














Category: STEM (Science, Technology, Engineering and Mathematics)

ORIGINAL

## Project management in the information technology sector

### Gestión de proyectos en el sector de las tecnologías de la información

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#### ABSTRACT

The article aims to demonstrate the importance of the application of information technologies within project management, through a critical analysis, in turn, explores the need to use agile methodologies within the IT sector. The research begins by addressing fundamental concepts regarding project management such as objectives and scope variables, information systems and methodologies needed to carry out an IT project are explored, as well as the challenges and needs that may arise during the implementation of an IT project. It was concluded that it is very important to use agile methodologies in IT projects, since this type of projects are characterized in obtaining results, therefore, it is necessary to have one or many multidisciplinary teams that work in an effective collaboration.

**Keywords:** Technology; Projects; Management; Information.

#### RESUMEN

El artículo pretende demostrar la importancia de la aplicación de las tecnologías de la información dentro de la gestión de proyectos, a través de un análisis crítico, a su vez, explora la necesidad de utilizar metodologías ágiles dentro del sector informático. La investigación comienza abordando conceptos fundamentales sobre la gestión de proyectos como son las variables de objetivos y alcance, se exploran los sistemas de información y las metodologías necesarias para llevar a cabo un proyecto informático, así como los retos y necesidades que pueden surgir durante la ejecución de un proyecto informático. Se concluye que es muy importante utilizar metodologías ágiles en los proyectos de TI, ya que este tipo de proyectos se caracterizan en la obtención de resultados, por lo tanto, es necesario contar con uno o muchos equipos multidisciplinarios que trabajen en una colaboración efectiva.

**Palabras clave:** Tecnología; Proyectos; Gestión; Información.

#### INTRODUCTION

In a global environment characterized by constant change and evolution, the high presence of technology in all aspects of society is evident in every activity we perform. In this constantly changing landscape, companies, increasingly technology-oriented, focus their products and solutions in the technology market, whether through information systems, large-scale technology solutions for global problems, mobile applications or innovation

and security projects.<sup>(1,2,3,4,5,6)</sup> The incursion into this sector brings with it a challenge for companies that want to position themselves as the best in the software industry. Better solutions are increasingly required, faster solutions with more efficient technology, solutions that involve the use of the latest technologies and with an implementation in record time.<sup>(7,8)</sup>

In response to this demand, project management emerges as a vital approach. This discipline, once primarily intended for traditional projects, has been inserted into the Information Technology (IT) sector to address these difficulties and bring to reality the increasingly challenging IT projects. Project management not only encompasses the skills, tools and knowledge that are indispensable for a successful project, but also becomes an essential strategic component in the equation of innovation and business evolution.<sup>(9)</sup>

To understand how to approach a better management of these projects, it is necessary to understand the definition of the project as such, and is that according to the PMI a project is defined as "a temporary effort that is carried out to create a unique product, service or result" (Project Management Institute, 2017, p.4)<sup>(10)</sup> and the art of organizing it to achieve its success is known as project management, this discipline is positioned as a strategic component within organizations, incorporating elements such as leadership, resolution capacity, knowledge and technology.

In the IT framework, project management not only involves the application of techniques and methods, but also represents a strategic partnership between leadership, problem solving, knowledge and technology. It functions as the director who orchestrates the conception, design, development and implementation of technology solutions in a fast-moving and changing environment.<sup>(11,12,13,14,15)</sup>

In line with the research of Ramos D et al.<sup>(16)</sup>, software development encompasses a series of critical stages that include the identification and specification of requirements, the construction of the product and its subsequent validation through testing. These stages should be characterized by their transparency and flexibility, which are essential to ensure proper project management.

Through all these stages, from planning to execution, project management in the IT field follows a series of meticulously defined steps. According to the software development life cycle model, this process includes planning, analysis, design, manufacturing and testing. Each of these stages is essential for successful achievement, underscoring the importance of a clear and adaptable approach to ensure the overall effectiveness of the process. Despite its crucial role, project management in IT faces intricate challenges.

The historical failure rate of software projects highlights the complexity inherent in their implementation. Constraints such as ambiguous requirements, insufficient communication with users, unrealistic expectations and changes in specifications can affect quality and delivery schedule, affecting customer satisfaction and the achievement of strategic objectives.

From an empirical perspective, it has been observed that in a proportion of more than 50 % of technological ventures, the full realization of the initially conceived objectives is not achieved, manifesting substantial deviations in temporal or financial terms. Some academics even claim that this percentage may be as high as 70 % or even 80 %.<sup>(17)</sup>

This article dives into the fabric of project management in the IT sector, unraveling its gears and challenges. It will explore how agile strategies have revitalized the landscape, and how aspects such as quality and delivery time, evaluated from diverse perspectives, continue to be the foundation for success in IT project management.

## Content (literature review)

### *Project management*

Project management is a great tool which supports and at the same time directly influences future operations, that is why it is important to know the profession, so that the best practices can be implemented by small, medium and large companies, in order to provide the necessary knowledge to improve procedures and increase their performance, so that the projects to be developed are able to cope with fluctuating market conditions.

All project management activities are documented so that they not only generate a result, but also knowledge and learning that leads to a better way, so that not only successes can be learned from, but also from the mistakes made.

This is why it is so important to analyze the different trends in project management worldwide, since companies and individuals are always looking for and implementing new projects to achieve objectives or needs that may arise in different situations and scenarios in life or the market.<sup>(8)</sup>

In conclusion, it is the set of methodologies for planning and directing the tasks and resources of a project.

A project brings together a specific set of operations designed to achieve a specific, measurable, achievable, relevant and time-bound (SMART) objective. The objectives of project management are:

- Manage the initiation, development, evolution and maintenance of the project.
- It is necessary to organize a series of meetings.
- Risk identification and management.
- Assignment of tasks.

- Use of effective communication tools.
- Conflict resolution.
- Adaptation to possible changes.<sup>(14)</sup>

Project objectives usually have:

- Kick-off meeting: A meeting that marks the beginning of the project, where team members are introduced, objectives are discussed and the overall scope of the project is established.
- Business Case: A document that describes the economic, commercial and technical justification for the execution of a project, including the expected benefits and associated costs.
- Contingency plan: A set of actions previously designed to address unforeseen situations or problems that may arise during the project, in order to minimize their impact on the success of the project.
- Project Plan: A document that details the activities, resources, timelines and tasks required to successfully complete the project. It is a guide that establishes how the project objectives will be achieved.
- Project Timeline: A diagram or table showing the planned dates for the execution of the different activities and tasks of the project, allowing a temporal visualization of the project as a whole.
- Deliverables: Concrete and verifiable results to be produced and delivered at different stages of the project. They are tangible products that demonstrate progress and completion of activities.
- Dependencies: Relationships between different project tasks and activities, where some activities must be completed before others can begin. Dependencies help establish a logical flow of work.
- Project Portfolio Management (PPM): An approach that focuses on selecting and managing a set of projects to achieve strategic objectives. PPM involves resource allocation, tracking and prioritization of projects.
- Budget: Estimate of the total costs necessary to carry out the project, including expenses related to human resources, materials, equipment and other elements.
- Project management software: Software tool designed to assist in the planning, monitoring and control of projects. It facilitates collaboration, task assignment and resource management.
- Project objectives: Specific and measurable goals that the project seeks to achieve. They should be aligned with the organization's strategic objectives.
- Project Scope: The scope defines the limits and boundaries of the project work, including the functions, features and deliverables to be delivered at the end of the project.
- Resource management: The planning, allocation and control of resources required to carry out project activities, including human, financial and material resources.

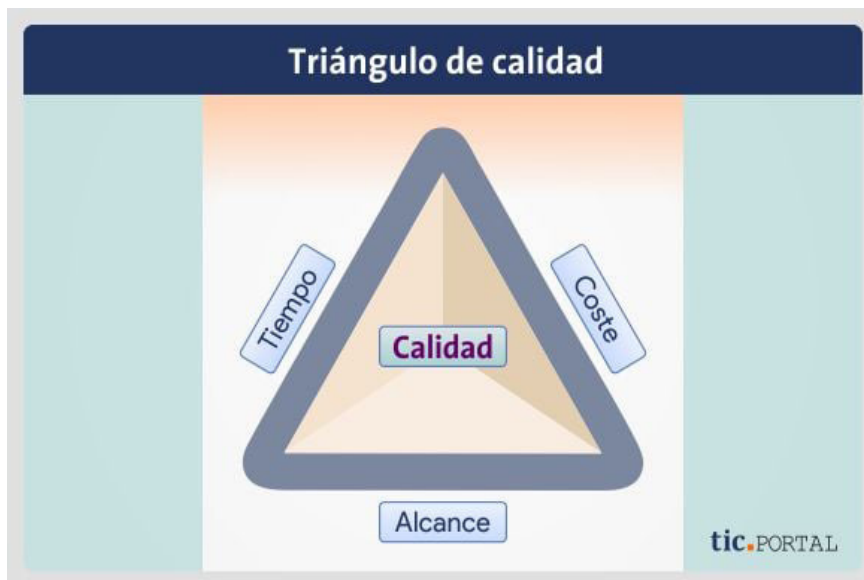


Figure 1. Quality triangle<sup>(3)</sup>

When developing a project there are 3 variables to take into account: time, cost and scope. These three variables are part of all projects and serve to ensure the quality of the project. These variables together form the Quality Triangle (also known as the Iron Triangle).

The scope variable specifies all the requirements, steps and tasks of the project development. On the other hand, time is a peculiar variable, it is not something that can be controlled as in the case of processes.

So it is a real challenge to use time efficiently, keeping the project on schedule and achieving the desired objectives. The last variable, cost, focuses on the budget set at the beginning of the project. All three variables are interconnected and are highly dependent on each other. The larger the scope of the project, the longer it will take and the higher the cost.<sup>(3)</sup>

### AGILE and SCRUM

Agile and Scrum are two specific methodologies for the software development industry. They can be understood in some way as anti-methodologies, since they break with certain guidelines of traditional project methodologies, this understood within the area of software development, where the customer's requirements are not fully established, since he himself does not know exactly what he wants.

Agile emerged in 2001 with The Agile Manifesto, which is the result of a meeting of an independent group of developers who did not feel comfortable with existing methodologies. Some elements of the Manifesto that summarize to a large extent the philosophy behind this methodology are:

- Individuals and their interactions are more important than processes and tools.
- Getting the software up and running is more important than doing extensive documentation.
- Collaboration with the customer is more important than contract negotiation.
- Responding to change is more important than following a plan.

Over the years and with the rise of the software development industry, several certifications have emerged such as:

- The Agile Certified Practitioner (ACP) from the Project Management Institute (PMI).
- APMG International.
- Strategyx Certificate (Associate or Master's) in Agile.
- International Consortium for Agile (ICAgile).
- Agile Certification Institute.
- Scaled Agile Academy.
- Scrum Alliance.

Subsequent to Agile came Scrum, a methodology for managing software development, designed for teams of about 10 people, and generally based on two-week development cycles, called "sprints," as well as short meetings called stand-up meetings. Approaches to scaling Scrum to larger organizations include large-scale Scrum and Scrum of Scrums. The ultimate SCRUM certification is the CSM - Certified Scrum Master, awarded by the Scrum Alliance.

While the agile approach still generates some skepticism, its benefits, such as the ability to accommodate changing customer requirements, immediate returns, close coordination and flexibility, are giving it increasing acceptance, especially in the software development industry. Thus, the importance of people over processes as a project management philosophy is becoming more successful. Likewise, due to the current speed of business, many companies are turning to agile practices to achieve their goals.

To adopt agile methodologies, especially in technology or software development projects, it is imperative to be able to make changes in an equally agile way, with requirements and specifications decided by people. This methodology is aligned with PMI best practices, which can be adopted as phases.

In order to evaluate whether such methodologies should be considered,<sup>(17)</sup> suggests the following checklist:

- It is a large team.
- A small iteration cycle is not possible.
- The requirements are clearly stated and detailed.
- The requirements do not change.
- Interested parties are not available during development.
- Complete documentation is required for success.

On the other hand, Agile and traditional methodologies coexist, so much so that the PMI recognizes the former as part of its best practices. The key difference is the planning horizon, with small cycles or iterations within incremental or waterfall planning.<sup>(13)</sup>

### Phases of project management

According to Anaraya Albornoz (2020) in appvizer magazine "Project management: definition, characteristics and phases". A project can be divided into 4, 7 or more than 10 phases. In a simplified way, these are the 4 main steps of project management.

#### 1) Analyzes needs

As we have seen above, the starting point for project planning is the formalization of the expected result.

Therefore, the need must be expressed clearly and precisely so that those involved in the project can respond effectively to the specifications and particularities of the project. From this analysis, the 3 structuring components of the project will be defined: time, budget and scope.

In fact, if the requirements analysis is incorrect, the project planning will necessarily be incorrect and the objectives will not be achieved. Often, the team writes the functional and technical specifications so that there is no ambiguity in the requirement.

## 2) Builds and plans

On the basis of the specifications, design and execution will work together to evaluate the effort required to deliver the expected result (coding phase). The other parameters are the result of this planning, the project usually evolves according to exchanges and decisions on the fly. "The stakeholders must jointly decide on a launch and delivery date."

Dividing the project into tasks and missions makes it possible to establish a sequence of tasks according to a schedule. This work often takes the form of a Gantt chart. In addition to the tasks and missions, the planning must take into account the reflection phases and non-productive times (meetings, decisions, expectations).

Phase 2 generally results in detailed planning.



Figure 2. Project management: definition, characteristics and phases: Phase 2<sup>(9)</sup>

## 3) Project follow-up

Project follow-up is the phase that requires the most interpersonal skills and reactivity. It is necessary to monitor the correct execution of each task. The project manager must be able to identify friction points, risks, opportunities, deviations and propose solutions quickly. "Project monitoring is simpler thanks to the use of dashboards and reporting tools."

Online project management software (SaaS) provides real-time information on project progress, offering greater maneuverability and control. Since communication and collaboration are also essential for the good interaction of the design and execution teams, entrusting your management to a tool like monday.com offers you a number of advantages:

- Efficient management of the workload of your teams.
- Integration with other tools you already use.
- Generation of schedules and workflows.
- Generation of reports and diagrams in both the mobile and desktop versions.

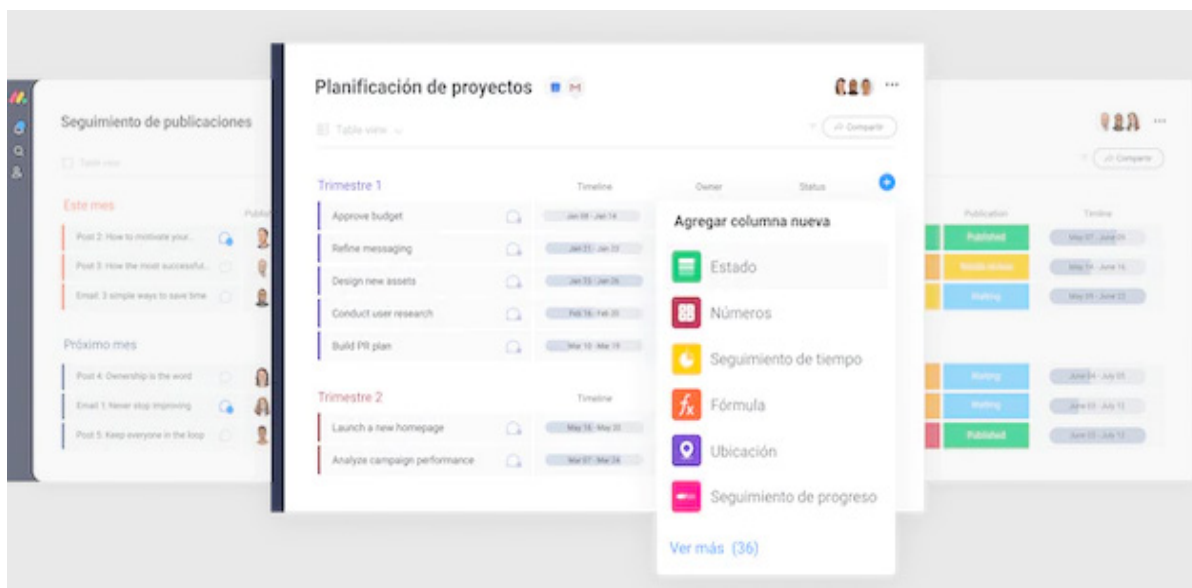


Figure 3. Project management: definition, characteristics and phases: Phase 3<sup>(9)</sup>

#### 4) Closing and evaluation

A project reaches the final phase when the objective is reached. To know this information, the objective defined at the origin of the project must be SMART (S-specific - Specific, M-measurable - Measurable, A-chievable - Achievable, R-ealistic - Realistic). Therefore, reports and dashboards are essential to justify the achievement of a goal. Contrary to what we may believe, there is still one last stage after the achievement of the objective: making a final report of the project. This evaluation allows future projects to benefit from good practices and avoid making the same mistakes. Learning is part of the project management culture, at every stage of project management, it is essential:

- Communicate regularly with stakeholders.
- Control drifts, anticipate risks.
- Adapt (loss of a talent, arrival of a new employee, technological opportunity).
- Manage human resources: this is the main factor in the success or failure of a project.<sup>(9)</sup>

#### Change in project management (post COVID-19)

Project management has undergone important changes since the COVID-19 pandemic. Today, trends point to the use of hybrid methodologies and the recruitment of more specialized profiles, among others. Organizations are increasingly demanding strategies, tools and project management professionals capable of driving a more efficient set of business processes. As the workplace changes and the expectations of project stakeholders evolve, companies will need to invest more time and money to perfect project management.

Wellington's State of Project Management Report indicates that only about 43 % of organizations complete their projects within their designated budget. Likewise, 29 % typically complete their projects on time. To make matters worse, only 47 % mention that their organizations have a track record of project success and 40 % that their projects always deliver all the benefits. According to a KPMG report, events such as COVID-19 greatly influence the approach taken by companies to project management and investment in new talent or technology. Fifty-eight percent of respondents believed the pandemic had a moderate or significant impact on their projects. Also, many project leaders noted that they were investing in digital collaboration tools and systems to keep their teams engaged and able to work remotely.

As of 2020, the KPMG report found that less than half of teams feel their organizations manage programs and projects effectively. It also revealed that only about 25 % of all projects were delivered and that 52 % of companies believe their projects are delivered to the satisfaction of stakeholders. Also, only about 40 % of organizations believe that their strategies for managing projects are effective.<sup>(15)</sup>

#### We are familiar with information technology: information

An IT environment consists of a large number of hardware, network and software components including computers, servers, routers, applications, microservices and mobile technologies. An IT infrastructure can be on-premises, in the cloud or on a hybrid platform that integrates both.

IT managers oversee and manage IT systems to ensure that they are always available and operate reliably. IT management responsibilities and tasks include:

- Determine business requirements for IT systems
- Manage IT budgets and costs
- Overseeing safety and compliance
- Monitor system and network security
- Implement new data systems, hardware and software.
- Provide technical or help desk support

IT departments are usually led by chief information officers (CIOs). They determine IT strategies and objectives for the business and ensure that they are implemented.<sup>(6)</sup>

The importance of information in organizations has always been recognized. From Frederick Taylor to Herbert Simon (referents of administrative theories) the company has been spoken of as a system of "information processing"<sup>(4)</sup> (Galbraith 1977; 1973).

Information is a necessary and valuable resource for companies that manage it properly. Information implies a process of interpretation and transformation whose main objective is the minimization of uncertainty in decision making, in an environment of growing complexity and uncertainty. Every person, every company and in general every organization is continuously capturing a series of data, most of which have no significance for them, but on the other hand, there are other data that help them to know the surrounding environment better and also to know themselves better. These data, which constitute the so-called information, will allow her to make better decisions. Therefore, timely and accurate information is a key factor.

Companies generate internal information and absorb external information from their main stakeholders, among which are their customers, suppliers, distributors and competitors, the State, financial institutions, trade unions and society in general. Considering the multiplicity of agents that interact with the company, and the large volume of information they handle, it is not surprising the difficulties companies encounter when it comes to exploiting this information in decision-making. Technology affects the members of organizations in various ways and is a key factor in determining the tasks required and the degree of specialization. It often determines the size and composition of the immediate work group and the scope for contacts with other workers and supervisors; it also affects the various functions and positions within the company and influences the specific design of each employee's job (Kast and Rosenzweig, 1998, 220). But for this, the organization must be viewed by means of a multiple analysis that simultaneously treats specific fields of the company as a viewpoint of the whole that it represents. Therefore, in the identification of key variables for the effective functioning of the organization, technology must be taken as a functional, conceptual, disposition and therefore option and decision element, relating it as a vital element for both managers and engineers.



Figure 4. Ait-El-Hadj, S. (1990). Technology management. The firm in the face of technological mutation<sup>(12)</sup>

From figure 4, the operational part can be related to the traditional conception of technology, to which one of the elements that integrates it with business strategy has been added: the management that technology offers as a source of internal or external information. The strategic part is combined with the role of management, pointing out the plans, structures, actions, approaches and controls that govern the operation of the company and that are directly responsible for its success.<sup>(12)</sup>

Another approach is presented by Mejía (1998a), for whom the overall profile of the company and its valuation are obtained through a holistic vision that encompasses and integrates management and technology as key factors for the success of the processes developed. For him, the development of products and processes, as well as product knowledge, is aimed at the growth of the technology used by the company to provide products to the

market. Competitiveness in manufacturing and competitiveness in sales identify the efficiency with which the operation is managed. The framework that provides structural and social support to the above is found in the administrative style and in the work environment. Finally, it should be mentioned that for management authors such as Kast-Rosenzweig (1998) and Martínez (2002), technology represents one of the strategic elements for the analysis of organizations, which is considered a resource, the result of a set of instruments and methods that each organization creates, adapts and applies in its production processes, whether of goods or services, and which also constitutes a commodity in the sense that it can be exchanged, sold or bought.

## DISCUSSION

The following discussion focuses on addressing the key challenges and opportunities in project management in the IT sector. Project management in IT is essential for success in a highly dynamic and constantly evolving environment. Just as technology trends change rapidly, the way we manage projects in this sector must also adapt.

Project management in the Information Technology (IT) sector has undergone a significant transformation in recent years. This is largely due to the rapid evolution of technology itself and the need for organizations to be agile and adaptable in an ever-changing digital environment. In this discussion, we explore some of the key aspects of project management in IT and how they impact the success of organizations.<sup>(7)</sup>

Project management in the information technology (IT) sector is considered a fundamental pillar in responding to the challenges and opportunities that characterize the changing world of technology. In a global environment marked by innovation and constant change, companies are driven to adopt technological solutions that not only adapt to the changing needs of users, but also enable them to remain competitive in an ever-changing marketplace. Project management appears to be an essential discipline to effectively address these challenges. Accurately defining project objectives, as described in the initiation phase, is an important starting point for aligning the team's efforts and ensuring that the project aligns with the organization's strategic objectives. Previous research supports this premise by showing that clearly defined goals not only reduce uncertainty, but also enable more focused and accurate planning.<sup>(1)</sup>

The planning and estimating phase emerged as an important area in IT project management. In an industry where budgets and time often fail, a robust approach is needed to address these challenges. The method proposed by Smith et al.<sup>(2)</sup> emphasizes the importance of applying advanced estimation techniques, based on historical data and taking into account possible risks. This can not only improve estimation accuracy, but also reduce the possibility of unexpected biases.

The book "Agile Project Management" examines the application of Agile methodologies in software development projects. The author highlights that organizations that choose to adopt Agile approaches tend to enjoy greater flexibility and to be able to respond more quickly to changes in the market, which supports our observation about the importance of agility in IT project management.<sup>(18)</sup> In addition, several other authors also emphasize the need for IT project management to adapt to business environments undergoing continuous change. This approach is evidenced in "Project Management for Information Systems" by James Cadle and Donald Yeates, which takes an in-depth look at how IT project management must adjust to the constant transformations in the business world.<sup>(19)</sup>

## CONCLUSIONS

Project management in the information technology (IT) sector is the process of planning, organizing, and executing projects involving the development, implementation, or maintenance of computer systems or services. It requires effective collaboration between the manager and the team, as well as detailed planning including objectives, budget, scope, timelines, and quality indicators.<sup>(5)</sup>

Project management in the IT sector involves a balance between the efficiency of information systems and the satisfaction of the needs and expectations of users and clients. It is a strategic activity that contributes to achieving organizational objectives and taking advantage of the opportunities offered by technology. It demands a capacity for innovation, adaptation and continuous learning, as well as an integral and systemic vision of the technological environment.

Project management in the IT sector is a key factor for the success of software projects, which require an agile methodology, an appropriate architecture, a multidisciplinary team and effective communication with customers and end users. The use of Agile development allows projects to be carried out with little known scope and to manage changes in a controlled manner. Traditional development is suitable for repetitive, well-known projects that require few changes afterwards.<sup>(20)</sup>

The evaluation of the results and the fulfillment of the established objectives acquire a significant relevance in the measurement of the success of the project. The definition of clear metrics and the assessment of the return on investment become pillars for future decision making.

In an ever-evolving technology environment, staying current with emerging trends such as artificial



intelligence, cloud computing and cybersecurity is essential. The ability to incorporate relevant innovations can make the difference in organizational competitiveness and success.

The IT project lifecycle, from conception to implementation and maintenance, emphasizes the importance of a structured and sequential approach. Each stage carries specific responsibilities that must be addressed methodically.

Nowadays, data are no longer a scarce resource of little interest and are becoming abundant and of strategic value for the management of modern public entities and, among these, their universities. These, translated into information, play a leading role in the permanent processes of accountability to society; they increase, if they are available in an open and accessible manner, the levels of institutional transparency and citizen confidence in public actions; they favor planning and national, sectoral and institutional decision-making based on information; they allow for the monitoring and evaluation of public policies; they allow for the monitoring and evaluation of public policies; and, if they are available in an open and accessible manner, they increase the levels of institutional transparency and citizen confidence in public actions; allow the monitoring and evaluation of public policies materialized in development plans, programs and projects and, finally, favor the study, knowledge, prediction and implementation of preventive or corrective actions that contribute, from the public sector, to the construction of a better society.<sup>(11)</sup>

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