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Project Management Maturity in Small and Medium-Sized Enterprises in Morocco: an empirical investigation

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Abstract:
In the recent years, many studies have focused on assessment of Project Maturity. Some refer specifically to maturity of project management. In this article, we aim to assess the maturity level of Project Management in Small and Medium Sized Enterprises (SMEs) in Morocco. Therefore, we followed two approaches. The first is a pilot test for a four Moroccan medium-sized enterprise to determinate the level maturity of project management. The second is an empirical investigation in Moroccan SMEs by using a survey based on questionnaire of CMMI to demonstrate its capacity in project management.

Keywords: *Project Management, CMMI, Small and Medium-Sized Enterprise, Maturity.*

1. Introduction

Currently, many organizations work with projects that can be in different nature [1]. These projects, common in industries such as engineering services, information technology, construction and pharmaceutical have one thing in common: they need to be managed [2]. Hence, project management can be applicable to any organization with the core objectives of scope, quality, schedule and cost [3].

In literature, Project Management is defined as "a general purpose management tool that can bring projects to successful completion and to the satisfaction of the project stakeholders, given the traditional constraints, of defined scope, desired quality, budgeted cost, and a schedule deadline [4].So, project management refers to the progressive development of an enterprise-wide project management approach, methodology, strategy, and decision-making process [5].

In order to enhance project performance, many surveys reveal that the project management maturity level must be high [6]. In literature, Project management maturity is a concept widely used in the project management community among practitioners, professional associations, and researchers [7]. So, many studies have determined that the project management maturity of organizations is related to the success of projects [8].Besides, others studies revealed that Project Management maturity is significantly related to business performance [9]. Therefore, the study of the level of the Project Management Maturity in companies becomes a necessity.

In this paper, we will describe the maturity model most reviewed in the literature with a comparative study of different models. Besides, we will present the results of the two approaches in order to assess the level maturity of project management in Moroccan SMEs.

2. Maturity Models:

The concept of maturity models is increasingly being applied within the field of Information Systems (IS), both as approach for organizational development [10, 11, 12] or as means of organizational assessment [13, 14]. So, in order to improve the efficiency and effectiveness of activities, organizations have adopted maturity models. These frameworks evaluate the degree to which organizational processes are similar to some established standard. Once the gap between current practice and established standard is identified, organizations can create initiatives to improve processes.

In this way, they can progress to higher levels of maturity. While the use of maturity models has been established in the operations field, they are relatively new to project management, only having emerged in the last 20 years [15]. Their effectiveness in improving organizational performance is still being debated with authors finding no effect **[16]**, limited effects and strong effects **[17]**. This part reviews the following Project Management maturity models: OPM3, P2M (Japan), P3M3 (UK), Maturity by Project Category

Model (Brazil), Project Management Maturity Model, Project Excellence Model (Europe).

2.1 OPM3:

OPM3 focuses on the comparison of organizational activities to best practices, defined by PMI as the optimal method of meeting a particular stated objective [18]. OPM3 assesses best practices in Project, Program and Portfolio management by analysing:

•**Capabilities** – Presence of specific organizational activities that have been identified as part of a best practice.

•**Outcomes** – The beneficial results that organizations obtain from performance of those activities.

•**Key Performance Indicators (KPIs)** – Measures that are used to determine the existence and strength of a capability.

Organizations can then be classified into four stages of development in each process area at the Project, Program and Portfolio level:

- Standardize: Structured processes are adopted.
- Measure: Data is used to evaluate process performance.
- Control: Control plan developed for measures.
- Continuously Improve: Processes are optimized.

2.2 P2M :

The Japanese project management association has also created a Project Maturity management within the P2M framework [19]. In this process model, maturity classified into the following five levels:

- Level 1 Haphazard: Projects are managed informally with a high failure rate.
- Level 2 Systematic: Dedicated project teams are formed, improved success rate for familiar projects.
- Level 3 Scientific : Quantitative data is used to support project planning and delivery.
- Level 4 Integrated : Company wide systems are implemented to manage multiple projects in a systematic manner.
- Level 5 Optimization : Projects are aligned with corporate strategies and company is recognized as an industry leader in Project Management.

2.3 P3M3:

The UK Government through the Office for Government Commerce have also created a framework for managing project activities in organizations, the Portfolio, Program and Project Management Maturity Model or P3M3 [20].This integrative framework contains three components:

- Portfolio Management Maturity Model (PfM3).
- Program Management Maturity Model (PgM3).
- Project Management Maturity Model (PM3).

P3M3 evaluates each component using a 9 questions instrument to classify organizational activities into five levels of maturity:

- Level 1 Awareness of Process Organization recognizes the existence of Projects, Programs and Portfolios and attempts to run them in a different manner to operations.
- Level 2 Repeatable Process Organization ensures that individual programs and projects are run with their own processes to a specified standard.
- Level 3 Defined Process Organization wide process implemented for Projects, Programs and Portfolios .
- Level 4 Managed Process. Data is used to improve Organization wide process.
- Level 5 Optimized Process Continuous improvement of organization wide processes.

2.4 Maturity by Project Category Model:

This model has been used to evaluate firms from Brazil [21]. Using a 40 questions instrument, it also classifies project maturity into 5 levels using 6 project dimensions.

	Technical and Contextual competence Industry and cultural expertise of team	Methodology Degree to which a formal methodology is employed	Informatization Degree to which data is used to make decisions	Organizational Structure Degree to which a formal structure is adopted	Strategic Alignment Degree to which strategy and projects are integrated	Behavioural Competence Degree to which cultural issues are managed
Level1 Initial	*Projects are conducted by intuition, little planning, no standardized procedures.*					
Level 2 Known	*Company begins to adopt PM tools and processes*					
Level 3 Standardized	*Company adopts a formal project methodology.*					
Level 4 Managed	*Improvement processes are put in place for methodology.*					
Level 5 Optimized	*Methodology is optimized and best practice database is implemented.*					

2.5 Kerzner Project Management Maturity Model:

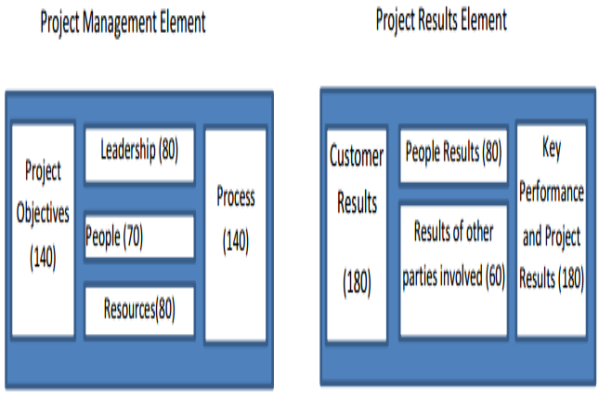
Kernzer [22] has also created a 5 level project maturity model, described in the table below:

Level 1	**LEVEL 1: Common Language (80 questions)** Organization recognizes the importance of project management and begins learning fundamental principles.
Level 2	**LEVEL 2: Common Processes (20 questions)** Organization begins to apply project management and begins to apply methodologies and specific processes.
Level 3	**LEVEL 3: Singular Methodology (42 questions)** Organization develops and applies company wide PM methodology.
Level 4	**LEVEL 4: Benchmarking (25 questions)** Project practices are compared to industry leading firms using a structured approach to identify opportunities for improvement.
Level 5	**LEVEL 5: Continuous Improvement (16 questions)** Knowledge gained from benchmarking is continuously applied to improve project management.

2.6 IPMA Project Excellence Model (Europe):

The IPMA Project Excellence Model [23] is a maturity model inspired by Total Quality Management (TQM).

The framework consists of two elements and allocates 1000 points according to the schema below:



In contrast to the distinct stages of previous models, the Project Excellence Model can rank organizations based on points out of 1000. These frameworks all reflect the distilled knowledge of the practioner community and are prescriptive in nature [24].A review of the previous frameworks indicates that they vary in goals and approach. Below Table 1, a comparative study between different models of maturity [25].

2.7 Goals:

OPM3, P2M and PMMM seek to align project management to organizational strategy through creation of an overarching framework. By contrast, P3M3 assumes that while areas are connected, there are no interdependencies between each model. Strategic alignment is only considered at the level of the Project, Program or Portfolio. In this way, each area can be assessed independently and improvement efforts are focused on particular areas. The project excellence model does not explicitly evaluate alignment between projects and organizational strategy. Kerzner and the Project Excellence model make no specific claims to strategic alignment and focus on the execution of project activities.

2.8 Approach:

OPM3 draws upon a database of 600 best practices and can provide defined actions for any areas of weakness. PMMM and P3M3 are far less comprehensive, basing their assessments on 40 and 27 item questionnaires. The Project Excellence model incorporates a national focus and compares project performance both within and across countries. The dimensions of project performance assessed exhibits similar variation. Due to this variation in approach, findings from these assessments are not directly comparable. Overall, project maturity models are a

necessary component of OPM but are not sufficient to examine the contribution of projects to organizations. The core concept of these maturity models is that change in organization takes a life cycle approach [26]. In this way, processes have distinct start point and end along with an underlying mechanism that drives progress. In PM maturity models, firms begin at Level 1 (little awareness of PM) and the mechanism of progress is increasing knowledge of PM, evidence by improving practices. Firms then reach the "end state" of industry leading/continuous improvement, in which processes are constantly refined.

Table. 1 Comparative study of different Maturity Models

Maturity Model	*Description*	*Maturity Level*	*Core Domain*	*Questionnaire*
Capability Maturity Model Integration	A model for software process improvement developed by the Software Engineering Institute (SEI).	5 Levels	9 Areas PMBOOK	No specific questionnaire.
BerkeleyPM Process Maturity Model	A model is designed to demonstrate the value of project management in Computing performance.	5 Levels	9 Areas PMBOOK	No questionnaire (Method and simulation).
PMSolutions Project Management MaturityModel	A model that describes the steps necessary to increase the level of maturity project management and improve performance.	5 Levels	9 Areas PMBOOK	No questionnaire (Méthode, interview, Benchmark,…)
Organizational Project Management Maturity Model « OPM3 »	A model that focuses on the clear correlation between the ability of an organization to manage projects, programs and portfolios and efficiency to implement its strategy.	4 Levels	9 Areas PMBOOK	No specific questionnaire.
Portfolio, Programme & Project Management Maturity Model « P3M3 »	A model that focuses on the addition of portfolio management and program model describing the key process areas that contribute to successful projects.	5 Levels	9 Areas PMBOOK	No specific questionnaire.
Project Management Maturity Model	A model that can only assess the maturity of the organization and compare it to other organizations.	5 Levels	9 Areas PMBOOK	No specific questionnaire.

3. CAPABILITY MATURITY MODEL INTEGRATION (CMMI):

The most widely used of models maturity at the present is CMMI, which can be used for process improvement and maturity/capability determination [27]. So, Capability Maturity Model Integration (CMMI) Model was developed and first introduced in 2001 with version 1.0, by Carnegie Mellon University, Software Engineering Institute (SEI) as sponsored by the U.S. Defense Department. It was based on the original CMM model which was developed and introduced in the late 1980s continuing in use up through the turn of the century. CMMI integrated the original CMM or software CMM (SW-CMM) with the CMM models on system engineering (SE-CMM) and on integrated product development (IPD-CMM). These and other CMM models have proved useful for many organizations but the differences among these models were causing problems of compliance and diverging directions in focusing on improvements [28].

For some authors of study, the CMMI is a model that would help to study the levels of maturity which an organization has achieved or can be achieved in the development of its processes in knowledge management [29]. CMMI is a model consisting of "best practices" oriented process improvement for product development and services [30]. Capability maturity is a measure for your (or your vendor's!) likelihood / ability to deliver as promised, on-time, to cost. Increased maturity means significantly reduced risks, time and cost of software development [31].

Another important feature of the CMMI model over the CMM model is the introduction of continuous representation which enables the option of assessing and grading each process individually with a process capability level. Furthermore, the concept of continuous representation which was a central concept in the ISO 15504 (SPICE) model, allows CMMI to be ISO 15504 compatible, a feature important for the international community [27].

Software Engineering Institute (SEI) has accepted as a basic principle for process management, that "the quality of a system or product is highly influenced by the quality of the process used to develop and maintain it". Another basic principle is that the capability of a company to produce software successfully depends on its maturity, which can be measured using the methods provided in the model as maturity levels. Each maturity level considers a given group of processes or process areas. Achievement of a capability level in those process areas, as elaborated in the model, grants that particular maturity level to the organization [27].

CMM, CMMI, and similar process capability models have been long studied. Many papers have reported the costs and benefits [32] [33] to organizations of using process capability models for Software Process Improvement (SPI), including intangible benefits [34] [35]. Some earlier papers have discussed organizational motivations for adopting these approaches [36].

Table 2. Capability and Maturity Levels of CMMI

Levels	*Continuous Representation Capability Levels*	*Staged Representation Maturity Levels*
Level 0	Incomplete	N/A
Level 1	Performed	Initial
Level 2	Managed	Managed
Level 3	Defined	Defined
Level 4	Quantitatively Managed	Quantitatively Managed
Level 5	Optimizing	Optimizing

Each representation has its advantages and situations for suitable applicability [37]. The staged representation is suitable for an organization that does not emphasize one process over another, but needs an overall guidance for improvement, or an organization in need of producing an indication or proof of its general level of maturity. The latter situation may be required as a precondition to enter a bidding process in some country or organization. The continuous representation provides flexibility for selecting the processes considered important for achieving the business goals of the organization, as the organization best sees fit for the situation [38]. It allows the measurement of improvement at the process level. This finer level of assessment enables better monitoring of process improvement by upper management.

The two representations are not independent. They are based on the same 22 process areas, and there is a transformation or mapping from the continuous representation to the staged representation, known as equivalent staging. If a company achieves certain capability levels in certain PA's, then it is automatically assumed to obtain certain maturity levels.

CMMI gives each process area some goals which have to be satisfied to achieve certain capability levels for that process. Goals come in two types, as specific goals and generic goals. Specific goals are unique to each process area, whereas the same generic goals apply to all process areas. A specific goal describes the unique characteristics that must basically be present to satisfy the particular process area A generic goal describes the characteristics that must be present to institutionalize the processes that implement a process area [37] [38].

4. CMMI EVALUATION:

In this part, to examine the maturity level in SMEs in Morocco, we refer to two guiding documents for CMMI assessment. First, we use SCAMPI (Sample Questions Asked during CMMI Appraisals) which is The Standard CMMI® Appraisal Method for Process Improvement. It's designed to provide benchmark quality ratings relative to Capability Maturity Model Integration (CMMI) models. It is applicable to a wide range of appraisal usage modes, including both internal process improvement and external capability determinations [39].And for the second, we use appraisals based on study of model evolution and software capability realized by Mark PAULK and approved by SEI (Software Engineering Institute) [40]. So, we refer to another appraisal CMMI because we aim to examine strongly the maturity level of project management.

For the first, which is SCAMPI, is Based on some experiences and others feedback, following are the general questions asked during CMMI appraisals. These are arranged process area wise. The questions are generic, will give a direction to head, and wouldn't be asked as it is in an appraisal. The questions in SCAMPI assessments are very specific in nature and intended to corroborate the evidence found elsewhere [41]. View Table 3, 4, 5, 6. All of questions were formulated to cover the process area of SCAMPI. It is given below:

- PP & IPM : Project Planning & Integrated Project Management.
- PM & C : Project Monitoring & Control.
- P & PQA : Process & Product Quality Assurance.
- CM : Configuration Management.
- M & A : Measurement & Analysis.
- TC : Technical Solution.
- TI : Product Integration
- V & V : Verification & Validation
- OPF : Organizational Process Focus
- OPD : Organizational Process Definition
- OT : Organizational Trainings
- RM : Risk Management
- DA & R : Decision Analysis & Resolution
- OPP : Organizational Process Performance
- QPM : Quantitative Project Management
- CA & R : Causal Analysis & Resolution
- OI & D : Organizational Innovation & Deployments

LEVEL / AREA	***RM and RD***	***PP and IPM***	***PM and C***	***P and PQA***	***CM***	***MA***
LEVEL 2	***13 Questions***	***25 Questions***	***17 Questions***	***9 Questions***	***23 Questions***	***13 Questions***

Table 3. LEVEL 2 of SCAMPI

LEVEL / AREA	***TS***	***PI***	***V and V***	***OPF***	***OPD***	***OT***	***RM***	***DA and R***
LEVEL 3	***22 Questions***	***20 Questions***	***35 Questions***	***28 Questions***	***8 Questions***	***20 Questions***	***31 Questions***	***6 Questions***

Table 4. LEVEL 3 of SCAMPI

LEVEL / AREA	***OPP***	***QPM***
LEVEL 4	***5 Questions***	***14 Questions***

Table 5. LEVEL 4 of SCAMPI

LEVEL / AREA	***CA and R***	***OI and D***
LEVEL 5	***15 Questions***	***19 Questions***

Table 6. LEVEL 5 of SCAMPI

There were five possible answers to each question, each answer receiving points as shown below:

Choice of answers: Points received:

• Definitely yes = 4 points
• Usually = 3 points
• Planned but not applied = 2 points
• Not sure = 1 point
• Definitely no = 0 point

Each answer received a 0 to 4 point grade, as also shown above. The questions were so constructed that more points always contributed positively to higher maturity.

5. APPLICATION OF THE TWO APPRAISALS:

The questionnaire SCAMPI was administrated in four Moroccan software companies. The companies were visited at an appropriately high level which was often the general manager. A responsible and knowledgeable person was identified who answered the questions posed, sometimes referring to his colleagues or other employees in the company. The interviews usually took about 1 and half hours. These companies have all claimed to have adopted a process approach to achieving quality, some rather recently, some for a longer time. Table 7 below shows the years the companies were established and the number of employees they had at the time of conducting the questionnaire:

Table 7. The year of organization and its number

The Organization	***The Year of Organization***	***The numbers of workers***
The Organization A	***1986***	***220***
The Organization B	***2005***	***30***
The Organization C	***2006***	***40***

On the other hand, to determinate the maturity level of project management in SMEs in Morocco, we have decided to apply the questionnaire structured on 5 levels based on CMMI [40].

We have sent a mail to 120 Moroccan's companies in order to evaluate the real maturity level inside. The companies investigated are with workforce less than 250 and turnover of less than 10 millions USD. It is composed of SMEs from different economic sectors.

This includes manufacturing, information technology, insurance, sales and distribution industries. This survey was addressed to any person at management level (Project manager, engineer, Director IS, IT manager…).

Only 41 have completed responses to questionnaire. A response rate of approximately 34% which meets Malhotra and Grover's 30% response rate hurdle [41].

6. RESULTS:

The answers to SCAMPI questionnaire of each Moroccan's company in each level, was in the level 2 for only one company (The organization A), but for the rest wasn't even in the level 2.

For the maturity level 5 of SCAMPI results, specifically process "Organizational Innovation and Deployment", it emerged that only one company (The organization A) has at least answered positively to fourteen questions, but the other, it has answered only to one question positively. For the other process, it all has some positive answers (3 and 4 points) and negative answers (0, 1 and 2 points).

At the level 4 of maturity, it has all negative and positive answers for different process and also for the level 3 and 2 of maturity.

On the other hand, the level 2 of maturity was completed by one company with some remarks (The organization A). In our study, we consider the company that has the level when it has completed all questions with 3 or 4 points in each question.

Table.8 below shows the results of this survey. It gives the total points obtained of each process at maturity level.

Table 8. Maturity Level of Project Management

LEVEL	PROCESS	ORGANIZATION A	ORGANIZATION B	ORGANIZATION C	ORGANIZATION D
LEVEL 2	RM and RD	42	20	15	23
	PP and IPM	75	35	30	40
	PM and C	48	25	34	18
	P and PQA	27	9	2	18
	CM	77	21	28	41
	MA	43	10	15	23
LEVEL 3	TS	50	20	33	43
	PI	61	22	39	50
	V and V	77	40	51	65
	OPF	64	29	31	55
	OPD	19	10	13	16
	OT	48	28	38	44
	RM	67	31	43	54
	DA and R	17	9	5	12
LEVEL 4	OPP	15	2	8	12
	QPM	33	1	10	13
LEVEL 5	CA and R	21	0	4	8
	OI and D	34	0	2	4
The Final Score		818	312	401	539

On the other hand, according to the second study, the results of answer to the questionnaire based on CMMI [40] show that: For the level 2 of maturity results, it emerged that only a 23, 75 % have a level 2. But, for the level 1, there is a 76, 25 % on the level 1. For the level 3, 4 and 5 of maturity, there is no SMEs Moroccan have this level. As a result and according to the two studies in this article, the majority of SMEs in Morocco have the maturity level 1. There is very few of SMEs that have maturity level 2. It reached this level with great efforts.

We can conclude that the Moroccan SMEs don't pay attention for the concept of project management. They focus their efforts on technologies. They don't have a consultant specialized on project management, but they were planned to hire someone. Even in our research, the consultant and manager don't give a great importance to the project management. Although they admit that they need to better define and establish their basic processes. Some of them don't even establish a planning to realize his project. Another interesting and perhaps expected result was the correlation between the number of employees and the final score. Companies with 20 or 50 employees were far off from achieving a maturity level of 2, whereas a company with more than 200 employees was there.

The Moroccan SMEs have to focus their efforts on the process of project management to improve it. The results of this assessment confirm that Project Management Maturity methodologies have not yet been used most effectively in Morocco. Although they show a reasonable level to have been achieved already, there is still quite a lot to do in order to achieve perceived potential. The survey's results reflect a "not defined" level of maturity of project management for Moroccan small and medium-sized enterprises. They need to use a Maturity model which is significant tools to ensure continuous improvement of systems and activities.

7. CONCLUSION:

Based on the pilot test on the hand, on the other, empirical investigation, two approaches was used to assess the level maturity of project management for small and medium-sized enterprises in Morocco. We have utilized two methods in this study. The first is based on SCMAPI which is a specific appraisal CMMI. And the second, it's an appraisal CMMI based on the study of capacity and evolution models. We aim in this paper to be more specific, to have an evidence results and to reinforce our study. In this study, we found that the majority of companies don't have a process management. Near of 80 % are on the level 1 of maturity of project management. Only 11 % of companies can be on the level 2. They need to do more work on the project management. Hence, managers, consultants and directors plan to reach maturity in the future. Besides, 85% of respondents believing that implementing project management methods is important or very important, this may be just a matter of time to realize. In the future work, we have a purpose to design a model maturity of project management adapted specifically to Moroccan SMEs in order to help the companies to implement easily the maturity in the project management process.

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