.

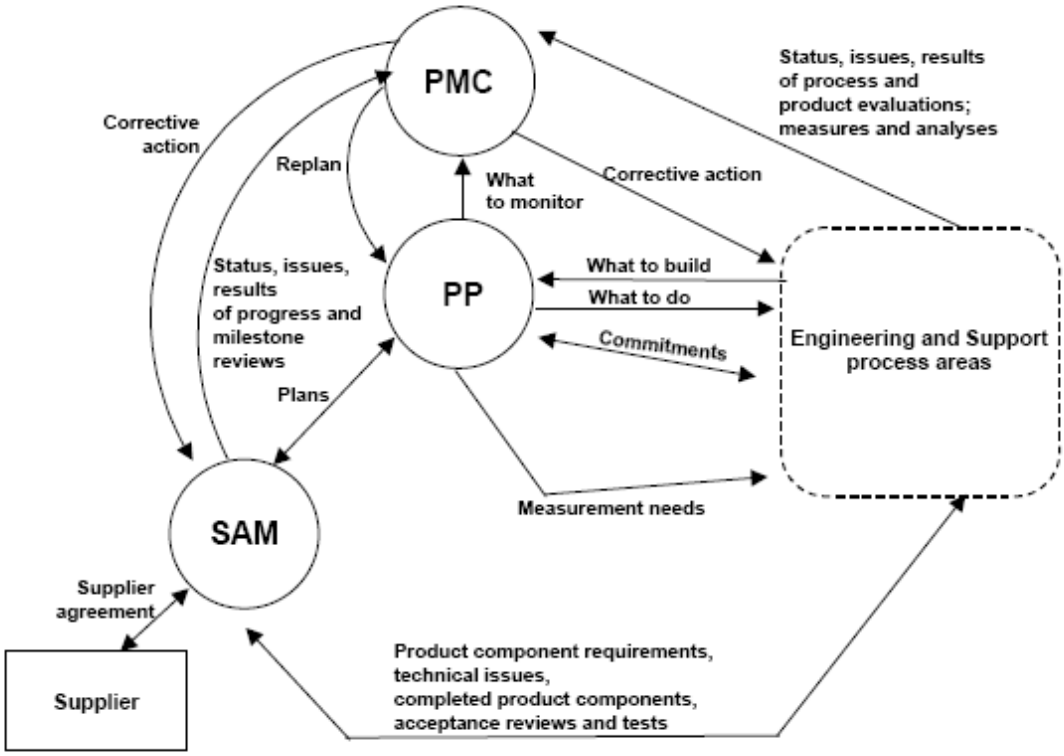


Figure 8.2. Interactions between Basic Project Management Process Areas, CMMI (2002).

8.3.2 Step 2: Advanced Project Management Process Areas

The advanced Project Management process areas are shown in figure 8.3 and address activities such as establishing a defined process that is tailored from the organization's set of standard processes, coordinating and collaborating with relevant stakeholders, risk management, and quantitatively managing the project's defined process. Each of the advanced Project Management process areas is strongly dependent on the ability to plan, monitor, and control the project. The basic Project Management process areas provide this ability.

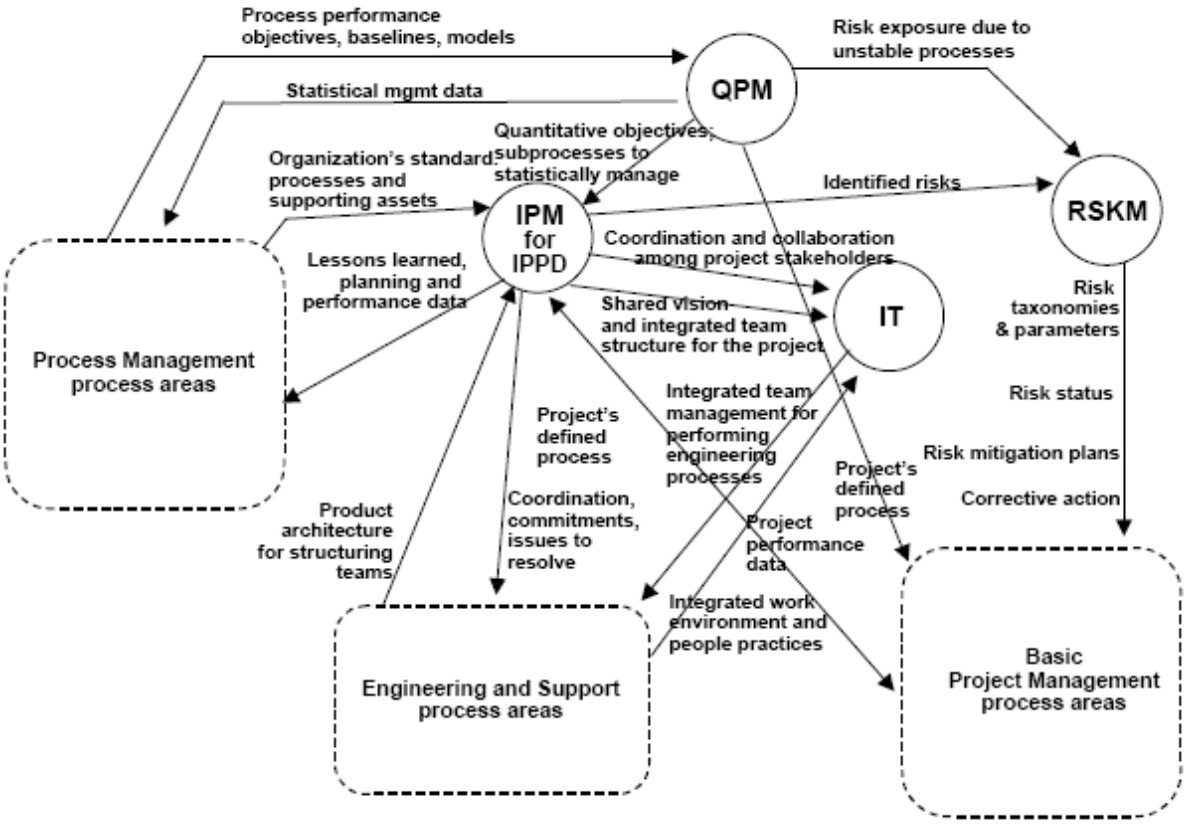


Figure 8.3. Interactions between Advanced Project Management Process Areas CMMI (2002).

Although risk identification and monitoring are covered in the Project Planning and Project Monitoring and Control process areas, the Risk Management (RSKM) process area takes a more continuing, forward-looking approach to managing risks with activities that include identification of risk parameters, risk assessments, and risk handling.

The Quantitative Project Management (QPM) process area applies quantitative and statistical techniques to manage process performance and product quality. Quality and process-performance objectives for the project are based on those established by the organization. The project's defined process comprises, in part, process elements and sub-processes whose

process performance can be predicted. At a minimum, the process variation experienced by sub-processes that is critical to achieving the project's quality and process-performance objectives is understood. Corrective action is taken when special causes of process variation are identified.

Integrated Project Management (IPM) for IPPD and Integrated Teaming (IT) are not applicable to basic project management and IPPD does not apply to the Framework in the author's mind at present although it may well do so in future. In fact, determination of those process areas that must be applied in the Framework will not be as simple as the decision made in step 1 above. For this reason the author suggests a more complete iteration of the IDEAL model, this time including the Initiating and Diagnosing steps to build sponsorship and determine which of the process areas in this grouping need to be implemented and how.

8.3.3 Step 3: Process Improvement: the Continuous Representation

Having tailored the CMMI to focus on Project Management process areas only, the intent in step 3 is to raise the capability of the chosen process areas from its current levels to an appropriate level. As discussed in chapters 8.3.3.1 and 8.3.3.2, the author suggests raising capability of the chosen process areas to level 3 within the continuous representation of the CMMI.

8.3.3.1 Capability Levels

Capability levels in the continuous representation provide a recommended order for approaching process improvement within each process area. All continuous representations of CMMI models reflect capability levels in their design and content. For each process area, a capability level consists of related specific and generic practices that, when performed, achieve a set of goals that lead to improved process performance. In this chapter, the phrase "the process" means the process or processes that implement the process area and "Institutionalization" implies that the process is ingrained in the way the work is performed.

The specific practices belonging to the process areas in the Project Management category are all capability level 1 practices. When using the continuous representation in an appraisal, process areas are rated relative to a particular capability level. There are six capability levels numbered 0 through 5. The capability levels of process areas are achieved through the application of generic practices or suitable alternatives.

8.3.3.2 Raising Capability

Reaching capability level 1 for a process area is equivalent to saying you perform the process area, or more precisely, you are achieving the specific goals of the process area.

Reaching capability level 2 for a process area is like saying you manage your performance of the process area. There is a policy that indicates you will perform it (that is, a process or processes that are intended to cover it). There is a plan for performing it, there are resources provided, responsibilities assigned, training on how to perform it, selected work products from performing the process area are controlled, etc. What this means in detail is spelled out in the generic practice elaborations for the capability level 2 generic practices that appear in the process area. In other words, an organizational activity can be planned and monitored just like any project or support activity.

Reaching capability level 3 for a process area assumes that there is an organizational standard process or processes that cover that process area that can be tailored to the specific need.

Reaching capability level 4 or 5 for a process area is conceptually feasible but may not be economical except, perhaps, in situations where the product domain has become very stable for an extended period of time.

8.4 Conclusion

As noted by Lientz and Rea (1998) a successful product typically evolves over time. This chapter presents a proposal for increasing maturity of the Framework, by raising the capability of its constituent processes over time. The proposed approach is to:

- Complete the implementation of the basic project management process area in the first post-baseline process improvement project;
- Secondly, select the appropriate CMMI advanced process areas from the same category and implement them as part of the Framework; and
- Raise the capability of the chosen process areas to level 3 in a third process improvement project.

Process improvement may be seen as the activity of elevating the performance of processes and typically takes the form of an improvement project, as recommended above. The benefits of such projects are manifold and process improvement has been excluded from Chapter 9 “Conclusions and Recommendations” as the decision to go ahead with such improvement has already been made and takes place in parallel to the marketing of the product.

The author has heard it jokingly said that “In theory, there is no difference between theory and practice, but in practice there is a great deal of difference.” At the current, defined capability level, the Framework organization is interested in deploying standard processes that are proven and that therefore take less time and money than writing and deploying new processes. The path chosen for process improvement is representative of this thinking and provides a low-risk, proven path to increasing the capability of the CMMI processes included in the Framework.

Val più la pratica della grammatica.

9 Conclusions and Recommendations

This objective of this study has been to develop a product that satisfies a need that the author perceived in a certain market space. The study did achieve this purpose, in that successive versions of the product have been successfully installed at three pilot sites and a baseline version has resulted, client-independent and ready for marketing. A proposal for the improvement of the product's constituent processes (in terms of capability) has been made in Chapter 8, although this does not constitute a change in product features, but rather a maturation of the product.

A product must remain aligned to its target market and grow as its target market demands. In this case the market is maturing and for that reason the product that aims to satisfy these markets needs to adapt over time. This chapter investigates some conclusions made and possible enhancements of the product's features to better satisfy its clients in the future.

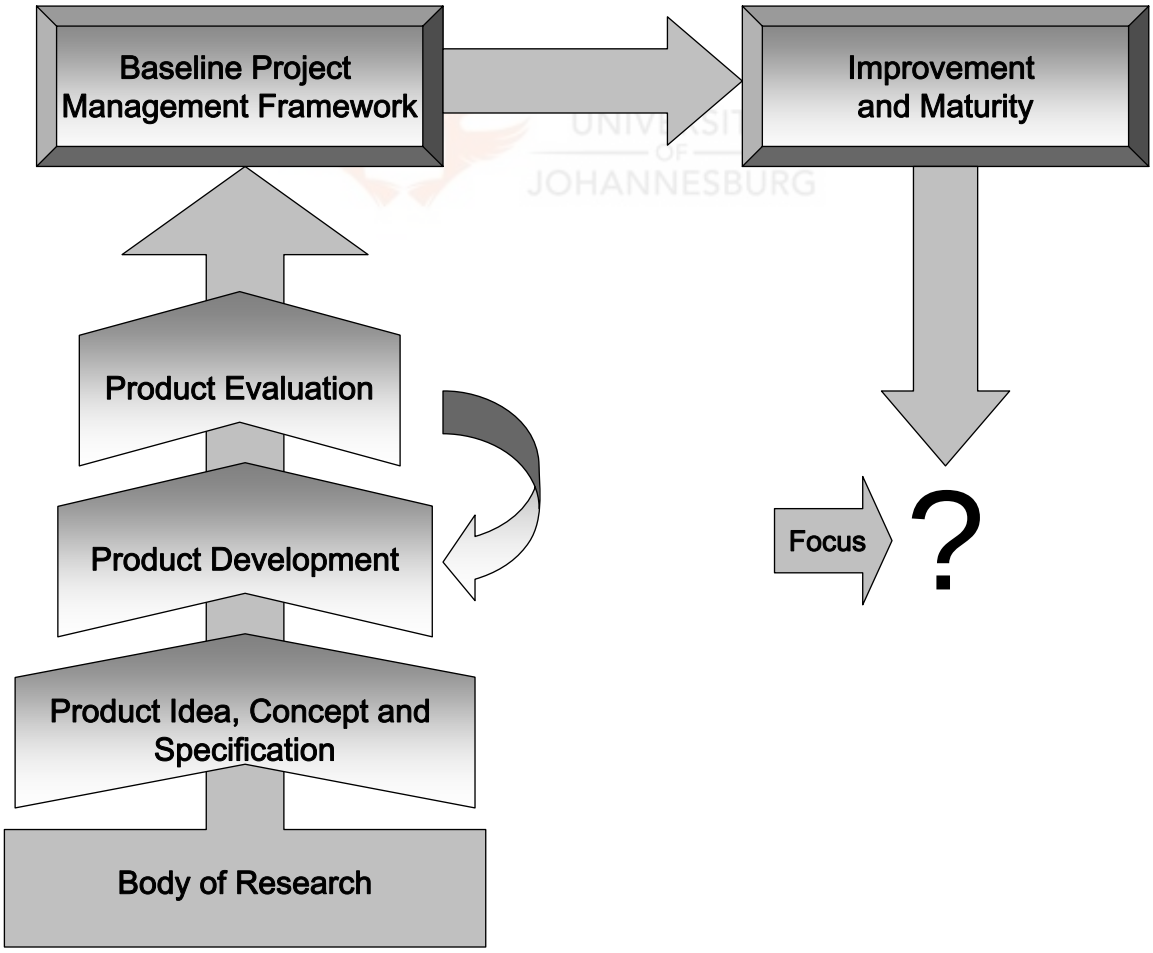


Figure 9.1. Chapter Focus in Product Innovation Process.

9.1 Introduction

The first portion of this chapter contains some conclusions derived from the current research. The balance of the chapter explores possible further research and development work to:

- Enhance the functionality of the current baseline Framework;
- Extend the Framework in areas that will benefit it's user community; and
- Create similar products that cover related functional areas.

According to the Third Edition of the PMBOK® Guide (2004), "*project management exists in a broader context* that includes program management, portfolio management and (the) project management office." This broader context is the primary source for deriving areas for Framework extension and for the creation of similar products. As before, a product management approach is used as a point of departure and sources for areas for enhancement of the current Framework functionality are *initially* those same sources that were considered for Framework development.

The PMBOK® Guide (2000) has been the primary source for the development of the Framework and provides a place of departure for consideration of possible further work. It is not, however, a forgone conclusion that it will be the primary source for further work done in this regard. To this end, the current chapter is not limited to the sources used in the original research and the author has purposely attempted to include wider reading in the discussions of chapter 9.3.

The above approach is confirmed by Bentley (2006), who found that "The treatment of project organization is very different in the two approaches (PMBOK® Guide and PRINCE2.) The Guide places projects in a larger program environment and includes the concept of a Project Management Office (PMO). However, it is difficult to see a clear project organization structure or understand the relationship between the project manager, the PMO and senior management."

As mentioned earlier in this chapter, the author again considers a product management approach as an appropriate point of departure for product enhancement and extension. In this regard, as per Tatikonda's (1999) definition of product development projects, they are either *platform* (which result in products that initiate a new family of products for a company) or *derivative* projects (which extend an existing product family platform). For the purpose of the recommendations in this chapter, only derivative products will be considered, as the Framework itself is considered to be the platform product.

9.2 Research conclusions

The most encouraging results from the research survey is that 100% of respondents very strongly agreed that the Framework provided simple access to a common set of PM process and tools and would recommend it to other users. The research consisted of more than the research survey though and this chapter will therefore consider conclusions from the pilot sites and the author, over and above the research survey results.

As noted by Lientz and Rea (1998), launching a product means that the product must have been developed and tested. Marketing of the current baseline version of the PM Framework occurs in parallel with the development of its process improvement evolution. Once the process improvement project is complete, the resultant product will become the baseline product. Based on the experience gained during the two client pilot implementations, the author believes that it is reasonable to expect that further iterations of the product will result from client implementation projects. The implication of these factors is that the product under discussion is likely to change over its lifespan, but always with a baseline version, that forms the basis of any implementation at given point in time.

In order to cater for such enhancements and / or changes, the product implementation typically occurs with a maintenance agreement as an augmented product offering, as discussed in chapter 7. The decision to extend the product offering in this way came about because of the lessons learnt at the pilot sites. The author believes that this type of discovery should have been made earlier and is an example of the conclusions drawn from the pilot sites and what would have been done differently in hindsight.

9.2.1 Conclusions from the pilot sites

The author and product sponsor had no certain way of knowing that the product would satisfy the perceived market demand based on the pre-technical specification and therefore decided to follow good advice. As per Brooks' (1987) suggestion, the first pilot has been discarded and two more pilots were done at client sites until some satisfaction has been obtained that the product satisfied an actual need and not just the perceived need of the author. At each pilot site, the business drivers for wanting to utilize the PM Framework were vastly different, but conceptually such decisions are always made based on the value that each organization perceived it could gain from implementing the product. In each case, the pilot organizations were willing to invest resources in order to reap such benefits as has been predicted by the author. In each case, the benefits were reaped and the Framework grew in maturity and focus, resulting in the baseline version of the product as discussed in chapter 7 of this research document.

Having walked the road of developing the Framework and documenting this process, the author has noted some areas that he would have approached differently if the opportunity presented itself to perform similar work. A discussion of these aspects follows in chapter 9.2.2.

9.2.2 What the Author Would Have Done Differently

The discussions below are not the author's lament over spilled milk, but rather some advice that he intends to follow in future and would recommend for others who intend to perform work of similar ilk. Learning from the mistakes that others have made, in the author's opinion, remains the cheapest form of learning.

9.2.2.1 Knowledge Management Approach

The author's approach to knowledge management as part of the current research was to identify the types of knowledge to be managed and to focus on building a product that uses this knowledge to assist its target market in certain areas.

Hall and Sapsed (2005) have stated that the sharing and application of knowledge have been widely identified as key sources of sustained competitive advantage. They have also noted that knowledge management in project-based environments remain problematic and argue that the tendency to share or hoard knowledge depends upon organizational incentives, which in turn are shaped by industrial and organizational circumstances. If the author was to perform similar research in future, he will make use of their research results, which became available some time since the inception of the PM Framework. As indicated by Hall and Sapsed (2005), the author believes that it will facilitate better use of explicit knowledge management tools like an intranet, the expert system and the reporting of 'lessons learnt.'

9.2.2.2 Triple stream not single stream

As discussed in section 4.4.2, the author followed a dual stream process of product innovation as part of the current research. This approach did not affect the research per se, but does affect the product as a whole, because by the time that the product was market-ready, a marketing plan existed that had not kept up with development. The impact thereof is severe from a corporate and marketing point of view but does not influence the current research in terms of its objectives.

The author feels that he may have followed Crawford's (2004) Triple Stream Process: product stream, evaluation stream and marketing stream. This implies the identification and performance of a deliberate set of activities, leading to a successful new product launch. The development stream should focus on three things, not just the new product itself.

Simultaneously with the product's creation, there should have been the creation of an evaluation plan and a marketing plan – three parallel streams.

The above approach is in line with that proposed by Lientz and Rea (1998) too, as a means for relieving concern over the sequential nature of developing products and in doing product manufacturing.

9.2.2.3 Use Of An Augmented Product Concept

A definition of an Augmented Product (American Marketing Association, 2006) is the "Core Product, plus all other sources of product benefits, such as service, warranty, and image. The augmented aspects are added to the physical product by action of the seller, e.g., with company reputation or with service." The baseline Framework is being marketed as an augmented product, including training, template-of-template processes, etc. but the product at conceptual level was not developed in this way. The author believes that, had the concept been developed as an augmented product and not just as a core product, that those additional benefits, which are of interest to the target market, would have been identified and integrated into the total product earlier. This is turn may have resulted in a more complete product at an earlier stage of the product innovation process.

9.2.3 Conclusions from the Research Surveys

In terms of evaluation of the data and sample, Parten (1965) warns that a very high no-opinion vote should lead the surveyor to suspect the validity of the questions. The aggregated results of the survey are contained in Appendix C and indicate that very few "no-opinion" votes were cast, validating the questions asked as being of value. Within the aggregated results, a lower aggregated result leant towards agreement and a higher figure meant greater disagreement.

To the author, the most meaningful results from the research survey are that *all respondents strongly agreed* that:

- the PM Framework provided simple access to a common set of PM process and tools; and
- they would recommend the Framework to other users.

In terms of focus for future versions of the Framework, the survey results suggest that programme management and portfolio management are favoured over a greater focus on process and work guidelines. The survey also supported the author's view on WBS development and use of a project performance measurement technique such as EVM (as expressed in chapter 5.)

Rosenberg (1968) noted that the history of science has shown that alertness to results outside of the original concern of the investigator, have yielded valuable scientific discoveries. He says that the term “serendipity” has been used to describe this type of discovery. Aware of this fortuitous possibility, the author investigated the survey results and found that the respondents, in general, appeared to have very strong opinions about the questions asked in the “Framework Benefits” section of the survey.

Multiplying the number of projects that the survey relates to, with the number of questions in the section, provides a total of 35 x 7 = 245. Of these 245 project-questions, only 8 were given neutral (response = 3) answers, 79 were agreement (response = 2) and 158 were strong agreement (response = 1.) The exact implication of this observation is not clear, but to the author the 65% “strong” response regarding the benefits of the Framework, indicates a possible emotional involvement that he was not previously aware of.

This emotional angle of project management has also been noted by Gareis (2004) who goes as far as to state that consciously dealing with emotions is a success factor in project management. He states that emotions in projects may be structurally caused or specifically induced as needed. He also indicated that it is a PM’s task to analyse emotions, and to plan and carry out strategies and actions for dealing with them. At least one author has an unpublished work in this regard (Weisinger, 2006) and the author suspects that there may be a significant opportunity for research within a combination of the fields of Project Management and Emotional Intelligence.

9.3 Recommendations for Future Research

Based upon the project management context discussed earlier in this chapter, the following sections discuss the possible extension of the Framework product. These topics for further research are collaborated by the findings of the Winter and Smith (2006), quoting from the EPSRC Network Proposal (2003), when they state that (the current) PM research “focuses almost exclusively on the ‘management of a project’ and ‘doing the project right’ (i.e. to specification, budget and on time) rather than for example, the ‘management of project portfolios’ and ‘programme management’ which are more strategically orientated towards ‘doing the right projects’.” Their support appears to be towards more research relating to the latter of the two categories, relating specifically to programme and portfolio management.

9.3.1 Project Management Office (PMO)

Based on the expansion of the PMO in Appendix D, it is the author’s opinion that the current research should be extended to include the addition of high-level PMO processes in the Framework product. These processes should focus on a recommended rollout path for the

Framework and not aim to be a stand-alone product offering. When comparing it to the benefits that Tom Mochal (2006) advocate for a PMO, among other features, it should:

- Establish and deploy a common set of project management processes and templates, which saves each project manager from having to create these on their own. These reusable project management components help projects start-up more quickly and with much less effort. (Part of the Project Management Framework);
- Not make any provision in terms of methodology; and
- Make recommendations only for the following: communication, repository, training, coaching, project status monitoring, metrics and overall advocacy of project management to the organization.

9.3.2 Program Management

From the Program Management discussion in Appendix D, it may be seen that it is simply the way that a program of projects is managed and that program management is performed in addition to project management (viewed as the management of the single projects of a program.) The author believes that further work in this regard should be based on the PMBOK® Guide (2004) processes of Initiating, Planning, Executing, Monitoring & Controlling and Closing a program, where the typical program roles are program owner, program manager, and a program coordination team; typical program communication structures are program owner meetings and meetings of the program coordination team.

The author recommends that the current research be extended (seen as enhancement of the current functionality) to include the addition of the program management processes in the Framework product. These processes should not aim to be a stand-alone product offering, but focus on differentiating program and project management, re-using the core Framework processes if possible. If this last requirement proves possible and advisable, then the program management extension of the Framework may be as simple as developing a methodology for it and slotting it into the Framework as per the Framework design for being usable for all manner of projects.

9.3.3 Project Portfolio Management

Portfolio Management is not the management of multiple projects and it is not merely an extension of Project Management. In fact, as discussed in Appendix D, Portfolio Management and PM are not alike at all. The major function of the portfolio management process is to prioritise a dynamic list of projects, identify those that need to be added to the pipeline, those that need to continue in the pipeline, and those that need to be ejected from the pipeline. The first time that a project is conceived and conceptually planned, it will undergo the initial scrutiny in the light of the current organizational objectives. Then,

periodically, this project will be evaluated in the light of the organizational objectives that are prevailing at that point.

Project portfolio management usually has two major facets. One facet deals with organizational issues of business objectives, strategy, and profitability. The other facet deals with performance of individual projects in meeting those goals. The project component is the one that monitors the effectiveness and efficiency of individual projects. The organizational portion has three components: a component that selects projects, one that monitors the selection process periodically, and one that monitors the organizational resource demand profile. With the increase in use of management by projects, an ongoing project portfolio management process ensures that the composite group of projects that is selected and managed is totally supportive of the organization's financial portfolio.

It is the author's opinion that the current research be extended to include the addition of portfolio management, but not inside the Framework product. Instead, a similar product may be researched and developed, to be marketed as a standalone product. The reasons for this are the disparity in process, functions, users and overall market segmentation. In addition, for these reasons, the author would recommend a thorough marketability study before commencement of the exercise.

9.3.4 Conclusion

Expanding the Framework to cover the areas discussed within this chapter is in line with the approach suggested by Tiwana and Ramesh (2001). They suggest leveraging process knowledge gained during the development of an e-service so that the e-service platform can be extended or created to support the (further) needs of various customer segments. The recommended changes to the Framework, to allow for the addition of the PMO and Program and Project Portfolio Management will cover label and process knowledge, as skill and people knowledge continues to fall outside the scope of the current work.

It is proposed that the same steps be followed in adding these functions, as were followed in producing the original Framework. The choice of sources for the phases and processes to be included will therefore be determined as part of the project. In terms of feature management, the author feels that the program management additions be made as extensions of the current Framework as a logical progression in the project maturity of the client organization and with standalone capability. The reason for this is that, although it is not in line with agreed process improvement thinking utilized as part of this research, it will allow an organization to commence using the Framework from a logical management perspective. In other words, the Framework will then be used from the top down and not from the bottom up, allowing senior management to ensure that their required reporting structures (as part of

Program and Project Portfolio Management) are in place by the time that the Project Management Framework is being utilized.

9.4 Conclusion

Thomas Kuhn (1962), when asked the question of why research must be done, answered that amongst other things, research results add to the scope and precision with which a paradigm or theory can be applied. One practical implication of this statement is that without adequate research, the project management paradigm will not grow or be applied as well as the case may be if adequate research is performed in this area. It has been the author's intention to contribute to such growth and increased application of the theory by (1) developing the product and (2) documenting its development to the extent that it has been done within this thesis.

The project management paradigm appears to be evolving in general and more so in certain fields and geographic locations, but basic project management will remain and needs to be addressed in an organization prior to the application of advanced techniques and thinking. The author believes that the current research, advocating this conclusion, is based on something he and others have found value in and therefore believes it can add value to the Project Management (PM) body of knowledge.

There are many possible approaches for the implementation of project management, but the aspects that make this research unique and of value is the following:

- The PMBOK® Guide makes it clear that it must be tailored to be effective: this research tailors the Guide for a sector, a time and a place (not just for an organization);
- The above tailoring resulted in a unique approach to implementing IT project management in SA;
- It was not done for financial gain, but to contribute to the Project Management body of knowledge and to even push the frontier of this body of knowledge, thereby
    - Benefiting a community, and
    - Opening up a new focus area for research within the profession.
- The combination of research, experience and observation was documented to provide a substantial body of high quality work, available for future research in this regard.
- The research has experimentally (and experientially) validated the author's theory about improving the state of IT project management in SA.

As noted by Rider (2004), Africa (and South Africa in particular) needs to become self sufficient and effective at running projects. It is the author's sincere hope that the PM

Framework, as discussed in this document, provides a point of departure for the South African companies that are seeking the benefits that the project management in general and the Framework in particular, aims to deliver.

Tutto è bene quello che finisce bene.

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11 Appendices

11.1 Appendix A: Background of Pilot Organizations

11.1.1 IZAZI Solution (PTY) Ltd

IZAZI Solutions is an IT solutions provider with a strong focus on the Financial Services Sector. IZAZI was established in August 1999 by ex-consultants from Accenture, IBM and PWC and has grown into one of the premier IT and business consulting companies in the South African Banking Sector. IZAZI's primary value propositions are consulting in the areas of system selection and design, system implementation and outsourcing. IZAZI is built around a number of different competencies, which allows the organisation to offer a "complete" solution in its respective value propositions. These competencies include, banking domain specialists, process analysts, business analysts, software developers, IT infrastructure specialists and project managers.

11.1.2 Harmony Gold

Harmony Gold Mining Company Limited was formed in 1950 as a Rand Mines managed company to exploit the single Harmony mine lease. In 1997 Harmony severed its links with Randgold and became an independent, unhedged, South African gold producer. Since then, the company's directors have set out to grow Harmony into a world-class gold mining company.

In 2005, Harmony was the fifth largest gold producer in the world, with increasing growth potential in South Africa, Australasia and Papua New Guinea. In FY05, Harmony produced 3 million ounces of gold, predominantly from South African sources.

11.1.3 South African Post Office

The South African Post Office is a public company with the SA government as its sole shareholder. It operates in terms of its memorandum and articles of association, the Post Office Act of 1998 (as amended) and the Companies Act of 1973 (as amended). The business units are Mail, Retail Services, Postbank, Courier Services & Parcel Deliveries.

Over the past five years, the South African Post Office's management team has steered the company to an impressive financial turnaround. Starting from an operating loss of R577 million in 2000/01, the South African Post Office achieved operating profits of R27 million in 2003/04 and R135 million in 2004/05. After its hugely successful turnaround, the South African Post Office is now in a position to pursue growth opportunities, both in its core

business and related sectors. At the same time, emerging trends in the postal industry pose unprecedented challenges.

11.2 Appendix B: Sayings and their English Translations

Taken from the Jacomac website of European Sayings and Idiomatic Expressions (http://sayings.jacomac.de/)and from the About Italian website (http://italian.about.com/.)

Spanish: El que con lobos anda a aullar aprende.
English: The one that hangs out with wolves learns to howl.

Italian: Patti chiari, amicizia lunga.
English: Clear agreements make for good friends.

French Ne pas y aller par quatre chemins
English: Not to go there following four lanes.

German: Probieren geht über Studieren.
English: To try goes over studying

Swedish Lika bär leka bäst
English: Similar berries play best

Italian: Scopa nuova scopa bene.
English: A new broom sweeps clean.

Italian: Sbagliando s'impara.
English: One learns from his mistakes.

Italian: O mangiar questa minestra o saltar questa finestra.
English: Either eat this soup or jump out this window.

Italian: Uomo avvisato, mezzo salvato.
English: Forewarned is forearmed.

Italian: Val più la pratica della grammatica.
English: Experience is more important than theory.

Italian: Tutto è bene quello che finisce bene.
English: All's well that ends well.

11.3 Appendix C: Research Survey Results and Sample Artefacts

The Baseline version of the Project Management Framework, rolled out at client level consists of phases, processes, roles and activities, templates, training material, checklists and work guidelines, samples of which have are presented in this chapter. Alternatively, the reader may access further information regarding the Framework at www.projectlife.co.za.

11.3.1 Results of the Research Survey

The total number of projects that the survey relates to (question 1 of the survey) is 35.

Question	Average Response
Has the PM Framework provided simple access to a common set of PM process and tools?	1.00
Has the PM Framework promoted usage of PM best practice?	1.11
Has the PM Framework increased the level of assured competence to your projects?	1.71
Has the PM Framework standardized terminology in your environment?	1.09
Has the PM Framework standardized PM processes in your environment?	1.71
Has the PM Framework provided a common method to track project progress?	2.09
Would you recommend the Framework to other users?	1.00
More focus on Process?	1.60
More Templates?	1.34
More Work Guidelines?	1.63
More focus on Maturity?	1.43
More focus on Program Management?	1.17
More focus on Portfolio Management?	1.29
Sufficient knowledge and technique in developing a WBS from scratch?	3.74
Sufficient use of an applicable project performance measurement techniques, such as EVM?	3.94

Table 11.1 Aggregated Results of the Research Survey

11.3.2 Content of the Research Survey

Project Management Framework Feedback Questionnaire.

How many projects have you managed / sponsored using the PM Framework?	

Please answer the survey by entering an appropriate response:

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree.

Section 1: PM Framework benefits

Has the PM Framework provided simple access to a common set of PM process and tools?	
Has the PM Framework promoted usage of PM best practice?	
Has the PM Framework increased the level of assured competence to your projects?	
Has the PM Framework standardized terminology in your environment?	
Has the PM Framework standardized PM processes in your environment?	
Has the PM Framework provided a common method to track project progress?	
Would you recommend the Framework to other users?	

Section 2 What would you like to see more of in future releases of the PM Framework?

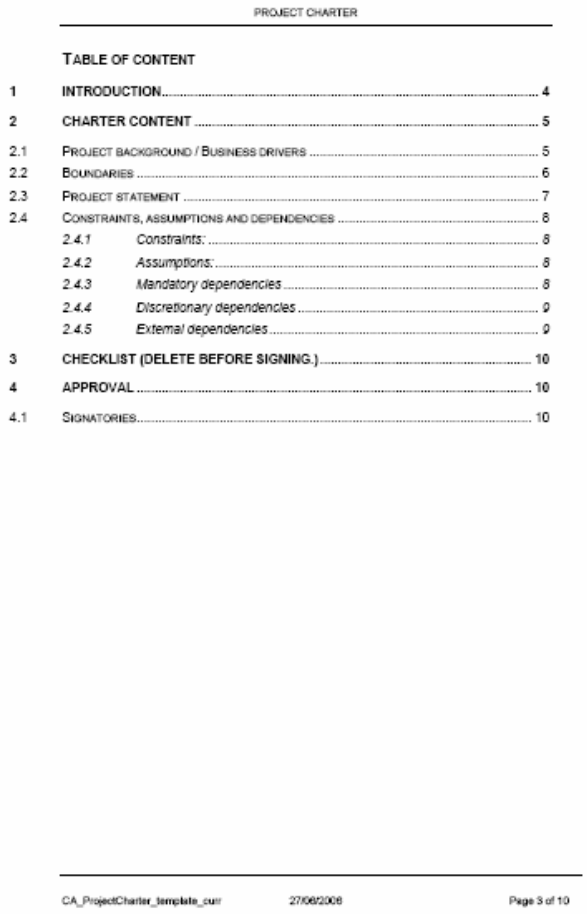
More focus on Process?	
More Templates?	
More Work Guidelines?	
More focus on Maturity?	
More focus on Program Management?	
More focus on Portfolio Management?	

Section 3: Are the following aspects well understood and used within your organization?

Sufficient knowledge and technique in developing a WBS from scratch?	
Sufficient use of an applicable project performance measurement techniques, such as EVM?	

Section 4: Comments

11.3.3 Content of the Charter Template



PROJECT CHARTER

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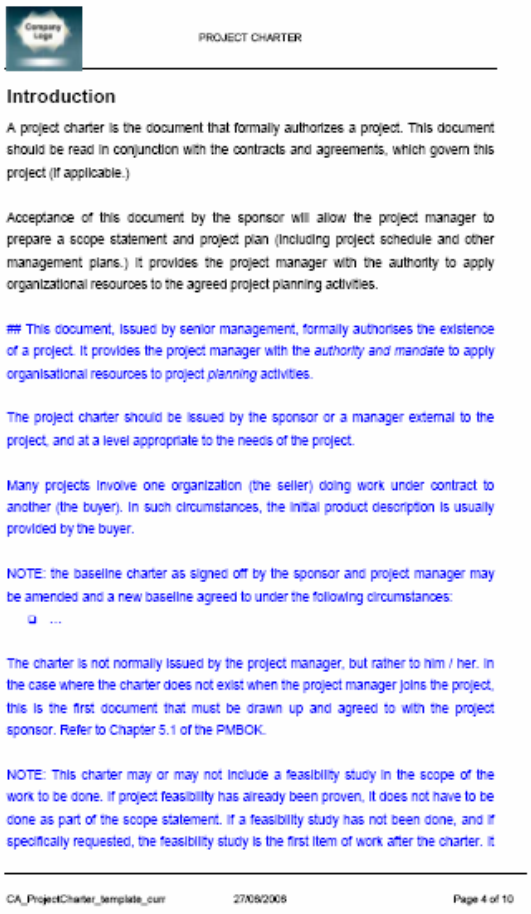

PROJECT CHARTER

1 Introduction

A project charter is the document that formally authorizes a project. This document should be read in conjunction with the contracts and agreements, which govern this project (if applicable.)

Acceptance of this document by the sponsor will allow the project manager to prepare a scope statement and project plan (including project schedule and other management plans.) It provides the project manager with the authority to apply organizational resources to the agreed project planning activities.

This document, issued by senior management, formally authorises the existence of a project. It provides the project manager with the *authority and mandate* to apply organisational resources to project *planning* activities.

The project charter should be issued by the sponsor or a manager external to the project, and at a level appropriate to the needs of the project.

Many projects involve one organization (the seller) doing work under contract to another (the buyer). In such circumstances, the initial product description is usually provided by the buyer.

NOTE: the baseline charter as signed off by the sponsor and project manager may be amended and a new baseline agreed to under the following circumstances:

- ...

The charter is not normally issued by the project manager, but rather to him / her. In the case where the charter does not exist when the project manager joins the project, this is the first document that must be drawn up and agreed to with the project sponsor. Refer to Chapter 5.1 of the PMBOK.

NOTE: This charter may or may not include a feasibility study in the scope of the work to be done. If project feasibility has already been proven, it does not have to be done as part of the scope statement. If a feasibility study has not been done, and if specifically requested, the feasibility study is the first item of work after the charter. It

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is important to clearly state this in the boundaries and project statement sections of the charter. The charter may also be limited to just a feasibility study.

To make the best use of auto content generation, play careful attention to:

- Enter key information under document properties (Alt f, i.)
- Press Ctrl a and F9 to update fields in document. ##

2 Charter content

2.1 Project background / Business drivers

Document the positioning of the project within the business relative to existing business strategies.

List the business need / drivers behind the selection of the project. If available at this stage, list the benefits that the sponsor wishes to derive. These benefits should be measurable and not anecdotal, i.e. improve productivity from X / day to XXX / day, averaged over the organisation per calendar month. These will be revisited in the scope statement.

Checklist:

- Are the business drivers written in business language and clearly understood?
- Do the business drivers and/or background statements have any empirical support to help validate their importance?
- Are there any business goals, strategies, or principles that need to be referenced?
- Does the statement show how the project fits in the context of the business it supports?
- Does the information convey a compelling need to do the project? Does it "sell" the project's business value?##

2.2 Boundaries

Document the project boundaries – clear inclusions and exclusions known from the start.

In scope and out of scope items. Specifically include or exclude the feasibility study in the scope of the project. The charter may also be limited to just a feasibility study for a prospective project(s).

There are two major places where scope is defined. The high-level scope is established in the Project Definition (charter). The detailed scope is defined in the approved business requirements. Of the two, project managers most often have difficulty writing the high-level scope statements. If you struggle determining what your scope section should look like, there are four categories that can help you.

Deliverables

If you do nothing else, the scope section should include the major deliverables that the project team is creating. Generally, you only include the final deliverables that your project delivers to the client and not the internal documents used by your project team. For instance, a Business Requirements Report and Current State Assessment could be listed as project deliverables since they are both client approved deliverables. You would not need to mention internal project documents such as the project workplan, Technical Design, or Test Cases. If you think that the reader might have any confusion about other potential deliverables that you won't create, these should be specifically listed as out-of-scope so that there is absolutely no ambiguity.

Lifecycle

If your project is only going to execute a portion of the lifecycle, the scope statement should identify this as a lifecycle boundary. For instance, if you have a project that's only going to cover project analysis, you should specifically include the Analysis Phase as in scope, while identifying the Design, Construct, Test, and Implement Phases as being out of scope.

Data / data sources

It's possible that your project will work with some types of data and won't work with others. For example, you might state that financial data is in scope, while sales and manufacturing data is out of scope. "Data sources" are files, tables, or databases of aggregated data. So you might state, for instance, that the Customer Database and General Ledger are in-scope, while the Billing Tables are out of scope.

Organizations

If your solution covers more than one organization, you can state which ones are in scope and which are out of scope. For instance, your project may focus on Human Resources and Accounting, but the Manufacturing Division might be out of scope.

Major functionality

If your project is delivering a solution with less than full functionality, you should describe the major features and functions that are in and out of scope. For instance, decision support and management reporting might be in scope, while overnight batch processing might be out of scope.

##

2.3 Project statement

The project statement is a one-sentence description of what the project will do, when it will be done and how much it will cost. Regardless of the size of the project it is important to limit the project statement to a single sentence. The purpose for this is to explain quickly what the project is, when it will be done, and what it costs. State the business need and the product (overall outcome) the project aims to achieve, and by when (strategic goal).

Checklist:

- Is the statement short and concise (10-20 words maximum)?
- Is it clear from reading just this one statement what the project will accomplish?
- Does the statement indicate when the project will be completed?
- Does the statement indicate what the project will cost?

- Is a feasibility study included in the scope of the project and is this clearly indicated?
- Is the primary trade-off listed, i.e. time is more important that cost and quality on this project. ##

2.4 Constraints, assumptions and dependencies

2.4.1 Constraints:

-

Constraints are factors that limit the sponsor's options. One of the most common constraints for many projects is funds availability.

When a project is performed under contract, contractual provisions will generally be constraints. Another example is a requirement that the product of the project be socially, economically, and environmentally sustainable, which will also have an effect on the project's scope, staffing, and schedule. ##

2.4.2 Assumptions:

-

Assumptions are factors that, for planning purposes, are considered to be true, real, or certain. Assumptions affect all aspects of project planning, and are part of the progressive elaboration of the project. Project teams must identify, document, and validate assumptions as part of their planning process.

2.4.3 Mandatory dependencies

-

Mandatory dependencies are those that are inherent in the nature of the work being done. They often involve physical limitations. (On a construction project, it is impossible to erect the superstructure until after the foundation has been built; on an

electronics project, a prototype must be built before it can be tested.) Mandatory dependencies are also called hard logic. ##

2.4.4 Discretionary dependencies

Discretionary dependencies are those that are defined by the project management team. They should be used with care (and fully documented), since they may limit later scheduling options.

Discretionary dependencies are usually defined based on knowledge of:

- "Best practices" within a particular application area.
- Some unusual aspect of the project where a specific sequence is desired, even though there are other acceptable sequences.

Discretionary dependencies may also be called preferred logic, preferential logic, or soft logic. ##

2.4.5 External dependencies

External dependencies are those that involve a relationship between project activities and non-project activities. For example, the testing activity in a software project may be dependent on delivery of hardware from an external source.

Checklist:

- Have known assumptions about the following categories of factors been considered and documented: Scope, Schedule, Financing, Resources, Expectations, Sponsorship, Customers, Technologies, Vendors, Partners & Business Relationships?
- Have constraints in the following categories been considered and documented: Timeframes & Deadlines, Funding, Resources, Skill Levels, Dependencies, Legal, Policy, Technology? ##

3 Checklist (delete before signing.)

- Have the major project stakeholders been identified?
- Are the stakeholders in agreement regarding the product (or service / result) description contained in the charter?
- Does the product description document the relationship between the product or service being created and the business need or other stimulus that gave rise to the project?
- All projects should be supportive of the performing organization's strategic goals; have these been reviewed?
- Is the pm aware of the project selection criteria that were used for the selection of the project?

4 Approval

Charter approval is required from project sponsor and project manager and will form the basis for creating the scope statement.

4.1 Signatories

We the undersigned hereby acknowledge that we have full understanding of the contents, contained within this document and agree to adhere to the requirements thereof.				
NAME	DESIGNATION	SIGNATURE	DATE	APPROVE / REJECT / DEFER
	Project Sponsor			
	Project Manager			

11.3.4 Content of the Organizational Assessment Template

Content

1. Introduction

This document is intended as a tool for the MY COMPANY project manager. Most of the information should be obtained from MY COMPANY marketing or the sponsor (if the relationship allows very frank discussion.) Your initial opinion of the client may be wrong, so consider re-doing this document at the start of each phase, based on lessons learnt and in order for MY COMPANY teams to better understand the client culture in successive projects.

Reference:
Cadle, J. and Yeates, D. (2001). *Project Management For Information Systems, 3rd Edition.* Pearson Education Limited.

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Press Ctrl a and F9 to update fields in document. ##

2. Managing Project Stakeholders

According to the CMMI v1.1:
A "stakeholder" is a group or individual that is affected by or in some way accountable for the outcome of an undertaking. Stakeholders may include project members, suppliers, customers, end users, and others.

According to the PMBOK Guide, stakeholders are:
Individuals and organizations that are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or project completion. They may also exert influence over the project and its results.

Plan Stakeholder Involvement

Stakeholders are identified from all phases of the project life cycle by identifying the type of people and functions needing representation in the project and describing their relevance and the degree of interaction for specific project activities. A two-dimensional matrix with stakeholders along one axis and project activities along the other axis is a convenient format for accomplishing this identification. Relevance of the stakeholder to the activity in a particular project phase and the amount of interaction expected would be shown at the intersection of the project phase activity axis and the stakeholder axis.

For the inputs of stakeholders to be useful, careful selection of relevant stakeholders is necessary. For each major activity, identify the stakeholders that are affected by the activity and those who have expertise that is needed to conduct the activity. This list of relevant stakeholders will probably change as the project moves through the phases of the project life cycle. *It is important, however, to ensure that relevant stakeholders in the later phases of the life cycle have early input to requirements and design decisions that affect them.*

Examples of the type of material that should be included in a plan for stakeholder interaction include the following:

- List of all relevant stakeholders
- Rationale for stakeholder involvement
- Roles and responsibilities of the relevant stakeholders with respect to the project, by project life-cycle phase
- Relationships between stakeholders
- Relative importance of the stakeholder to success of the project, by project lifecycle phase
- Resources (e.g., training, materials, time, funding) needed to ensure stakeholder interaction
- Schedule for phasing of stakeholder interaction

Conduct of this CMMI specific practice relies on shared or exchanged information with the Plan for Needed Knowledge and Skills specific practice.

Typical CMMI Work Product:

- Stakeholder involvement plan, included in Project Plan template.

3. Managing Organizational Change as part of the project

Introduction

All new information technology systems bring a range of associated changes with them. These may be changes to business processes and procedures, new roles and responsibilities, organizational restructuring, new equipment or facilities, or new skills to learn. All of these involve people, and it is the people within any organization who are the key to the success of any implementation.

Information systems are only tools to enable people to take better decisions, so getting the commitment of the people who will use the system is central to the success of the IT project.

Managing change means being proactive in identifying and planning for the changes that need to take place within the business to support the new system.

Planning a change programme at the start of the project and running the programme throughout the life of the project and for some time beyond it can avoid many problems.

Organizing the project so that there is a user project manager with a responsibility for managing the change can be a great help in enabling these people issues to be tackled. Key considerations for such a programme are:

- Plan the change programme in the same way as the development and implementation of the system – these processes are integral and not separate.
- Ensure that the change program includes communications and training.
- Phase the introduction of a change to ensure that people are not bombarded with too many changes at once, and allow for periods of consolidation to enable people to become comfortable and confident with their new responsibilities, processes or environments.
- Involve "users" in planning and implementing the change programme because they understand the issues in the user community.

Organizational Change

The time to market for new products is decreasing year on year and privatization has brought radical changes to public institutions in SA. Increased globalization in many sectors has brought the challenge of managing across national boundaries and cultures. Organizational change is commonplace and one main lesson seems to be that there is not one easy prescription for managing change – there are many complex influences on the way people react to change.

The first thing to look for is the business context for your project: what is really driving the investment of all this time and effort in delivering new IT systems? There are four broad reasons for organizations to invest in large-scale corporate IT development programmes:

- Business survival – time is often the key success factor which means possible compromise on scope specification, marginalization of persons who resist the change and focus on delivering the essential functionality to those users who are key to the business; production automation and workflow systems often fit in this category.
- Improved efficiency – rarely is the increased operational efficiency due to design of the system itself, in most cases it is people's better decision making capability based on the information provided by the systems that increase efficiency; Management Information systems (MIS) and office systems often fall in this category.

- Potential competitive advantage – the key here is to encourage innovation and new ideas throughout the project lifecycle; rapid prototyping and end-user solutions are tactics that often have value in this context.
- External factors such as legislative change, merger, privatisation, etc. – here the specification is not under your own control and the pm needs to be mindful of the external stakeholders who have to be satisfied. Involvement is a key process here, to ensure that all the stakeholders (internal and external) are taken along every step of the way. Be ready for contingency plans when the ground rules are changes unexpectedly. It is not enough to comply with the letter of the law but rather to continually test that all parties have a common understanding of what is required. Risk profiling tools are especially useful tools for such projects.

Result of this section goes to item # 1 in the assessment results.

Resistance to Change

Your personal reaction to any change dictates whether you will be receptive or resistant to it. The changes resulting from information systems projects often meet resistance because the project managers have not anticipated the personal reactions to change they might meet from the people affected by a new system. One of the paradoxes of change: any new situation contains within it some danger, some loss but also the potential for new opportunities. Darryl and Connor and others have developed questionnaires to classify people as either D or O-type: Danger people or Opportunity people. Most project leaders are O-type but the majority of users who are targets for a new system are probably D-type people, and they may well see threat in the change and seek ways of trying to resist it.

Identify stakeholders who are type D people and list their names in item # 2 of the assessment results as deserving special attention in the change process.

Organizational Change

The impact of the change curve on your project and the tactics you can employ to drive people along it depends on the culture of the organization in which you are working. Charles Handy and Roger Harrison classify organizations according to the degree of centralization and the degree of formality in the way things are done, refer to figure below. Handy uses the metaphor of the gods of Parnassus as the four main types of business organization: Zeus, the entrepreneur; Apollo, god of order and bureaucracy; Athena, patroness of craftsmen; and Dionysus, worshipped by artists and professionals.

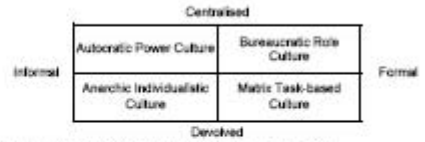


Figure 1: Organizational Cultures (Handy and Harrison)

Power Culture (Zeus)
Here obtaining and demonstrating sponsorship is the key. Everyone looks to those with the power to supply the answers and sanction actions, e.g. owner-managed businesses or in larger organizations, where a charismatic leader can develop a power culture. Be aware that, whatever formal sign-off route has been agreed, no significant products will really be approved until the person at the top has said yes.

Role culture (Apollo)
Here the culture is formal and centralized. Everyone has a role, a job description and a formal relationship with others in related roles. Public sector organizations and large financial institutions are often bureaucratic role cultures. The watchword here is to play by the rules but also to be aware that there is probably a parallel informal set of relationships that people use to "get around the system" and "to get things done."

Task-based culture (Athena)
Here the tasks are devolved to the lowest practical level but there is still a formal framework for reporting and decision-making. Organizations like this are used to forming task forces and problem solving teams. Modern manufacturing companies often fall into this category. The main difficulty here is that the user staff may want to get too involved in the running of the project, to question all the internal working arrangements of the project and to be engaged throughout the lifecycle rather than just providing input or review at a specific stage.

Individualistic culture (Dionysus)
Here the culture is so informal and decentralized that people often do not like to think of it as an organization at all, e.g. professional organizations. In a culture such as this, everyone has a distinct voice and all opinions deserve to be aired. This can be a very challenging place in which to run an IT project. The watchwords are to use the formal mechanisms, such as base lining of specifications and plans, sparingly. But when you do, make a big show of it.

Insert the result of the assessment of the client concern, based on Handy and Harrison, in item # 3 of the assessment results.

More recently, Gareth Jones and Rob Goffee have offered an alternative but connected analysis of organizational culture. They say that the character of an enterprise, a division, a department or a project can be described by identifying its

- Sociability; and its
- Solidarity.

Sociability is a measure of friendliness. It means that people relate to each other in a friendly and caring way; they 'look out' for each other. Project teams with high sociability play together outside work, invent their own language and develop their own team characteristics. Sociability is not a universally 'good' dimension: it has dark side. High sociability can lead to friendship becoming more important than performance.
If we think of sociability as a heart thing, then solidarity is a head thing. It is very much concerned with the tasks of project management: common goals, common tasks and mutual interests that affect everyone. You do not have to like everyone on your project but you have to focus to get the job done. Poor performance is not tolerated and poor performers are shown the door. These two dimensions – sociability and solidarity – give us the matrix shown below with the four different cultures.

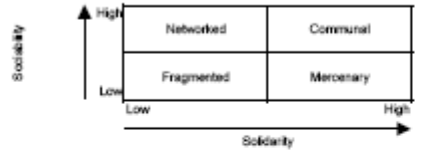


Figure 2: Sociability / Solidarity Matrix

In Networked cultures:

- People know each other at work and outside work. They know each other and help each other.
- There is openness, trust and tolerance.

- Poor performance is managed in the ways described in Ch 19 on performance management.
- Development is encouraged and there is an open approach to developing careers and moving people around.
- People deal well with complexity and uncertainty; they can feel their way towards a solution.

Networked cultures can be over-tolerant of poor performance; there can be over-reliance on consensus and too much focus on process and discussion rather than on outcomes and results.

In Mercenary Cultures:

- There is strong agreement about targets and goals.
- There is a real sense of purpose and drive.
- Work is very important and there is great task focus.
- Socialising has a purpose: to talk about work.

It is a ruthless place to work; there is no peace or sympathy and people who do not deliver are a 'waste of space.' Managers think short term about meeting results and there is little inclination to help anyone else.

In Fragmented Cultures:

- People work for themselves and not for the organization.
- High performance is everything; it is not whom you know but what you deliver that counts.
- There is a lot of freedom; you do not have endless consultation (high sociability) or constant reminders or corporate goals (high solidarity.)

It is not a particularly friendly place to work; a fragmented culture is the culture of the individual. This often makes it a culture found in legal practices, consultancies, journalism and the academic world.

People in Communal Cultures:

- Have a high level of commitment to each other. There is friendship as well as high energy and focus on the goals.
- Are focused on the product of service; there is no need for personal agendas.
- Work in teams all the time.
- Support the leader.

Communal cultures absorb all of your time. Either you are goal focused (high-solidarity) or you are colleague focused (high sociability.) It is great place to work if you believe in the

brand and went to belong, but not if you went time to think your own thoughts or have a life outside work.

Some organizations can be characterized by a single culture, but most organizations can demonstrate several different cultures within them at the same time. Also, no single culture is good or bad by definition; it all depends on what is right or appropriate for the competitive climate and the work context. If the department in which you are leading a project has a certain culture, you will need to accommodate your culture and the way you work to your client's culture.

Insert the result of the assessment of the client concern, based on Jones and Goffee, in item # 4 of the assessment results.

The Project Manager And Change

Most information systems are a tool for people to use to support them in their job – therefore to implement the change successfully you have to ensure that people are using the system effectively and efficiently. The pm should design and manage a change program which takes the users with him / her and ensures that the project as a whole delivers what the business needs. There are four overlapping stages in such a change programme:

- Launching the project;
- Winning hearts and minds;
- Skilling the end users; and
- After go-live.

The Change Manager

As soon as the project is launched, find a sponsor from the business who will act as the change manager; they will need to be credible and influential rather than senior. You need to work in partnership with the sponsor because you need them to visibly sign up to decisions and take a leading role in bringing about change.

Insert the name of the change manager, in item # 5 of the assessment results.

4. Assessment Results

The following table contains the results of your assessment of the client organization and change drivers, with a column that should be filled in to provide guidance to your team members. The results of this assessment should be reflected in the management plans.

#	Description	Result	Plan for Managing the project
1	Reason for change (chapter 2.3)	E.g. – Business Survival	E.g. Focus on time as non-negotiable trade-off (vs. scope, cost, marginalization of those opposed to the change.)
2	Type D people	☐ Joe Kotte ☐ Joanne Druer	☐ Involve in Steering Committee meetings to assure buy-in. ☐ Involve in design phase and testing, but not the build phase.
3	Organizational Cultures (Handy and Harrison)	E.g. Power Culture	E.g. Client's and dues-or-date sponsorship as part of all phases.
4	Organizational Culture (Sociability / Solidarity Matrix)	E.g. Mercenary Culture	Do not seek sympathy for underperformance, rather present workable and well thought through plans to rectify. Be aware of performance imperative when presenting plans, set based on efficiency. Do not sell long-term solutions at Steering Committee level.
5	Name of Change Manager and approach to involving him / her.	Name	Approach.
6a	Initiation Phase: Audience and Actions	Audience	Actions
7a	Definition and Planning Phase: Audience and Actions.	Audience	Actions
8a	Execution Phase: Audience and Actions.	Audience	Actions
9a	Closeout Phase: Audience and Actions.	Audience	Actions

11.3.5 Content of the WBS Development Guide

Content

1 Introduction

According to the PMBOK Guide, the project scope of work is determined iteratively and generally done by the project team with the use of a Work Breakdown Structure (WBS), allowing the team to capture and then decompose all of the work of the project.

The WBS is the key tool in the Definition and Planning Phase, where the work is defined, and, at the completion of this phase, when the plan – including the WBS – is baselined. The WBS is present in virtually every aspect of managing the project. Therefore, it is very important to prepare the WBS early and correctly.

The 100 percent rule is the most important criterion in developing a WBS and in evaluating the decomposition logic. It is as follows: *The next level decomposition of a WBS element (child level) must represent 100 percent of the work applicable to the next higher (parent) element.*

Notwithstanding the discussions below, within the Project Management Framework, it is suggested that the WBS, activity list and the WBS Dictionary are developed concurrently, in Microsoft Project, using the Notes field to document the work to be performed. A template for the schedule can be accessed at: IS_Schedule_template_001d.mpp

2 The Work Breakdown Structure (WBS)

It should be noted that the WBS itself does not show dependencies and is not time-based.

2.1 Anatomy of the WBS

There are different types of projects and, therefore, different types of WBS's, each with unique elements. All WBS's have two or more of the five types of Level 2 elements listed below (where level 1 is the total project.)

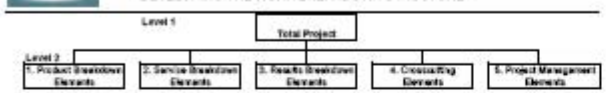


Figure 1.1. Levels 1 and 2 of a WBS.

1. Product Breakdown: based on the physical structure of the product(s) being delivered, the most common basis for a WBS and is the easiest WBS to develop.
2. Service Breakdown: service projects do not have a tangible, structured deliverable. The output is a defined body of work done for others: conference, wedding, vacation trip, etc. The breakdown is the logical collection of related work areas.
3. Results breakdown: results projects do not have a tangible, structured deliverable. The output is the consequence of a process that results in a product or conclusion: cancer research, culture change, etc. The work breakdown is a series of accepted steps.
4. Crosscutting element: a breakdown of items that cut across the project, such as architectural design, assembly or test. These are usually technical and supportive in nature. Rare in service or results projects.
5. Project management: a breakdown of the managerial responsibilities and activities of the project. It includes reports, reviews, and other activities of the project manager and his staff.

The first 3 types of elements are derived from the three types of projects, as indicated in the definition of a project in the PMBOK® Guide. " A temporary endeavour undertaken to create a unique *product, service or result.*"

The last 2 elements above are supporting elements necessary to completely define the scope of a project and meet the 100 percent rule.

Within the Project Management Framework, the activities of element 5 are included in the project schedule template, but should be reviewed for completeness, based on the specific needs of a given project.

2.1.1 Product Projects Breakdown

The product breakdown is the decomposition of the natural physical structure of the output product being developed, e.g. for developing software the documented source code, the

manuals and the CD-ROM with the executable program and installation software would be the deliverables.

This breakdown typically has more levels than the crosscutting or project management sections. Some parts of the product breakdown may require decomposition to a lower level than others because of the nature of the product and its components.

In product breakdowns, work packages can be assigned to either organizations or individuals, but specific resources are assigned only at the activity level.

2.1.2 Service Projects Breakdown

A WBS for a project where there is not tangible product, but where the objective is a service provided for a person or a group, has a second type of WBS element and a different approach to decomposition. The decomposition is based on a logical grouping of similar and related work elements, functions or skills. These types of WBS's are frequently developed from the bottom up, starting with a list of activities and grouping them into logical categories or functions. The basis for each level 2 element is that it represents a logical grouping of tasks that can be discretely described. Further, each element at every level lends itself to being assigned to a single persons or organization.

2.1.3 Results Project Breakdown

The results type project does not have a well-structured primary product as a deliverable, but may have several products that collectively achieve the desired result. A results project has a series of planned, well-defined steps and is a process-based project. An example would be the implementation of a new system, which forms part of a business' value chain, at multiple sites. The result is better customer service, faster ordering, single view of client from different software systems, etc.

The decomposition is based on process step necessary to achieve the project objectives. The 100 percent rule applies and the team must carefully review the child elements of each parent at each level to ensure that all the work is identified. Persons familiar with or expert in the process should be used in this analysis.

2.1.4 Cross-cutting Elements

These elements transect the peer WBS elements at each level and represent work that either supports the product category's development or content or is the next step in a process that results in a product.

Four types have been identified:

1. Integrative – level 2 or lower – integrates two or more peer WBS elements, e.g. the assembly element that combines other WBS elements such as develop Order Entry component, develop Update Stock level component and invoice Client component.
2. Analytical – level 2 or lower – an analytical activity that spans the work elements of a common parent, e.g. system analysis.
3. Process – level 2 or lower – represents a next step in a work progression. Similar to an Integrative element but is more related to the flow of work than the grouping or combination of several elements, e.g. Test and Evaluation
4. Project Management.

2.1.5 Project Management Breakdown

A special category of crosscutting element that occurs universally and has characteristics of the integrative, analytical or process elements within it at lower levels.

An example of typical work packages and activities are included in the table below.

Project Management (Level 2)	
Level 3	**Level 4**
Project Start and Finish	Contract Award Closeout Project
Meetings and Reviews	Kick-off meeting Monthly / Quarterly Project reviews Corporate Reviews In-Process Reviews Closeout Meeting Action Item Tracking System
Reports	Progress reports Budget / Financial Status reports
Plans	Project Charter Master Schedule Project Plan (Current and Future Phases) Risk Management and Other Plans Project Financing and Budget
Control	Schedule Tracking Cost Tracking

	EVM Analysis Variance Analysis Corrective Action Work-arounds
Administrative	Project Management Office Space / relocation Correspondence Control System
Project Support	Procurement / Purchasing Subcontract management Contract Management

2.2 *The WBS Dictionary*

This is a document that defines and describes that work to be performed in each WBS element. It information provided should not be lengthy, but it should sufficiently describe the work to be accomplished. A form may be used for this purpose, per WBS element. It can be easily converted into a statement of work for a project or sub-project. It must clearly and comprehensively define the total project scope.
Template: WBS Dictionary Template

Within the Project Management Framework, it is suggested that the WBS and the WBS Dictionary are developed concurrently, in Microsoft Project, using the Notes field to document the work to be performed.

3 Developing the WBS

The overall core process flow according to the PMBOK® Guide is as follows:

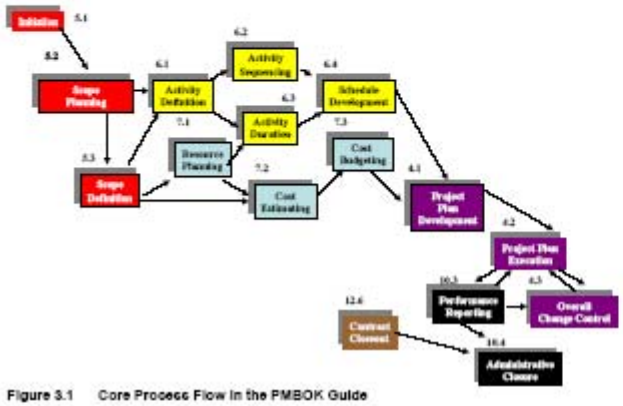


Figure 3.1 Core Process Flow in the PMBOK Guide

Scope Definition (chapter 5.3) is where the WBS is developed and Activity Definition (chapter 6.1) will lead to updates of the WBS.

3.1 *Scope Definition*

Scope definition involves subdividing the major project deliverables (as identified in the scope statement as defined in Section 5.2.3.1) into smaller, more manageable components to:

- Improve the accuracy of cost, duration, and resource estimates.
- Define a baseline for performance measurement and control.
- Facilitate clear responsibility assignments.

When there is poor scope definition, final project costs can be expected to be higher because of the inevitable changes, which disrupt project rhythm, cause rework, increase project time, and lower the productivity and morale of the workforce.

The Scope Definition Process is visualized as follows in the PMBOK:

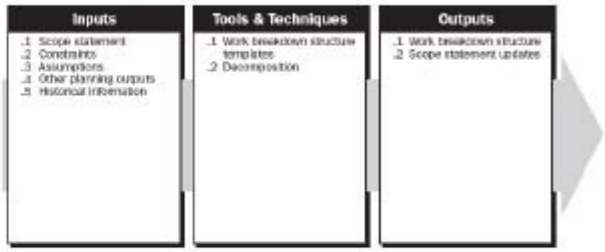


Figure 3.2 Scope Definition Process in the PMBOK Guide

At level 1 of WBS, is the Scope Statement.

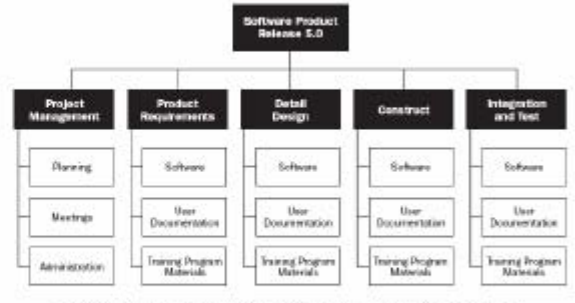
The Project Management Framework relies on the various competencies to supply a WBS template in the form of a schedule to the project manager. If a type of project is being performed for which no template is available, decomposition must be performed for the applicable type of project, whether for a product, service or result type of project.

Decomposition involves subdividing the major project deliverables or sub deliverables into smaller, more manageable components until the deliverables are defined in sufficient detail to support development of project activities (planning, executing, controlling, and closing). Decomposition involves the following major steps:

1. Identify the major deliverables of the project, including project management. The major deliverables should always be defined in terms of how the project will actually be organized. For example:
   a. The phases of the project life cycle may be used as the first level of decomposition with the project deliverables repeated at the second level, as illustrated in Figure 3.2
   b. The organizing principle within each branch of the WBS may vary, as illustrated in Figure 3.3.
2. Decide if adequate cost and duration estimates can be developed at this level of detail for each deliverable. The meaning of adequate may change over the course of the project—decomposition of a deliverable that will be produced far in the future may not be possible. For each deliverable, proceed to Step 4 if there is

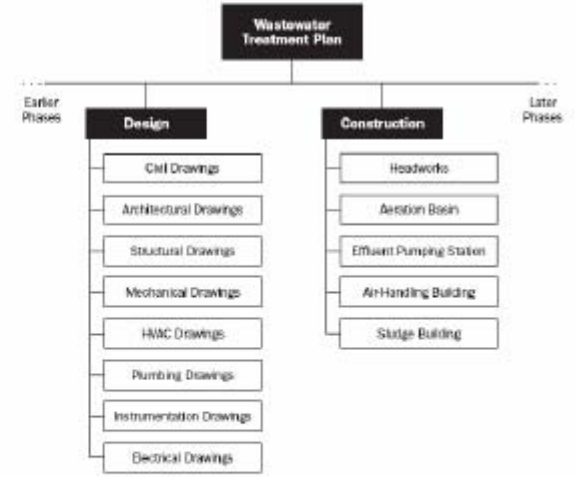
adequate detail, to Step 3 if there is not—this means that different deliverables may have differing levels of decomposition.

3. Identify constituent components of the deliverable. Constituent components should be described in terms of tangible, verifiable results to facilitate performance measurement. As with the major components, the constituent components should be defined in terms of how the work of the project will actually be organized and the work of the project accomplished. Tangible, verifiable results can include services as well as products (e.g., status reporting could be described as weekly status reports; for a manufactured item, constituent components might include several individual components plus final assembly). Repeat Step 2 on each constituent component.
4. Verify the correctness of the decomposition:
   a. Are the lower-level items both necessary and sufficient for completion of the decomposed item? If not, the constituent components must be modified (added to, deleted from, or redefined).
   b. Is each item clearly and completely defined? If not, the descriptions must be revised or expanded.
   c. Can each item be appropriately scheduled? Budgeted? Assigned to a specific organizational unit (e.g., department, team, or person) who will accept responsibility for satisfactory completion of the item? If not, revisions are needed to provide adequate management control.
5. Identify work products that will be reused. This must be done within each level of the WBS to ensure work product re-use. This is done in order to satisfy the CMMI Specific Practice "Estimate the Scope of the Project" within the Specific Goal "Establish Estimates" within Project Planning.



This WBS is illustrative only. It is not intended to represent the full project scope of any specific project, nor to imply that this is the only way to organize a WBS on this type of project.

Figure 3.3 Example WBS



This WBS is illustrative only. It is not intended to represent the full project scope of any specific project, nor to imply that this is the only way to organize a WBS on this type of project.

Figure 3.4 Example WBS

3.2 *Activity Definition*

Activity definition involves identifying and documenting the specific activities that must be performed to produce the deliverables and sub deliverables identified in the Work Breakdown Structure (WBS).

Experience has shown that defining activities or tasks is not as easy as it looks. Too often, there is inadequate definition and poor schedules, which result in communication problems. Activity definition is extremely important since activities are the building blocks for planning and controlling the project.

Within the context of the process of Activity Definition, decomposition involves subdividing project work packages into smaller, more manageable components to provide better management control. The major difference between decomposition here and in Scope Definition is that the final outputs here are described as activities rather than as deliverables. The WBS and the activity list are usually developed sequentially, with the WBS being the basis for development of the final activity list.

Within the Project Management Framework, it is suggested that the WBS and the activity list are developed concurrently, in Microsoft Project.

The activity list must include all activities that will be performed on the project. It should be organized as an extension to the WBS to help ensure that it is complete, and that it does not include any activities that are not required as part of the project scope. As with the WBS, the activity list should include descriptions of each activity to ensure that the project team members will understand how the work is to be done.

In using the WBS to identify which activities are needed, the project team may identify missing deliverables, or may determine that the deliverable descriptions need to be clarified or corrected. Any such updates must be reflected in the WBS and related documentation, such as cost estimates. These updates are often called refinements and are most likely when the project involves new or unproven technology.

The following table may be used to determine whether a work package should be further broken down.

SHOULD THE WORK PACKAGE BE DECOMPOSED FURTHER?	
The greater the number of positive answers to the following questions, the stronger the justification for breaking down the work package	
Y/N	Question
	Is there a need to improve the accuracy of the cost and duration estimates?
	Is more than one individual responsible for the work contents?
	Is there a need to know precisely the timing of activities internal to the work package?
	Is there a need to cost-out activities internal to the work package?
	Are there any dependencies between the internal activities and other work packages?
	Are there any significant time breaks in the execution of the work processes internal to the work elements?
	Do resource requirement within the work package change over time?
	Do the prerequisites differ among the internal deliverables within the work element?
	Are there any acceptance criteria applicable before completion of the entire work package?
	Can a portion of the work to be performed within the work package be scheduled as a unit?
	Are there any specific risks that require focused attention to a portion of the work package, requiring further division to separate them?
	Is the work package understood clearly and completely to the satisfaction of the various stakeholders?

3.3 *Identify work products (or components) to be externally acquired.*

This activity feeds into the Procurement processes and needs to be known as early as possible in the project lifecycle as it may affect the project time line, risk profile, etc.

3.4 *Identify work products that will be reused.*

It is the responsibility of the person performing the activity to assure that work products that will be re-used have been identified. In most cases the project manager will not necessarily have the correct skill set to perform this activity, but it is important that he or she pursues this

goal with those providing inputs into the WBS. As acknowledged by the CMMI and others, this activity can be especially fruitful in software projects

4 Glossary of related terms

WBS dictionary: a document that describes the work performed in each WBS element (Haugan)

WBS element: An entry in the WBS that can be at any level and is described by a noun or noun and adjective. (Haugan.)

WBS: A deliverable-oriented grouping of project elements that organizes and defines the total work scope of the project. Each descending level represents an increasingly detailed definition of the project work.

Work package: A deliverable at the lowest level of the work breakdown structure, when that deliverable may be assigned to another project manager to plan and execute. This may be accomplished through the use of a subproject where the work package may be further decomposed into activities.

11.4 Appendix D: The Project Management Context

11.4.1 Project Management Office (PMO)

Introduction

A Project Management Office (PMO) is also referred to as a program management office, a project (or program) office or a project (or program) support office (PSO.) In all cases, most sources agree that this organizational unit oversees the management of projects, programs or a combination of both.

The activities performed by the PMO is mostly functional support and covers areas such as training, software, standardized policies and procedures etc. It *may* also extend to

- Direct management of projects and responsibility for achieving project (or program) objectives;
- Performing the role of a major stakeholder and decision maker in projects;
- Resource assignment and changes; and
- Making recommendations or even terminating projects to ensure that business objectives are met.

Viewpoints

R. M. Wideman (2002) defines a PMO as "a group within an organization responsible for supply, support, and internal consulting to ensure that projects are carried out consistently and successfully in accordance with company strategies."

Now, a PMO (whether for project or program) does not have the same value proposition for every company: the PMO does not necessarily manage projects, and so has an indirect project connection. The value proposition for a PMO is much looser and more subjective than that of project management. Also, Wideman (2002) notes that an enterprise typically needs to be of a certain size before the overhead associated with a PMO becomes beneficial.

The PMBOK® Guide (2000) lists certain key features of a PMO and provides certain key differences between project managers and the PMO. It is the author's opinion that a PMO will benefit the organization by implementing processes and practices that allow every project

within the organization to be delivered consistently better, faster and cheaper. This thinking is directly in line with that which resulted in creation of the Framework product.

11.4.2 Program Management And Project Portfolio Management

Introduction

Gareis and Huemann (2000) view these two functions as necessary competencies for the project-oriented Company. They observe that project-oriented organizations simultaneously perform a number of different projects and that the more projects a company performs the more complex it becomes. In order to cope with this increasing complexity, new management competences are required. In their work done at the University of Economics and Business Administration (2000) they conclude that:

”For Project-oriented Companies it is not sufficient to have the competence to manage single projects efficiently, but additional competences, such as the competences for the assignment of projects and programs, for project and program coaching and auditing, for networking between projects, and for program management and project portfolio management are required. For all of these processes an explicit assessment and continuous further development is necessary.”

The Project-Oriented Company

In Morris and Pinto’s (2004) work, a Project-oriented Company is defined as a company which:

- “Defines “Management by Projects” as an organizational strategy;
- Applies temporary organizations for the performance of complex processes;
- Manages a project portfolio of different project types;
- Has specific permanent organizations to provide integrative functions;
- Applies a “New Management Paradigm”;
- Has an explicit project management culture; and
- Perceives itself as project-oriented.”

The project-oriented Company is characterized by the existence of an explicit PM-culture, i.e. by a set of PM-related values and norms. Project management is considered as a business process, for which there exist specific procedures and a common understanding of the performance of this process, the project roles involved, and the project management methods, to be applied.

They further state that project-oriented companies consider projects not only as tools to perform complex processes, but also as a strategic option for the organizational design of the company. By applying "Management by Projects" the following organizational objectives are typically pursued:

- Organizational differentiation and decentralization of management responsibility;
- Quality assurance by project team work and holistic project definitions;
- Goal orientation and personnel development; and
- Organizational learning by projects.

Having established the potential importance of program management and portfolio management for the project-oriented company, the following two sections explore these disciplines in more detail and make recommendations in terms of their applicability to future research.

11.4.3 Program Management

PMBOK® viewpoint

According to the Third Edition of the PMBOK® Guide (2004), "program management, in contrast with project management, is a centralized, coordinated management of a group of projects to achieve the program's strategic objectives and benefits.… Programs may include elements of related work outside the scope of the discrete projects in the program…. Projects are Chartered and authorized external to the project by the organization, a program or portfolio management body. "

MSP viewpoint

Harpham (2004) noted that successful delivery - across the public sector - is at the top of the UK government's agenda, and it has turned to improved programme and project management to achieve it. He notes that since election in 1997, Tony Blair's 'New Labour' government issued a White Paper barely 2 years later, entitled Modernising Government. This initiative had three main aims: to ensure that policymaking would be more 'joined-up' and strategic; to deliver public services to meet the needs of citizens (vs. the convenience of service providers); and to deliver public services that would be high-quality and efficient.

It was an ambitious reformation plan, allowing a leading role for IT in providing new forms of electronic service delivery. After initial failures, in 2000, the Office of Government Commerce (OGC) was set up as an office within the UK Treasury, incorporating the previous

dispensation's Central Computer and Telecommunications Agency (CCTA). On being established, OGC was designated as the authority for developing best practice in commercial activity within the government (and, as such, is responsible for PRINCE2, Managing Successful Programmes (MSP), the Management of Risk (M_o_R®) and a range of other best practice guidance).

Managing Successful Programs (MSP) (2001) is a companion to the Office of Government Commerce (OGC) of the United Kingdom publication: Managing Successful Projects with PRINCE2, the UK's equivalent of the PMBOK® Guide. The MSP have developed and published a guide to program management, the purpose of which is to help "ensure success with major projects and programs of business change." The MSP guide describes program management as: "A structured framework for defining and implementing change within an organization. This Framework covers organization, processes, outputs and ways of thinking that focus on delivering new capabilities and realizing benefits from these capabilities… The program selects or commissions projects, providing the overall coordination, control and integration of the projects' delivery. Program management includes the process of managing benefits from their initial identification and definition through to the eventual realization and achievement of measurable improvements. The key driver for a program is the on-going viability and relevance of the program's Business Case and the justification of benefit against costs."

The MSP (2001) also states that: "A program will involve considerable commitment in terms of resources (from a number of areas), a significant budget, lengthy timescales, potential disruption of (existing) projects or programs, and major business or organizational change."

The MSP (2001) points to the critical success factors of a successful program, as having these attributes:

- A clear and consistent vision of the changed business or other outcome;
- A focus on benefits and the internal and external threats to their achievement;
- Coordination of a number of projects and their interdependencies in pursuit of these goals;
- Leadership, influence, management and direction of the transition, including cultural change; and
- Program and project experience should be highly valued by organizations and should be reflected in the reward and reposting of program staff who has gained such experience.

Like project management, program management has a number of key processes and principles. The MSP (2001) guide identifies six processes (or stages.) These are:

- Identifying a program - to structure and formalize the program based on the strategic initiatives of the sponsoring organization;
- Defining a program - to develop a complete definition of the program such that the funding requirements can be committed;
- Establishing a program - to set up the program environment in terms of personnel, working practices and standards;
- Managing the portfolio - to manage the Project Portfolio such that the required benefits are delivered;
- Delivering the benefits - to manage the benefits realization process and to provide a transition to the new way of working; and
- Closing a program - to formally close down the program and confirm delivery of the Blueprint and Vision Statement.

They note that one key differences between a program and a project is that a project has a clear start and end. This means that some of the above stages may be somewhat hazy and become more refined as the program progresses. To the author it appears that the MSP (2001) implies that projects will come and go, and get completed as the program progresses.

The MSP (2001) flowchart for program management is included as Figure 11.1.

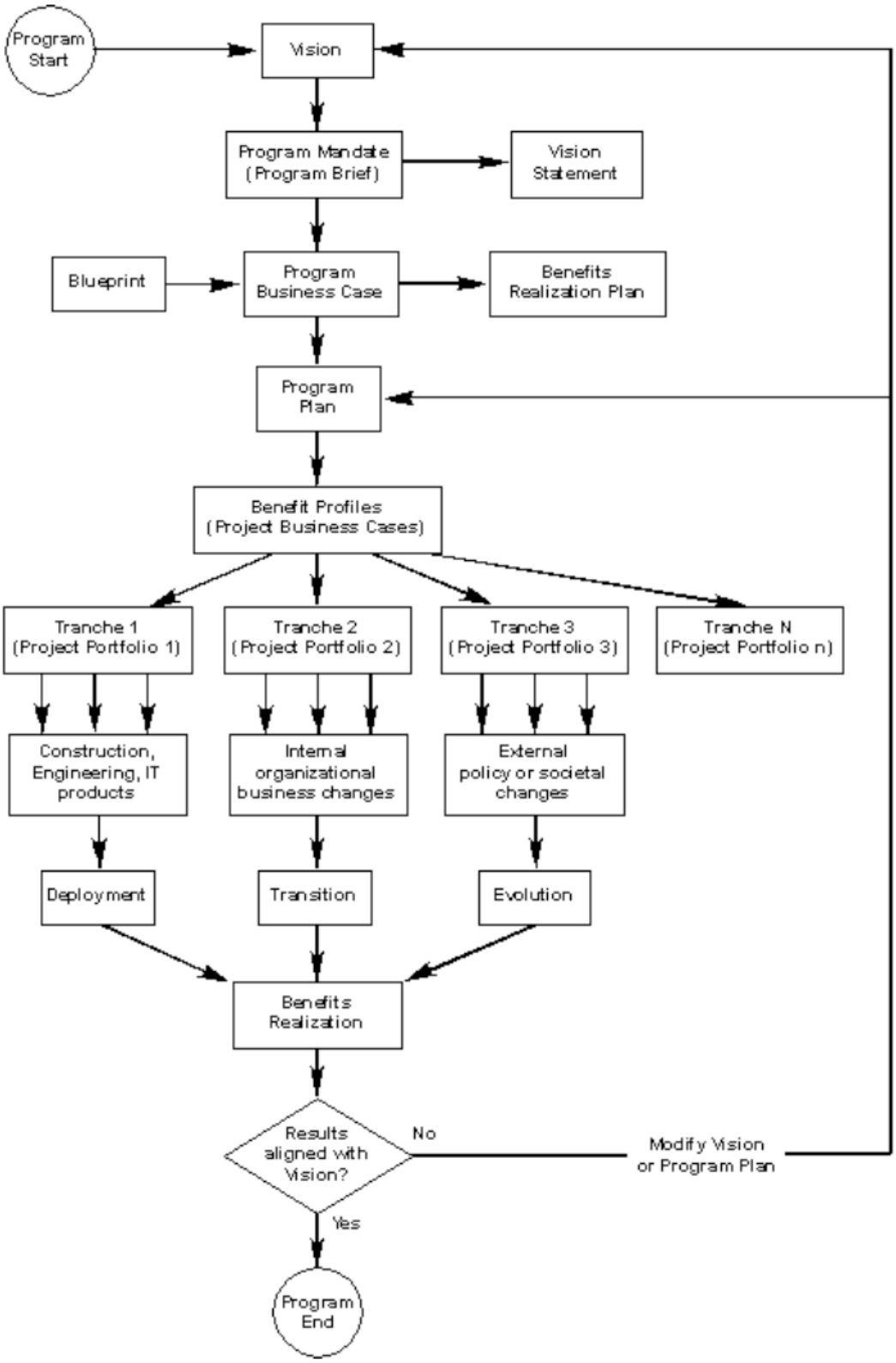


Figure 11.1. Managing Successful Programs (MSP) (2001) Flowchart.

The MSP (2001) also identifies eight principles for program management:

- Program management organization;
- Program planning;
- Benefits management - to identify, optimize and track the expected benefits from business change to ensure that they are achieved;
- Stakeholder management
- Issue and risk management
- Quality management
- Configuration management; and
- Audit.

Other viewpoints

Gareis and Huemann (2000), who view the definition of projects and programs as a function of the number and of complexities of the processes involved in their performance, take a different view. They define a program as: "A temporary organization for the performance of processes of medium and high complexity, which are closely coupled by common overall objectives." The process characteristics of a programme and project are mapped in figure 11.2.

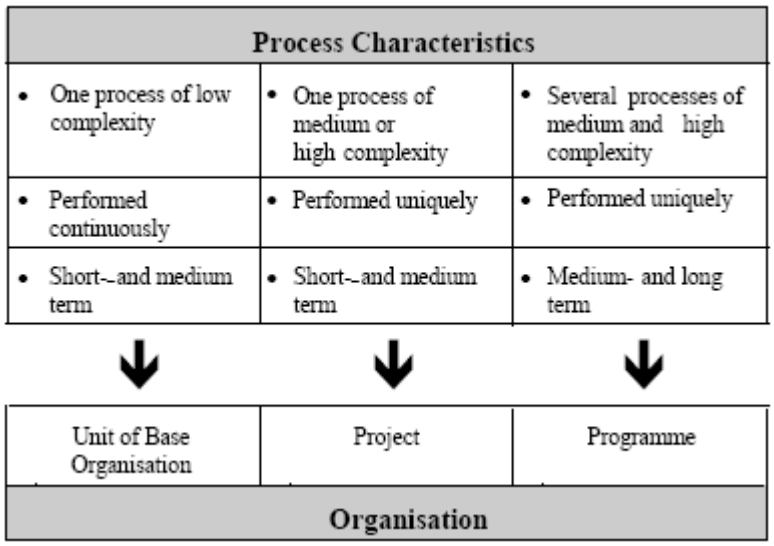


Figure 11.2. The Performance of Processes of Differing Complexity, Gareis and Huemann (2000).

They observe that a program applies to projects, on the one hand, as a differentiation instrument and on the other hand as integration structures, e.g. a program office, a program steering group, process owners, etc. Some of the projects in a program may be performed sequentially and some in parallel. Programs typically have:

- Program-specific strategies;
- Organizational rules; and
- Structures.

Some examples of programs are

- The development of a "product family" (*not* of a single product);
- The company-wide rollout of a comprehensive IT-solution (such as SAP);
- The reorganization of a group of companies in a holding structure;
- An organization's business strategy which is to be implemented through projects; and
- Huge financial investments, such as an oil platform at sea.

Wideman (2002), in turn, defines program management as being a management style very different from administrative or corporate management: "The objective of program management is to complete a set of projects usually related in some way by a common goal. The life of a program management organization may be quite extended. However, it is characterized by the completion of the projects under its responsibility, each of which has a clear and finite termination. Program management is terminated when all its projects are completed."

He also notes that:
"Program management is a disciplined way of handling change in an organization in a proactive way, whilst not comprising the whole of change management."
and
"The advantages of designing specific program organizations instead of defining a "Mega-Project" with several subprojects are as follows:

- Less hierarchical organization;
- Clearer terminology: a program manager and several project managers instead of one project manager and project managers of the sub-projects;
- Empowerment of the projects of the program by allowing for specific project cultures, specific relationships to environments, specific project organizations, etc.; and
- Differentiation between program ownership and different ownerships for the different projects."

11.4.4 Project Portfolio Management

PMBOK® viewpoint

In the Third Edition of the PMBOK® Guide (2004): "A portfolio is defined as a collection of projects or programs and other work that are grouped together to facilitate effective management of that work to meet strategic business objectives… Organizations manage their portfolios based on specific goals. One goal of portfolio management is to *maximize the value of the portfolio* by careful examination of candidate projects and programs for inclusion in the portfolio and the timely execution of projects not meeting the portfolio's strategic objectives… Senior managers or senior management teams typically take on the responsibility of portfolio management for an organization… Portfolio Management is the centralized management of one or more portfolios, which includes *identifying, prioritising, authorizing, managing and controlling projects, programs, and other related work*, to achieve specific strategic business objectives."

Other viewpoints

Gareis and Huemann (2000) have observed that:

"The more projects of varying types an organization holds in its project portfolio, the more differentiated it becomes, with a subsequent growth in its management complexity. In order to support the successful performance of the single project as well as to ensure the compliance of the objectives of the different projects with the overall company strategies, specific integrative structures, such as a strategic centre, expert pools, a pm-centre of competence, and a *project portfolio steering committee* are required. Some of these permanent organization(al structure)s might be virtual. In a project portfolio, different project types, such as internal and external projects, unique and repetitive projects, marketing-, contracting-, organizational development projects, etc. might be included."

The basis for the management of the project portfolio is a database with aggregated project data, such as the project type, relations of a project to other projects, information about the project organization, information about relevant project environments, and project ratios. This data can be used for relating projects to each other, for deciding about new projects to be started, for setting project priorities, and for stopping projects. For the management of a project portfolio a specific process and specific methods, such as the preparation of a project proposal-, and project portfolio reporting methods, are required. Typical project portfolio reporting methods are the bar chart of projects, the projects profit versus risk graph, the progress chart of projects, etc.

They view the objectives of the portfolio management process as:

- Optimising the results of the project portfolio (and not of the single projects);
- Selection of projects to be started;
- Interrupting or stopping projects;
- Definition of project priorities;
- Coordination of internal and external resources; and
- Organization of learning of and among projects.

The functions and responsibilities of the portfolio management process are shown in Figure 11.3:

Functions \ Responsibility	Project Portfolio Steering Committee	PM Center of Competence	Selected Project Owners	Staff Members, Project Managers	Proposal Teams	Documents
Preparation of Coordination						
• Up dating database of projects		P				
• Developing lists of projects, project portfolio graphs		P				1)
• Gathering project proposals		P			A	2)
• Gathering selected project status reports		P		A		3)
• Invitation of participants	I	P		I		4)
Performance of Coordination						
• Distribution of information material	I	P	I			
• Performance of Project Portfolio Steering Committee meeting	P	A	A			5)
Follow-up of Coordination						
• Up dating database of projects		P				6)
• Information to employees	A	P		I	I	

Legend

P ... Performance

A ... Assistance

I ... Information

Documents

1. Project Portfolio Report
2. Current Project Proposals
3. Selected Project Status Reports
4. Invitation to the steering committee meeting
5. Minutes of the steering committee meeting
6. Updated database of projects

Figure 11.3. Project Portfolio-Process-Responsibility Matrix, Gareis and Huemann (2000)

In his review of the MSP, R.M. Wiseman (2006) states that it is important to draw attention to the essential difference between project management and portfolio management:

"Project management, or even program management in the sense of very large projects, is all about the successful delivery of acceptable 'deliverables' in terms of achievement within constraints of time and resources. *Portfolio management goes much further and requires*

optimum selection of projects in the first place and the realization of intended benefits in the last."

There are many definitions for Portfolio Management, all of which appear to relate business objectives to projects. Portfolio Management is used to choose the right projects to satisfy a business objective (i.e. "doing the right things"), while Project Management (PM) is aimed at executing the projects correctly (i.e. "doing things right.")