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**THE NEW CULTURE OF MEXICAN MATURITY: A
PROFESSIONAL DEVELOPMENT PLAN AND STRATEGIC
ACTIONS AIMED AT IMPROVING THE MATURITY LEVEL ON
THE BAJA CALIFORNIAN PROFESSIONALS**

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Abstract. A Project Management Maturity Model helps organizations measure and mature their practices in project, program and portfolio management, through the definition of knowledge improvements in their processes. In Mexico, there are states with higher growth in the development of new projects, as has been seen in the last 20 years in the state of Baja California Norte. The national observatory reported that “the population of professionals in the state reached 305,374 people” (SNE, 2020). Therefore, it is intended to know if this sector of the population knows or applies any maturity model in their work. Therefore, a new maturity model is proposed that combines the strengths of the best-known models in the literature and proposes a plan of strategic actions aimed at maturity. The level of maturity of project management and individual, group and institutional competencies of this population in the state was analyzed by means of a multidimensional survey. To check its validity, exploratory factor analysis was applied. Knowledge in project management processes was found to have maturity level 3. However, the mission, vision and institutional competencies barely reached a level 2. Which suggests that the Baja Californian managements should work on these aspects. The new culture proposes an action plan that aligns with the strategies and fosters maturity in any organization.

Keywords: Maturity Models, Maturity level, OPM3, CP3M, CMMI.

LA NUEVA CULTURA DE LA MADUREZ MEXICANA: UN PLAN DE DESARROLLO PROFESIONAL Y ACCIONES ESTRATÉGICAS ENCAMINADAS A MEJORAR EL NIVEL DE MADUREZ SOBRE LOS PROFESIONISTAS BAJA CALIFORNIANOS

Resumen. Un Modelo de Madurez de la Gestión de Proyectos contribuye a que las organizaciones midan y maduren sus prácticas en gestión de proyectos, programas y portafolios, a través de la definición de conocimientos mejoras en sus procesos. En México, existen estados con mayor crecimiento en el desarrollo de nuevos proyectos, como se ha visto en los últimos 20 años en el estado de Baja California Norte. El observatorio nacional reportó que “la población de profesionistas en el estado alcanzó 305,374 de personas” (Servicio Nacional de Empleo [SNE], 2020). Por consiguiente, se pretende conocer si este sector de la población conoce o aplica algún modelo de madurez en su trabajo. Por lo anterior, se propone un nuevo modelo de madurez que combina las fortalezas de los modelos más conocidos en la literatura y propone un plan de acciones estratégicas encaminadas hacia la madurez. Se analizó el nivel de madurez de la gestión de proyectos y de las competencias individuales, grupales e institucionales de esta población en el estado por medio de una encuesta multidimensional. Para comprobar su validez, se aplicó el análisis factorial exploratorio. Se encontró que los conocimientos en los procesos de la gestión de proyectos cuentan con un nivel 3 de madurez. Sin embargo, la misión, visión y las competencias institucionales apenas lograron un nivel 2. Lo que sugiere que las gerencias bajacalifornianas deben trabajar en esos aspectos. La nueva cultura propone un plan de acciones que se alinee con las estrategias y fomente la madurez en cualquier organización.

Palabras clave: Modelos de madurez, Niveles de madurez, OPM3, CP3M, CMMI.

Introduction

According to Cooke-Davies (2002) as cited in Solarte and Sanchez (2014, p. 6), "The roots of maturity models stem from the work of Total Quality Management (TQM)," they play a great role in continuous improvement and have an important link to the mission and vision of any organization. Most maturity models are inspired by the Capability Maturity Model (CMM) developed by the Software Engineering Institute (SEI), where the organization progresses through a series of five levels. These five levels define an ordinal scale for assessing the maturity of an organization's processes and capabilities.

The Project Management Institute [PMI] (2013) defines the Project Management Maturity Model (PMMM) as "a framework that defines knowledge, assurance, and process improvements, based on best practices and capabilities, helps organizations measure and mature their project, program, and portfolio management practices" (p. 185). It can be seen that PMPMs have been evolving over time from just measuring the maturity of processes within an organization to becoming a culture that fosters maturity in an organization.

Currently, "about 30 PMMMs are known" (Backlund, Chronéer, & Sundqvist, 2013, p. 838), the best known are: the Organizational Project Management Maturity Model (OPM3) (PMI, 2013), the Capability Maturity Model (CMM) (Software Engineering Institute [SEI], 2010), and the Project, Program, and Portfolio Management Maturity Model (P3M3) (Murray & Sowden, 2015). The vast majority are supported by bodies of knowledge such as the Project Management Body of Knowledge (PMBOK) (PMI, 2017), the IPMA Baseline for Competencies (IPMA ICB) (International Project Management Association [IPMA], 2018), the APM Body of Knowledge (AMPBOK) (Association for Project Management [APM], 2012), among others. Each time any of

these bodies of knowledge are updated, consequently, the maturity models undergo an update.

In recent years, new maturity models have appeared such as the Colombian Project Management Maturity Model (CP3M) (Solarte and Sanchez, 2014), the Project Management Maturity Model developed by Prado (PMMM-Prado) (Prado, 2015), and the model made by Yimam (Yimam, 2011). These suggest new axes of analysis that were not considered in traditional maturity models.

Theoretical Framework

The analysis of maturity models and knowledge bodies

The bodies of project management knowledge that are most widely disseminated through the number of certifications throughout the Americas and Europe were analyzed. Eight PMMMs were found: the Organizational Project Management Maturity Model (OPM3) (PMI, 2013), Project Management Maturity Model (KPMMM) (Kezner, 2015), PM-Solutions Project Management Maturity Model (Crawford, 2015), Project Management Maturity Model, Programs and Portfolios (P3M3) (Murray and Sowden, 2015), Capability Maturity Model Integration (CMMI) (SEI, 2010), Colombian Project Management Maturity Model (CP3M) (Solarte and Sanchez, 2014), Maturity Model proposed by Abadir H. Yimam (Yimam, 2011), and Maturity by Project Category Model (PMMM) (Prado, 2015).

Table 1 analyzes the PMMMs based on the body of knowledge they rely on, the scope of each model, whether it has dimensions, its strengths, the domain, the focus on processes or systems, and the mandatory use of a body of knowledge.

Among the findings, the PMBOK is found in several maturity models with at least 8 knowledge areas, except integration and stakeholder management. The P3M3 only has the resource and risk management. CMMI correlates across objective profiles 2 and 3 (See Figure 1). The same situation is repeated when correlating the PMBOK, ICB-IPMA, and APMBOK bodies of knowledge (See Figure 2).

Table 1
Comparison of maturity models.

Model	Version	Edition	Domain	Author(s)	Levels	Axes of analysis or dimensions	Capabilities or processes	Base	Process / System	Area of knowledge
CP3M	5th	2014	Project approach	Solarte and Sanchez	1 - 5 (Inconsistency, Planning and Control, Integration, Strategic Alignment, Innovation and Optimization)	Five transversal analysis axes (PMBOK Guide, Strategic Alignment, Learning, Adaptability and Life Cycles). Sub-axes of analysis (Institutional Learning Orientation, Innovation Orientation), Institutional Support, Institutional Projectization)		PMBOK	Processes	Required
PMMM-Prado	3rd	2015	All domains	Prado	1-5 (Initial or embryonic or ad hoc, Known, Defined, or standardized, Managed and Optimized)	Competences (Project Management, contextual and technical-behavioral aspects) Methodology, Computerization, Use of the appropriate organizational structure, Alignment to the strategy.		PMBOK, ICB IPMA	Processes	Required

Abadir H. Yimam	1st	2011	Project approach	Yimam	From CMMI: Level 0. Incomplete, Level 1. Process developed, Level 2. Process managed, Level 3. Process defined, Level 4. Quantitatively Managed Process, Level 5.	Practical maturity dimension - incremental progression (practices: basic, intermediate, advanced) Process maturity dimension (Incomplete process, informally developed process, formally developed process, managed process, and defined process).	Knowledge Areas: Scope, Time, Cost, Financial, Quality, Human Resources, Communication, Risk, Procurement: Project Equipment and Project Material, Project Safety.	PMBOK, CMMI	Processes	Required
Kezner	3rd	2015	Project approach	Kezner	1-5 (Common Language, Common Processes, Unique Methodology, Benchmarking, Continuous Improvement)	N/A	Evaluates the following categories: *Scope management, *Time management, *Cost management, *Human resource management, *Procurement management, *Quality management, *Risk management, Communications management.	PMBOK	Processes	Required

CMMI	1.3	2010	Software	SEI	1-5 (Initial, Managed, Defined, Quantitatively Managed, In Optimization)	N/A	Capability level: 0- Incomplete, 1- Accomplished, 2- Managed, 3- Defined	CMM-SEI	Processes	Required
Crawford	3rd	2015	Project approach	Crawford	1-5 (Initial Processes, Structured Processes and Standards, Organizational Standards and Institutionalized Processes, Managed Processes, Process Optimization)	N/A	Evaluates all areas of PMBOK knowledge	PMBOK (areas)-CMMI (levels)	Processes	Required
P3M3	3rd	2015	All domains	Murray and Sowden	1-5 (Process Knowledge, Repeatable Process, Defined Process, Managed Process, Optimized Process)	N/A	7 perspectives: *Organizational Governance, *Management Control, *Profit Management, *Risk Management, *Stakeholder Management, *Financial Management, *Resource Management	It is not built around a particular body of knowledge.	System	Free to test by subject area or by levels

OPM3	3rd	2013	All domains	PMI	1-5 (Initial, Repeatable, Defined, Managed, Optimized, or Continuous Improvement)	N/A	10 areas of knowledge + 5 groups of processes, Projects: (Initiation, Planning, Execution, Monitoring-Control, and Closure) Programs: (Initiation, Planning, Execution, Monitoring-Control, and Closure) and Portfolio: Alignment, Monitoring, and Control.	PMBOK	Processes	Required
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Note: Source: own elaboration

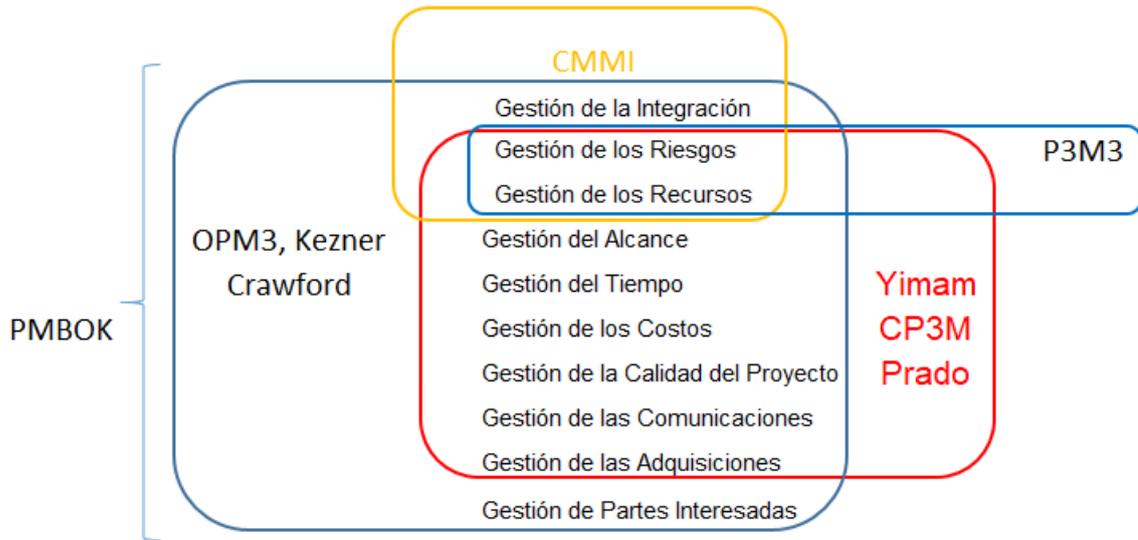


Figure 1. Correlation of the PMBOK with respect to the maturity models analyzed.

Note: Source: PMI (2017), PMI (2013), Kezner (2015), Crawford (2015), Murray and Sowden (2015), SEI (2010), Solarte and Sanchez (2014), Yimam (2011), and Prado (2015).

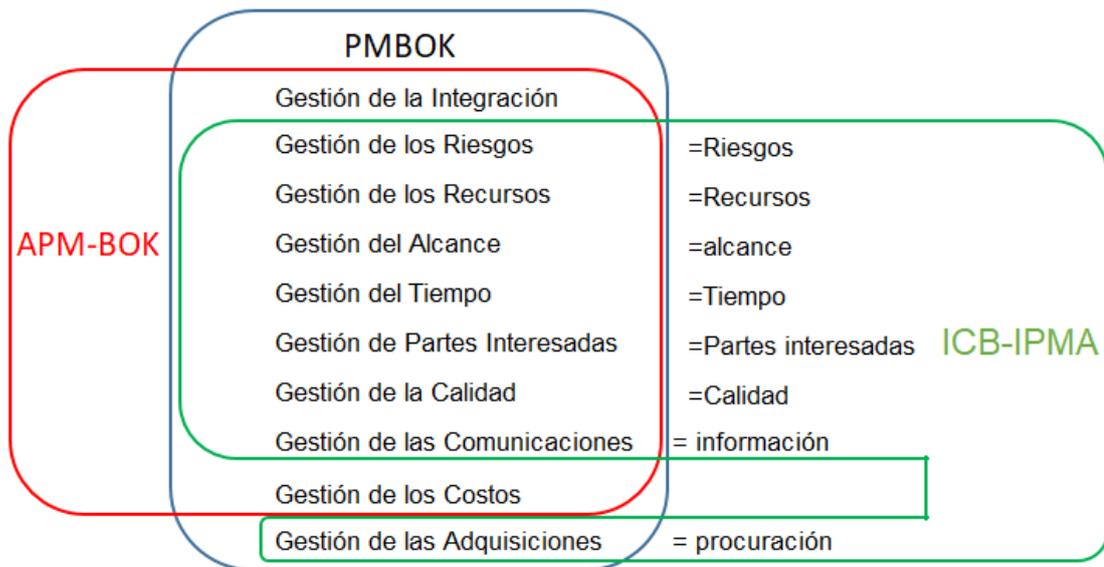


Figure 2. The correlation between the three bodies of knowledge analyzed.

Note: Source: PMI (2017), IPMA (2018), APM (2012).

It can be concluded that the three bodies of knowledge mentioned can be integrated into one. Being the APMBOK one of the most complete because it considers the knowledge at project, program, and portfolio management level in a single book.

On the other hand, when comparing P3M3 and CP3M, contextual similarities are observed such as strategic alignment, organizational governance, management control, and benefits management. In addition, when combined with APMBOK value management and ICB-IPMA program orientation, a new strategic dimension emerges (see Figure 3).

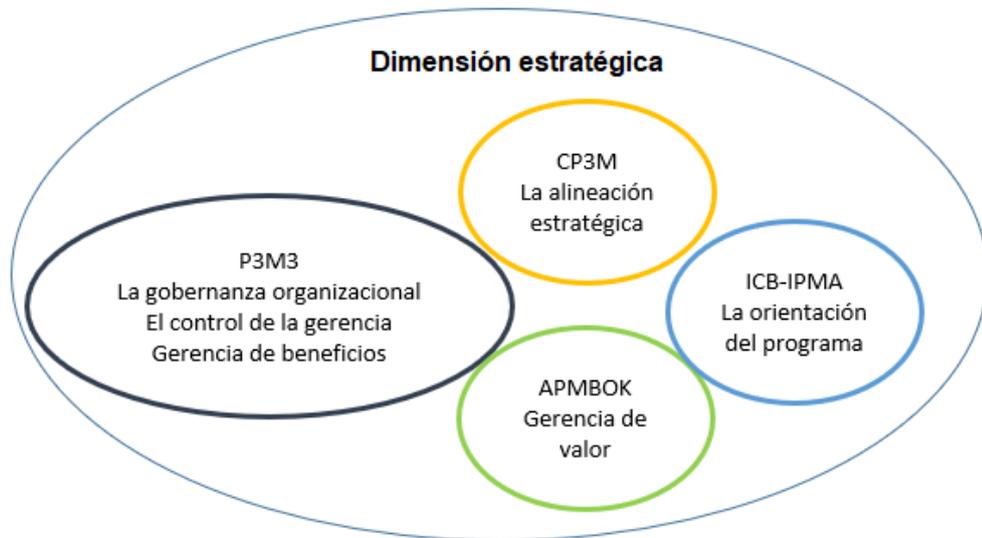


Figure 3. The strategic dimension.

Note: Source: IPMA (2018), APM (2012), Murray and Sowden (2015), Solarte and Sanchez (2014).

When analyzing Yimam, P3M3, CP3M, and ICB-IPMA, it is observed that their contextual competencies are common, these are the characterization of the organization and projects, the financial management. Thus, a new financial dimension emerges (See Figure 4).

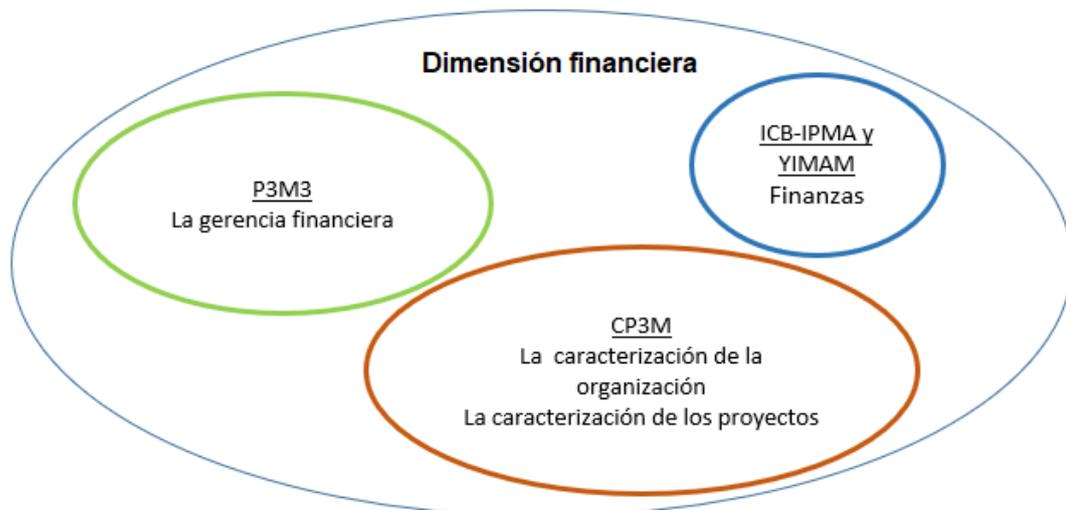


Figure 4. The financial dimension.

Note: Source: IPMA (2018), Murray and Sowden (2015), Solarte and Sanchez (2014).

Finally, when analyzing ICB-IPMA, PMI's Project Manager Competency Development (PMCD) and APMBOK, some common personal competencies for a project manager are observed, such as professionalism, conflict management, efficiency, and commitment and motivation. Regarding group performance, Saenz (2012) provides the following qualities, "success, group efficiency, task characteristics and contextual characteristics, composition, and identification of the group" (pp. 106-108). Finally, Mtoa and Solarte (2005, p.1509) provide institutional competencies such as "institutional learning, capacity and institutional support" (See Figure 5). Therefore, it can be concluded that there is a high compatibility to make a single maturity model. At

the same time, the coverage of the current models can be extended if they consider the three bodies of knowledge PMBOK, APMBOK, and ICB-IPMA.

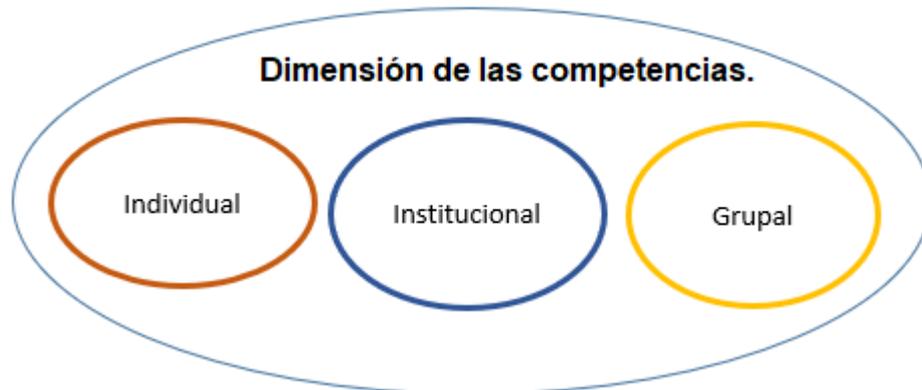


Figure 5. The dimension of competencies.

Note: Source: PMI (2007), Sáenz (2012), Santamaría and Hernández, (2016), Hernández, Cano, and Arano (2017).

Method

Objective of the research

The objective was to develop a new maturity model to be applied to the professional sector in the state of Baja California Norte. With the purpose of knowing if this sector of the population knows or applies a maturity model in their work.

The entity presents the ideal characteristics for its application due to its booming exponential development in the development of new projects in all areas. There are 95,882 companies established in the state, representing 2.3% of the total in all of Mexico (National Institute of Statistics, Geography and Informatics [INEGI], 2014). These represent a wide variety of productive sectors (manufacturing, aerospace, commerce, financial services, transportation, etc.). In addition, the state ranked sixteenth in gross national production.

Basis for developing a new maturity model

Based on the comparison of the PMMMs analyzed in Table 1 and together with the bodies of knowledge that support them, it was proposed to create a new proposal that combines contextual, performance, and knowledge competencies. It was proposed to create a new proposal that combines contextual, performance, and knowledge competencies. Moreover, it should be independent of any body of knowledge, the evaluation should be objective and easy to answer in order to judge each process, capable of evaluating the alignment of the strategic processes of the projects with the mission and vision, and at the same time, it should evaluate the competencies of its collaborators. That is economically accessible to initiate in the culture of project management maturity. In addition, it achieves results that are truly valid for the organizations and that present an adequate cost/benefit ratio.

The new culture of Mexican maturity.

Once the overlaps between the maturity models and the bodies of knowledge analyzed were identified, a new model was developed in which the strengths of each were combined. The new culture of maturity takes into account the financial and strategic

approaches, as considered by CP3M, ICB-IPMA, APMBOK, and P3M3. The capabilities and levels were taken from CMMI and OPM3. Finally, from the approach of individual competencies under the contributions of PMI PMCD, APMBOK, and IPMA ICB. In addition, it combines the contributions of Sáenz (Sáenz, 2012) at the group level. At the organizational level it is supported by CP3M together with the contributions of talent management (Santamaría and Hernández, 2016) and knowledge management (Hernández, Cano and Arano, 2017), being called as a whole the new Mexican maturity culture (NCMM).

The proposal proposes four dimensions that encompass the degree of maturity of an organization: knowledge or standard, financial and legal aspects, competencies, and strategic. Unlike other traditional maturity models, this model integrates individual, group, and institutional competencies. Considering them as key elements that affect the performance of project management execution. Like the other models that propose 5 levels to reach maturity, this one only proposes 4 levels to reach the *top model*, considering it as sufficient for small and medium companies that start on the road to organizational maturity (See Figure 6). In other words, that the organization has the freedom to reach the maturity that allows it to achieve its strategic goals.

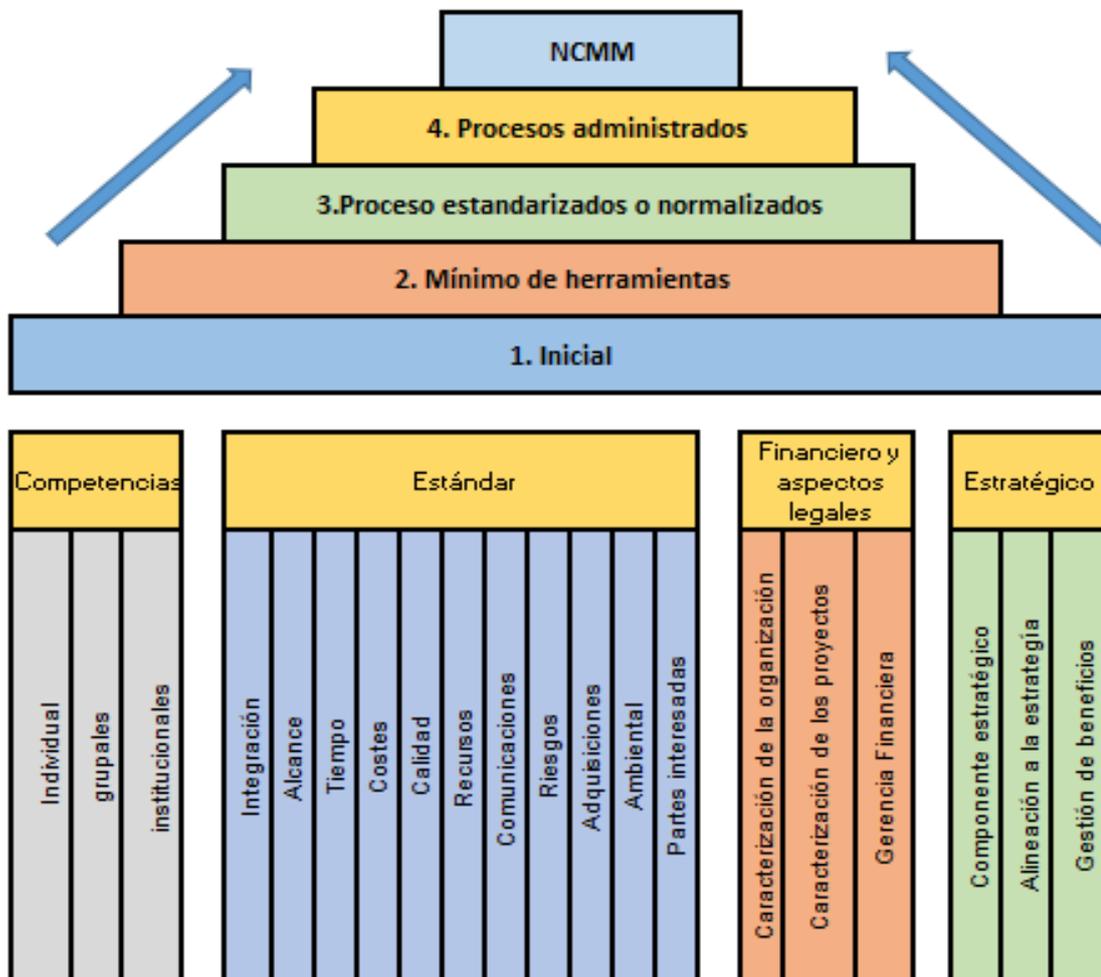


Figure 6. Graphical representation of the new Mexican maturity model.

Note: Source: own elaboration

Another attribute offered by the NCMM is that it reviews the current integrated command control of the analyzed organization and together with the contributions of the results of the evaluations of the new culture. It proposes an action plan that complements or modifies the integral command control, directing resources and infrastructure towards maturity. In the same way it applies it towards the competences of its collaborators, through an established professional development plan; which eliminates the deficiencies found to turn them into high performance teams. Unlike traditional maturity models, the new culture works at the same time on process capabilities and employee competencies. In addition, it evaluates its results longitudinally, rather than in a single snapshot as traditional models do.

The model can be implemented in any small and medium-sized organization that intends to get started in the culture of project management maturity. In addition, it allows you to create a customized plan focused on focusing resources and efforts towards maturity with the option to be certified in a recognized model.

a) *The skills dimension*

The new model suggests a dimension focused on analyzing the competencies of an organization that are observed from three approaches. From the individual or personal point of view, group, and institutional.

In the personal aspects, it includes the competencies of professionalism, conflict management, effectiveness, commitment, and motivation.

PMI (2007, p. 34) defines professionalism as "the performance of a person's ethical behavior that is governed by respect, responsibility, propriety, and honesty."

According to the APM (2012, p. 56), conflict management defines it as "a process that identifies and addresses differences, whereby, if not handled appropriately, they can affect project objectives."

According to IPMA (2018, p. 211), efficiency can be understood as "the ability to manage time and resources cost-effectively to produce the agreed products or services and achieve the expectations of the parties involved."

Motivation and commitment are defined as "the personal contribution that the manager and the people inside or associated give to a project. Consequently, it makes people feel part of a project and want to be part of it" (IPMA, 2018, p. 64).

The group aspect focuses on examining the competencies of the group in action. Among its elements are the contributions of Sáenz (2012, pp. 106-108), "group effectiveness, the success of the project, the characteristics of the tasks performed, the contextual characteristics of the field, the composition of the work team, and organizational identification."

The institutional aspect is divided into the sub-levels that must be evaluated from the contributions of Motoa and Solarte (2005, p.1509), "support (the provision of the necessary resources to successfully comply with the projects), capacity (evaluates the compliance of management in the organization), and institutional learning (evaluates the ability to permanently improve." The contributions of talent management are added, "customer service orientation, integrity, commitment, adaptability to change" (Santamaría and Hernández, 2016, p. 71) and knowledge management, "technological and innovation, intellectual and organizational" (Hernández, Cano and Arano, 2017, P. 49).

b) *The dimension of the standard*

This dimension describes the processes necessary to carry out a project or group of projects safely through to completion. In this aspect, the organization must have the knowledge competences based on any of the existing knowledge guides in the market. In this case, the model is supported by the three bodies of knowledge already mentioned above.

On the other hand, the areas are renamed as follows: integration, time, scope, communications, cost, quality, risk, procurement, and stakeholders. The areas that are renamed are Human Resources Management by Resources to encompass both the human part, the acquisition of machinery, and new technology. The areas that are added are Earned Value Management and Conflict Management by APMBOK. In addition, a new management is added called Environmental Management based on the ISO-14001 standard because any type of project can generate waste and these can impact directly or indirectly on the environment. This allows to cover all aspects that involve or alter the development of a project from various angles, outside and inside the organization.

In addition, the 5 process groups are maintained: initiation, planning, execution, monitoring and control, closing or deliverable. In some cases such as the maquiladora industry, the last group of processes is renamed because the newly produced product is being qualified on the production floor along with the delivery of documents and technical sheets to the immediate customer waiting for the start of mass production.

c) *Financial and legal aspects*

Another aspect to consider in the good functioning of a program or project is the legal and financial aspects. This dimension describes the aspects concerning the organization from the economic point of view, evaluates and analyses the data concerning the budgets allocated to the projects. In addition, it reviews all legal issues during the implementation of a project of the commitments made by the client - designer.

Financial Management is established to ensure that the likely costs of the initiative are captured and assessed within a formal business case and that costs are ranked and managed throughout the life cycle of the investment.

This management will evaluate two aspects: "one organizationally oriented and the other project oriented according to the financial aspects" of CP3M (Motoa and Solarte, 2005, pp. 1507-1508).

A management of legal aspects is added, taking as a reference the APMBOK APM (2006, p. 76), whose objective is to "promote legal awareness, consisting of a set of standards, values, ideals, and attitudes inside and outside the organization." In this sense, this management "must operate within the law and have knowledge of the legal system in the jurisdictions in which it operates: health and law, labor and contract law" (APM, 2012, p. 226).

d) *The strategic dimension*

This dimension is supported by the strategic component of the CP3M and the strategic alignment of the PMMM-Prado, which complement each other to strengthen this dimension. It evaluates that the projects are aligned with the organization's mission, as well as the correlation with the strategic plan and its structure to implement these strategies. The elements that make up the strategic dimension are the component and the strategic alignment.

The strategic component "evaluates three levels: how projects align with the organization's mission, how projects correlate with the objectives of the strategic plan, and the level of contribution of projects to organizational growth" (Motoa and Solarte, 2005, p. 1509).

Strategic alignment involves all stakeholders. "The organizational structure will define the roles and rules, as well as regulate the authority and power relationships between project leaders and the different areas of the organization involved in the projects" (Prado, 2015, p. 27).

The maturity levels of the proposal

The model is based on the CMM-SEI maturity levels. However, instead of considering all 5 levels, it will be limited to only 4 levels because very few organizations reach that level of maturity of excellence. In addition, companies that are beginners do not necessarily want to reach excellence but rather to improve their current situation. Table 2 lists the four levels of the proposal.

Table 2
Maturity levels of the new culture.

Level	Name of the level	Characterization
Level 1	Initial	<ul style="list-style-type: none"> • Top management does not consider the benefits of project management. • There is poor planning from the beginning of the project. • The team members do not feel identified. • Completed products and/or services exceed planned timelines and budgets. • It only meets the minimum necessary requirements.
Level 2	Minimum of tools	<ul style="list-style-type: none"> • Top management recognizes project management, but there is a lack of knowledge in the rest of the organization. • Some of the tools and good practices are applied locally. • Elaboration of the first procedures and instructions focused on project management. • I use rudimentary software programs dedicated to project management. • Projects and programs are not aligned with the organization's strategies, policies, and mission. • Project managers with limited autonomy and resources.
Level 3	Standardized or normalized processes	<ul style="list-style-type: none"> • Project management demonstrates successes, this enables standardization across the rest of the organization. • First steps are taken to align project management with policies, strategies, and mission. • Project managers receive formal training in technical, behavioral, and contextual competencies. • Project, program, and portfolio processes are defined and controlled.
Level 4	Managed	<ul style="list-style-type: none"> • Project management standards are already defined and established. • The first steps are taken to measure effectiveness and efficiency for decision making. • Countermeasures and actions to mitigate risks are established. • The indicators are visible to all employees. • The participation of everyone is encouraged to promote ideas and process improvements.

Note: Source: own elaboration

Data Collection Instrument and Sample Size

The survey was used as a data collection instrument over a period of six months. In addition, the technique of discretionary and snowball sampling was used, making use of social networks such as LinkedIn, Facebook, emails of known contacts, and the

participation of volunteers in different specialties. The population analyzed were managers, engineers, graduates belonging to small, medium, and large companies that are directly related to the projects.

A confidence level of 95% and a margin of error of 6% was used and applying the sample size equation (See Equation 1), resulted in 255 volunteers to be surveyed.

Equation 1. *Size of the sample to be analyzed.*

$$n = \frac{NZ_{\alpha/2}^2 P(1-P)}{(N-1)E^2 + Z_{\alpha/2}^2 P(1-P)} \quad (1)$$

Note: Source: Valdivieso, Valdivieso, and Valdivieso (2011, p. 158).

Where N = 305,374 professionals in Baja California Norte, P= 0.6, $\alpha=0.$, E = .06, $Z_{\alpha/2} = Z_{0.025} = 1.96$ (confidence level of 95%).

n= 255 participants

On the other hand, the questions asked were of the closed type that allowed measuring the intensity of the maturity of the processes and knowledge by applying the Likert scale of 5 levels, whose levels are particular to each dimension (See Annex 2). In addition, a web page was developed to deposit the results of the survey (See Figure 7).

Each volunteer answered the four dimensions except in the dimension of standard or knowledge, which was the only one according to their process or daily activity, i.e., members of engineering and managers answered the questionnaire to their engineering processes and project management, members of quality, finance, purchasing, logistics, environmental responded according to their own management surveys.

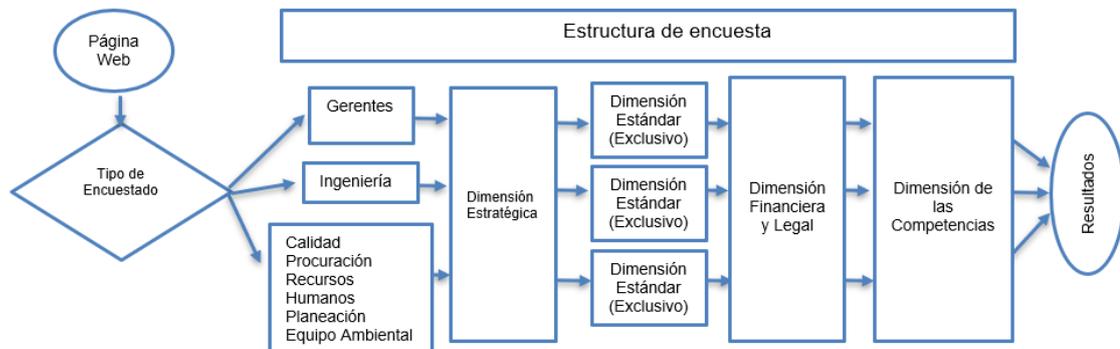


Figure 7. Structure of the survey of the new maturity model.

Note: Source: own elaboration

Results collection phase

In order to know the degree of maturity in all the federal entity, the present work divided its analysis in its four dimensions: knowledge or standard, financial and legal aspects, competences, and strategic.

To validate each of the surveys, the SPSS program was used, taking into consideration the following steps.

- Cronbach's Alpha was used to measure the reliability of each survey, that is, that the survey items are correlated with each other. Saenz (2012, p. 110) states that "Alpha values between 0.6 to 0.7 are considered weak, and values above 0.7 are considered acceptable or excellent." For the purposes of this research, an Alpha with a value higher than 0.6 is considered acceptable because there may be items in the survey that can be considered significant.
- Using the AFE to find new factors representative of each set of questions that make up each survey.
- The new factors, together with the scoring of their elements, allow to know the perception of the volunteers in the form of quick results and at the same time it is confronted against the results of the survey. In this way it is possible to have an approximation to validate the survey regarding the maturity level of each domain.
- Each survey is made up of three main elements: its alignment with the organization's mission and vision; the analysis of its project and competency management processes; and the analysis of its institutional capacities.

On the other hand, the survey questions are of the closed multiple-choice type with five answers each. Each answer is linked to a specific maturity level with its attributes and competencies. The respondent only has to answer according to the processes and competencies he/she performs on a daily basis (See Annex 2 for more information). In the end, the sum of each dimension will allow us to know the maturity level of the whole state.

Results interpretation phase

Once the results were presented and the deficiencies detected in the survey were known, a group of volunteers who experience the problems in the implementation of their projects were asked to help brainstorm possible causes for the development of tree diagrams. A group of volunteers who experience the problems in the implementation of their projects were asked to help brainstorm possible causes for the elaboration of tree diagrams. If the problem(s) can be measured, then they are candidates to become new indicators. In the end, a matrix with actions was obtained that complements the BSC and can be applied in any organization with slight modifications (see Figure 8). Annex 1 expands on the subject.

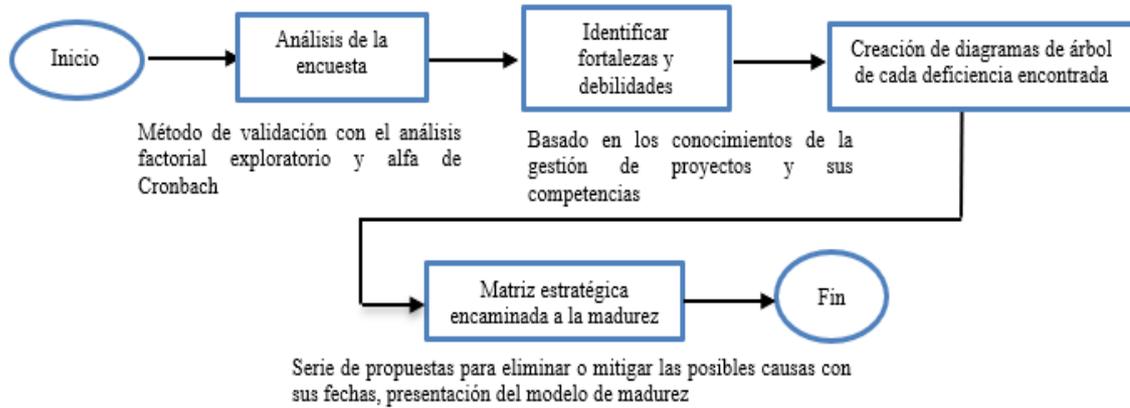


Figure 8. Data collection and interpretation.

Note: Source: own elaboration

Results

The results obtained by applying the new maturity culture on the Baja Californian professionals are presented below. Table 3 presents the scope of the population. It can be seen that the bulk of the respondents are members of a large company with 52.94%, and SMEs are the second group with 37.65%.

Table 3

Scope of the survey of the Baja California population.

Turn	Population	Percentage
Large Company	135	52.94%
SMEs	96	37.65%
Government	8	3.14%
Automotive / Transportation	8	3.14%
Construction	7	2.75%
Fishing	3	1.18%
Academic	2	0.78%
Total	255	

Note: Source: own elaboration

In addition, other demographic data of the surveyed population is presented. In which 76.47% have a university degree, followed by 18.42% with a master's degree. The bulk of the surveyed population is in the range of 43 to 51 years old with 30.98%, followed by the 36 to 43 years old population with 27.45%, and, in third place, the 26 to 35 years old group with 27.06%. In addition, the seniority in their last job is headed by the group between 2 to 5 years with 45.49%, followed by the group from 0 to 1 year with 20% and, in third place, the group from 6 to 9 years with 18.04%.

Strategic Dimension

The survey of this dimension has 15 questions and they were answered by all volunteers. When running the reliability analysis on the survey, the Cronbach's Alpha value of 0.933 was calculated; therefore, its result is reliable because it is greater than 0.7. When applying the AFE, a KMO¹ value of 0.863 is recognized; therefore, it is also favorable. In conclusion, there is correlation between the variables of the survey applied,

¹ The Kaiser, Meyer, and Olkin (KMO) test is a method that "checks whether the partial correlations between variables are small" (International Business Machine [IBM], 2020, para. 2). Like Cronbach's Alpha, both methods allow us to know whether the survey items are correlated with each other. Considering as favorable values above 0.7.

in addition three factors were obtained whose sum of their variances reach a value higher than 75.34% (See Table 4). The first factor recognizes questions E4, E5, E7, E11, and E12. The second factor has questions E1, E2, E3. The third factor is made up of only E9, E13, and E15.

Table 4
AFE analysis for strategic dimension.

	Rotated component matrix ^a		
	Component 1	Component 2	Component 3
Q1	.169	.885	.006
Q2	.249	.843	.293
Q3	.247	.873	.213
Q4	.860	.317	.008
Q5	.751	.479	.210
Q6	.328	.594	.545
Q7	.713	.349	.324
Q8	-.013	.377	.588
Q9	.382	.265	.740
Q10	.412	.414	.658
Q11	.773	.199	.238
Q12	.844	.048	.338
Q13	.413	.196	.723
Q14	.651	.024	.441
Q15	.192	-.065	.808

Note: Extraction method: principal component analysis.
Rotation method: Varimax with Kaiser normalization.^a

a. The rotation has converged in 6 iterations. Source: own elaboration

When comparing the volunteers' perception of factor 1 (knowledge), 36% of the volunteers considered themselves to be at level 3, while the other 39.2% of the volunteers perceived themselves to be above level 3. For factor 2 (mission and vision), 42.3% of the volunteers believed they were at level 4, while the other 49.8% of the volunteers thought they were below level 4.

On the other hand, when comparing the overall results of the dimension (See Table 5) against the quick results, the new factors fit perfectly with the overall weights given by the volunteers.

Table 5
Survey results for the strategic dimension.

Mission - Vision	Knowledge	Institution
4 (42.35%)	3 (43.5%)	2 (40%)

Note: Source: own elaboration

Legal and Financial Dimension

There were ten questions associated with financial processes and five questions related to legal processes. When applying the reliability analysis for the financial survey, a Crobach's alpha of 0.853 was reached. On the other hand, the Crobach's alpha for the legal segment reached 0.811, both results are favorable. When applying the AFE of the financial segment, a KMO of 0.705 was obtained and a superior accumulated variance of 71.9% for 3 factors (See Table 6). Factor 1 (financial processes) is comprised of F1, F2,

F3, F4, F5, F6, and F7. While factor 2 are F8 and F9 (innovation); and factor 3 (institutional) F10.

Table 6
AFE analysis for the financial dimension.

	Rotated component matrix^a		
	1	Component 2	3
Q1	.343	-.159	.746
Q2	.767	.032	.123
Q3	.763	.264	.078
Q4	.838	.174	.153
Q5	.890	.043	.081
Q6	.778	.317	.119
Q7	.607	.557	-.031
Q8	.209	.853	-.040
Q9	.121	.730	.502
Q10	-.024	.232	.804

Note: Source: Own elaboration.

For the exploratory factor analysis of the legal segment, a KMO of 0.674 was obtained with a cumulative variance weight above 58.35% for a single factor (the same five questions).

When applying the 4 factors against the volunteers' perception. The first factor related to financial processes, 45.5% of the volunteers think they are at level 3, while the other 16% think they are below level 3, and the other 38.43% think they are above level 3. Regarding factor 2, which links it to the alignment to innovation and stimuli for new financial strategies, 43.4% of the volunteers think they are at level 3, the other 34.1% of the volunteers think they are below level 3. A 43.4% of the volunteers' perception was considered to be at level 3, the other 34.1% of the volunteers believe to be below level 3. The third factor related to institutional support, 42% considered it to be at level 2. The single factor related to legal processes, 42.75% of the volunteers think that they are at level 3, while the other 40% think that they are at levels below 3.

When confronting the new factors against the results of the complete financial and legal dimension, it is observed that they again fit with the overall results of the dimension.

Table 7
Results of the survey of the financial and legal dimension.

Mission - Vision	Knowledge	Institution
3 (46.7%)	3 (39.61%)	3 (41.18%)

Note: Source: Own elaboration

Dimension of competences

The competencies dimension was divided into three parts: individual, group, and institutional competencies. In turn, this was divided into subgroups (see Table 8). On the other hand, the group and institutional results reached an average of level 2. This indicates that work must be done on the integration of teams in order to reach the desired potential. What is striking is the institutional competencies, which gave a maturity level of 2. This result is significant, since management does not seem to provide adequate tools and training to its employees to perform their role to the fullest.

Table 8
Analysis by subgroups for the dimension of competencies.

Individual		Group		Institutional	
Professionalism	3.947	Effectiveness	4.400	Innovation support	2.192
Ethics	3.603	Quality	3.003	Capabilities	2.875
Conflict resolution	2.396	Customer Service	3.278	Institutional learning	1.949
Efficiency	2.739	Productivity	3.039		
Commitment	3.715	Task uncertainty	2.651		
Motivation		Task Interdependency	2.632		
		Field Independence	1.719		
		Field dependency	3.1856		
		Composition	2.515		
		Identification	2.945		

Note: Source: Own elaboration

Knowledge dimension or standard

The knowledge dimension is divided according to the functional departments which are engineering, management, quality, human resources, safety and environment, procurement, and logistics. It can be understood that some departments acquire more responsibilities than others according to the execution of programs and projects.

When analyzing the results from the different participating departments, a common trend emerges. Volunteers give a level 2 maturity in the alignment of the mission and vision of their organization. A level 3 maturity in their day-to-day processes and a marginal level of maturity to 2 maturity with respect to institutional competencies (See Table 9).

Table 9
Results by department according to knowledge dimension.

Department	Mission - Vision	Knowledge	Institutional
Quality	2.4619	3.397	2.006
Logistics	2.4156	2.789	1.537
Procurement	2.829	3.419	1.888
Safety and environment	2.717	2.425	2.333

Note: Source: Own elaboration

On the other hand, management and engineering results on the five groups of processes for executing programs and projects achieved a level 2 maturity because the majority considered the closure processes to be poor. On the other hand, information security and institutional competencies achieved a maturity level of 2. These are aspects that management must take into account in an institutional and continuous manner.

Table 10

Engineering and program management results.

Planning	3.135
Execution	3.297
Control	3.061
Closing	2.913
Resources and technologies	3.019
Security and information	2.839
Institutional	2.405

Note: Source: Own elaboration

Discussion and conclusions

The New Mexican Maturity Culture is structured from several existing maturity models. This means that its methods have already been validated in hundreds of organizations around the world. In addition, the NCMM focuses on knowing a multidimensional space of the process being analyzed, supported by talent and knowledge management. Unlike traditional models that only focus on asking questions related to the capabilities of project management processes to know their maturity level against a standard.

This model was first tested by analyzing the population of professionals in Baja California, Mexico.

Among the findings, the NCMM presents that in the dimension of individual and group competencies it presents a level 3 of maturity. However, some group competencies such as uncertainty of the task, independence of the field, composition and identification still need to be matured. It is recommended to acquire greater cohesion in order to reach group maturity.

On the other hand, the strategic, financial, and knowledge dimensions present a level 3 maturity in their processes. However, the four dimensions show little support from Baja California management to strengthen their competencies and innovation. Therefore, it is recommended that this aspect be evaluated in an institutional manner in Baja California organizations.

In addition, most of the companies surveyed are not aligned with the mission and vision of their organizations. As the demographics show, 65% of the population still does not know the values of the place where they work. This is a key aspect that management must review in an institutional manner.

Another interesting fact during the execution of the survey is that all participants completed the four assigned surveys with a hundred percent in a period of four minutes for the shortest one and twenty minutes for the longest one. This was one of the fastest maturity models to answer and no incomplete answers were found. Another striking aspect was that no human resources representatives participated in the survey. It is suspected that this group does not participate in surveys with psychological backgrounds.

Another contribution of the NCMM is that, once the weaknesses of the survey were detected, some volunteers worked on tree diagrams to explain the reasons why full maturity was not reached. The results of these tree diagrams were converted into action maps with indicators, which, in turn, complement the integrated command control for any Baja California company (See Annex 1 for more details).

It can be concluded that the NCMM was able to present an ex post diagnosis of the low population of California. As well, it is able to generate value by presenting a complementary comprehensive command control focused on organizational maturity.

One of the limitations detected was the degree of participation to achieve the desired goal. In this case, different methods of dissemination were applied: known friends, co-workers, dissemination in social networks, sending emails, and messages. At the same time, continuous reminders were sent to distant respondents. Another limitation was the number of questions for the competency and standard dimensions. Since the most representative questions had to be selected for each subgroup, this could slightly affect the checks.

From a methodological point of view, the present research opens the door for further studies using different types of survey platforms. Another field would be the use of new testing methods during the application of project management maturity models. Or also, applying the new maturity model in other types of organizations.

From the academic point of view, it opens the invitation to go a little deeper into the standardization of maturity models in order to take a step towards standardization. On the other hand, it invites to take a step towards perfecting the new maturity model through new studies.

From a practical point of view, the new maturity model is invited to be applied in a different organization or economic sector. In order to know the maturity level of that organization, improve a process, undertake organizational improvement, or develop a professional plan for their employees.

References

- APM (2006). *APM body of knowledge*. (5th ed.). Association for Project Management.
- APM (2012). *APM body of knowledge*. (6th ed). Association for Project Management.
- Backlund, F., Chronéer, D. and Sundqvist, E. (2013). Project Management Maturity Models - A critical review. A case study within Swedish Engineering and Construction organizations. *Procedia - Social and Behavioral Sciences*, 119 (2014), 837 - 846. <https://doi.org/10.1016/j.sbspro.2014.03.094>.
- Hernández, C., Cano, M. and Arano R. (2017). *Knowledge management for the development of labor competencies and its impact on the productive process of companies* [PDF file]. <https://www.uv.mx/iiesca/files/2017/10/06CA201701.pdf>
- IBM (May 5, 2020). *Factor analysis: descriptive*. https://www.ibm.com/docs/es/spss-statistics/25.0.0?topic=SSLVMB_25.0.0/spss/base/idh_fact_des.html
- INEGI (2014). *Economic Censuses 2014, Baja California* [PDF File]. https://www.inegi.org.mx/contenidos/programas/ce/2014/doc/minimonografias/mbc_ce_2014.pdf
- IPMA (2018). *Individual Competence Baseline for Project, Programme & Portfolio Management*. (4th ed.). International Project Management Association.
- Khoshgoftar, M. and Osman, O. (2008). *Comparison of Maturity Models* [Paper]. 2nd International Conference on Built Environment in Developing Countries. <http://eprints.usm.my/34679/1/HBP20.pdf>

- Motoa, G. and Solarte L. (2005). *Development of a maturity model to assess project management in organizations* [PDF file]. http://www.aepro.com/files/congresos/2005malaga/ciip05_1497_1516.240.pdf
- Murray, A. and Sowden, R. (2015). *Introduction to P3M3*. (3rd ed.). Axelos.
- PMI (2007). *Project Manager Competency Development Framework (PMCD)*. (2nd ed.). Project Management Institute.
- PMI (2013). *Organizational Project Management Maturity Model (OPM3)*. (3rd ed.). Project Management Institute.
- PMI (2017). *Project Management Body of Knowledge (PMBOK)*. (6th ed.). Project Management Institute.
- Prado (2015). *Maturidade em gerenciamento de projetos*. (3rd ed.). Editorial Falconi.
- Santamaría, N. and Hernández, V. (2016). *Desarrollo de un modelo de gestión por competencias para la mejora del desempeño de la ONG para la discapacidad Fundación Cuesta Holguín* [Master's Thesis, Pontificia Universidad Católica del Ecuador]. <http://repositorio.pucesa.edu.ec/bitstream/123456789/1781/5/76286.pdf>
- SEI (2010). *CMMI® for Development, Version 1.3. Improving Processes for Developing Better Products and Services*. Carnegie Mellon University
- Sáenz, A. (2012). *Project management success. A new approach between the traditional and the dynamic* [Doctoral thesis, ESADE]. <https://www.udocz.com/mx/read/30211/arturo-saenz-tesis-rev-1>
- SNE (2020). *Professional landscape by state*. https://www.observatoriolaboral.gob.mx/static/estudios-publicaciones/Panorama_profesional_estados.html
- Solarte, L. and Sánchez, L. (2014). Project management and organizational strategy: the CP3M© V5.0 Project Management Maturity Model. *Innovar*, 24(52), 5-18. <https://doi.org/10.15446/innovar.v24n52.42502>
- Valdivieso, C. E., Valdivieso, R. and Valdivieso, O. A. (2011). *Sample size determination using decision trees* [PDF file]. <ftp://ftp.repec.org/opt/ReDIF/RePEc/iad/wpaper/0311.pdf>
- Yimam, A. (2011). *Project management in the construction industry of developing countries (the case of ethopian contractors)* [Master's Thesis, University of Maryland]. https://drum.lib.umd.edu/bitstream/handle/1903/11594/Yimam_umd_0117N_12290.pdf?sequence=1&isAllowed=y

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Annexes

Annex 1

Tree Diagrams

Once the deficiencies found in the four dimensions of the new culture were detected. The tree diagram method was applied to explain the reasons why the maturity and success of the projects was not achieved. From its results, a set of action matrices were created that will complement the integral command control of any company.

At the end of the exercise 6 tree diagrams were found, which are financial, project team competencies, infrastructure and internal processes, human resources, safety and environment, and supply chain.

In the case of the financial tree diagram, its objective was aimed at making the operation more efficient, improving profitability and cost control. For the project team competencies diagram, the objectives were aimed at increasing team cohesion, implementing project management culture, and improving current processes. In the diagram corresponding to infrastructure and internal processes, all processes in action and the search for and implementation of new technologies were considered. The human resources management diagram aimed to attract candidates, identify potential resources with the necessary skills to meet the requirements of the new processes, as well as measure the performance of each member. Finally, to establish an achievement and reward program for all associates. The safety and environmental management diagram aims to meet the new labor regulations and the awareness of environmental management within the organization.

Finally, we have the tree diagram for the supply chain, which focused on solving two problems. The first one is related to reducing the time to meet the abrupt ramps demanded by customers. The second problem is to improve communication with the customer / suppliers to improve response times in the supply chain.

Table A-1

Example of a Customer Focus competency and growth tree diagram.

Dimension	Strategy No.	Strategy	Success Factor No.	Critical success factor	No. of initiative	Initiative
Customer focus competencies and growth	C1	Enhancing the structure of customer-focused teams	C1-1	Increase the cohesion of work teams.	8	Consolidate the complete adherence of the CFT structure.
					9	Reinforce the company's values and teamwork.
			C1-2	Training plan for professional development in project management	10	Implement a project management training and development plan.
					11	Include a "Basic Package" of Project Management. With exam.
	C2	Improve project management processes	C2-1	Improve communication to align with customer requirements	12	Feasibility search for CFT members to achieve PMI certification.
					13	Provide training to the CFT in Communication and Stakeholder Management.
14					Using lessons learned to support your current projects.	
					15	Evaluation for using an external company to use temporary employees for NPI activities.

C2-3	Technical Expertise Improvement Plan	16	Identify whether project management training materials are available in the global corporation. Processes from other Corporate sites may be reproduced on our site.
		17	
C2-4	NPI Configuration Systems	18	Perform Kaizen for BOM configuration and quote transfers. Set metrics.
		19	
C2-5	Disciplined management of executions and metrics	20	Measuring performance. Annual voice of the customer review / injuries learned and implemented for NPI.
		21	

Note: Source: Own elaboration.

Annex 2

Surveys

As previously mentioned, the survey questions are linked to analyzing a specific maturity level of a process. The respondent should only answer one of the answers that he/she considers related to his/her processes and competencies that he/she performs on a daily basis. It also allows to know their individual performance level, how they relate to their group and their affinity, and if they have the necessary support and tools to perform their role in order to achieve the strategic objectives of the organization. In the end, the responses of each respondent define the level of maturity in each dimension.

Table B-1 presents the distribution of questions presented by the NCMM. It can be observed that the greatest number of questions are in the domains of competencies and knowledge. In the case of knowledge, it can be said that the questions are focused on engineering processes and program managers, rather than on the other management areas, given their contribution to project management.

Table B-1
Distribution of the questions in the NCMM.

Survey	Questions
Competences	39
Financial	15
Strategic	15
Skills - Engineering	31
Knowledge - Quality	10
Knowledge - Procurement	10
Skills - Logistics	13
Knowledge - Safety and environment	13

Note: Source: Own elaboration.

The strategic dimension survey

The survey is composed of fifteen questions in total. In turn, it is divided into three groups. The first group consists of three questions are dedicated to know if the strategies are aligned with the mission and vision of the organization. The second group has nine questions focused on whether management informs stakeholders of its strategic plans and mechanisms. Finally, the last group of questions analyzes whether the strategic plans include projects for institutional growth, innovation, and incentives for employees.

Table B-2 below presents an extract of the questions used in the strategic dimension. In addition, it presents the possible answers that can be selected by the respondent that is related to his or her perception.

Table B-2
Extract from the questions of the strategic dimension

In the last 12 months, in your personal opinion, do you consider your organization:	
Identification	Questions
E4	<p>Do you have rules, as well as regulate the authority and power relationships between project managers and the different areas of the organization involved in the projects?</p> <ul style="list-style-type: none"> a) I don't know b) They exist, but I am not well informed c) They exist, but there is little diffusion d) There are well-structured rules, and I am familiar with their procedures. e) There are well structured rules where we share information. The rules are aligned to the Mission and Vision of the organization. We care about having a good working environment and collaboration.
E5	<p>Are you aware of the strategies and plans, how they affect them, and what their inputs should be?</p> <ul style="list-style-type: none"> a) I don't know b) They exist, but I am not well informed c) They exist, but there is little diffusion d) I have the knowledge. I am informed of the processes on a regular basis, and some indicators are analyzed, and we participate in the strategies on an ongoing basis. e) I am the role model and an authority on the subject. Management listens to new criteria and suggestions. We all align ourselves to achieve the same goal. We rely on trends and take action to eliminate or mitigate potential risks. In addition, I use state-of-the-art tools to develop my activities according to strategies and plans.
E6	<p>Do you communicate strategies and plans to all stakeholders as they may affect them?</p> <ul style="list-style-type: none"> a) Rarely b) Communicates when there is something important c) Yes, on a regular basis d) It is a common practice in the organization. Management listens to new criteria and suggestions. Everyone is aligned to achieve the same goal. Information is stored electronically. e) It is a common practice in the organization. Management listens to new criteria and suggestions. We all align to achieve the same goal. We rely on trends and take actions to eliminate or mitigate potential risks. In addition, I use state-of-the-art tools to store information and review actions learned from other projects to reduce risks.
E7	<p>Do you consider the current and future needs of different stakeholder groups (shareholders, customers, employees, suppliers)?</p> <ul style="list-style-type: none"> a) Rarely b) It is contemplated, but seldom reported c) It is reported regularly, but to certain groups. d) Processes are reported and known on a regular basis. Some indicators are analyzed, and we participate in strategies on an ongoing basis. e) Processes are reported and known on a regular basis. Management listens to new criteria and suggestions. We are all aligned to achieve the same goal. We rely on trends and take action to eliminate or mitigate potential risks using state-of-the-art tools.

Note: Source: Own elaboration.

On the other hand, the survey of the competences dimension allows to know the perception that exists in the working groups, a small self-assessment of some of the competences at individual level is made. Finally, it analyses the competencies offered by the organization in relation to project management. The survey is divided into three main groups: individual competencies, group competencies, and institutional competencies. As previously mentioned, there are nine questions focused on individual competencies, twenty-six questions focused on group competencies, and four questions focused on institutional competencies. Table B-3 presents an extract of the individual competencies together with the closed responses.

Table B-3
Extract from the competency dimension survey

In the last 12 months, in your personal opinion, do you consider your organization:		
Individual competences	Identification	Questions
Professionalism	C1	Do you show a commitment to achieving your organization's desired results? a) I never do b) I rarely do c) I often do d) I frequently do e) Yes, I always do
	C2	Do you use manners and forms of address towards your colleagues, customers and superiors? a) I never do b) I rarely do c) I often do d) I frequently do e) Yes, I always do
Ethics	C3	Do you practice values such as responsibility, punctuality, study, perseverance, character, concentration, training, discretion, among others? a) I never do b) I rarely do c) I often do d) I frequently do e) Yes, I always do
Conflicts	C4	Have you been trained to manage and control a conflict, design alternative solutions, be open to innovations, and use methods to achieve conciliation of the parties? a) I have not been trained b) I have the minimum training but have not applied it to my job c) I have the minimum training and have applied it to my job d) I have mastery and share my knowledge to others e) I am the role model, and I am an authority on the subject
Efficiency	C5	Have you been trained to achieve the programmed objectives and goals with the minimum of resources and time available? a) I have not been trained b) I have the minimum training but have not applied it to my job c) I have the minimum training and have applied it to my job d) I have mastery and share my knowledge to others e) I am the role model, and I am an authority on the subject
	C6	Are you able to make a plan to achieve the best possible performance and achieve the desired results? a) I have not been trained

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- b) I have the minimum training but have not applied it to my job
 - c) I have the minimum training and have applied it to my job
 - d) I have mastery and share my knowledge to others
 - e) I am the role model, and I am an authority on the subject
-

Note: Source: Own elaboration.

