

# Learning capacity and effectiveness in the management of organizational projects

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## Abstract

Best practices in project management have been positioned in the organizational field as a suitable alternative to achieve the planned objectives. Learning capacity is one of the most important advantages of any organization, linked to human talent and business culture. This research sought to establish the relationship between organizational learning capacity and effectiveness in the management of the projects executed. In this study, 192 project managers were surveyed. The data were processed through a multivariate factor analysis method with the purpose of specify the relationship between the proposed variables. This research allowed us to understand learning capacity as a multidimensional variable that positively affects project management.

*Keywords:* project management; learning capacity; effectiveness; work teams; organizational culture.

# Capacidad de aprendizaje y efectividad en la gestión de proyectos organizacionales

## Resumen

Las buenas prácticas en gestión de proyectos se han posicionado en el ámbito organizacional como una alternativa apropiada para lograr los objetivos planeados. La capacidad de aprendizaje es una de las ventajas más importante de toda organización, ligada al talento humano y a la cultura empresarial. Esta investigación buscó establecer la relación existente entre la capacidad de aprendizaje organizacional y la efectividad en la gestión de los proyectos ejecutados. Para el desarrollo de este estudio se encuestaron 192 gerentes de proyecto. Los datos fueron procesados a través de un método de análisis factorial multivariado con el propósito de precisar la relación entre las variables propuestas. Esta investigación permitió comprender la capacidad de aprendizaje como una variable multidimensional que incide positivamente sobre la gestión de los proyectos.

*Palabras clave:* gestión de proyectos; capacidad de aprendizaje; efectividad; equipos de trabajo; cultura organizacional.

## 1 Introduction

Currently, knowledge is interpreted as a strategic resource in organizations. The competitive advantages of a company depend on the knowledge that workers have acquired over time formally or through their personal experience [1]. Modern trends in knowledge management seek to establish the capacity of organizations to generate new knowledge and use it for the challenges of daily life, improving operational efficiency and value creation rates [2]. Knowledge must be considered as a resource that grows and transforms over time, allowing for greater development and organizational maturity [3].

On the other hand, in the last two decades, the best practices in project management have been positioned in the organizational context due to their nature of efficiency and effectiveness. Project management has left the strict field of engineering, integrating the human and business dimension [4]. However, a high rate of project failure is evident, mainly caused by the little experience of the project manager or the members of the project teams. Likewise, the maturity models, which measure the adoption of best practices in project management, show a positive relationship between knowledge management and the quality of the results obtained [5]. Knowledge must be understood as a quality asset that allows generating new income, reducing costs,

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eliminating risks or generating a competitive advantage for organizations [6].

Thus, the learning capacity of an organization is supported by work teams, in other words, by human talent. Learning capacity must be understood as a multidimensional variable inspired by the human component [7]. Peter Senge [8] interprets organizational learning capacity as the result of five integrated disciplines: systems thinking, personal mastery, mental models, shared vision, and team learning.

The importance of investigating the learning capacity and its relationship with the effectiveness of organizational projects is justified by the need to find new and better alternatives that increase the probability of success in planned projects, reducing uncertainty and the failure rate through knowledge and lessons learned.

The aim of this research was to validate the relationship between organizational learning capacity and effectiveness in the management of organizational projects. The organizational learning capacity was interpreted as a latent variable for its development. Likewise, the concept of effectiveness was interpreted from its basic definition that integrates the efficient management of resources and the efficacy achievement of the planned objectives.

## 2 Theoretical framework

### 2.1 Learning Capacity

As the first element of this theoretical framework, the concept of organizational capacity was explored. Nelson and Winter [9] mention that organizational capabilities are made up of action and performance. Therefore, an organization has a capacity when it manages to effectively execute an action, which is valuable and appreciated by the different stakeholders, which represents a differentiating position compared to other referent organizations. For the development of a capacity, there must be routines or patterns of action that allow the organization to generate enough knowledge to solve day-to-day problems naturally and not as a sporadic triumph in a specific situation. In other words, capabilities represent a reliable pattern of action to respond to organizational challenges [10].

Organizational learning capacity can be defined as the sum of learning that results from permanent social interaction inside and outside the organization and strengthens individual and group reflection processes [11]. Organizational learning capacity depends on the potential for creation, assimilation and knowledge transfer to act correctly in changing environments. If the level of development of the organizational learning capacity is high, the competitiveness index will be positively affected [12]. In this sense, the dynamic nature of learning capacity is identified, which is associated with rapid changes in the environment, especially motivated by the economy, technology and culture. This affects the behavior of companies; their strategic position must respond to the new environmental conditions. The results that an organization achieves will depend on its knowledge base and its learning capacity [13].

Peter Senge [8] identifies five disciplines that an intelligent organization must have and that can be interpreted

as variables that define organizational learning capacity: systems thinking, personal mastery, mental models, shared vision, and team learning. Every organization must be open to permanent learning, this will allow its work teams to adapt more easily to changes in the environment, making it an intelligent organization. Each member of an organization is valuable and capable of delivering innovative and quality results that impact the vision of the organization, strengthening its competitive advantage.

Systemic thinking is associated with the ability to understand the environment as a system through the variables that make it up. In other words, systemic thinking is defined as the ability to solve problems in a complex environment characterized by the interaction of multiple variables [14]. Systems thinking identifies the multidimensional interrelationships of everyday situations, instead of associating them with linear cause-effect chains. Reality is understood as a system made up of interconnected objects through subsystems and not as a series of isolated situations, this allows the identification of behavior patterns for decision making. The whole is always more than the sum of the parts [15]. The interrelation between the different subsystems greatly affects the results obtained, in this sense, studying a situation in a disjointed way affects the decisions that can be made to a great extent the results due to evaluation and response biases. In the field of project management, systemic thinking has a determining meaning, the diversity of elements that make up a project define a complex character to the management and the achievement of the common result [16].

An intelligent organization, with the capacity to learn, is developed through work teams with a high level of personal mastery, with the capacity to adopt individual growth and learning routines that strengthen the organization and allow it to solve problems in a creative and less reactive way. People with personal mastery make objective decisions and more accurately assess what is important and what is not [17]. Personal mastery facilitates a clear vision of reality, allowing us to differentiate what is desired from what can actually be achieved. An intelligent organization is developed through continuous learning. In the case of project management, continuous learning is one of the key variables to achieve the success of a project [18].

A mental model can be defined as a thought mechanism through which a person tries to explain how a specific reality works. Mental models in principle are hypothetical and have an important role in cognition processes, allowing people to have an interpretation of the context in which they interact, directly affecting their behavior [19]. Strengthening the organizational learning capacity requires modifying people's mental models, which makes teams work as a group process of professional and personal growth, this implies the permanent review of the organizational culture. Individual behavior is determined by their mental models [20].

Vision is defined as the medium-term goal of an organization. Achieving a shared vision involves people with a common purpose, in this sense, aligning the personal vision with the shared vision creates the necessary synergy to achieve the expected results. Talent in organizations is diverse and converges through the interaction of different systems, generating new ideas and ways of interpreting

reality [21]. The shared vision gives meaning to the innovation processes through the contribution to the organizational strategy, integrating the efforts towards the same direction. In the case of project management, the performance of project teams depends on the interpretation that each member makes of the common vision [22].

Finally, intelligent organizations generate group knowledge and take advantage of collective experience. Focusing efforts in the same direction allows ideas to be translated into actions, improving performance and organizational competitiveness [23]. Permanent dialogue stimulates the combination of ideas and the transformation of knowledge. The learning capacity depends on the socialization environment that is created within the organization [24]. Based on these reflections, the research hypotheses are proposed:

H1a: Systemic thinking is positively related to the development of learning capacity.

H1b: Personal mastery is positively related to the development of learning capacity.

H1c: Mental models are positively related to the development of learning capacity.

H1d: Shared vision is positively related to the development of learning capacity.

H1e: Team learning is positively related to the development of learning capacity.

## 2.2 Organizational project management

Project management is characterized by being a discipline of high organizational impact, which allows facing the challenges of continuous improvement and development of competitiveness. Thus, project management has adopted many of the principles of administration, ceasing to be an exclusive area of engineering to become a transversal discipline that involves organizational, philosophical and human positions [25]. The strength of the projects lies in the achievement of results through a shared vision, framed in strategy, leadership, teamwork and a particular understanding of reality. Project management goes far beyond the application of a methodology or a tool; on the contrary, it should be understood as synonymous with development and the common good [26].

Effectiveness is defined as the balance between efficiency and efficacy. From the traditional approach to project management, efficiency is achieved through the correct management of resources, ensuring control of the three base variables: scope, time, cost [27]. On the other hand, efficacy is related to the achievement of the objectives set for the project and therefore with the creation of value for the different interest groups based on the results [28].

One of the key success factors of a project is the quality of the knowledge that can be accessed, this will ensure the quality of the process and the results, minimizing the probability of making errors throughout the project's life cycle [29]. The experience of the project manager and the members of the project teams becomes a valuable resource over time, with learning capacity being the differentiating factor that allows the appropriation of new and better skills [30].

The knowledge absorbed by an organization can be transformed into a quality asset that allows the achievement of the company's objectives [31]. For the specific case of project management, a quality asset must allow the generation of benefits, the optimization of costs, the reduction of risks or the creation of a competitive advantage. For this reason, organizational projects must be aligned with its strategy so that knowledge becomes a quality asset [32].

From the theory of dynamic capabilities, continuous learning is the most efficient mechanism that organizations have to generate innovation and mature their processes. Thus, two types of capabilities must be adopted: transformative, related to the ability of companies to absorb knowledge and adapt it to their real context; and configurational, associated with the ability of companies to take advantage of knowledge and link it with organizational and technological skills. Thus, project management can be understood as a new type of capacity that facilitates the transformation of the organization through knowledge [33]. Based on these reflections, the second research hypothesis is proposed. In addition, Fig. 1 shows the relationships between the identified variables and the research hypotheses:

H2: The learning capacity positively affects the effectiveness in the management of organizational projects.

## 3 Methodology

This research was quantitative, non-experimental, exploratory and deductive [34]. A non-probabilistic convenience sample of 192 project managers was selected. The requirements to participate in the study were: To have a minimum experience of 5 years in software project management; have obtained a certification in some methodological approach in project management and have executed a minimum of 5 software projects in any industry. The data collection method was personal interview. Table 1 shows the main characteristics of the sample.

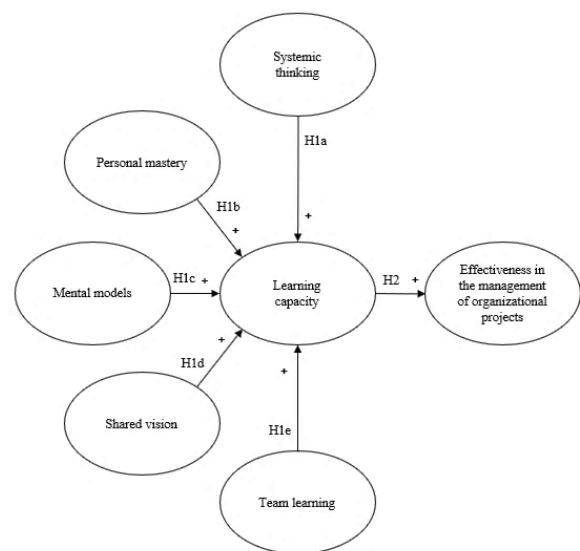


Figure 1. Conceptual model. Source: The authors.

Table 1.  
Characteristics of the sample.

Topic	Description
Number of project managers surveyed (sample)	192
Data collection period	June to December 2022
Size of surveyed companies	SMEs
Average years of experience in software project management	7 years
Project Managers surveyed certified in SCRUM	40%
Project Managers surveyed certified in PMBOK	77%
Average number of employees of the companies surveyed	57
Surveyed companies that develop business information systems	75%
Surveyed companies that develop mobile software	172
Surveyed companies that work in web development	55
Surveyed companies that use PMBOK to manage their projects	87
Surveyed companies that use SCRUM to manage their projects	57
Surveyed companies that use their own methodology to manage their projects	28
Surveyed companies that do not use a specific methodology to manage their projects	20
Surveyed companies with some level of CMMI certification	17
Average time of the projects executed by the surveyed managers	15 months
Average number of people that make up the project teams	10

Source: The authors.

The survey used was custom designed for this study based on the theoretical framework, it consisted of 30 questions grouped into 6 sections, according to the 5 variables identified, plus the sample characterization questions. Responses were collected using a five-position Likert scale: (1) Totally disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, (5) Totally agree. The survey was validated to determine the validity and reliability index.

With the support of 7 expert researchers in issues related to project management, the clarity of the wording, the conceptual approach and the relationship of the question with the selected variable were evaluated using Aiken's V Coefficient. Subsequently, a pilot test was carried out applying the survey to a subgroup of 10 project managers. With the data collected, a Cronbach's Alpha index of 0.973 was obtained, this showed a high reliability of the data.

The processing of the collected data was carried out through a multivariate factorial analysis. This data reduction technique makes it possible to eliminate the redundancy or multicollinearity of the information through the grouping of variables with common meaning, obtaining the number of dimensions necessary to explain the responses of the subjects [35].

The purpose of factor analysis is to find the minimum number of dimensions to explain the maximum information

contained in the data, in other words, to find homogeneous groups of variables from a large data set. When the factors that explain the latent variable are previously known, the factorial analysis will be confirmatory; but if the factors are not known, the analysis will be exploratory. In the case of this research work, it will be a confirmatory analysis.

## 4 Results

A multivariate factor analysis model is a structured process that requires obtaining positive results in each of the following stages: (1) evaluating the relevance of applying a factor analysis, (2) obtaining the factors, (3) rotating the factors, (4) Obtain the factorial scores. The results obtained in each of the proposed stages are presented below:

### 4.1 Evaluating the relevance of applying a factor analysis

Validating the relevance of applying a factor analysis model to the collected data requires calculating two indices: Kaiser Meyer Olkin (KMO) and Bartlett's test of sphericity.

The KMO compares the correlation coefficients, it is used to identify if the variables share common values. The results can vary between 0 and 1. Values between 0.5 and 1 indicate a high correlation of the data, this allows the development of a factor analysis model without any restrictions. The Bartlett index shows if the correlation matrix obtained is an identity matrix, this means a low data correlation, therefore factor analysis should not be applied. If the Bartlett index is close to 0, it will be feasible to apply a multivariate factor analysis. Table 2 shows the results obtained in this stage, for the five variables studied.

The results obtained in the KMO and Bartlett indices show a high correlation between the variables studied; This allows us to conclude that developing a factor analysis model is feasible. In the case of the KMO index, values greater than 0.8 were obtained. Regarding the Bartlett index, the values obtained are equal to 0.

### 4.2 Obtaining the factors

In this stage, the degree of importance of each of the variables studied is calculated to determine which ones should be conserved. Therefore, the proportion of the global variance of each of the variables was calculated. The variance will be directly proportional to the importance of the variable. For this study, the Kaiser criterion was used, in this sense the result of the 5 variables studied was greater than 1, no variable was eliminated. Table 3 shows the results obtained in this stage.

Table 2.  
Results evaluating the relevance of applying a factor analysis

Variable	KMO	Bartlett
Systemic thinking	0,821	0,000
Personal mastery	0,856	0,000
Mental models	0,810	0,000
Shared vision	0,858	0,000
Team learning	0,877	0,000

Source: The authors based on the data collected.

Table 3.  
Results of obtaining the factors

Variable	Primary Values		Sum of squared charges of extraction	
	Kaiser Index	Variance	Total	Variance
Systemic thinking	3,424	11,841	3,424	11,841
Personal mastery	3,023	10,243		
Mental models	2,879	8,586		
Shared vision	2,742	6,966		
Team learning	3,522	5,301		

Source: The authors based on the data collected.

### 4.3 Rotating the factors

In this stage, the meaning of the variables was interpreted through the distribution of factors. The purpose of this step was to obtain a set of new variables with a lower number than the original one. For this study, the PROMAX rotation method was used, because the objective was to find the relationship between effectiveness in project management through the five identified variables. This procedure, like those of the two previous stages, was carried out with the SPSS software, thus validating the five selected variables.

### 4.4 Obtaining the factorial scores

Finally, the equations described by the variables identified in the theoretical framework were built. Using the SPSS software, the coefficients for each of the variables that explain learning capacity as a multidimensional variable were calculated. Then, in additional data processing, the coefficients that explain the latent variable *effectiveness in the management of organizational projects* through *Learning capacity* were calculated. The results obtained are presented below:

$$LC = (ST * 0,852) + (PM * 0,916) + (MM * 0,830) + (SV * 0,843) + (TL * 0,893) \quad (1)$$

$$EMOP = (LC * 0,897) \quad (2)$$

Due to the high correlation between the data collected through the survey, the coefficients that explain each of the five variables studied were calculated, integrating the data into an easier-to-handle equation: Eq (1) and (2). If the survey were applied again to another sample, the data collected could be directly replaced in these equations, obtaining an indicator for each of the factors studied.

As shown in eq. (1), Learning Capacity (LC) is strongly related to Systemic thinking (ST); Personal mastery (PM); Mental models (MM); Shared vision (SV), Team learning (TL). Similarly, Effectiveness in the Management of Organizational Projects (EMOP) shows a high correlation index with Learning Capacity (LC), Eq. (2).

Finally, based on the collected data, the Spearman index was calculated to carry out the respective validation of the formulated research hypotheses. The results obtained are presented below.

Hypothesis test 1a:

H0a: Systemic thinking is NOT positively related to the

development of learning ability.

H1a: Systemic thinking is positively related to the development of learning capacity.

Table 4 shows the results obtained from Spearman's Rho test for hypothesis 1a. The correlation coefficient for the variables studied is 0.853, equivalent to a high relationship. On the other hand, the significance index is 0.020, less than 0.05. Therefore, with these results, the null hypothesis should be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Systemic thinking and Learning capacity.

Hypothesis test 1b:

H0b: Personal mastery is NOT positively related to the development of learning capacity.

H1b: Personal mastery is positively related to the development of learning capacity.

Table 4 shows the results obtained from Spearman's Rho test for hypothesis 1b. The correlation coefficient for the variables studied is 0.813, equivalent to a high relationship. On the other hand, the significance index is 0.027, less than 0.05. Therefore, with these results, the null hypothesis should be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Personal mastery and Learning capacity.

Hypothesis test 1c:

H0c: Mental models are NOT positively related to the development of learning capacity.

H1c: Mental models are positively related to the development of learning capacity.

Table 4 shows the results obtained from Spearman's Rho test for hypothesis 1c. The correlation coefficient for the variables studied is 0.827, equivalent to a high relationship. On the other hand, the significance index is 0.029, less than 0.05. Therefore, with these results, the null hypothesis should be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Mental models and Learning capacity.

Hypothesis test 1d:

H0d: Shared vision is NOT positively related to the development of learning capacity.

H1d: Shared vision is positively related to the development of learning capacity.

Table 4 shows the results obtained from Spearman's Rho test for hypothesis 1d. The correlation coefficient for the variables studied is 0.794, equivalent to a high relationship. On the other hand, the significance index is 0.025, less than 0.05. Therefore, with these results, the null hypothesis should be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Shared vision and Learning capacity.

Hypothesis test 1e:

H0e: Team learning is NOT positively related to the development of learning capacity.

H1e: Team learning is positively related to the development of learning capacity.

Table 4.  
Spearman's Rho results hypothesis test 1

Learning capacity		
Variable	* Correlation coefficient	Significance bilateral
Systemic thinking	0,853	0,020
Personal mastery	0,813	0,027
Mental models	0,827	0,029
Shared vision	0,794	0,025
Team learning	0,857	0,022

\* The correlation is significant at the 0.05 level (bilateral)  
Source: The authors based on the data collected

Table 5.  
Spearman's Rho results hypothesis test 2

Effectiveness in the management of organizational projects		
Variable	* Correlation coefficient	Significance bilateral
Learning capacity	0,821	0,014

\* The correlation is significant at the 0.05 level (bilateral)  
Source: The authors based on the data collected

Table 4 shows the results obtained from Spearman's Rho test for hypothesis 1e. The correlation coefficient for the variables studied is 0.857, equivalent to a high relationship. On the other hand, the significance index is 0.022, less than 0.05. Therefore, with these results, the null hypothesis should be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Team learning and Learning capacity.

Hypothesis test 2:

H0: Learning capacity is NOT positively related to effectiveness of organizational project management.

H2: Learning capacity is positively related to effectiveness of organizational project management.

Table 5 shows the results obtained from Spearman's Rho test for hypothesis 2. The correlation coefficient that explains the incidence of learning capacity and effectiveness in the management of organizational projects is 0.821, equivalent to a relationship high. On the other hand, the significance index is 0.014 less than 0.05. Therefore, with these results, the null hypothesis must be rejected and the alternative hypothesis accepted, validating that there is a positive correlation among Learning capacity and effectiveness of organizational project management.

Finally, Figs. 2 and 3 present an analysis of the data collected related to the perception of the project managers surveyed about the importance of learning capacity and the effectiveness achieved in the projects developed.

Fig. 2 shows that 90% of those surveyed consider that learning capacity is very important to achieve results in a project. In the comments delivered, the project managers highlight the importance of having experienced human talent to ensure the quality of the results. The question asked to those surveyed was: Do you think that the learning capacity of the work teams is important for the achievement the project results?

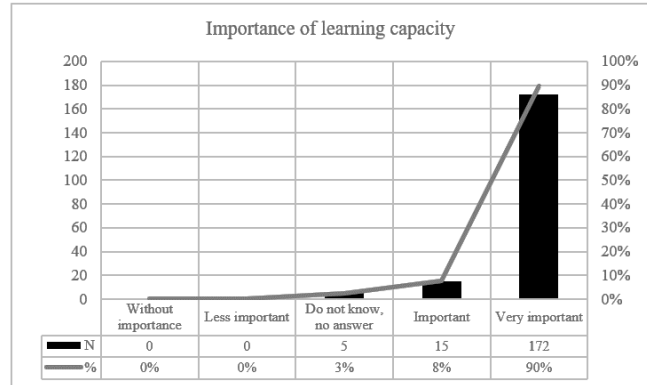


Figure 2. Importance of learning capacity.  
Source: The authors.

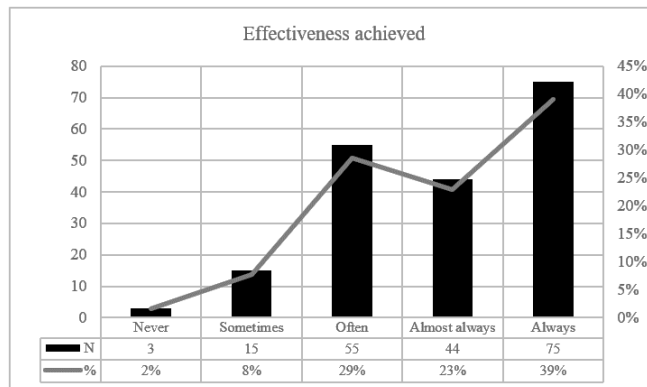


Figure 3. Effectiveness achieved.  
Source: The authors.

Fig. 3 shows that 91% of those surveyed completed their projects effectively: often, almost always, and always. This result coincides with the index of importance of learning ability obtained in the previous question. The question asked to those surveyed was: How often do the projects you have developed achieve the expected results in the planned time and with the assigned resources?

4. Discussion

Based on what has been established throughout the investigation, three key elements will be developed within this discussion section. The first idea deals with the importance of knowledge in the organizational context. Undoubtedly, this concept has been widely studied, becoming a determinant of the character of modern organizations, in which a positive relationship between learning capacity and performance can be evidenced. In this sense, within the framework of the concept of competitiveness, the maturity of organizations becomes a differentiating advantage, which allows companies to respond more precisely to the constant changes in the environment. This is how this study allows us to understand learning capacity as one of the key factors in organizational development, this idea is relevant because it has guided the

transformation of modern society in recent decades.

A positive trend is observed in the adoption of best project management practices in organizations, consequently, project management can be understood as a transversal discipline that involves organizational, technical and human theories. The creation of value for the different stakeholders will be the result of the effectiveness index achieved through the organizational projects. In this sense, it would not be strange to understand project management as a multidimensional organizational capacity that integrates good management practices and strengthens organizational performance. These arguments lead us to rethink the role that the project manager plays in society, distancing him from his role as a control entity and taking him towards a position of strategist with a holistic approach, with the ability to understand the success of the project through an approach of sustainable development. More than technical skills, the project manager must be able to discuss ethical dilemmas, in such a way that the decisions made are correct and allow a positive impact to be generated through the results achieved.

As a closing point for this section, knowledge is highlighted as a quality asset for value creation. In a knowledge society it makes sense to give priority to human talent as the main differentiating factor. High performance project teams are made up of people with high human and technical capabilities. Treasuring the lessons learned throughout the execution of the projects and transferring them effectively within the organizations, allows improving the organizational maturity index, reducing the degree of uncertainty and the probability of making errors. A wise leader is one who gives his experience to others in search of the common good.

## 5 Conclusions

For the first proposed hypothesis, it was possible to establish that organizational learning capacity is a latent variable that depends on multiple variables. In the case of this study, the five disciplines proposed by Peter Senge were taken as a reference, finding an average positive correlation index of 0.82 according to the data collected. With this result, it is highlighted that the organizational learning capacity will achieve a high degree of maturity to the extent that other independent capacities are strengthened in people.

The validation results for the second hypothesis allow us to observe that a high maturity index in the organizational learning capacity positively affects the effectiveness of organizational projects. With a correlation index of 0.82, it can be concluded that there is a strong relationship between learning capacity and project results. This highlights the importance of learning curves and the value of experience in the context of projects. The learning and adaptation capacity that the members of the project teams must have been also highlighted. The experience without a high learning capacity that responds to the new environmental conditions can be unsuccessful.

Finally, throughout the studied variables, a multifactorial equation is proposed as the first step in the construction of an organizational learning capacity index. This is an important input for the construction of a statistical model that allows

measuring the learning capacity index of the project teams and establishing action plans that improve their performance, improving the creation of value for stakeholders.

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