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Learned Lessons Management Model for Project Administration

Javier Antonio Pinedo Cabarcas[1], Carlos Eduardo Uc Ríos[2], Raúl José Martelo Gómez[3]

Abstract

Around the world, organizations are turning to best practice methods and standards to guide the development of their projects. However, simply following these guidelines does not guarantee success in the execution and conclusion of a project. This research focused on designing a management model for the lessons learned throughout the life cycle of the projects. The ML3C model, developed as a result of this research, demonstrates its effectiveness in project management by facilitating the systematic collection and organization of valuable information derived from lessons learned from past experiences. This efficient organization of data translates into significant advantages, such as cost reduction, time savings, and improved customer satisfaction when receiving the desired service or product. In conclusion, project management is optimized by using tools that allow the effective use of lessons learned, as proposed in this research.

Keywords: *Project management, learned lessons, knowledge, satisfaction.*

1. Introduction

As time progresses, project management (PM) professionals have continued their constant pursuit of optimizing knowledge derived from project management experiences (Pan & Zhang, 2021). This endeavor is intended to drive efficiency and effectiveness in achieving objectives, focusing on managing the critical variables of budget, time, and scope. Numerous investigations highlight the importance of applying lessons learned in the field of PM. For example, the systemic knowledge model of lessons learned for organizational learning in projects (Duffield & Whitty, 2016) and the practice of interproject knowledge sharing (Hartmann, & Dorée, 2014) have highlighted its relevance.

Furthermore, data mining applied to lessons learned collected at the closure of computer projects has proven to be a valuable source of knowledge (Ril, et al., 2013). Addressing knowledge management and organizational learning (OL) in the context of PM has also been identified as a way to improve success rates (McClory , et al., 2017). Even the use of social networks as a collaboration tool has emerged as a means for the exchange and use of knowledge in the management of lessons learned in projects (Virginio, et al., 2016).

Despite the wide range of research underscoring the importance of learned lessons (LL), a constant challenge remains: how to improve PM through LL without it becoming overwhelming, static, or unstructured information? In many cases, lessons are recorded in an ad hoc manner, following personal approaches, which makes their sharing and

[1] Master in IT Strategic Management. Systems Engineer. Full-time Professor of the Systems Engineering Program at the University de Cartagena. Email: javierpinedo@unicartagena.edu.co.
[2] Professor of Doctorate Projects at the International Ibero-American University - UNINI MÉXICO
[3] Master in Computer Science. Systems Engineer. Full-time Professor of the Systems Engineering Program at the University de Cartagena. Email: rmartelog1@unicartagena.edu.co

consolidation in a common database (DB) difficult. The lack of standardization in the process hinders its usefulness and accessibility (Kovács & Falagara, 2021). The proper structuring of LL is essential since it can boost their use both manually and automated, through data mining techniques or the use of artificial intelligence. Effective LL management is intrinsically linked to better control of the key variables of scope, time, and budget in projects.

In this research, a solution to these challenges is proposed. It focuses on the creation of an LL management model (MM) that addresses the systematic collection and organization of these lessons throughout the entire project life cycle (LC). This dynamic, easy-to-deploy tool enables project managers to continuously detect, analyze, document, and apply lessons, directly contributing to more efficient PM and successful outcomes. LL management is revealed as an essential component on the path to continuous improvement in project management. Below, Table 1 shows a comparison of the LL management models.

Table 1: Comparative table of LL management models.

Modelo / Comparative	ML3C	Towards excellence in project management through the process of lessons learned	Learning between projects: more than sending messages in bottles	Conceptualizing the lessons learned process in project management: towards a triple cycle learning framework	A collaborative model based on social media to support the management of lessons learned in projects
Group or committee	✓	✓	✓	✓	✓
Provides database repository	✓				
Involve stakeholders	✓				
Involves senior management	✓				
Involves external experts	✓	✓	✓	✓	✓
Social interaction between experts	✓	✓	✓	✓	✓
It provides a procedure for calculating efficiency and efficacy	✓				

Source: Authors

Given the above, a comprehensive solution to the challenge identified is proposed through the design of a MM intended for LL. This model, developed to address the problem in question, includes several key elements. In particular, it focuses on defining the optimal times to carry out LL registration, as well as establishing a solid structure for the DB in which they will be stored.

2. LL management

LL represent an invaluable resource for project managers, playing a fundamental role in improving the management of similar projects. Beyond their usefulness in optimizing the planning of new projects, these lessons constitute a shield against repeating past mistakes. In this sense, they play a crucial role in reducing risks and identifying areas for improvement. It could be argued that LL not only form a central pillar for progress in organizational PM practices but also encompass a series of essential elements, such as the categorization and detailed description of the situation, its impact, the recommendations made, and suggested actions (Rowe & Sikes, 2006). In addition, they allow linkage with other critical aspects, including problems, risks, and opportunities, as well as any relevant information.

To get the maximum benefit from LL, it is imperative to record and store them properly. These lessons emerge as output information in each phase of a project, evolving to become a fundamental input that is updated throughout the project's execution. The responsibility for recording these lessons falls on both the individuals and the teams involved in the project. It is important to highlight that the knowledge generated can take various forms, from audiovisual content to other appropriate formats that ensure the effectiveness of the LL. At the end of the project, all data is centralized in what is known as an LL repository, following the guidelines of the Project Management Institute (PMI, 2017).

Numerous studies support the significance of LL, exploring various approaches, such as social interaction models (Hartmann, & Dorée, 2014) or the intrinsic interconnection between learning and daily practice in the field of PM (Gomez, 2015). These analyses reveal the lack of exploitation of LL in many organizations, due in part to the misperception of them as simple data stores. In search of enriching the management of these assets, this research proposes the creation of an MM of the LL that covers all stages of the LC of the project, providing a dynamic, effective, and easily implementable tool. Its objective is to allow project managers to detect, analyze, integrate, document, and perpetuate the knowledge acquired.

Aware of the relevance of LL in PM, this proposal actively incorporates knowledge management and OL as fundamental components in PM. This approach is intended to increase the success rate of projects, as noted by McClory et al. (2017). Proper management of the LL repository involves checking and removing duplicate records, as well as purging obsolete information. The creation and maintenance of a DB of experts in PM is established as an essential element for the exchange of experiences and the acquisition of knowledge that contributes to the fulfillment of the project objectives.

Fostering a learning environment throughout the project makes it possible to review optimal results, increasing positive factors and reducing negative ones (Lobczowski, Lyons, Greene, & McLaughlin, 2021). This practice allows the formulation of best practices, risk assessment, and monitoring of early warning indicators (McClory, et al., 2017). Furthermore, the use of LL to estimate the duration of activities, based on previous experiences, significantly improves efficiency.

In conclusion, the importance of a continuous recording of LL during all stages of a project is underlined, as emphasized by the Informatics Project Office (PMO Informática,

2018). This approach not only ensures the retention of valuable knowledge but also provides a solid pillar for success in PM.

3. Efficiency and Effectiveness

In the present research, a descriptive methodological approach is used to shed light on PM practices in an organization located on the northern coast of Colombia. The main objective is to examine whether this organization is effectively implementing LL management and, if so, how it employs tools and strategies to carry out such management. Furthermore, this research adopts an exploratory approach, as it focuses on the application of a procedure, in this case, the ML3C model, to address a problem that has received little attention in the field of the organization under study or that has not been sufficiently explored yet as has been observed in the literature (Hernández, Fernández, & Baptista, 2014).

To carry out this research, various data collection instruments have been used, with interviews being one of the main methods used. The fundamental purpose of this research is to establish a solid connection between PM and LL, and to determine whether the application of the proposed model has a positive impact on the efficiency and effectiveness of the projects in question. To achieve this goal, it is imperative to acquire a deep understanding of the information available regarding the LL management process.

In this context, to evaluate effectiveness and efficiency, widely recognized formulas have been used, such as those provided in the literature (Planning, 1998). These formulas represent essential tools to measure and quantify efficiency and effectiveness in PM, allowing an objective and quantitative evaluation of the results. Rigorous application of these formulas in the research context will contribute to obtaining an accurate picture of the effectiveness and efficiency of PM in the organization studied. Below they are exposed.

$$\text{Efficacy} = \frac{AR}{ER} \quad (1)$$

$$\text{Efficiency} = \frac{\frac{AR}{AC} \times AT}{\frac{ER}{EC} \times ET} \quad (2)$$

AR = Achieved Result; ER = Expected result; AC = Achieved cost;

EC = Expected Cost; AT = Achieved Time; ET = Expected Time

However, with regard to the calculation of efficacy, the formula proposed by (Planning, 1998) has been selected to be used, although the names of the variables have been modified in accordance with the nomenclature used in the context of this research. The adaptation of this formula allows for greater consistency with the specific framework of this study.

Regarding efficiency, although the result is equivalent to the one obtained through the traditional formula, its application in this case is presented in a slightly different way. Here, efficiency is expressed as a single quotient, and both the numerator and denominator involve the multiplication of all relevant factors. This modification, in the way of expressing efficiency, adjusts to the needs and objectives of the research since it facilitates a more detailed and comprehensive evaluation of all the elements involved in PM in the context of the organization under study.

$$\text{Efficacy} = \frac{FA}{PA} \quad (3)$$

$$\text{Efficiency} = \frac{PB \times FA \times PT}{FB \times PA \times FT} \quad (4)$$

Wherein:

FA = Final Achievement; PA = Projected Achievement; FB = Final Budget;

PB = Projected Budget; FT = Final Time; PT = Projected Time

In case it is encountered a scenario where the projected time is reached or executed, and if the efficiency is calculated then:

$$\text{Efficiency} = \frac{\text{PB x FA}}{\text{FB x PA}} \quad (5)$$

If efficiency is calculated when 100% of the projected budget is executed, a second scenario would result wherein:

$$\text{Efficiency} = \frac{\text{FA x PT}}{\text{PA x FT}} \quad (6)$$

Finally, a third scenario would arise, which would be to calculate the efficiency when 100% of the projected achievement is achieved, then:

$$\text{Efficiency} = \frac{\text{PB x PT}}{\text{FB x FT}} \quad (7)$$

It is true that by obtaining a result equal to or greater than 1 in efficacy, it can be concluded that the objectives or scope of the project have been achieved. However, it is crucial to keep in mind that achieving these objectives does not necessarily guarantee the effectiveness of the project, since the achievement of the objectives could be accompanied by a budget and time expenditure greater than initially projected. This is why the importance of measuring efficiency in PM is highlighted.

Efficiency increases as time and budget variables are managed more effectively, and in this sense, LL play a fundamental role. However, it is essential to emphasize that improving efficiency is closely related to the tools used to carry out optimal LL management. The level of efficiency will increase significantly depending on the quality and efficiency of these tools used to access the knowledge stored in the repositories. In this context, the implementation of artificial intelligence, such as artificial neural networks, is presented as an advanced and promising solution. These technologies can enhance the ability of organizations to take advantage of LL and apply them effectively in future projects, contributing to the achievement of successful results and the optimization of resources in terms of time and budget.

Below are the following ranges of values for efficacy and efficiency:

Efficacy less than 80% is considered ineffective.

Efficacy greater than or equal to 80% and less than 90% is considered moderately effective.

Efficacy greater than or equal to 90% is considered very effective.

Efficiency less than 80% is considered inefficient.

Efficiency greater than or equal to 80% is considered efficient.

The central focus of this research focuses on understanding how the implementation of the ML3C model in LL management contributes to a more effective storage of knowledge, based on the experiences acquired in PM. In the first step, the identification of the requirements in each phase of the LC of the project is carried out, which are closely related to the LL, and determine the optimal moments for their registration.

Subsequently, a procedure is designed, which in this case is materialized in a documentary model. This process is nourished by all the information collected and consulted about LL, which is subjected to a thorough analysis. The purpose of this analysis is to determine the most effective strategy for the conception of the documentary model for the management of LL. The model is built to optimize the capture, organization, and application of knowledge derived from project experiences, with the aim of maximizing its usefulness and effectiveness in future initiatives.

Ultimately, the central interest of this research lies in developing a tool that strengthens the retention and use of LL in the LC of the projects, thus promoting continuous improvement and efficacy in PM in the organization of the Colombian north coast. This process involves comprehensively considering the register and structure requirements of the DB to be stored, to establish a solid foundation for effective LL management.

4. Diagnosis of the learned lessons management

In the development of this research, the 17 project coordinators of a prominent organization on the Colombian northern coast were selected as the population, who play a crucial role in the execution of the entity's main projects. To collect relevant information, convenience sampling was chosen, considering that it sought to obtain the perspective of each actor involved in PM in the organization under study. This approach allowed to analyze how each coordinator manages the LL in their respective area and sector.

The information collected from the project managers, obtained through interviews, was subjected to detailed analysis to understand their perception of the usefulness of LL. In total, 15 experts from the organization were interviewed, of which 72.7% stated that they used a good practice model for PM.

Regarding the registration of LL, 72.7% of those interviewed stated that they carried out this process in the PM. However, it is observed that only 54.5% of the respondents record the LL in all phases of the project's LC, evidencing variations in recording practices.

Regarding the tools used, 45.5% opt for word processors, while only 36.4% use electronic sheets. It is notable that, according to the experts interviewed, electronic forms are considered more effective for the registration and search of LL.

Among the significant findings, 54.5% of interviewees shared and consulted LL with other project managers, indicating a collaborative practice in knowledge management. However, 72.7% of directors stated that they do not always use the same format for LL registration, revealing a lack of standardization in this process.

All directors agreed that the best way to store LL is in a DB with a unique structure of fields or data to be recorded. This consensus underlines the importance of having a unified approach to LL registration to increase the chances of project success, based on experiences, both positive and negative, from previous projects.

5. Management model of LL – ML3C

In the development of this research, the task of creating an MM of LL intended to be applied in the organization under study has been undertaken. This initiative is based on three cardinal variables, namely Scope, Time, and Budget, which play a crucial role in the management and control of the objectives set, oriented towards improvement in both efficiency and efficacy. To elaborate this model, the processes and areas of knowledge established in the PMBOK methodology, recognized as a reference in PM, have been used.

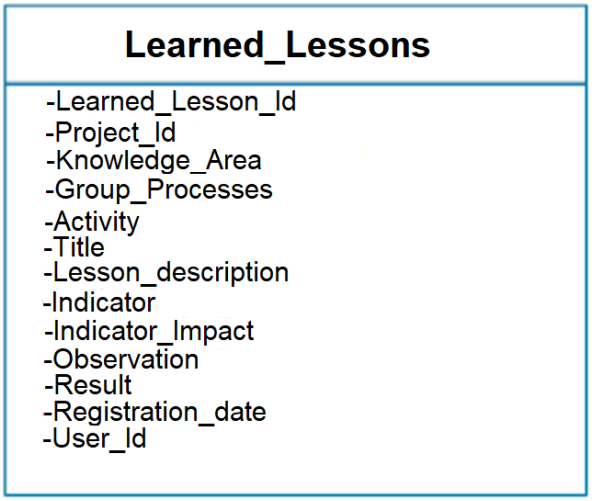
Evaluating project progress has been a well-established practice over time, employing various techniques to compare and contrast time, cost, and scope with predefined objectives. This monitoring begins from the initial phases and primary activities of the project's LC, an approach that is comprehensively integrated into the proposed model, known as ML3C. This model is characterized by its cyclical structure, where each cycle hosts activities designed to optimally build an LL registry, ready to be consulted and adopted at relevant times during project execution.

5.1 Operation and Tools that support the ML3C model

5.1.1 Structure of the learned lessons database

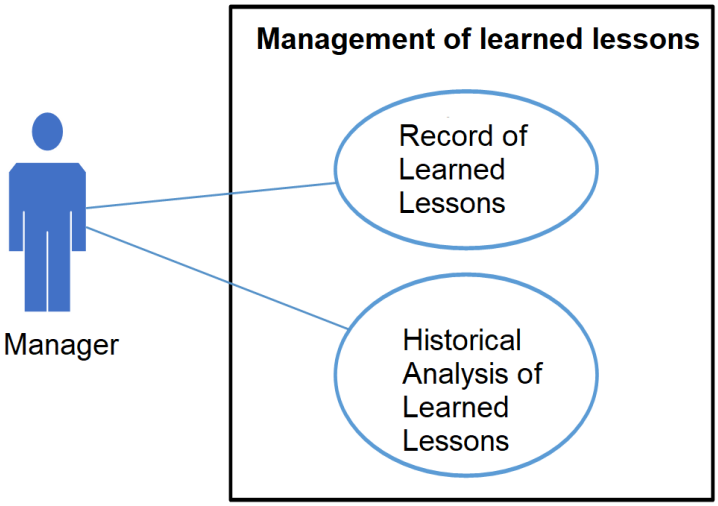
In order to have unified, structured, secure, easily accessible information that can be validated and integrated, it is necessary that all records are stored in a single format, that is, in a DB that can be managed by an information system (IS). For this, the following DB structure or table that must have the LL is defined (Figure 1 and Figure 2):

Figure 1: Structure of the table or suggested repository for the storage of the LL.



Source: Authors

Figure 2: Use case: LL management.



Source: Authors

5.1.2 Organic structure of the learned lessons management team

As mentioned in the construction cycle, and given the importance or relevance of this cycle, the creation or existence of a committee responsible for the application or registration of LL is necessary, for this, the way how each member interacts in the proposed model is defined, that is, the functions or roles that each member will perform:

Project Manager or Director: In addition to the functions inherent to project management, the project manager or director is the one who determines the need to use the LL, in addition to establishing whether it is necessary to convene the committee, this is because the project director project has the authority and knowledge to adopt the recommendations of various LL. For this reason, the director, when necessary, may invite

senior management or interested parties in cases where the LL suggest the modification of the budget and/or time of the project, in order to obtain their approval.

Area Leader: It is the expert responsible for the development of the activities inherent to the area on which the model will be applied, that is, this member can vary throughout the LC of the project.

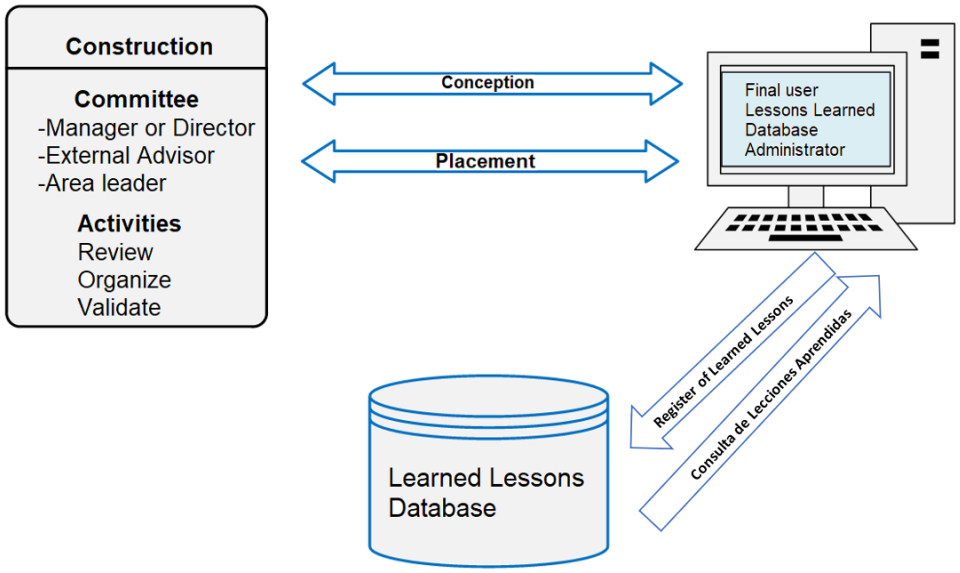
External Advisor: The external advisor is a professional with extensive experience and knowledge in PM, who acts as a guest to increase or achieve greater use of the LL contained in the repository, and will act as support for the validation and review of the records taken into account by the model to apply in the respective phase. This professional, like the area leader, can change throughout the LC of the project. The participation of an external advisor is not necessarily mandatory for the model to work.

Final User: Is the user responsible for executing the lookup or creation functions for registries of LL in the repository or DB.

5.1.3 Map of cycles and activities of the learned lessons

For the development of the ML3C MM, three cycles were executed, conception, construction, and placement, represented in Figure 3, hence the name ML3C.

Figure 3: Cycles and activities of the ML3C MM.



Source: Authors

Conception: In this cycle, the project manager conceives the need to generate or consult information in the LL DB. This means that two situations can occur, the first is that before a hit or miss occurs, the LL DB is consulted to support a decision, and the second scenario is when it is determined that there was a hit or miss in the project, which generates the need to create a registry in the LL DB.

Construction: After completing the first cycle, the construction cycle is given only in cases when it is required to create a registry in the LL DB, for this it is recommended to apply the following guidelines:

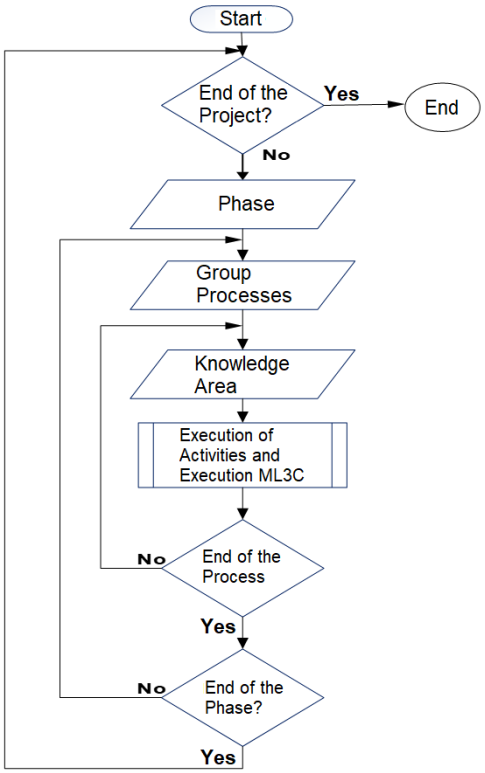
For this cycle, the LL team must be made up, which must be made up of the project manager or director, a member of the team responsible for executing the project, as well as one or more external experts. In some cases, it is necessary that senior management also take part. The LL committee must identify at which stage of the LC of the project the lesson learned is generated, as well as which indicator or variable it positively or

negatively affects, then the activities related to the event are identified. It is important to take into account that this cycle, like the previous one, is carried out throughout the entire project, that is, in all phases of the LC.

Placement: This last cycle is where the information to be registered in the DB is determined, in the case of adding information or LL, understanding that the information to be entered has already been reviewed, refined, and validated by the responsible body. As in the case of adopting a lesson learned for its application, it must be reviewed and endorsed.

The flowchart indicated in Figure 4 shows how the ML3C model procedure is executed in all the activities that are immersed in the process groups and knowledge areas that form the LC of the project.

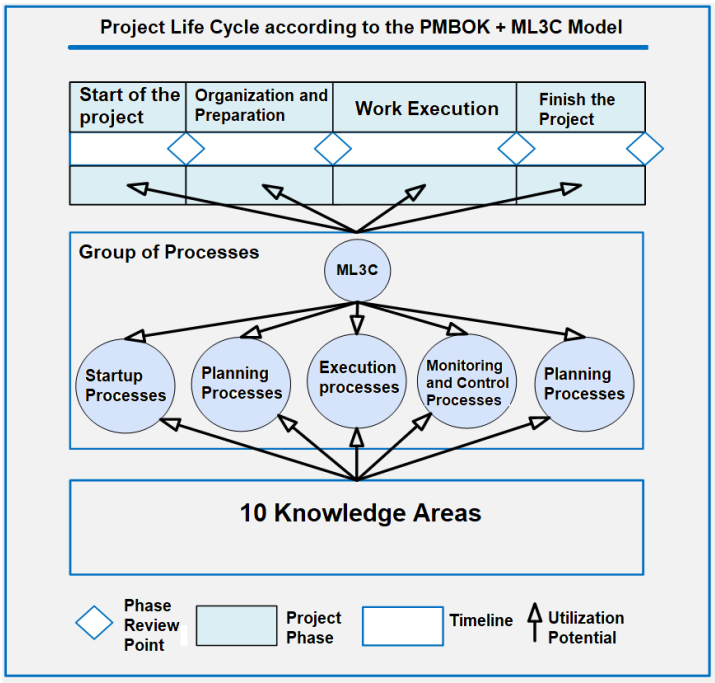
Figure 4: ML3C Functional Flow Chart.



Source: Authors

Next, Figure 5 shows the LC of the project according to the PMBOK model of the Project Management Institute (PMI) to which the ML3C model is attached, which works transversally to the group of processes, that is, it is immersed in the initiation, planning, execution, control, and monitoring, and planning processes, which in turn are in all areas of knowledge. This process is carried out throughout the timeline, that is, during the entire time that the LC phases of the project last.

Figure 5: LC of the Project according to PMBOK with ML3C.



Source: Own elaboration based on PMBOK 6

6. Results and Conclusions

Experts in the field, as well as developers of good practice models for PM, converge in proposing the need to establish a data bank that centralizes and systematically manages all the knowledge derived from the experiences of project managers. This initiative stands as a means to transmit said knowledge to future projects, thus providing a valuable resource that contributes to continuous improvement.

It is imperative to underline the importance of implementing the LL management process, as this practice substantially increases the chances of project success in terms of efficacy and efficiency. However, it is crucial to recognize that the tasks associated with registering valid information in the DB, as well as its use, fall exclusively to the personal decision and discretion of the project manager.

Despite the existence of various models for LL management, each one presents particularities, such as depending on the use of social networks, lacking a unified format for the repository, or not using a DB that facilitates its integration with information systems or PM software. These models can also work without efficient techniques for finding lessons, such as the application of artificial intelligence. Implementing a more holistic approach, encompassing unified formats, integration with advanced technologies such as artificial intelligence, and the use of structured databases, could be a significant step towards optimizing LL management at the project level.

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