A PRACTICAL METHOD FOR ASSESSING THE FINANCIAL BENEFIT OF PROJECT MANAGEMENT

by

Serge J. Schiltz

Dr.sc.inf., M.B.A., dipl.inf., dipl.math., PMP

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APPROVED:

_____ ,(Mentor)

_____ ,(Senior Faculty)

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To my family,

the most important project of my life.

Acknowledgments

This thesis concludes a very interesting period of two years during which I have studied toward a Master of Science degree in Project Management. My former superior Tom Louis gave me the opportunity to study many hours during work time and to complement my project management experience with a solid theoretical background. I take advantage of this additional knowledge in my daily work and I recently earned the "Project Management Professional" certification of the Project Management Institute. All this substantially enhanced my professional qualification and — being somewhat addicted to the academic world — I took great pleasure in it. Thanks, Tom!

Throughout the study program, I was supported by my wife Fabienne who is always interested in discussing my learnings and as a mother she does a wonderful job in our common project, which is our family with our daughters Aurélie and Florence. The topical support was provided by excellent instructors of City University, in particular by Barbara Endicott-Popovsky who was my instructor for many courses and who I finally chose as a mentor for my thesis.

Empirically verifying my research hypothesis proved to be more difficult than I would have expected. I contacted more than 300 individuals to request their participation in my survey and I had to call up or e-mail many people repeatedly to get less than 10% responses. Is it the recession, the anxiety of a possible war, or do people just not value project management enough? There may be many explanations for the reluctance to participate in a survey like this. In light of this difficulty, I would like express my gratitude to all those who have contributed data to this study but who I cannot name here for confidentiality reasons. The sample of companies of all sizes and from many industries that

they represent is the foundation for the validity of my research results.

Serge J. Schiltz

Liestal (Switzerland)

March 2003

Vita

Name:	**Serge Jean-Marie Schiltz**	
Birth Date & Place:	August 23, 1967 — Luxembourg	
Nationality:	Luxembourger	
Schools:	1973–1979	Primary School Eischen (Luxembourg)
	1978–1986	Music Conservatory of Luxembourg
	1979–1986	Lycée Michel-Rodange Luxembourg
	1986–1987	University of Luxembourg
	1987–1994	University of Fribourg (Switzerland)
	1995–2003	City University of Bellevue, WA
Degrees/Certifications:	2002	PMP (Project Management Professional)
	1996	M. B. A.
	1994	Dr. sc. inf. (magna cum laude)
	1991	dipl. math.
	1990	dipl. inf.
Positions:		**Swiss Re**
	2001–	Project Management Consultant (PMO)
	1999–2000	Business Application Architect (BAA)
	1998–1999	Senior Reinsurance Analyst (Finance)
		City University of Bellevue, WA
	1997–2001	Adjunct Faculty Member
		Swiss Life
	1996–1998	Senior Assistant Manager (International)
	1994–1996	Database Specialist (Switzerland)
		University of Fribourg
	1990–1994	Graduate Assistant (Informatics)
	1987–1990	Assistant Secretary (Mathematics)

A PRACTICAL METHOD FOR ASSESSING THE FINANCIAL BENEFIT OF PROJECT MANAGEMENT

Serge J. Schiltz
City University, 2003

Supervisor: Barbara Endicott-Popovsky

At an increasing pace, organizations are forced to transform themselves for being able to survive in an ever-changing business world. For many organizations, projects have become the means of choice for implementing change. Numerous studies however identify a wide-spread discomfort with projects: too many projects fail to deliver. Project management experts can easily identify a major reason for this situation, which is that project management best practices are ignored in many organizations. The extent of this causality, which is obvious for experienced project management professionals, is however difficult to fully recognize for the uninitiated. Project management best practices do not guarantee project success nor does their absence guarantee failure. Their presence just increases the chances for success ... but to what extent?

To quantify the latter is the purpose of this study: to what extent does the application of project management best practices have a measurable impact on project success? This correlation has been quantified by a research team at the University of California at Berkeley. The complexity of their process assessment however represents an obstacle for many organizations to determine where they currently stand in terms of project management best practices. For this study, we have developed a very simple process (maturity) assessment which requires minimum time and effort from the participants. A field study with a sample of 23 projects has shown that the correlation between the determined project man-

agement process maturity (or application of best practices) and project success can be proved even with this simple assessment.

The practical use of this research study is that, with this tool, project management experts can determine an organization's potential for project management process improvement and quantify the benefit of such an improvement, even if they cannot get the funds for carrying out a detailed study. Such a quick-and-simple evaluation can be used as a "door opener" to raise senior executives' awareness for the benefits of improving project management practices.

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Chapter 1

Introduction

1.1 Background

In times where technological developments create new opportunities at an ever faster pace and start-up companies threaten established corporate giants using new business models, rapid change is the motto of the day. Few business leaders would disagree that projects are *the* vehicle for implementing change; project management is more important than ever.

> *The Swiss Re organization is moving towards making all business processes compatible with e-business requirements. [...] Projects are the vehicles we use for implementing applications and managing related change. The ability to build and sustain good project management capabilities at Swiss Re is therefore absolutely critical to our success.* — Walter Kielholz, CEO of Swiss Re, in (PMO Team, 2000).

The above statement is just an example giving an impression of the importance that is attached to project management in today's business world. But if project management is considered that important, why do so many projects fail in one way or the other. According to studies published by KPMG (Whittaker, 1999) and the Standish Group (Standish Group, 1994), at least IT projects show a very

discouraging picture: 90% of all IT projects are late, 50% are not completed in time, and a startling 30% are stopped while they are underway. What is wrong?

1.2 Problem Statement

Business leaders may be aware of the importance of project management. Therefore, they invest in the development of project management skills, acquisition of project management tools, set-up of project management offices, etc. Enhancing project management capabilities of an organization requires a large investment. But do businesses know how much they should invest into project management capability? Do they know how much is necessary to reach the level of capability adequate for the business their organization is doing? All these open points boil down to one single question:

> *Do business leaders know how much financial return they can expect from an investment into project management?*

We are not aware of any large-scale study that would give a positive answer to this question. Project management professionals have the difficult task of making senior executives aware of the benefit that further investment into raising project management maturity of their organizations can generate.This selling job" (Thomas, Delisle, Jugdev, & Buckle, 2002) is not easy without studies quantifying the claims. A study commissioned by the Project Management Institute and conducted at the University of California at Berkeley (Ibbs & Kwak, 1997a) aims at providing such supporting material. Ibbs and Kwak have proved the existence of a correlation between the level of project management maturity and a value that they call "Project Management Return on Investment" (PM-ROI). They have been able to provide a number of interesting results. However, the complexity of their maturity assessment is an obstacle to its application in an organization where senior executives are not yet fully convinced that it is worth

investing into project management. What is needed is a quick and simple assessment that a few individuals can apply in an organization to make a rough estimate of how much a return on investment into project management could be for a particular organization.

1.3 Research Hypothesis

The existence of a positive correlation between an organization's level of PM process maturity and its actual process performance has been proved by Young-Hoon Kwak (Kwak, 1997). Our goal is to determine if it is possible to prove such a correlation with a less complex PM process maturity assessment. Our research hypothesis will therefore be

> *H*ypothesis: The PM process maturity assessment can be simplified in such a way that the positive correlation between the determined PM process maturity and the organization's actual project performance can still be proved.

This hypothesis will be confirmed by developing a simple, 25-question maturity assessment that allows to identify the positive correlation.

1.4 Research Approach

There are two goals for this study. The first is to develop a PM process maturity assessment questionnaire that can be applied for this study and self-administered by the participants. The second is to prove the correlation mentioned in the research hypothesis. Therefore, the following steps are planned for this research:

1. Research about PM process maturity
2. Development of a PM process maturity assessment questionnaire

3. PM process maturity assessment of an as large as possible sample of organizations

4. Evaluation of PM process maturity assessment

5. Identification of correlation and conclusions

1.5 Thesis Overview

This thesis consists of five chapters. Chapter 1 gives an introduction to the general topic and research goals of the study. It briefly describes the motivation, research hypothesis and approach.

Chapter 2 is a review of the literature related to PM process maturity and its correlation with organizations' project success. Other maturity assessment models are analyzed and an approach to developing our particular, simple assessment defined.

The PM process maturity model is developed and presented in chapter 3. It is explained in detail why this particular approach has been chosen and which specific properties we intend to identify by asking these particular questions.

The result of the large-scale PM process maturity assessment is presented in chapter 4. The results are analyzed and major findings pointed out. The correlation of the level of PM process maturity with organizational process performance is identified and quantified.

In chapter 5, we draw the conclusions from this study and and recommend further steps.

Chapter 2

Literature Review

2.1 PM Maturity Models

2.1.1 Benchmarking and Process Maturity

Benchmarking is defined as "information accessing or industrial research that allows a manager to compare his activity's performance to the same performance in another organization. The process of benchmarking points out the management practices that should be used to attain excellence." (Project Management Institute, 2003). The term 'process maturity' is used to refer to the level of consistent application or establishment of a set of defined processes within an organization. Determining the project management process maturity of an organization is therefore benchmarking its performance in terms of the implementation of project management processes.

Our thesis is that project financial success correlates with the level of project management process maturity of an organization. In order to verify this thesis, we must define a benchmarking model using which we can quantify an organization's PM process maturity that can be put into relation with the financial performance of its projects.

A number of project management (process) maturity models are available

today. Their application is however relatively complex because they aim at making a very detailed maturity assessment from which an organization can identify possible improvement areas. This complexity makes them unsuitable for a summary assessment (as we intend to do) that has the purpose to just get senior managers to buy into a project management process improvement. In the remainder of this chapter, we will briefly describe and compare some of the most prominent PM maturity models available today.

2.1.2 $(PM)^2$ Maturity Assesssment Methodology

A research team formed by Professor William C. Ibbs at the University of California at Berkeley set itself the goal to investigate the financial and organizational benefits to organizations that result from the implementation of project management processes (Ibbs & Kwak, 1997b). One of their research steps was to develop a five-level "Project Management Process Maturity" $(PM)^2$ model (see figure 2.1) that would allow them to collect and compare project management process information for a number of organizations (Ibbs & Kwak, 1998) to be used in further research studies. The five levels of maturity are described as follows (Kwak, 1997):

Level 1 – Ad-hoc Stage Organizations at level 1 do not use formal procedures for executing a project. Project activities are poorly defined and cost estimates are inferior.

Level 2 – Planned Stage At the planned stage, informal and incomplete procedures manage a project. The organization has a strength in doing similar and repeatable work.

Level 3 – Managed Stage Most of the project management problems are identified and informally documented. PM data for project planning and management are collected across the organization.

Level 4 – Integrated Stage At the integrated stage, an organization can manage, integrate, and control multiple projects efficiently. PM process data are standardized, collected, and stored.

Level 5 – Sustained Stage At the sustained stage, PM processes are continuously improved. PM data are collected and rigorously analyzed to improve processes. Innovative ideas are vigorously pursued.

As opposed to other, existing project management maturity models, $(PM)^2$

- evaluates organizations' financial effectiveness
- allows to determine a fine-grained maturity at the level of knowledge and process areas as defined by PMI's PMBOK (Project Management Institute, 1996), and
- takes into account actual project performance (Kwak & Ibbs, 2000).

The ultimate goal of Ibbs' team is to identify "success drivers", i.e. to determine the most critical factors for project success and to estimate the order of magnitude of the return on investment that an organization draws from raising its project management process maturity (Ibbs & Kwak, 2000).

In an initial phase, Ibbs' research team has used the $(PM)^2$ model to asses the project management process maturity of 38 organizations from four different industries (Engineering and Construction, Information Management and Movement, Information Systems, Hi-Tech Manufacturing). They found an overall maturity average of 3.26. The breakdown by knowledge area and industry is shown in figure 2.2, by process area and industry in figure 2.3. According to these results, maturity of risk management is lowest across all industries.

While the $(PM)^2$ assessment gives a very detailed picture of an organization's project management process maturity, its application is relatively complex. The three-part questionnaire contains 148 questions for which the respondents

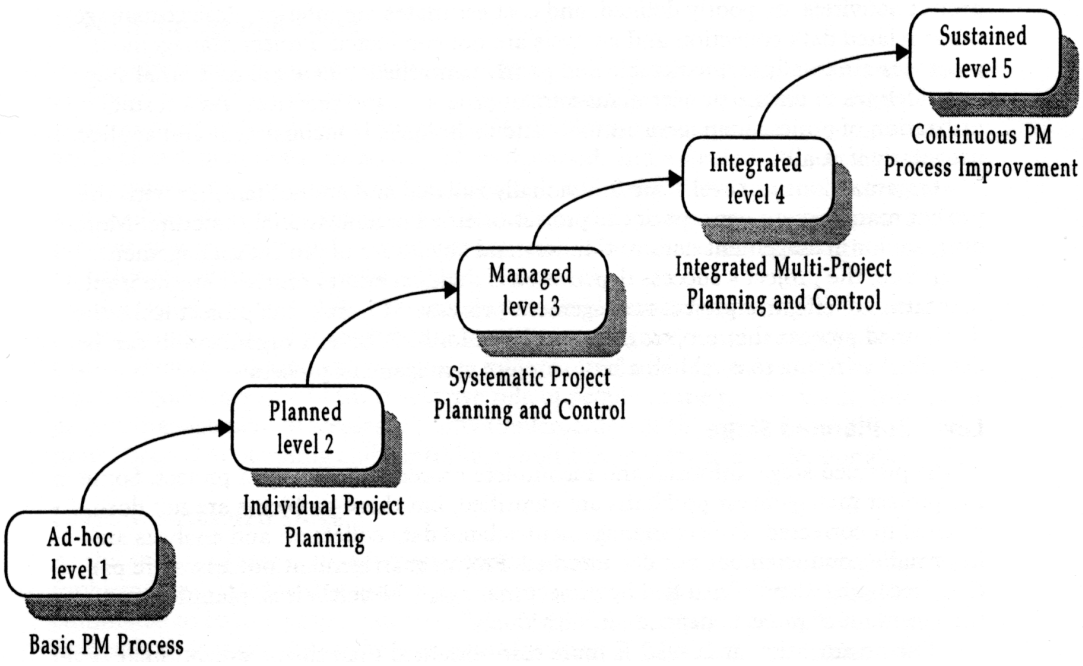

Figure 2.1: Five levels of $(PM)^2$ (Ibbs & Kwak, 1997a)

Knowledge areas	EC	IMM	IS	HTM	All Companies
Scope	3.52	3.35	3.25	3.37	3.42
Time	3.55	3.41	3.03	3.50	3.37
Cost	3.74	3.22	3.20	3.97	3.47
Quality	2.91	3.22	2.88	3.26	3.06
Human Resources	3.18	3.20	2.93	3.18	3.12
Communications	3.53	3.53	3.21	3.48	3.44
Risk	2.93	2.87	2.75	2.76	2.85
Procurement	3.33	3.01	2.91	3.33	3.14
Overall Maturity	3.34	3.24	3.02	3.36	3.24

Figure 2.2: Breakdown of maturity assessments by Knowledge Area (Kwak & Ibbs, 1997)

Process Area	EC	IMM	IS	HTM	All Companies
Initiation	3.25	3.34	3.57	3.60	3.39
Planning	3.61	3.49	3.43	3.55	3.53
Execution	3.31	3.27	2.90	3.32	3.19
Control	3.55	3.31	2.98	3.25	3.31
Closing	3.28	3.43	2.90	3.05	3.20
Facilitating	3.14	2.99	2.73	3.25	3.00
Overall Maturity	3.36	3.31	3.09	3.34	3.28

Figure 2.3: Breakdown of maturity assessments by Process Area (Kwak & Ibbs, 1997)

must choose one out of five options that best describes their organization's situation (Kwak, 1997). In order to make sure that responses are accurate and consistent, participating organizations had to be carefully chosen, respondents had to be trained, and interviews with the researchers were necessary. As a consequence, the study's sample size is relatively small with only 38 organizations that volunteered to participate.

2.1.3 SEI's Capability Maturity Model

The Capability Maturity Model (Paulk et al., 1993) of SEI is a framework that describes the key elements of an effective software development process (Paulk, Weber, Garcia, Chrissis, & Bush, 1993). The very thorough description of the framework makes it a strong theoretical starting point for developing process maturity models in other areas (such as project management). The authors describe a step-by-step process for deriving key practices which can be translated into very focused questions.

This process starts with maturity levels for which process capabilities are described. The question is: "What are the distinguishing capabilities that an organization has when it is at maturity level X?". By describing these capabilities, key process areas are identified, together with the goals that are attained using these process areas. In the next step, common features characterizing the

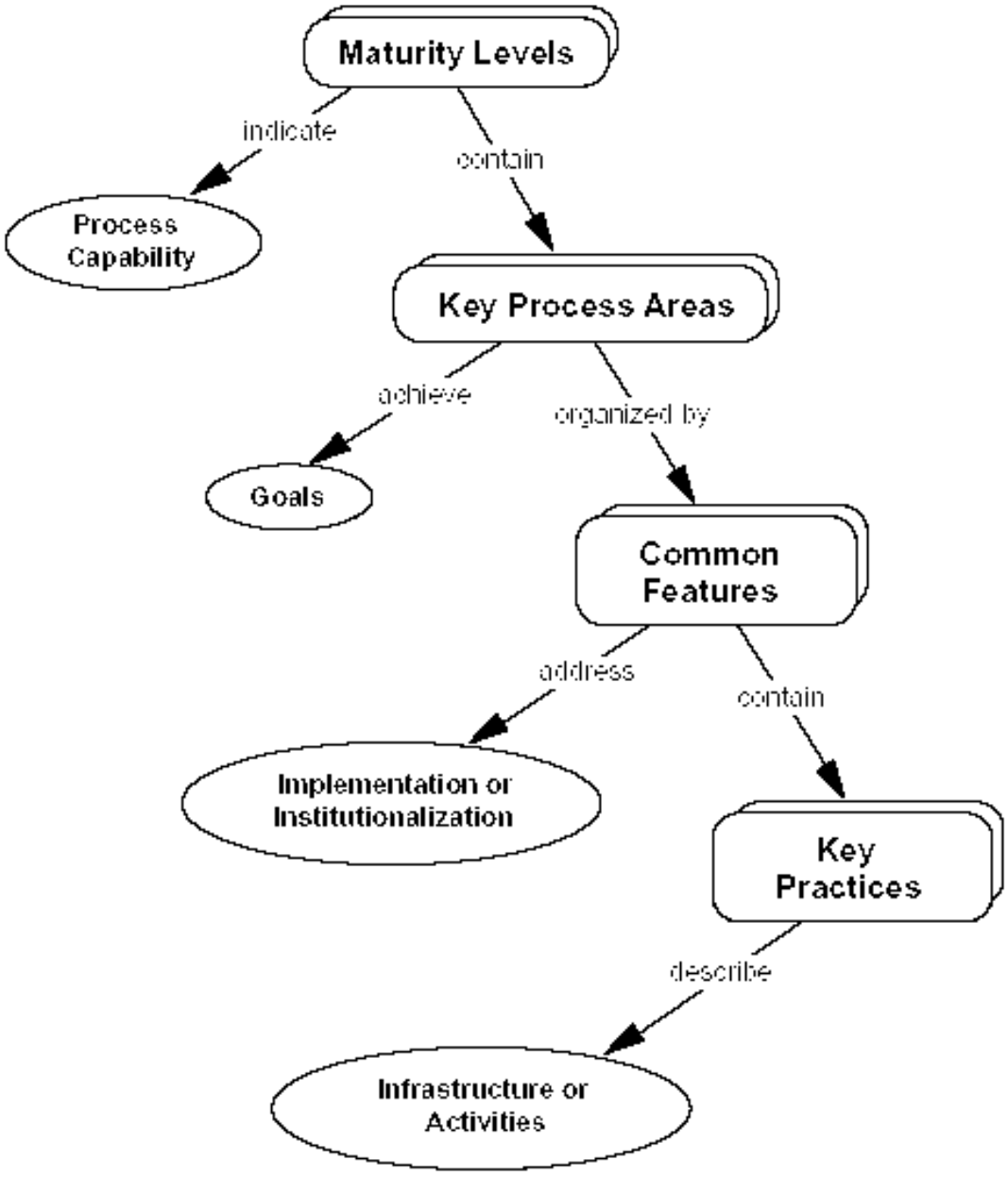

Figure 2.4: CMM Derivation Process (Paulk et al., 1993)

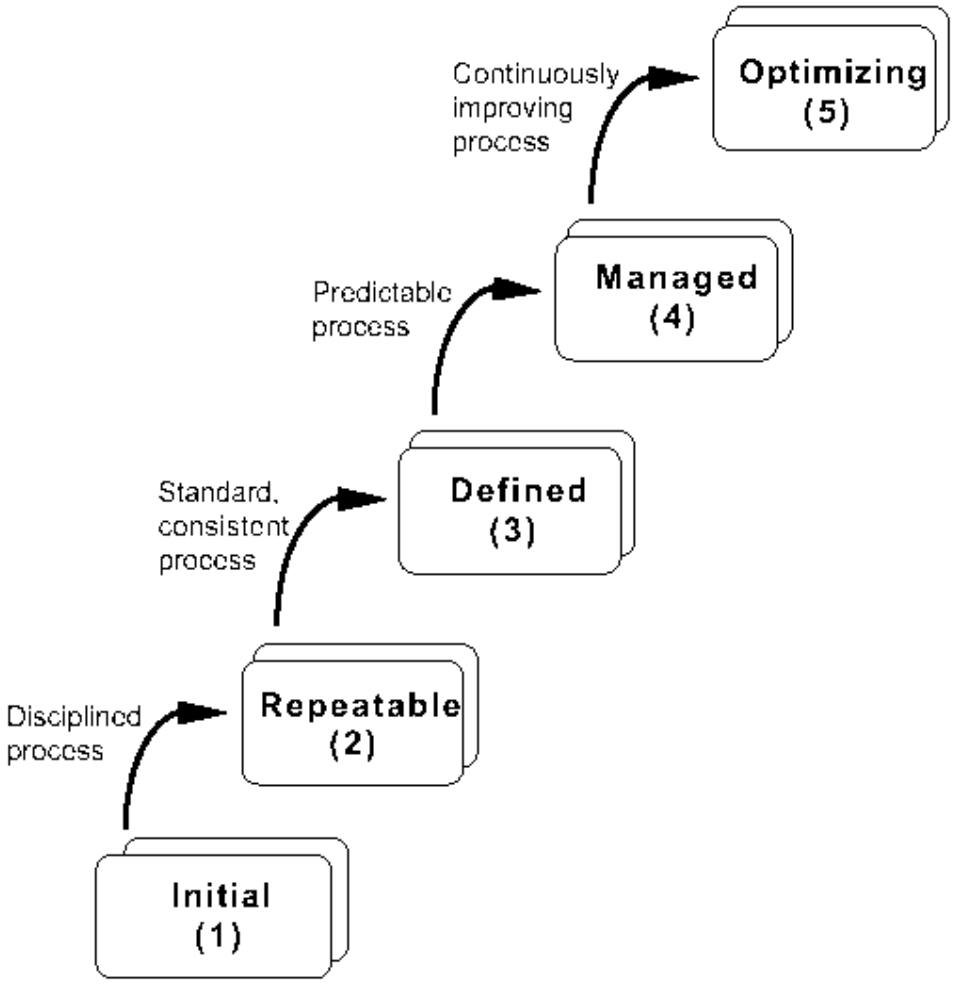

Figure 2.5: CMM Maturity Levels (Paulk et al., 1993)

successful implementation of these process areas are determined. Finally, key practices that indicate the successful implementation of the common features, i.e. infrastructure that is in place or activities that are performed, are described. This derivation process is depicted in figure 2.4. In a final step, it is then relatively straightforward to formulate questions that have to be asked in order to determine the presence of key practices.

The CMM defines five levels of process maturity that are very similar to those of the $(PM)^2$ model. The maturity levels are shown in figure 2.5. The levels (for software development) are defined as follows (Paulk et al., 1993):

Level 1 – Initial Level The organization does not provide a stable environment for software development. Project success depends on having good software managers or teams.

Level 2 – Repeatable Level At the repeatable level, the organization establishes basic guidelines for managing the software project and its various procedures.

Level 3 – Defined Level The organization has a formally documented standard process for developing and maintaining software engineering and management.

Level 4 – Managed Level At the managed level, the organization sets quantitative goals for both software products and processes. They have a predictable process.

Level 5 – Optimizing Level The entire organization is focused on continuous process improvement. Software processes are evaluated to prevent known types of defects from recurring and lessons learned are spread to other projects.

An example questionnaire for the CMM is available in (Zubrow, Hayes, Siegel, & Goldenson, 1994). Unlike the $(PM)^2$ questionnaire that asks the respondent

to identify the situation description that comes closest to what can be found in his organization, the CMM questionnaire gives the respondent four options throughout: 'yes', 'no', 'does not apply', and don't know'. This type of questions allows more clear-cut answers with less room for interpretation. Therefore, less support is required for the respondents.

2.1.4 Kerzner's Project Management Maturity Model

Harold Kerzner and the International Institute for Learning (IIL) see project management as a core competency that many companies must develop in order to remain competitive in the market. In this view, project management maturity models are an important strategic tool for senior management (Kerzner, 2001) that allows an organization to benchmark its capabilities in respect of project management with its competitors. As such, a project management maturity assessment model is a tool for establishing project management excellence, which is considered a condition for success.

Like $(PM)^2$ and CMM, Kerzner's maturity model defines five levels using which an organization is ranked from lacking project management processes to continuous improvement. These five levels are shown in figure 2.6 and are described in the following (Kerzner, 2001):

Level 1 – Common Language The organization recognizes the importance of project management and the need for a good understanding of the basic knowledge on project management.

Level 2 – Common Processes At his level, the organization recognizes that common processes need to be defined and developed so that project success can be repeated.

Level 3 – Singular Methodology The organization defines a single methodology for project management in order to take advantage of the associated synergistic effect.

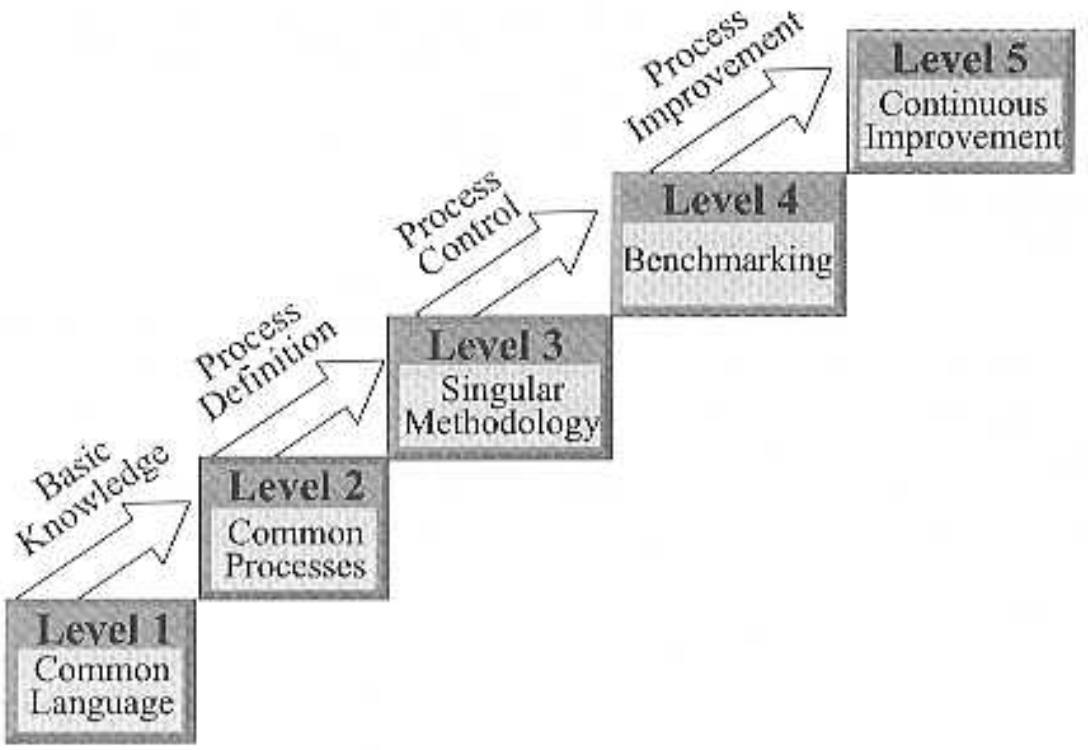

Figure 2.6: Kerzner's Maturity Levels (Kerzner, 2001)

Level 4 – Benchmarking The organization recognizes that process improvement is necessary to maintain competitive advantage.

Level 5 – Continuous Improvement At this level, the organization evaluates the information obtained through benchmarking and decides how to improve its processes.

The questionnaire is explained in Kerzner's book about PM maturity models (Kerzner, 2001). The questions are formulated as multiple-choice where the respondent chooses the answer that most closely describes his current situation, very much like in the $(PM)^2$ questionnaire. This project management maturity assessment is also offered as an electronic assessment on the Internet that can be licenced by organizations through IIL.

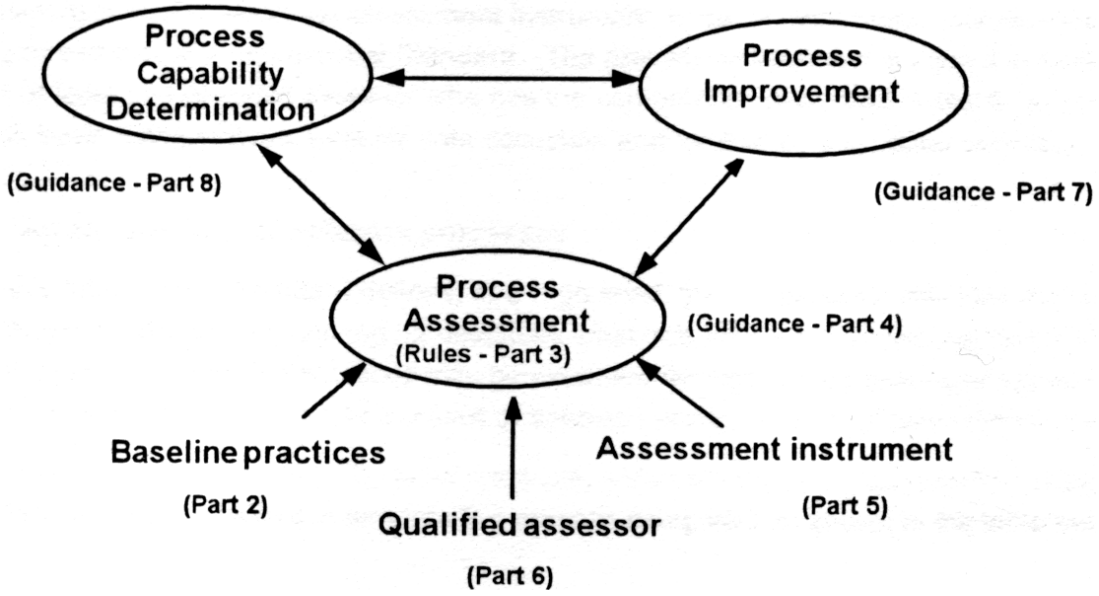

Figure 2.7: ISO/IEC Software Process Assessment (SPICE Project, 1995)

2.1.5 ISO/IEC Software Process Assessment

An international standard for a framework to assess software process has been developed in the SPICE project, which started in 1991 (SPICE Project, 1995). The approach assesses an organization's software processes against baseline practices to determine the potential capabilities of a process and to propose a process improvement, as shown in figure 2.7. The assessment instrument (questionnaire) is not part of the standard, but only guidelines on how to construct or select such a tool. The model defines six levels of maturity; it adds a "Level 0 – Not Performed Level" to the five levels that can be found in other process maturity models (SPICE Project, 1995):

Level 0 – Not-Performed Level There is general failure to perform the base practices in the process. There are no easily identifiable products or outputs of the process.

Level 1 – Performed Informally Level Base practices are generally performed, but may not be rigorously planned and tracked. Performance depends on individual knowledge and effort.

Level 2 – Planned-and-Tracked Level Performance of the base practices is planned and tracked. Work products conform to specified standards and requirements.

Level 3 – Well-Defined Level Base practices are performed according to a well-defined process using approved, tailored versions of standard, documented processes.

Level 4 – Quantitatively-Controlled Level Detailed measures of performance are collected and analyzed. This leads to a quantitative understanding of process capability and an improved ability to predict performance, which is objectively managed.

Level 5 – Continuously-Improving Level Quantitative process effectiveness and efficiency goals for performance are established, based on the business goals of the organization. Continuous process improvement against these goals is enabled by quantitative feedback from performing the defined processes and from piloting innovative ideas and technologies.

The approach to identify process capabilities that must be present at the different maturity is very similar to what is found in SEI's CMM, which does not come as a surprise as several people were involved in both initiatives.

2.1.6 MicroFrame's Self Assessment Tool

Microframe Technologies, together with Project Management Technologies, have developed and made available on the Internet a self-assessment tool for project management maturity with 50 multiple choice questions (Enterprise Planning Associates, 2000). The result of this quick self-assessment is a ranking in one of the five following categories:

Level 1 – Ad-hoc The project management process is described as disorganized, and occasionally even chaotic. Systems and data processes are not

defined. Project success depends on individual effort. Chronic cost and schedule problems.

Level 2 – Abbreviated Some project management processes and systems are established to track cost, schedule, and performance. Underlying disciplines, however, are not well understood or consistently followed. Project success is largely unpredictable and cost and schedule problems are the norm.

Level 3 – Organized Project management processes and systems are documented, standardized, and integrated into an end-to-end process for the company. Project success is more predictable. Cost and schedule performance is improved.

Level 4 – Managed Detailed measures of the effectiveness of project management are collected and used by management. The process is understood and controlled. Project success is more uniform. Cost and schedule performance conforms to plan.

Level 5 – Adaptive Continuous improvement of the project management process is enabled by feedback from the process and from piloting innovative ideas and technologies. Project success is the norm. Cost and schedule performance is continuously improving.

Microframe's questionnaire assesses an organization's maturity at a very high level and does not allow a detailed analysis according to knowledge or process areas. It does however give an organization an idea where they stand in terms of project management process maturity without having to go through a complex and expensive assessment process. In this respect, this self-assessment comes very close to a PM maturity assessment such as we intend to develop for this study.

2.2 Benefits of PM

2.2.1 Project Success and Failure

What makes the success or failure of a project? Several factors are involved when determining if a project has delivered:

- Completeness of planned deliverables
- Delivery according to the planned schedule
- Meeting of financial objectives
- Customer satisfaction

The latter point is interesting in the sense that a project can be perceived to be not successful, even if the formally agreed, measurable project goals have objectively been reached. Typically, such a situation arises when the formally defined project objectives have not been thoroughly discussed and agreed with all stakeholders. However, this criterion is difficult to measure in a small-scale assessment like we intend to do for this study. Checking what a project has delivered against what has been formally agreed would also exceed the resources that we have available for this study. We wil therefore focus on the second and third points — cost and schedule compliance — which can be measured with little effort.

2.2.2 Project Management and Project Success

According to a study conducted by KPMG Canada in 1997 (Whittaker, 1999), the three most common reasons for failure of information technology projects are:

- Poor project planning,
- A weak business case,
- Lack of top management involvement and support.

*C*ost Overruns	% of responses
Under 20%	15.5%
21 – 50%	31.5%
51 - 100%	29.6%
101 – 200%	10.2%
201 – 400%	8.8%
Over 400%	4.4%

Figure 2.8: Magnitude and frequency of cost overruns (Standish Group, 1994)

*T*ime Overruns	% of responses
Under 20%	13.9%
21 – 50%	18.3%
51 - 100%	20.0%
101 – 200%	35.5%
201 – 400%	11.2%
Over 400%	1.1%

Figure 2.9: Magnitude and frequency of schedule overruns (Standish Group, 1994)

Unlike what might have been expected, technical complexity is not among the main reasons for failure. All the mentioned reasons are purely project management related. In some business areas, in particular in information technology projects, deviations from cost or schedule plans are rather the norm than the exception. Standish Group's CHAOS report 1994 (Standish Group, 1994) show that the average cost overrun of an IT project is 178% (see figure 2.8), the average time overrun 239% (see figure 2.9).

If we contrast this to a survey conducted by the Center for Business Practices (Center for Business Practices, 2002), we can see a contradiction. To the question how valuable project management is to an organization, respondents answered: very valuable (30.3%), valuable (37.2%), moderately valuable (30.3%), of little value (2.3%), not valuable (0%). How come project management is expressed to be this valuable to organizations while at the same time, project management practices appear to be poorly applied? A large-scale study about "selling" project management to executives (Thomas et al., 2002) identified a

"knowing-doing gap" with regards to project management with senior executives; they know how important project management is for them to reach their strategic goals, but they often fail to actually take the necessary steps for improving project management practices in their organizations.

Chapter 3

Simple PM Maturity Model

3.1 PM Maturity Levels

We have seen in the literature review of chapter 2 that most existing maturity models use a five- or six-level model for describing an organization's process maturity. For our simple PM maturity model, we have decided to use a five-level model similar to the one of SEI's CMM (Paulk et al., 1993) or Kwak and Ibbs' $(PM)^2$ (Kwak & Ibbs, 2000), but to use a simpler language for describing the different levels so that they can be better understood by senior managers who are not particularly familiar with the topic. The maturity levels of our model are graphically represented in figure 3.1 and are described below.

3.1.1 Level 1: Unstructured Level

At Level 1, project success depends on having good project managers and/or good project teams. The organization does not provide a structured project management environment which would make project success predictable. The project management processes are not stable and are continuously modified as the work proceeds. Projects are managed on an ad-hoc basis.

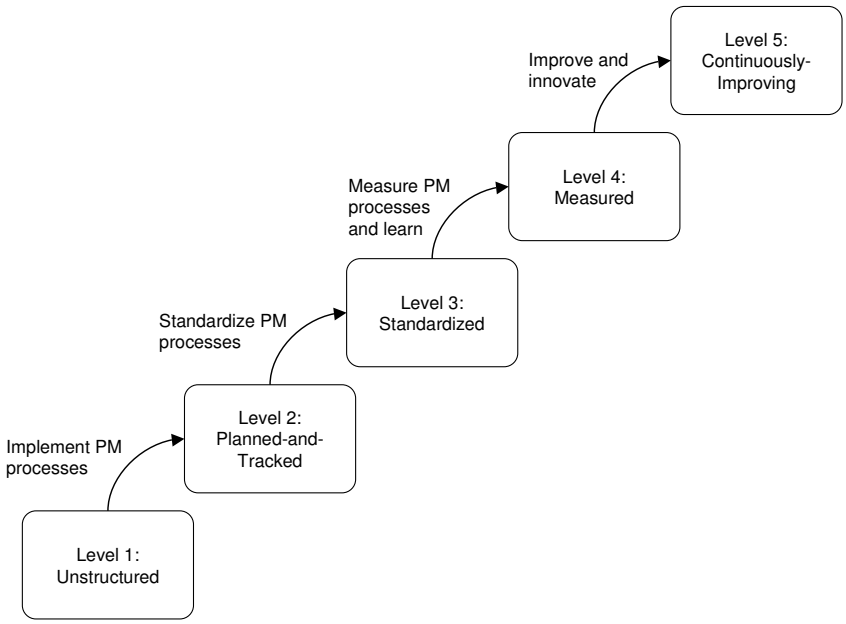

Figure 3.1: Levels of the Simple Maturity Model

3.1.2 Level 2: Planned-and-Tracked Level

In a Level 2 organization, it is common practice to plan and track project cost, schedule, and scope. The organization establishes basic guidelines for project management. There is however major variation in the project management processes as the implementation of processes is mainly dependent on the individuals involved in a project.

3.1.3 Level 3: Standardized Level

At the Standardized Level 3, an organization formally documents and enforces standard processes for project management. Project management activities are stable and repeatable. Project success is very predictable.

3.1.4 Level 4: Measured Level

A Level 4 organization evaluates and measures project management processes and collects lessons learned from projects across the organization. It sets quantitative goals for project management and identfies deviations as they occur so that corrective action can be taken immediately.

3.1.5 Level 5: Continuously-Improving Level

A Level 5 organization is entirely focused on continuous project management process improvement. Improvements take place both by incremental advancements in the existing process and by innovations which employ wholly new techniques and practices.

3.2 Key Process Areas

In order to develop an as concise and effective PM process maturity questionnaire as possible, we are going to apply SEI's derivation process described in section 2.1.3 and graphically represented in figure 2.4. This process starts with the identification of the key process areas on which project success is dependent. The limitation to a small number of key process areas is central to our approach because we have set ourselves the goal to make our maturity questionnaire as short as possible, i.e. to ask a maximum of 30 questions.

Through their research about project management practices, Kwak and Ibbs have identified the key characteristics of project management processes at the different levels of their $(PM)^2$ Project Management Process Maturity Model (Kwak & Ibbs, 2002). Their findings are shown in figure 3.2. These key processes translate into organizational characteristics that are listed in figure 3.3. We are using this result as a starting point for our derivation of questions in our simple maturity assessment.

Maturity level	Key PM processes
Level 5	PM processes are continuously improved
	PM processes are fully understood
	PM data are optimized and sustained
Level 4	Multiple PM (program management)
	PM data and processes are integrated
	PM processes data are quantitatively analyzed, measured and stored
Level 3	Formal project planning and control systems are managed
	Formal PM data are managed
Level 2	Informal PM processes are defined
	Informal PM problems are identified
	Informal PM data are collected
Level 1	No PM processes or practices are consistently available
	No PM data are consistently collected or analyzed

Figure 3.2: Key PM Processes of the $(PM)^2$ Model (Kwak & Ibbs, 2002)

Maturity level	Major Organizational Characteristics
Level 5	Project-driven organization
	Dynamic, energetic, and fluid organization
	Continuous improvement of PM processes and practices
Level 4	Strong teamwork
	Formal PM training for project team
Level 3	Team oriented (medium)
	Informal training of PM skills and practices
Level 2	Team oriented (weak)
	Organizations possess strengths in doing similar work
Level 1	Functionally isolated
	Lack of senior management support
	Project success depends on individual efforts

Figure 3.3: Major Organizational Characteristics in the $(PM)^2$ Model (Kwak & Ibbs, 2002)

3.3 Simple Maturity Model and Questionnaire

Based on the key process area focus that Kwak and Ibbs have described for the $(PM)^2$ model, we have derived questions described described below.

3.3.1 Level 1 – Unstructured Level

At the initial level, no process capability can be measured. Therefore the default level, if nothing can be detected, is the Initial level. No questions need to be asked to determine if this level is reached.

3.3.2 Level 2 – Planned-and-Tracked Level

At the Repeatable level, basic process capabilities are present and characterize a disciplined process, which however is not spread to the entire organization.

Level 2 KPA: Scope Management

Goal 1: To identify the deliverables that make up the project scope.

Commitment to Perform: Require the project plan to detail the scope.

Ability to Perform: Basic project management training.

Activities Performed: Breakdown of high-level deliverables into manageable tasks during the planning phase.

Measurement and Analysis: Screening of project plan documentation.

Verifying Implementation: Determine if all deliverables were broken down into tasks so that the scope is entirely covered and responsibilities assigned so that time and cost can be reasonably estimated.

Question 1: Were all project deliverables that make up the full scope of the project identified and documented before project work started?

Question 2: Was all project work broken down into tasks for which time and cost can be reasonably estimated and responsibilities assigned before project work started?

Goal 2: To keep track of approved changes to the project scope.

Commitment to Perform: Require regular scope reviews.

Ability to Perform: Project manager with sufficient skills and time in place.

Activities Performed: Continuous updating of project scope document.

Measurement and Analysis: Review of project scope document and of documented change management process.

Verifying Implementation: Verify if scope changes were agreed and documented.

Question: When changes were made to the project scope, were they always documented in a written project scope description?

Goal 3: To identify project stakeholders.

Commitment to Perform: Reward involvement of project stakeholders.

Ability to Perform: Staff project team with enough company experience.

Activities Performed: Stakeholder identification activity in the planning phase.

Measurement and Analysis: Verify that all impacted parties have reviewed and agreed to the project plans.

Verifying Implementation: Check if all important stakeholders have been identified, their input sought and documented.

Question: Were the project's stakeholders identified and their involvement planned and documented before project work started?

Level 2 KPA: Time Management

Goal: To create project schedules for planning and tracking.

Commitment to Perform: Require detailed schedule to be availabe.

Ability to Perform: Project management skills / training.

Activities Performed: Activity scheduling during planning phase.

Measurement and Analysis: Screening of project plans.

Verifying Implementation: Verify if a detailed project schedule is available for the entire project execution.

Question: Was a schedule created before the project work started that showed start and end dates for all project activities?

Level 2 KPA: Cost Management

Goal: To make realistic cost estimates for project elements.

Commitment to Perform: Require cost estimates to be available on a task level.

Ability to Perform: Project management and expert knowledge.

Activities Performed: Cost estimating on a reasonable level during planning.

Measurement and Analysis: Monitor project costs against cost plan baseline.

Verifying Implementation: Verify if detailed cost estimates were made for all project activities.

Question: Were cost estimates made for each activity and/or planned expense of the project before project work started?

Level 2 KPA: Quality Management

Goal: To perform quality control if severe problems occur.

Commitment to Perform: Require acceptance test at delivery.

Ability to Perform: Establish accountability for projects.

Activities Performed: Acceptance test.

Measurement and Analysis: Quality reports and satisfaction surveys.

Verifying Implementation: Analysis of quality reports and satisfaction surveys.

Question: Did the customer perform a quality/acceptance test against product specifications when the product of the project was delivered?

Level 2 KPA: Human Resource Management

Goal: To define roles and responsibilities within the project organization.

Commitment to Perform: Define project role guidelines.

Ability to Perform: Create guidelines.

Activities Performed: Clarify roles during planning phase.

Measurement and Analysis: Screening of roles and responsibilities matrices.

Verifying Implementation: Confirm the presence of a roles and responsibilities definition.

Question: Were your and other people's tasks and responsibilities on the project defined in a written document?

Level 2 KPA: Communications Management

Goal: To ensure project performance reporting when requested.

Commitment to Perform: Require regular performance reporting.

Ability to Perform: Understanding of performance reporting by project manager and steering body.

Activities Performed: Measure and report project performance regularly.

Measurement and Analysis: Screening of project performance reports.

Verifying Implementation: Verify the existence of a regular progress reporting to the steering body.

Question: Did the project report progress to a steering body in more or less regular intervals throughout the execution of the project?

Level 2 KPA: Risk Management

Goal: To identify and analyze risks.

Commitment to Perform: Require risk identification and analysis.

Ability to Perform: Project management training.

Activities Performed: Identifiy, rank and assess risks during project planning.

Measurement and Analysis: Screening of risk management plans.

Verifying Implementation: Check if an initial risk analysis has taken place and if the risk impact has been assessed.

Question: Have risks been identified and assessed as to their quantitative and/or qualitative impact before project work started?

3.3.3 Level 3 – Standardized Level

Level 3 KPA: Scope Management

Goal: To continuously verify scope and plans.

Commitment to Perform: Require scope verification at phase ends.

Ability to Perform: Define scope verification process.

Activities Performed: Walk through scope and deliverables at the end of each phase.

Measurement and Analysis: Screening of steering body minutes.

Verifying Implementation: Check if a formal scope verification has been done by the steering body.

Question: Has the steering body of the project formally verified against a project deliverable list that the full scope has been completed whenever a milestone was reached?

Level 3 KPA: Time Management

Goal: To effectively control schedules.

Commitment to Perform: Require detailed schedule tracking.

Ability to Perform: Timesheet reporting system.

Activities Performed: Track the progress per activity according to degree of completion and time spent.

Measurement and Analysis: Review of project progress reports.

Verifying Implementation: Verify if low-level status information has been collected regularly .

Question: Has status information (time spent and degree of completion per task) been collected regularly?

Level 3 KPA: Cost Management

Goal: To effectively control project cost.

Commitment to Perform: Require detailed project cost reports.

Ability to Perform: Accounting system allowing projects to get adequate reports.

Activities Performed: Permanently control expenses .

Measurement and Analysis: Analyze development of cost reports.

Verifying Implementation: Verify availability and accuracy of project cost reports at regular intervals.

Question: Did the project (manager) track expenses in such a way that he would have been able to determine all committed expenses (even if not yet invoiced)?

Level 3 KPA: Quality Management

Goal: To establish quality standards and policies and manage quality.

Commitment to Perform: Require minimum quality levels.

Ability to Perform: Define quality standards.

Activities Performed: Quality planning and control.

Measurement and Analysis: Quality audits.

Verifying Implementation: Quality audits.

Question: Did the project define (and formulate in writing) a quality goal that was verified throughout the execution?

Level 3 KPA: Communications Management

Goal: To effectively manage communication with all stakeholders.

Commitment to Perform: Require stakeholder analysis.

Ability to Perform: Communications management skills.

Activities Performed: Stakeholder analysis and active management.

Measurement and Analysis: Review stakeholder requirements analysis.

Verifying Implementation: Verify if stakeholder requirements have been identified and documentation before project execution started.

Question: Were all project stakeholders identified and their needs analyzed and documented before project work started?

Level 3 KPA: Risk Management

Goal 1: To continuously manage risks throughout the project.

Commitment to Perform: Risk management system.

Ability to Perform: Risk management skills.

Activities Performed: Regular review of project risks.

Measurement and Analysis: Review status meeting minutes.

Verifying Implementation: Check availability of regular risk reports and corrective action.

Question: Did the project team regularly review project risks, reasses them and take appropriate action throughout the project execution?

Goal 2: To collect and archive lessons learned.

Commitment to Perform: Reward collection of lessons learned.

Ability to Perform: Provide repository for lessons learned.

Activities Performed: Document lessons learned during project closure.

Measurement and Analysis: Screen lessons learned repository.

Verifying Implementation: Verify existence and accessibility of lessons learned and of project documentation archive.

Question: Were "lessons learned" collected, documented, and stored in a central place where they are available for future projects?

Level 3 KPA: Procurement Management

Goal: To manage procurements consistently.

Commitment to Perform: Procurement policy.

Ability to Perform: Create policy.

Activities Performed: Actively and consistently manage procurements.

Measurement and Analysis: Conduct procurement audits.

Verifying Implementation: Verify availability and compliance with procurement guidelines.

Question: Were there any procurement guidelines/policies defined for the organization and did the project follow them?

3.3.4 Level 4 – Measured Level

Level 4 KPA: Quality Management

Goal: To quantify goals for project quality improvement.

Commitment to Perform: Define minimum quality goals for projects.

Ability to Perform: Quality measurements.

Activities Performed: Define required quality goals, plan achievement and control.

Measurement and Analysis: Continuously measure quality and identify correlations with variations in quality assurance.

Verifying Implementation: Check if impact of quality assurance activities is determined.

Question: Was the effectiveness of quality assurance activities analyzed during project execution?

Level 4 KPA: Human Resource Management

Goal: To effectively staff projects based on skills.

Commitment to Perform: Create skills register.

Ability to Perform: Freedom to staff based on skills register.

Activities Performed: Establish skills requirements and select staff accordingly.

Measurement and Analysis: Measurement of gap between skills required and skills available.

Verifying Implementation: Verify if skills requirements were determined and met.

Question: Did the project team perform an analysis of skills required for the project and could the project be staffed accordingly?

Level 4 KPA: Risk Management

Goal 1: To use lessons learned of previous projects for risk identification and analysis.

Commitment to Perform: Offer PMO Services.

Ability to Perform: Create Lessons Learned repository.

Activities Performed: Identifiy, rank and assess risks during project planning.

Measurement and Analysis: Assess impact on risk management plans.

Verifying Implementation: Verify if lessons learned of prior projects affected the risk management plans.

Question: Did the project team use documented lessons learned from a former project for identifying and assessing project risks?

Goal 2: To integrate risk management between multiple projects.

Commitment to Perform: Offer PMO Services.

Ability to Perform: Centralize risk management.

Activities Performed: Identifiy, rank and assess risks during project planning and compare with other projects.

Measurement and Analysis: Assess impact on risk management plans.

Verifying Implementation: Verify if the risk analysis was coordinated with other projects.

Question: Was the risk analysis of the project coordinated with the risk analysis done by other projects in parallel?

Level 4 KPA: Procurement Management

Goal: To integrate procurement audits in the entire process.

Commitment to Perform: Establish procurement policies.

Ability to Perform: Audit position available.

Activities Performed: Procurement audits.

Measurement and Analysis: Establish the level of compliance with procurement policies.

Verifying Implementation: Verify the existence of and compliance with procurement policies.

Question: Are procurement audits for projects part of the normal procurement process in your organization?

3.3.5 Level 5 – Continuously Improving Level

Level 5 KPA: Time and Cost Management

Goal: To continually reduce schedule variance.

Commitment to Perform: Encourage improvement.

Ability to Perform: Training.

Activities Performed: Continually improve cost and schedule performance.

Measurement and Analysis: Analyze cost and schedule performance trends.

Verifying Implementation: Verify if cost and schedule perforamcne are systematically analyzed and acted upon.

Question: Are schedule and budget performance of projects systematically analyzed in your organization and ways to improve sought?

Level 5 KPA: Quality Management

Goal: To continually improve quality.

Commitment to Perform: Encourage improvement.

Ability to Perform: Training.

Activities Performed: Continually improve quality.

Measurement and Analysis: Analyze quality trends.

Verifying Implementation: Verify if quality is systematically analyzed and acted upon.

Question: Is quality systematically audited in projects in your organization and improvement sought?

3.4 Response Weighting

In the previous section, we have derived 25 questions for determining the effects of an organization's PM process maturity on project performance. For determining the overall process maturity, we could take the approach to give an equal weight to all questions, as Kwak has done for the $(PM)^2$ model (Kwak, 1997). The danger with this approach is that contradictions in questionnaires where respondents claim to have seen higher maturity effects in low maturity organizations can significantly falsify assessments. This risk is low for the $(PM)^2$ maturity assessment as the assessment process is closely monitored by a group of experts belonging to Ibbs' research team, but it is significant for our simple model as it is based on a self-administered assessment. We therefore decided to cut the five-level maturity model into four one-level increments for which the responses are evaluated separately. Before adding the four one-level results to an overall maturity rating, the results achieved at a particular level are multiplied with the results of all lower-level increments, which limits the impact of inconsistent responses, as is shown in the example in figure 3.4.

Level	Questions	Answered 'Yes'	Result	Weighted Result
1	0	–	1.0	1.0
2	10	8	0.8	$1 \cdot 0.8 = 0.8$
3	8	4	0.5	$1 \cdot 0.8 \cdot 0.5 = 0.4$
4	5	0	0.0	$1 \cdot 0.8 \cdot 0.5 \cdot 0.0 = 0.0$
5	2	1	0.5	$1 \cdot 0.8 \cdot 0.5 \cdot 0.0 \cdot 0.5 = 0.0$

Total: $1.0 + 0.8 + 0.4 + 0.0 + 0.0 = 2.2$

Figure 3.4: Maturity Calculation Example

Chapter 4

Survey and Research Results

4.1 Maturity Assessment and Questionnaire

4.1.1 Assessment Delivery

One of the major goals of this study was to design a maturity process which is as simple as possible and to avoid having to involve experts who would help administer the assessement and check the validity of answers. The idea was to create an assessment questionnaire that can be self-administered by the respondents but which would still provide a minimal level of consistency. The approach we chose was to aim at having more than one team member of the same project respond to the questionnaire independently. The resulting maturity ratings for one project would then be averaged.

Unfortunately, most organizations misunderstood the instructions and had the questions answered by only one person. In some cases, where inconsistencies were obvious, we therefore had to discuss the answers with the respondents.

4.1.2 Questionnaire Design

An important design consideration was to remove the obvious association between questions and maturity levels expressed in the ordering of questions as listed

in section 3.3.2; there was a concern that the respondents would try to make their projects "look good" and thereby introduce a bias into their answers. We therefore decided to order the questions randomly.

It was a goal of the study to get project data from as many respondents as possible. Distributing paper forms to several hundred people would have been logistically difficult and would have caused major costs for paper, envelopes, and postage. We therefore initially planned to upload the questionnaire to a Web site and to only distribute electronic links to the participants. An IT company offered to create and host our questionnaire, but the feedback that we got from the initial testers of the paper version of the questionnaire indicated that the respondents would feel more comfortable with an electronic from in Microsoft Word format. The final version of the questionnaire consists of two parts:

1. An introductory letter with an appended form for general project information such as project name, contact person, budget, actual cost, planned duration, and actual duration (see appendix A).

2. A questionnaire form that can be distributed to several project participants with 25 Yes/No questions (see appendix B)

4.1.3 Questionnaire Testing

An initial paper version of the questionnaire has been tested among a few project managers at Swiss Re. Results of this test were the rephrasing of several questions, the visual emphasizing of some key words, and the decision not to host the questionnaire on a Web site, but to rather distribute an electronic Microsoft Word version which can be printed and mailed or edited and e-mailed by the respondent, depending on his/her preference.

Industry	Responses	Projects	Organizations
IT Services	13	12	6
Financial Services	7	4	3
Other	9	7	5

Figure 4.1: Distribution of survey sample across industries

Industry	Average	Minimum	Maximum
Information Technology	2.71	1.25	4.60
Financial Services	2.04	1.28	2.64
Other	2.18	1.11	3.29
*O*verall	2.43	1.11	4.60

Figure 4.2: Average PM maturity by industry

4.1.4 Selection of Survey Participants

The questionnaire was sent to approximately 300 individuals: 100 M.B.A. and B.S.B.A. alumni of the former City University Zurich site, 190 members of the PMI Switzerland chapter, as well as number of other acquaintances working in the project management field.

4.2 Evaluation of Maturity Assessment

We got a total of 23 responses about 17 projects in 11 Swiss organizations. The distribution across industries is shown in figure 4.1. The average maturity rating and range per industry are listed in figure 4.2.

4.3 Project Cost and Schedule Indexes

We have seen in section 2.2.1 that quantifiable measures for project success are the conformance to cost and schedule plans. To evaluate these criteria, we define

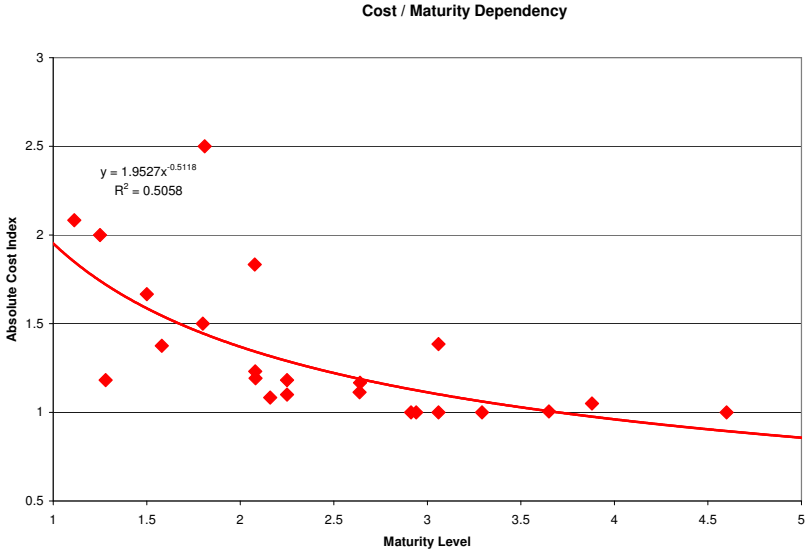

Figure 4.3: Correlation between ACI and PM Process Maturity

an Absolute Cost Index (ACI) and an Absolute Schedule Index (ASI) as follows:

$$ACI = \frac{|ActualProjectCosts - OriginalBudget|}{OriginalBudget} + 1$$
$$ASI = \frac{|ActualProjectDuration - OriginalProjectDuration|}{OriginalProjectDuration} + 1$$

Note that the definitions for ACI and ASI are different from the Earned Value ratios CPI (Cost Performance Index) and SPI (Schedule Performance Index) as defined for example in PMI's PMBOK (Project Management Institute, 2000) or the key figures CI (Cost Index) and SI (Schedule Index) defined by Kwak in (Kwak, 1997). The closer ACI and ASI are to 1, the better the project performance.

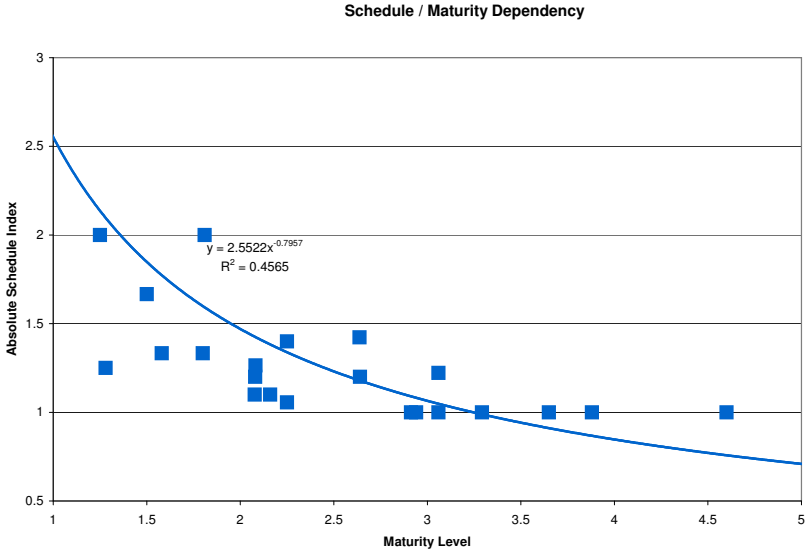

Figure 4.4: Correlation between ASI and PM Process Maturity

4.4 Determination of Correlation

For this evaluation, Microsoft Excel's regression analyis functions have been used for determining a best-fit correlation between the Absolute Cost Index and the PM maturity, respectively the Absolute Schedule Index and the PM Maturity. For the Absolute Cost Index, the function

$$y = 1.9527 \cdot x^{-0.5118}$$

has been determined. The correlation coefficient is $R^2 = 0.5058$. This equation graphically represented in the scatter diagram in figure 4.3. For the Absolute Schedule Index, the function

$$y = 2.5522 \cdot x^{-0.7957}$$

has been determined. The correlation coefficient is $R^2 = 0.4565$. This equation graphically represented in the scatter diagram in figure 4.4.

For both indexes, the correlation coefficient R^2 is in the range of 0.5, which means that there is a reasonably strong dependency between the indexes and the PM maturity.

Chapter 5

Research Summary and Recommendations

5.1 Hypothesis Validation

The research motivation and problem statement for this study are presented in chapter 1. The objective of this research was to prove that the correlation between an organization's sophistication of project management processes with the cost and schedule performance of its projects can be verified with a very simple and quick maturity assessment. The hypothesis to be verified was the following:

> *H*ypothesis: The PM process maturity assessment can be simplified in such a way that the positive correlation between the determined PM process maturity and the organization's actual project performance can still be proved.

The maturity assessment conducted with 23 projects in 14 Swiss organizations has verified the hypothesis. The correlation coefficients of the determined functions are such that the existence of the correlation can be considered verified.

5.2 Research Summary

In this research, a simple and quick maturity assessment procedure and questionnaire with 25 Yes/No questions have been developed and field tested. This maturity assessment does obviously not provide the level of detail that other, more complex assessments offer and it cannot be used to precisely identify potential areas of process improvement for an organization. The validity and usefulness of the assessment has been proved with the confirmation of a correlation between the determined process maturity and the cost and schedule index achieved by the assessed organizations in their projects.

5.3 Recommendations

The Project Management process maturity assessment developed for this study is able to provide a situation assessment for an organization requiring very little time, personnel, and funding. It can therefore be used to provide arguments for an investment into better project management practices if an organization's senior is reluctant to providing funds for a more detailed assessment of project management maturity. In this sense, our assessment can function as "door opener". I does not answer the question what an organization should do to improve its project management practices, but it gives information about the extent of the problem an organization has and provides an order of magnitude of the financial impact that this problem causes. This should help project management professionals in convincing senior management to fund a more detailed assessment that can identify the steps required for improvement.

The complete maturity assessment process, questionnaire, and calculations are made publicly available in this document. We encourage project management colleagues to make use of this new tool and thereby help the project management discipline get the recognition it deserves based on its value to organizations.

Appendix A

Survey Instructions

The following letter was sent to more than 300 individuals to request their participation in the study. The table on the second page was used to collect general project information about cost and schedule variance.

S e r g e S c h i l t z
Dr. sc. Inf., dipl. math., M.B.A.

U n t e r e r B u r g h a l d e n w e g 5 • C H - 4 4 1 0 L i e s t a l
T e l : + 4 1 (6 1) 9 0 3 2 4 1 5 • F a x : + 4 1 (6 1) 9 0 3 2 4 1 6 • E m a i l : s c h i l t z s @ a c m . o r g

Project Management Maturity Assessment

Dear Madam or Sir

I am a student in the *"Master of Science in Project Management"* program of *"City University of Bellevue, WA (USA)"* and I am currently working on my Master's Thesis with the title *"A Practical Method for Assessing the Financial Benefit of Project Management"*. I have developed a very simple Project Management Maturity (PMM) assessment questionnaire (25 Yes/No questions) and I intend to determine a correlation between an organizations' PMM and their ability to meet schedule and cost goals in projects. The results of my study only have statistical significance if as many organizations as possible participate in this survey. I would therefore be extremely grateful if you accepted to contribute no more than 10 minutes of your and a few of your colleagues' time to this study.

I would like to ask you to

- identify one or more projects that completed within the past 12 months, performed within your organization or which your organization was involved in
- for each of these projects, indicate the original budget and planned duration (in months) at project launch, as well as the actual costs and duration (in months) at completion in the attached table and return it to me
- distribute the attached questionnaire to
    - one project manager/leader
    - one team/workstream leader
    - two project (core) team members

  per participating project and ask them to return it completed directly to me

You may use fictitious project and respondent names, but please use them consistently so that I can match the responses. In any case, all information provided to me will be held strictly confidential. My thesis will not relate participating organizations to the results of PMM assessments. However, you will receive a copy of the thesis report together with the individual PMM assessment report for your organization.

Please feel free to copy this letter as well as the attached questionnaire and distribute it to interested colleagues within and outside your organization and encourage them to participate. Every contribution is greatly appreciated.

Regards,

Serge Schiltz

Organization: _____
Contact person: _____
Address 1: _____
Address 2: _____
City: _____

Project Name	**Original Budget**	**Planned Duration**	**Actual Cost**	**Actual Duration**

Please return the questionnaire as soon as possible to

Serge Schiltz
Unterer Burghaldenweg 5
CH-4410 Liestal (Switzerland)

or schiltzs@acm.org

Thank you!

Appendix B

Maturity Questionnaire

The questionnaire used for the simple Project Management Process Maturity assessment is shown on the following pages.

Project Management Maturity Assessment

This questionnaire is part of a project management maturity assessment performed by *Serge Schiltz* – student of *City University of Bellevue, WA (USA)* – as part of his Master's Thesis Project. The goal of the study is to determine a correlation between an organization's project management maturity and its ability to meet cost and schedule objectives in projects.

All answers given in this form will be held strictly confidential. Organizations participating in the survey will receive a copy of the Thesis with the results of the study.

Organization: _____ Project: _____

Respondent: _____ Phone: _____

Project Function: _____

Please answer all questions to the best of your knowledge. This is neither a personal assessment nor a project assessment, but an *evaluation of your organization's capability to successfully carry through projects*. Please try to answer as honestly and objectively as possible. However, what counts are not proven facts that you need to research, but your personal observations.

The interpretation of answers is the following:

- *Yes* you confirm that you have personally observed the items/practices/behaviors described in the question
- *No* you have not personally observed all items/practices/behaviors described in the question
- *Don't know* your role in the project was such that you feel unable to answer the question (this is a very exceptional case because normally, you should have been able to observe the items/practices/behaviors if they have been present)

Please return the questionnaire as soon as possible to

Serge Schiltz
Unterer Burghaldenweg 5
CH-4410 Liestal (Switzerland)

or schiltzs@acm.org

Thank you!

		Yes	No	Don't know
1.	Were your and other people's tasks and responsibilities on the project defined in a **written** document?	☐	☐	☐
2.	Has the steering body of the project **formally verified** against a project deliverable list that the **full** scope has been completed whenever a **milestone** was reached?	☐	☐	☐
3.	Are procurement audits for projects part of the normal procurement process in your **organization**?	☐	☐	☐
4.	Are schedule and budget performance of projects **systematically analyzed** in your **organization** and ways to improve sought?	☐	☐	☐
5.	Did the project (manager) track expenses in such a way that he would have been able to determine **all** committed expenses (even if **not yet invoiced**)?	☐	☐	☐
6.	Is quality **systematically audited** in projects in your **organization** and improvement sought?	☐	☐	☐
7.	Was a schedule created **before** the project work started that showed start and end dates for **all** project tasks?	☐	☐	☐
8.	Was **all** project work broken down into tasks for which time and cost can be reasonably estimated and responsibilities assigned **before** project work started?	☐	☐	☐
9.	Were all project deliverables that make up the **full** scope of the project identified and documented **before** project work started?	☐	☐	☐
10.	Were "lessons learned" collected, documented, and stored in a **central** place where they are available for **future** projects?	☐	☐	☐
11.	Was the **effectiveness** of quality assurance activities **analyzed** during project execution?	☐	☐	☐
12.	Did the **customer** perform a quality/acceptance test against **product specifications** when the product of the project was delivered?	☐	☐	☐
13.	Were cost estimates made for each individual activity and/or planned expense of the project during project planning?	☐	☐	☐
14.	Has status information (**time** spent and degree of completion per activity) been collected **regularly**?	☐	☐	☐
15.	Was the risk analysis of the project **coordinated** with the risk analysis done by **other projects** in parallel?	☐	☐	☐
16.	When changes were made to the project scope, were they **always** documented in a **written** project scope description?	☐	☐	☐

		Yes	No	Don't know
17.	Did the project team **regularly** review project risks, **reassess** them and take appropriate action throughout the project execution?	☐	☐	☐
18.	Were there any procurement guidelines/policies defined for the **organization** and did the project follow them?	☐	☐	☐
19.	Have risks been identified and assessed as to their quantitative and/or qualitative impact before project work started?	☐	☐	☐
20.	Did the project team use documented lessons learned from a **former** project for identifying and assessing project risks?	☐	☐	☐
21.	Were the project's stakeholders identified and their involvement **planned** and documented **before** project work started?	☐	☐	☐
22.	Were **all** project stakeholders identified and their specific **needs** analyzed and documented **before** project work started?	☐	☐	☐
23.	Did the project team perform an analysis of skills required for the project **and** could the project be staffed accordingly?	☐	☐	☐
24.	Did the project (manager) **report progress** to a steering body in more or less regular intervals **throughout** the execution of the project?	☐	☐	☐
25.	Did the project define (and formulate **in writing**) a quality goal that was **verified throughout** the execution?	☐	☐	☐

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11.	List of Figures (if applicable)	_____
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	b. Problem Statement	_____
	c. Review of Literature	_____
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