



Escola d'Enginyeria de Telecomunicació i  
Aeroespacial de Castelldefels

UNIVERSITAT POLITÈCNICA DE CATALUNYA

# MASTER THESIS

**TITLE:** Management of an ICT project in the public sector implementing a new system

**MASTER DEGREE:** Master's degree in Applied Telecommunications and Engineering Management (MASTEAM)

**AUTHOR:** Marta Pancorbo Marmol

**ADVISOR:** Jesús Alcober Segura

**DATE:** September, 8th 2023



**Title: Management of an ICT project in the public sector implementing a new system**

**Author: Marta Pancorbo Marmol**

**Advisor: Jesús Alcober Segura**

**Date: September, 8th 2023**

## **Abstract**

The Master's Thesis (TFM) deals with the management of implementation projects in the public sector through the collaboration between NTT Data, the company where the internship was carried out, and the Centre of Telecommunications and Information Technologies of Catalonia (CTTI). The study focuses on a specific project for the Department A of the Generalitat de Catalunya and explores the integration of management methodologies, such as NTT Data's COM and CTTI's Agile approach, to improve efficiency and quality in project execution.

The TFM provides a detailed overview of the project phases, from pre-documentation to implementation, highlighting the importance of project management in the public sector and the need to ensure the efficient use of public resources. It describes the methodologies used, such as SCRUM and functional testing, and emphasizes collaboration with end users to ensure that the final product meets their expectations.

The paper also highlights the relevance of user acceptance testing (UAT) and customer feedback meetings to continuously refine and improve the project. Furthermore, it details the importance of documentation, such as user manuals and workflows, to facilitate the understanding and effective use of the developed application.



## DEDICATION

Als meus pares, Felip i Anna, us dec l'estímul constant, el suport indestructible i l'amor sense reserves. Sense la vostra guia i suport, aquest camí hauria estat molt més difícil de recórrer.

A la meva germana, Laia, per ser una font de suport incondicional. El teu amor i la teva comprensió han estat un far en els moments més foscos.

Al meu avi Antonio, que sempre ha estat a prop en els moments més crucials. La teva saviesa i la teva presència han estat un far guia.

I a la meva iaia Francisca, tot i que ara resideixes entre les estrelles, la teva memòria i el teu esperit continuen donant-me força per continuar endavant. Mai et podré oblidar, iaia

A tots vosaltres, moltes gràcies!



## **ACKNOWLEDGEMENTS**

I would like to thank all the people who have made this project possible.

First of all, to the director of the TFM Jesus Alcober who trusted me to carry out this motivating project and the confidence to accompany me during it. I would also like to thank Ismael Jarauta and David Navarro for their constant support, guidance and advice, always providing quality help. Thanks to them, this project has had good results.

Finally, I would especially like to thank my family and friends for being the main drivers of my dreams and for supporting me in times of failure, encouraging me to continue.





# CONTENTS

<b>1. INTRODUCTION.....</b>	<b>11</b>
1.1. Context.....	11
1.2. Motivation.....	11
1.3. Objectives.....	12
<b>2. STATE OF THE ART.....</b>	<b>13</b>
2.1. Project.....	13
2.1.1. Project Life Cycle .....	13
2.2. Project Management .....	14
2.2.1. History .....	15
2.2.2. PMBOK .....	17
2.2.3. PMI .....	17
2.2.4. ISO 21500 .....	18
2.2.5. PM <sup>2</sup> .....	18
2.2.6. PRINCE2 .....	19
2.2.7. Methodologies .....	19
2.2.7.1. Waterfall .....	20
2.2.7.2. Agile .....	20
<b>3. IMPLEMENTATION.....</b>	<b>23</b>
3.1. Previous Documentation .....	23
3.1.1. NTT DATA Methodology .....	23
3.1.2. CTTI Methodology .....	24
3.1.3. Project Methodology .....	27
3.1.4. Implementation Project.....	27
<b>4. VALIDATION .....</b>	<b>33</b>
<b>5. CONCLUSIONS.....</b>	<b>35</b>



---

# 1. INTRODUCTION

## 1.1. Context

In the era of digital transformation, information, and communications technology (ICT) plays a fundamental role in the development and modernization of public services. Specifically, Spain, like other countries, has experienced a considerable growth in the adoption of ICTs in the governmental sector in the last years. The strategic incorporation of these technologies has been shown to be crucial for improving the efficiency, transparency and quality of the services offered to citizens. In this context, the implementation of new ICT systems represents not only a challenge, but also an opportunity to encourage innovation and progress in public administration. [1][2][3] The Final Master's Thesis (TFM) focuses on the study and management of an ICT project in the public sector in Catalonia, which aims to implement a new system that enhances the efficiency of the services currently available. This initiative is in the context of a growing interest in the digitization and modernization of public administrations of the country.

For this purpose, we will use the experience acquired in the internship at NTT Data company [4], using as a practical case a project contracted by the Catalan public sector. In order to achieve this, it will be based on the guidelines and principles established by the Center for Telecommunications and Information Technologies (CTTI) of the Generalitat de Catalunya [5]. The CTTI, as the entity that centralizes the IT and telecommunications services of the Catalan public administration, has an essential role in the design, coordination, and deployment of technological projects to fulfill the requirements of the different government departments.

The collaboration between NTT Data and CTTI offers a unique opportunity to study and manage the implementation of an ICT project in the Catalan public sector.

## 1.2. Motivation

Since I was a child, I was very passionate and curious about technology, and it was clear to me that my future will be inevitably linked to that fascinating world.

During my undergraduate degree, I maintained an interest in emerging technologies and their potential for changing the world that surrounds us. The Internet of Things, particularly, has attracted my attention for its ability to connect devices, collect data, and provide smart solutions in several fields, including utilities. Combining my passion for technology with the desire to generate a positive impact on the society, I decided to focus my professional career in ICT project management.

While pursuing my master's degree, I had the opportunity to do an internship at NTT Data Corporation, where I was able to apply theoretical knowledge and acquire more practical understanding in the management and implementation of technological applications. The internship allowed me to learn about the ICT

project development process and to understand the real challenges and opportunities that are presented in a real-world environment.

Furthermore, NTT Data's collaboration with the Catalan Center for Telecommunications and Information Technologies (CTTI) to implement ICT projects provides a unique opportunity to investigate and manage relevant cases in the Catalan public sector, given the interest and advancement of technology in the field of public administration. This experience and knowledge acquired during my internship will provide me with a solid foundation for the final thesis of my master's degree.

### **1.3. Objectives**

The objectives are focused on the study and management of an ICT project in the public sector of Catalonia, with the aim of implementing a new system that enhances the efficiency of the services available. To achieve this purpose, the following specific objectives are established:

- Obtain general knowledge about project management.
- Understand the most important methodologies currently in use.
- Detail management methodologies used by the company and CTTI.
- Analyze the phases of the project and its development.
- Focus the study on the tasks performed during the internship.
- Validate the implementation of the system, focusing on the practices performed at NTT Data.

---

## 2. STATE OF THE ART

Project management is becoming essential due to the increasing complexity of modern projects. Technological advances have provided the ability to solve ambitious multidisciplinary tasks, but they have also increased the need of structured and collaborative approaches.

Fast evolving technologies and markets demand faster and more accurate delivery of results, which means that projects must adapt to unexpected changes and emerging opportunities.

Today's reality contains a wide variety of challenges and opportunities, from digital transformation to addressing global issues such as environmental sustainability and cutting-edge healthcare.

For this context, an understanding of the history and methodology of project management is essential to address the challenge effectively and successfully.

### 2.1. Project

Based on PMBOK guidelines [6], a project is defined as a temporary effort that is undertaken to create a unique product, service or result. The temporal nature of projects indicates a beginning and an end to the project work or a phase of the project work. Projects can stand alone or be part of a program or portfolio.

PMBOK, which stands for Project Management Body of Knowledge, is a comprehensive guide developed and maintained by the Project Management Institute (PMI).

It is a basic compilation of knowledge and best practices in the project management discipline. Its main objective is to provide a reliable framework to help professionals and organizations manage projects efficiently and effectively. This guide is not only based on theory, but also draws on the practical experience of project management professionals from around the world. This compilation provides guidance for planning, executing and controlling projects in a variety of industries and environments.

The PMBOK is structured to include the key knowledge areas of scope, time, cost, quality, human resources, communication, risk and procurement management. Each knowledge area is grouped into specific processes that describe the tasks and responsibilities necessary to consistently achieve project objectives.

#### 2.1.1. Project Life Cycle

A project goes through different phases from the beginning until the end of its duration, which are called the project life cycle.

These stages of a project include a set of differentiated processes, but they interact and relate to each other. Stage progress does not always occur

sequentially, but iteratively. Each of the stages can be considered as a small project.

The Project Management Body of Knowledge (PMBOK) divides the project management life cycle into five distinct stages:

- 1) Initiation
- 2) Planning
- 3) Execution
- 4) Supervision
- 5) Closing

The first stage is the definition of the project and ends with the approval of the interested parties.

The second stage, or planning phase, defines the scope and details the objectives and choice of methodology, as well as the actions to be applied to meet the objectives. It ends with the approval and closure of methods, such as employees, dates of objectives and requirements.

This stage can be repeated in case of re-planning in the execution.

The third stage, execution, materializes the previously planned work, implementing the product. It ends with a version of the product.

The control or supervision stage is in charge of the evaluation and review of the progress of the execution to avoid possible risks and to be able to anticipate them by making the necessary changes. It ends with the acceptance of the execution, after repeated evaluation.

Finally, the last stage, the closure, concludes the rest of the previous stages and provides a final version of the suitable product.

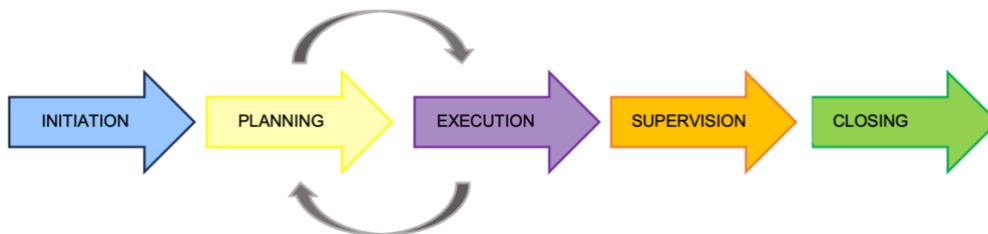


Fig. 1 Project Management Life Cycle

## 2.2. Project Management

Project management is defined by the Project Management Institute [6] as the use of knowledge, skills and techniques to execute projects effectively and efficiently. It is a strategic competency for organizations, enabling them to link the results of a project with business goals to better position themselves in the marketplace.

All projects have constraints that must be considered and investigated to ensure their success.

In the PMBOK, constraints are defined as "the state, quality or feeling of being constrained by some action or inaction. Constraints or limitations applied either internal or external to a project affect the performance of a project or process." Some constraints are "scope," "time," "cost," "quality," "risk," and "communication." [7]

The scope of a project defines the coverage and content of the work to be performed. Understand the project objectives, deliverables, tasks and constraints. Effective scope management involves properly defining and controlling the internal and external content of the project to avoid deviations and unplanned changes.

Time management includes planning, tracking and following up on projects. Establishing objectives, scheduling tasks and allocating resources effectively are key to achieving deadlines. Time management makes it possible to anticipate possible delays and take corrective action if necessary.

Cost management refers to managing and allocating the financial resources needed to implement the project. This includes estimating expenses, creating a budget, tracking actual costs and ensuring that the project stays within the available budget.

Quality management involves defining quality standards and requirements for project deliverables. Ensuring that a product or service meets established expectations and specifications contributes to greater customer satisfaction and overall project success.

Risk management is essential to identify, assess and mitigate potential impediments that could affect project success. It involves anticipating and planning how to manage potential risks (from unforeseen risks to operational risks) and developing strategies to minimize their impact.



Fig. 2 Project constraints

### 2.2.1. History

Throughout history, humans have been involved in a multitude of enterprises and projects, from the construction of the ancient Egyptian pyramids to the development of state-of-the-art modern technology.

The history of project management is summarized by referencing the most important moments by author Duncan Haughey, PMP [8].

- 1) In 1917 the Gantt Chart was developed by Henry Gantt and is still in use today.
- 2) In 1956 the American Association of Cost Engineers, currently AACE, was founded.
- 3) The Critical Path Method (CPM) was invented by Dupont Corporation in 1957.
- 4) In 1958 the U.S. Navy invented the Program Evaluation and Review Technique (PERT), used for the Polaris Submarine Project.
- 5) On this same submarine project, the Work Breakdown Structure (WBS) technique was created and published for later use in 1962.
- 6) In 1965 the International Project Management Association (IPMA) was founded.
- 7) In 1969, the Project Management Institute (PMI®) was founded in the United States.
- 8) In 1975, the company Simpect Systems Limited created the PROMPTII method to try to establish guidelines in the phase flow of a computer project.
- 9) In 1979 the National Computer and Telecommunications Agency (CCTA) of the United Kingdom used this method for all project information systems.
- 10) In 1975, Fred Brooks published the book "The Mythical ManMonth: Essays on Software Engineering. The central theme addressed by Fred Brooks in the book is that "Adding human resources to a delayed software project makes it more delayed".  
He additionally says that the extra time in discussing tasks, commitments, and technical details, as well as evaluating the results becomes exponential as more people are added.
- 11) In 1986 SCRUM first appeared as a project management methodology. It follows an Agile Development approach, focusing on iteration, collaboration and response to change, which is particularly effective in software development environments.
- 12) In 1987 the PMBOOK guide was published by PMI. This was intended as an open book, in order to complement it and also to standardize the practices accepted by the institute in project management.
- 13) In 1989 the procurement department of the U.S. undersecretary of defense incorporated earned value management (EVM) as an important part of its procurement management.



- 14) In 1994 the first CHAOS report was published by the Standish Group in which information was collected on failures in ICT industry projects with the aim of improving the industry and making it more successful.
- 15) The UK Government's Central Computer and Telecommunications Agency CCTA replaced its PROMPTII in 1996 with the improved PRINCE (projects in controlled environments).
- 16) In 1997, Dr. Eliyahu M. Goldratt invented Critical Chain Project Management (CCPM). It addresses the management of uncertainty and time in projects, identifying critical tasks and protecting them from possible delays.
- 17) In 1998 the American National Standards Institute (ANSI) recognized the PMBOK as a standard.
- 18) In 2008 the fourth edition of the PMBOOK was born (PMBOOK 2008).
- 19) In 2008 the European Union published its own PM<sup>2</sup> or Project Management Methodology for public professionals.
- 20) The UK undertook a comprehensive revision of PRINCE in 2009, which was renamed PRINCE2 after the changes were implemented.
- 21) In 2010 the fifth edition of the PMBOOK was developed by PMI.
- 22) In 2011 the new PMI Agile Certified Practitioner credential was launched.
- 23) In 2012, The ISO 21500 Standard was prepared by the ISO/PC 236 Project Committee, Project direction and management. This International Standard provides a high-level description of concepts and processes that are considered to be part of good practice in project leadership and management. [9][10]
- 24) In 2018, the focus of PM<sup>2</sup> was modified intending to be open to both public and private practitioners.

### **2.2.2. PMBOK**

PMBOK is not a specific methodology, but a set of flexible guidelines and methodologies that can be adapted to different types of projects and organizational needs. Its applications provide a common language and framework that facilitates communication among team members and facilitates the standardization of project management practices.

### **2.2.3. PMI**

PMI is an international non-profit organization that brings together professionals involved in project management. Since the beginning of 2011, it is the largest

association in the world and has nearly 500,000 members from almost 100 countries.

#### 2.2.4. ISO 21500

ISO (International Organization for Standardization) is an organization for the creation of international standards composed of various national standardization organizations.

The objective of UNE-ISO 21500 is to identify and sequence tasks within a project.

This standard offers many benefits, such as improved project execution through the transfer of knowledge between projects and organizations, and greater efficiency in the bidding process through the use of a common terminology for project management.

#### 2.2.5. PM<sup>2</sup>

PM2 <sup>[11][12]</sup> is a Project Management Methodology developed by the European Commission. It describes it as "A common Project Management Methodology for all Institutions, Member States, Suppliers and Citizens of the European Union". Its main objective is to provide simple and easy-to-implement solutions so that organizations can manage their projects and resources more effectively. To achieve this, it offers a set of globally recognized good management practices, described in international standards and methodologies such as PMBOK-PMI or PRINCE2, and of course all the experience and rigor of the European Commission.

PM2 is oriented to go one step further than PMBOK methodologies, for example, intended to be a step-by-step guide for the development of a project, rather than a reference guide.

The PM2 Methodology is based on Project Management best practices and rests on four pillars:

- 1) A project governance model (the Roles and Responsibilities).
- 2) A project life cycle (the Project Phases).
- 3) A set of processes (the project management activities).
- 4) A set of Project Artifacts (the documentation templates and guidelines).

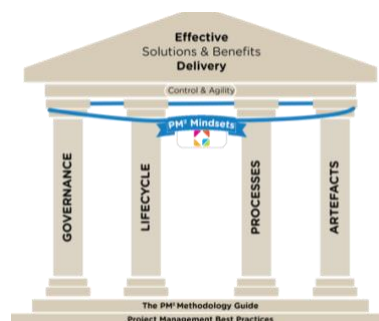


Fig. 3 House of PM2

## 2.2.6. PRINCE2

PRINCE2 is an approach derived from the predecessor PRINCE, which was developed by the UK's Central Computer and Telecommunications Authority (CCTA) in 1989 as a standard for IT systems project management. It is closely related to telecommunications projects. The acronym PRINCE stands for Project in a Controlled Environment, although it is also applied outside the ICT framework.

Born in 1996, PRINCE2 has gained enormous popularity in project management as a general (non-ICT specific) approach. The latest version was revised in 2017. It is a structured, process-based approach covering all aspects of project organization, management and control. Its potential is to ensure that deadlines are met, planning is feasible and cost-effective. To do this, life cycles must be clearly defined in terms of principles, process groups and management domains.

## 2.2.7. Methodologies

Next, it will detail project management methodologies that can be classified into two broad categories: traditional methodologies and agile methodologies.

Both the fundamentals and practical applications of these methods will be addressed, providing a solid foundation for understanding how each fits into different possible project contexts.

In this particular analysis, the main features of each approach will be highlighted along with their advantages and disadvantages. There are many derivative methods and mergers of the main categories, but in this thesis, we will focus on providing a comprehensive overview of the most influential and best-established methods in the field today.

It is important to note that choosing the right methodology for a particular project is not easy and, when exploring a methodology, other factors such as adaptability, flexibility and ability to cope with change will also be considered.

The traditional approach, also known as the waterfall approach, has been the basis throughout the history of project management. These methods are characterized by a sequential and linear approach to project execution, with each phase having to be completed before moving on to the next. In other words, there is no feedback, but rather each stage must be completed and closed completely in order to move on to the next.

Some of the most well-known methods are:

- 1) **Waterfall:** This approach involves linear, orderly phases, from planning to final implementation and delivery. Each stage is completed before moving on to the next.

- 2) **Critical Path Method (CPM):** Focused on the sequence of tasks and the identification of the critical path to minimize the total project duration.
- 3) **Critical Chain Project Management (CCPM):** Focuses on resource management and identification of bottlenecks, with the objective of optimizing resource efficiency.

#### 2.2.7.1. *Waterfall*

The Waterfall approach, often referred to as "Waterfall", is a traditional framework methodology that was first implemented in 1970 by Winston W. Royce and quickly began to be adapted to a wide variety of industries due to its logical sequence and ease of implementation. [13][14]

The phases that make up the methodology follow a sequential process in a single direction, and without the possibility of returning to the previous one. This linear approach begins with planning and designing, followed by implementation, testing and final delivery.

- Requirements: Project or phase definition and start-up approval.
- Design: Development of management plans.
- Implementation: Execution of the tasks planned in the previous point with the objective of completing the deliverables.
- Testing: Supervision of the executed tasks and comparison with the planning. At this point, corrective measures should be applied in case of deviations.
- Maintenance: Completion of the phase or project, which occurs in three situations: when the approval and set of deliverables is achieved; when it is not possible to execute some or all of the planned tasks; or when the project loses viability.

The most outstanding advantages of the Waterfall methodology is that it is one of the simplest models to manage since each phase has specific deliverables. In addition, planning and scheduling is much easier because the project requirements are agreed upon in the first phase. These features prove useful for smaller projects, allowing easy measurement of progress towards objectives.

Some disadvantages are that it is not a model oriented to large projects, since it is not very effective, because if the requirements are not clearly established from the beginning, changes should be made. That is why the methodology is considered linear and rigid, lacking flexibility to adapt to unexpected events.

Nowadays, this methodology is still used in projects in which the final objective is totally clear and defined.

#### 2.2.7.2. *Agile*

Agile methodologies emerged as a response to the limitations of the traditional methodology in the field of project management. The traditional approach, as it has been observed, presents certain restrictions in its capacity to overcome

adaptability, uncertainty triggered by the changes in the market and technology on a daily basis. In a world where agility and innovation are essential, agile methodologies have gained importance.

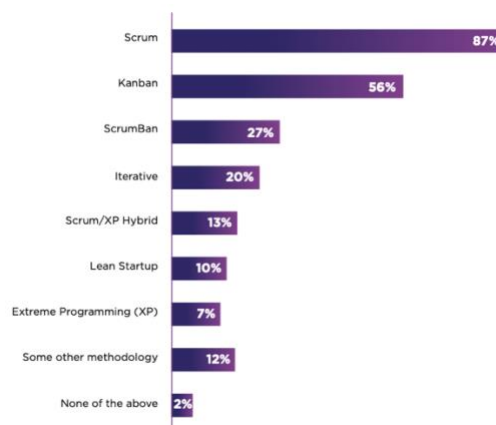
These methodologies recognize that the nature of modern projects often involves the necessity to adapt and change as circumstances evolve. They are based on principles such as adaptability, collaboration and continuous delivery of value.

Rather than relying on detailed planning from the outset, agile methodologies promote flexibility and constant adjustment. Multidisciplinary teams work together in short, iterative cycles, producing incremental project deliverables. This approach allows for greater interaction with customers and stakeholders, which in turn leads to a greater understanding of requirements and the ability to make adjustments on the fly.

Agile methodologies are not only relevant in software development but have also proven their effectiveness in a variety of fields, from construction project management to digital product creation. Some of the key principles guiding these methodologies include prioritizing people and interactions over processes and tools, delivering functional software continuously, collaborating with customers, and responding quickly to change.

The Agile Manifesto or Manifesto for Agile Software Development is a fundamental pillar of agile methodologies. It sets out four core values and twelve principles that define the agile philosophy and approach to project management. This manifesto acts as a beacon that guides teams towards adaptability and constant value delivery. (For a more detailed look at the Agile Manifesto see Annex 1)

There are many agile methods, which have in common the reduction of risks, based on iterations and the collaboration of all involved as a single team. Below is a graph representing the most used agile methodologies in the past year 2022, based on the results of the "State of Agile" study conducted every year by Version One. [15]



**Fig. 4** Results of the "State of Agile" study 2022

After understanding the principles and underlying philosophy of agile methodologies, we can jump into one of the most popular and widely used agile methodologies today: SCRUM.

This methodology stands out for its focus on adaptability, collaboration and continuous delivery of valuable results. SCRUM, which has become a benchmark in project management, is characterized by its flexible structure and iterative practices.

In Scrum, regular, partial deliveries of the final product are made, prioritized by the benefit they bring to the recipient of the project. Therefore, Scrum is particularly suitable for projects in complex environments, where results need to be obtained quickly, where requirements are changing or poorly defined, where innovation, competitiveness, flexibility and productivity are essential.

When exploring SCRUM and its application in different contexts, it is essential to understand its structure, roles and ceremonies, as well as the advantages it offers to manage projects in an agile and successful way. (For more information see Annex 2)

## 3. IMPLEMENTATION

This chapter presents a detailed description of the tasks performed during the internship at NTT Data. This internship took place in the public sector, specifically in a new system implementation project.

Project management in the public sector is essential to ensure the efficient use of public resources, compliance with deadlines and the effective implementation of projects that benefit communities and citizens. It also plays a vital role in transparency and accountability, as government projects often involve public funding.

The implementation was contracted by the Centre de Telecomunicacions i Tecnologies de la Informació de Catalunya, also known as CTTI.

CTTI <sup>[16]</sup> is the public company that integrates all the IT and telecommunications services of the Generalitat de Catalunya. It is responsible for designing, building, coordinating and deploying technological projects to provide solutions to the departments and different bodies of the public administration.

It is attached to the Presidency Department.

CTTI is responsible for the management, coordination and technological modernization of the telecommunications services and information systems of the Generalitat, following a Pla Global de Transformació (PGT) that aims to achieve savings, efficiency and innovation in six areas:

- Workplaces
- Applications
- Telecommunications
- Data Processing Center
- Policies and standards
- ICT management and control tools

The implementation project will be assigned to a specific Department of the Generalitat. From now on the Department will be referred to as Department A.

### 3.1. Previous Documentation

#### 3.1.1. NTT DATA Methodology

NTT DATA is a leading global information technology and business services company with a presence in more than 50 countries around the world. It was founded in Japan and has become a key player in the consulting and technology industry. The company offers a wide range of services, including consulting, systems development, project management and customized technology solutions for a variety of industries.

The company's project management methodology is a key component of its success in delivering efficient, high-quality technology solutions to its clients.

COM (Corporate Methods) is NTT Data's proprietary methodology, developed by combining experiences gained in real project situations to reduce problems or risks during project execution. Its use is the best way to guarantee project development in terms of time, quality and budget.

COM methods are grouped into three families, depending on the type of projects: IT Methods, Management Methods and Strategy Methods.

COM allows managing and executing any of the different types of projects/services performed by the company.

Given that the project being worked on is a development and implementation project, the minimum deliverables suggested by the company's methodology to meet minimum quality requirements are the following:

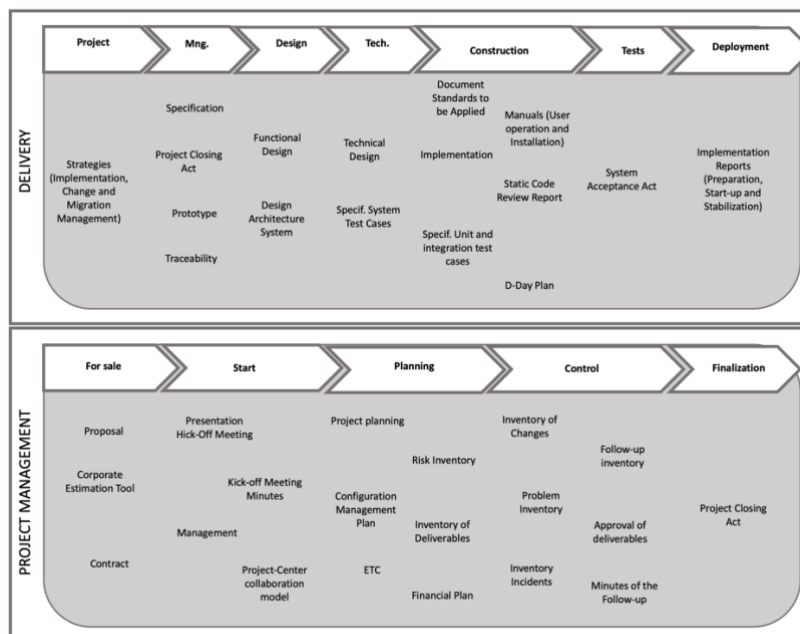


Fig. 5 COM Methodology

### 3.1.2. CTTI Methodology

The Telecommunications and Information Technology Center of Catalonia, known as CTTI, performs a central role in the management and modernization of information technology and telecommunications in the Generalitat de Catalunya.

As a public entity attached to the Department of Presidency, CTTI is responsible for designing, coordinating and carrying out technological projects that provide solutions to various departments and agencies of the public administration. Within the framework of this collaboration with CTTI, it is crucial to understand the methodology used by this entity for the execution of technological projects.

This methodology not only influences how the project is planned and executed, but also has an impact on the quality of the results and the efficiency in the use



of public resources. The following is a description of the CTTI methodology and how it was integrated into the Department A project.

CTTI follows an Agile Work Model. From Qualitat i Mètodes we are working on the Agile approach for the development of solutions, making a proposal of methodology, implementation, roles and responsibilities and tools. This initiative has resulted in the SCRUM/CTTI proposal, which is based on the Dual Track Scrum model:

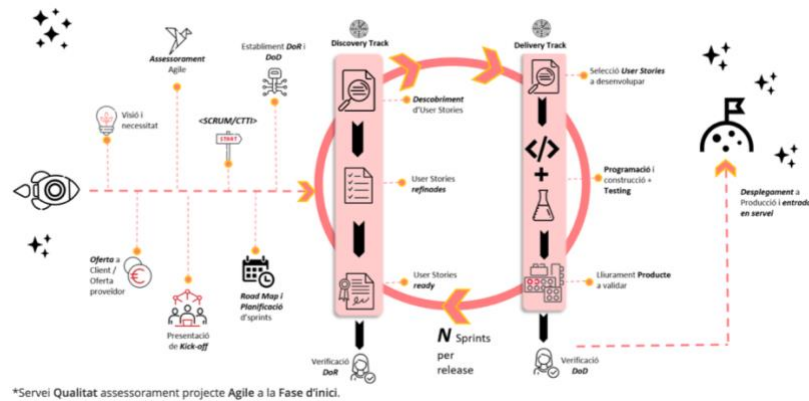


Fig. 6 SCRUM/CTTI [17]

From the CTTI body provides accessible information regarding agile techniques, as shown in the previous axis. This information can be consulted by the departments themselves and applied in their daily work.

There are three main axes of execution: the identification of the agile model chosen is the most appropriate, the evaluation of the maturity of the agile process during the execution of the project and the discovery of requirements with agile methodologies. (More information on the support offered can be found in Annex 3)

Scrum is a reference model that defines a set of practices, where each participant assumes a role (Scrum Master, Product Owner, Development Team, ...), this allows to adapt to the needs and preferences of each team or organization. From Qualitat solutions of CTTI they propose the use of the <SCRUM/CTTI> model:

- <SCRUM/CTTI> is based on Dual Track Scrum which is an agile organizational model that separates the effort to "discover" and "define" a "user story" from the effort to "deliver" and "build" the product.
- It consists of two tracks of activity: discovery and delivery.

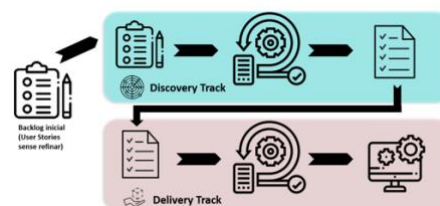


Fig. 7 Dual Track Scrum [18] (For more information, see Annex 4)

A relevant component for understanding the management of project phases is the project life cycle. A product has a specific life cycle, from the moment the need or opportunity that motivates it is identified to the moment it no longer provides value. The following is a description of the product life cycle at CTTI.

### CICLE DE VIDA DEL PRODUCTE . Visió centrada en els usuaris

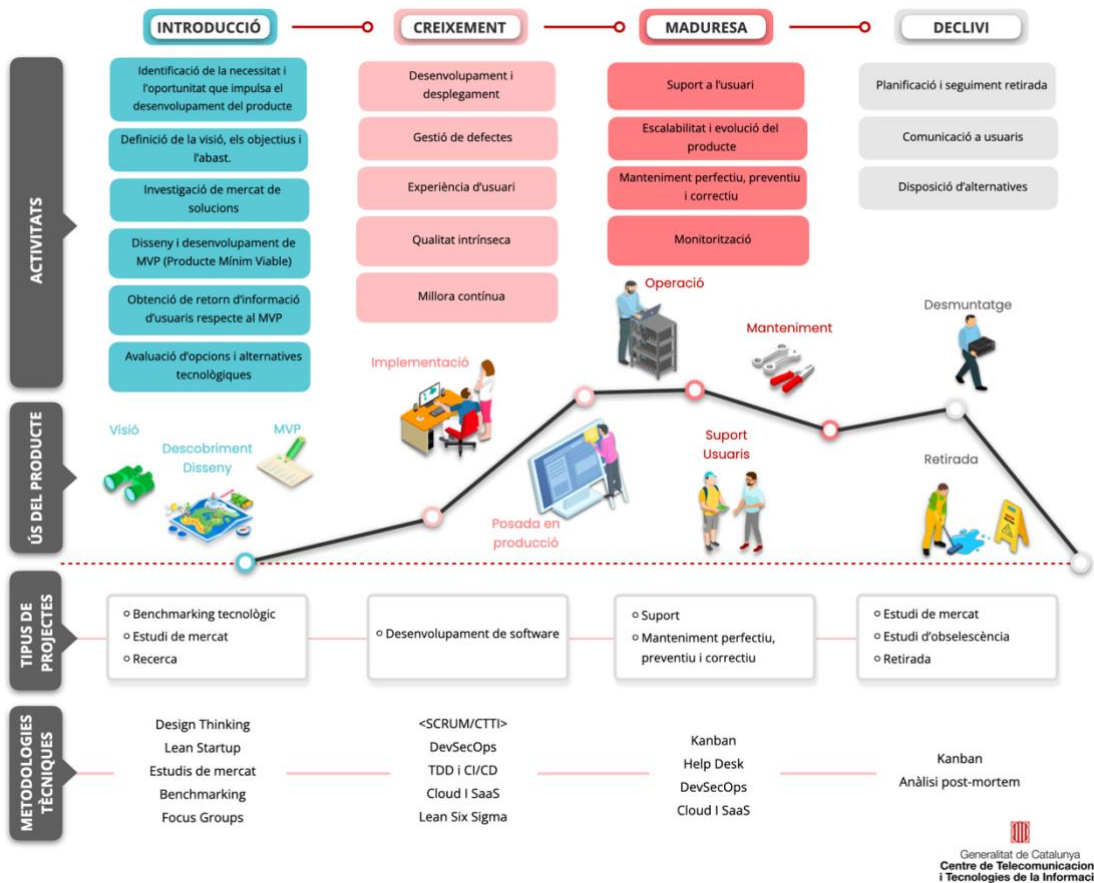


Fig. 8 Product life cycle [19]

To ensure the quality of the project, the Quality Gate is essential. The question to be answered is: can I deliver my project to production? To answer this question, a set of Boolean conditions based on measurement thresholds are defined.

On the one hand, for Agile models, QA proposes the DoD and DoR, on the other hand, for Waterfall models they propose 6 different scenarios for the Quality Gates.

Focusing on the implementation project they have been working on during the internship, let's see the graph they present.

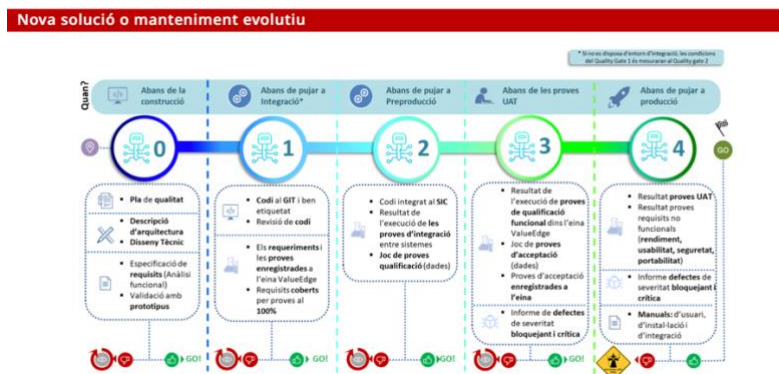


Fig. 9 New solution or evolutionary maintenance [20]

(For more detailed information on other scenarios, see Annex 5)

### 3.1.3. Project Methodology

The collaboration between NTT Data and CTTI for the development and implementation of Department A is based on the integration and complementarity of their methodologies. Mainly, the CTTI methodology is followed, which was already aligned with the particularities of the public sector. However, when areas or aspects were identified where NTT Data's own methodology, known as COM (Corporate Methods), offered additional value, these elements were incorporated on an ad hoc basis.

On NTT Data's side, daily's conducted every day at the same time with the entire team working on the project are added to comment on 3 key aspects.

- 1) Previous Day's Accomplishments: each team member reported on what they accomplished the previous day.
- 2) Current Day's Objectives: The objectives for the current day were discussed.
- 3) Potential Obstacles: Any obstacles or challenges that could affect progress were identified and addressed.

These meetings provided a real-time view of the project's progress and allowed for quick decision-making to overcome obstacles.

### 3.1.4. Implementation Project

NTT DATA presented a document as a proposal to respond to the following shortcomings of the current system available to Department A.

- Difficulty in the consolidation of the interrelations between the administration and the students of sector A. The current model does not allow the consolidation of the telematic model so that it becomes the usual form of relationship between the Department and the students, nor the improvement of the services to be offered by the administration, currently limited due to the technological obsolescence of the applications and support tools.

- Impossibility of achieving totality in Academic Management and Competency Management. The current application responds to a part of the Academic Management, but not in its totality, and does not have a solution implemented by the Competence Management. These needs cannot be carried out in the current system given its technological limitations.
- Technological obsolescence. The current application and support tools are developed with an obsolete technology and architecture that penalizes the A sector and students in their digital transformation and in overcoming the digital divide.
- Difficulty in integration and communications with other systems. The current model does not favor intercommunication and integration with other information systems.
- Need to increase efficiency and effectiveness in the management of competency-based training in order to adapt to new regulations and organizational changes. The current model is not very flexible and does not provide the necessary facilities or the appropriate degree of autonomy to be able to implement changes in an agile and efficient manner.
- Exhausted system life cycle. The continuous regulatory changes implemented during all these years in the current application and support tools have been adding a high complexity, which means that any change in regulations implies a traumatic action in the current applications and support tools, with a high cost, both in terms of construction and quality control to provide a correct service.

The proposed solution is a new system that we will call System A, which should cover the entire management academic and the for the management of competencies.

In this TFM, functional tasks have been developed to support. First, it started with the writing of use cases.

A use case represents how a type of user will use the system to be developed to perform a task. In its initial version it will include the title and a textual description. As the analysis progresses, the basic flows, alternative flows, etc., will be incorporated.

The format used is the one provided by CTTI as a template (See: Annex?).

Defining a use case in a complete and structured way is essential to ensure effective communication between the development team and the functional team. Some important aspects to consider when detailing the flows of a use case are the following:

- 1) Clarity and Consistency: Simple language should be used and ambiguities that may generate confusion should be avoided.
- 2) Flow Diagrams: It is considered to use flow diagrams to visualize the processes in a clearer way and to understand the change of state of the procedures in this particular case. A flow chart can encompass a large number of use cases.

- 3) Sequence of Steps: The specific steps that must be followed to complete the use case should be detailed. The more detailed this is, the less confusion will arise.
- 4) Inputs and Outputs: The required inputs and expected outputs for each use case should be specified.

A well-defined use case not only reduces the possibility of misunderstandings, but also serves as a valuable reference for the development team throughout the project life cycle.

A use case extracted from the application under development for subsequent implementation is the modification of a student's data.

The detailed use case is shown in table.

Nom del cas d'ús	Modify data of a student
Descr. del cas d'ús	The purpose of this use case is to indicate the procedure to be followed by the user to modify the information associated with a student.
Actors participants	
Flux d'esdeveniments bàsic	<ol style="list-style-type: none"> <li>1. The user accesses to view the data of a student (See use case: "xxxxx").</li> <li>2. The user clicks on the "Modifica" button and the screen is displayed with the fields in editable format with the "Cancel·la" and "Guardar" buttons.</li> <li>3. The user updates the data and presses the "Guardar" button.</li> <li>4. The application displays a dialog box with the text "Confirmeu que voleu continuar?" and the "Confirmar" and "Cancel" buttons.</li> <li>5. The user clicks the "Confirmar" button.</li> <li>6. The dialog box closes and the student's file is displayed with the updated data, showing at the top the message "Les dades han estat modificades correctament". This message will disappear after 15 seconds.</li> </ol>
Fluxos alternatius	<ul style="list-style-type: none"> <li>• If at point 5 the user presses the "Cancel·la" button, the application closes the dialog window.</li> <li>• In point 5, if the user has not filled in a mandatory field, the application will mark the field in red color and will display at the top of the screen the message: "Cal omplir tots els camps obligatoris". This message will disappear after 15 seconds.</li> </ul>
Cond. entrada	
Cond. sortida	<ul style="list-style-type: none"> <li>• The student's data is modified correctly.</li> </ul>
Requisits vinculats	

The data of the participating actors and binding requirements have been removed for privacy reasons.

The original functional document of the project with which we have been working has a volume of 151 use cases.

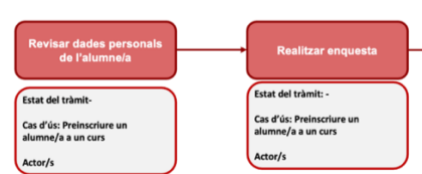
Given the high number of use cases and the number of steps that encompass many of them, the decision was made to create flowcharts for their global understanding and to allow a global understanding of where the singular use case itself is located.

This allows a more exhaustive tracking of the input and output of each of the cases and to know the origin of each of the states.

The following image shows a practical example of a flowchart used. It corresponds to the enrollment of a student. It should be noted that some data have been suppressed for privacy, although the most important elements and components are shown in the figure.

As can be seen, the red box indicates the action being performed and is accompanied by a gray box that indicates the status of the process as it is at the time of entry, the use case we are dealing with and, finally, the actors involved in it.

This diagram can be preceded by another diagram.



**Fig. 10** Piece of flux diagram example

All these use cases will be checked one by one to verify their correct operation. For this purpose, CTTI provides the ValueEdge tool where all the use cases must be introduced.

ValueEdge allows to perform all the management through workflows defined for each entity (Requirements, Tests, Defects...).



**Fig. 11** ValueEdge [21]

For each different use case you must enter the number of tests necessary to cover all possible flows.

You will always have the flow in which everything is done correctly and the flow of pressing the close button.

Let's see the necessary test cases that have been entered for the previously presented use case of modifying a student's data.

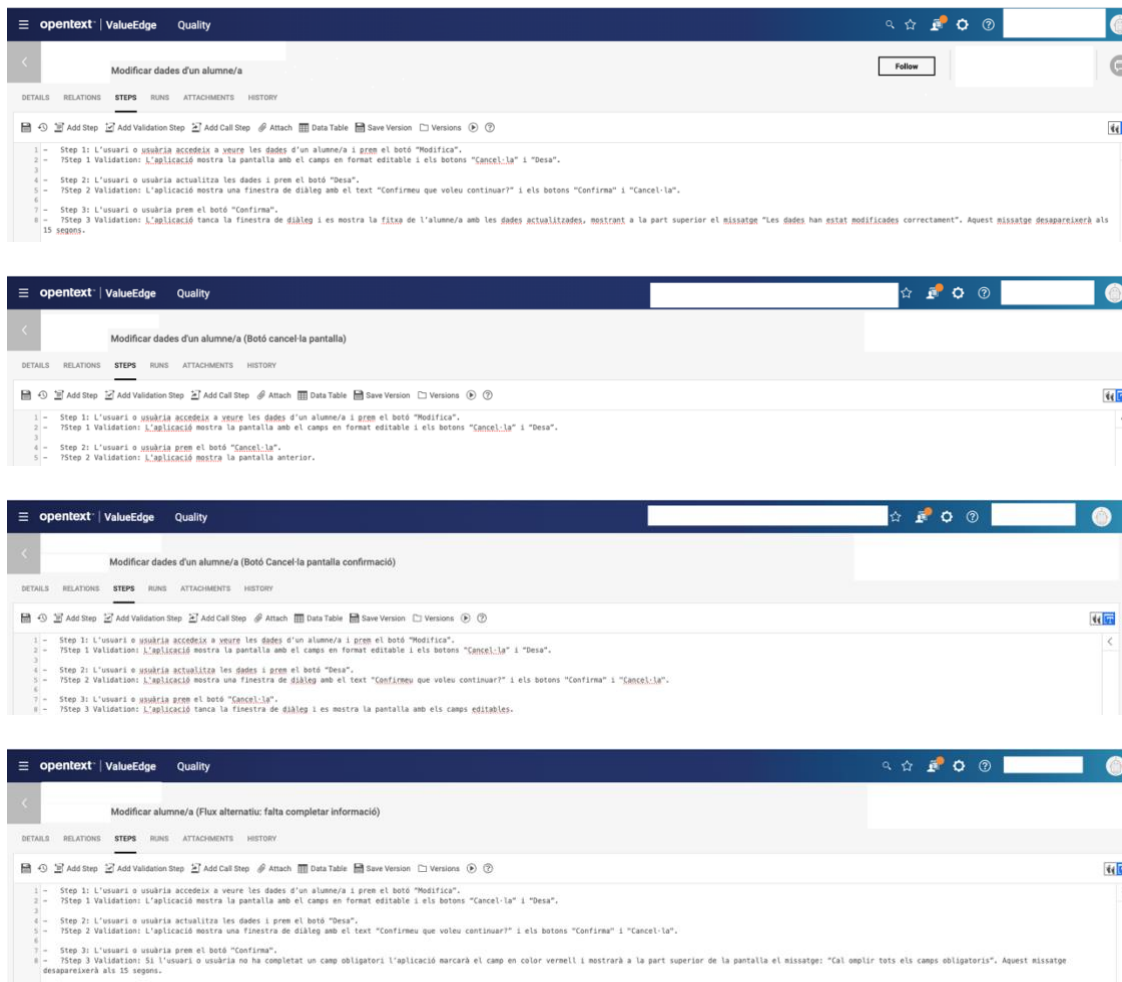


Fig. 12 Test cases for the use case

As can be seen in the following figures, for this particular use case, four test cases must be prepared for evaluation.

First, the ideal flow, where the user correctly modifies the data and saves it.

In the event that the mandatory data are not completed, when the confirmation button of the pop-up window is pressed, the application will warn that they must be filled in and will indicate this in red.

If it is necessary to modify a student's data and just before clicking on the confirmation button of the pop-up window you decide to go back to make more changes, you can click on the cancel button.

Finally, if you wish to go back to the previous page and not make any changes, click on the cancel button.

The structure used to enter the test cases in the ValueEdge tool is as shown in the pictures. First, there is the step performed by the user interacting with the application, followed by the validation step, which is the one performed by the application as it has been programmed.

For a user manual of the ValueEdge tool, please consult the link.

An important part performed by the functional team is the testing, that is, the testing of the application.

To do this, there is no standard to be followed by the company, but for a better organization of the components that perform the tests, some criteria to be followed are agreed upon.

All the parts involved in the application must be checked, whether it is the aesthetic part or the more functional part.

Aesthetics refers to the colors used, font sizes, spelling, menus, types of buttons, types of drop-downs, types of alerts and notifications established among other aspects to be taken into account.

Functionality is the verification of the correct realization of the flow defined in the use cases.

For this case study, NTT Data's monitoring of the tests is done in excels. For each test detected, it is noted whether it is correct or not. If it does not act as it should or does not conform to the expected aesthetics, the problem and the version number of the tested application are noted.

The problems found, more technically known as bugs, must be reported to the development team for further improvement.

**Description.**

By not entering all the required fields of the student's information, the alert message and the red checkboxes do not appear once an attempt is made to confirm the modification.

**Steps to reproduce it.**

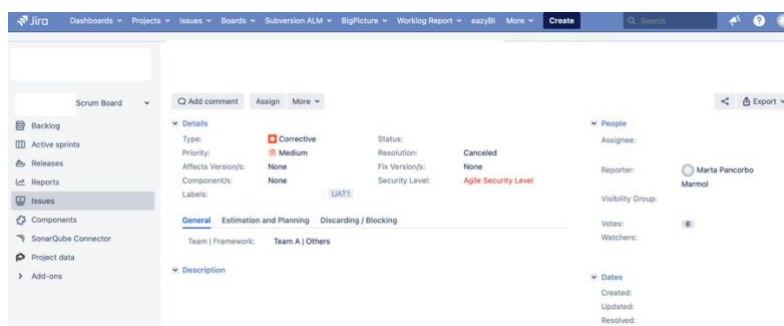
1. Access the application.
2. ...
3. Modify the student's data.

**Current result.**

The data to be completed do not appear in red, nor the warning message that it is necessary to fill in all the required fields to save correctly.

**Expected result.**

The data to be completed appear in red and the alert message that it is necessary to fill in all the obligatory fields to save correctly.



**Fig. 13** Bug report in JIRA



## 4. VALIDATION

User Acceptance Tests (UATs) take a critical role in the project development process. These tests provided a fundamental scenario where part of the functional team and CTTI and people representing department A come together to evaluate the progress of the project and make sure that each sprint meets the expectations and needs of the users.

At the end of the first sprint, i.e., the first agreed part of the development with the customer in the planning, the UAT session is established.

In these sessions, NTT Data presents the status of the application and its functionality, to be later evaluated by the client.

In these sessions, the client is provided with enough knowledge to test the application for a couple of days and then hold a meeting to discuss any doubts that may have arisen.

In order for the users testing the application to feel more confident, a user manual is provided.

The user manual follows the template provided by CTTI ([https://qualitat.solucions.gencat.cat/procediments/manual\\_usuari/](https://qualitat.solucions.gencat.cat/procediments/manual_usuari/)).

The following figure shows a practical example for the use case Modify student's data.

### 3.1.1.5 *Modificar dades d'un alumne/a*

#### 3.1.1.5.1 *Descripció*

Aquesta funcionalitat indica el procediment que ha de seguir l'usuari o usuària per modificar la informació associada a un alumne/a.

#### 3.1.1.5.2 *Perfils d'Usuaris Autoritzats*

Actors o actores participants d'aquesta funcionalitat són

#### 3.1.1.5.3 *Operativa de la Funcionalitat*

Aquesta funcionalitat permet la modificació de les dades de l'alumne/a. La pantalla conté la mateixa informació que es mostra a "[Consultar dades d'un alumne/a](#)". Per accedir a l'edició, s'ha de realitzar una consulta per a l'alumne/a concret i pressionar el botó "Modifica".

Modificats els camps s'ha de prémer el botó "Desa" per a emmagatzemar-los correctament. Aleshores apareix una finestra de diàleg per a confirmar la modificació.

*Il·lustració 37: Finestra de diàleg confirmació modificació alumne/a*

**Fig. 14** User manual

The feedback meeting held after testing by the customer is important to determine how the application evolves and if it really fits what they expected from it.

On NTT Data's side, it can be used to evaluate how the sprint has been executed and completed. These meetings are usually held with the whole team together. Each component, whether development or functional, must think of aspects to improve and aspects to continue for the next sprint to be developed.

This gives a voice to those components that often in the daily work do not have a voice in the meetings, but their opinion is important and relevant to improve and continue forward with the project.

## 5. CONCLUSIONS

In the development of the Master's Final Project, an exhaustive analysis of the management of implementation projects in the public sector has been carried out, focusing on a specific project for the Department A of the Generalitat de Catalunya. During this process, several management methodologies have been explored and applied, highlighting the collaboration between NTT Data and CTTI as an effective strategy to improve efficiency and quality in the execution of the project.

Several significant contributions have been identified in the development and implementation of this project. Firstly, the integration of NTT Data's COM methodologies and CTTI's Agile approach has proven to be an effective strategy for addressing the challenges and complexities associated with projects in the public sector. This combination of approaches has allowed for greater adaptability, resulting in improved responsiveness to changing requirements and increased customer satisfaction.

In addition, the importance of collaboration with end-users at all stages of the project has been emphasized. This collaboration has ensured that the final product meets the expectations and needs of the users, which is essential in the context of public administration, where transparency and accountability are key.

Despite the successes achieved in this project, there have also been challenges and aspects that did not work as expected. One of the main challenges was managing the inherent complexity of projects in the public sector, especially in terms of process alignment and legacy technology. This complexity often resulted in delays and changing requirements.

Based on the lessons learned and results obtained in this thesis, several promising lines for future developments and research in this field are identified:

- **Data Management:** Investigate more advanced approaches to data management in public sector projects, focusing on data security and user privacy.
- **Change Management:** Proactively address change management in implementation projects, anticipating and mitigating resistance to change and ensuring a smooth transition.
- **Continuous Improvement:** Establish a continuous improvement cycle to constantly evaluate and improve project management processes in the public sector.



# ANNEXES

**TITLE:** Management of an ICT project in the public sector implementing a new system

**MASTER DEGREE:** Master's degree in Applied Telecommunications and Engineering Management (MASTEAM)

**AUTHOR:** Marta Pancorbo Marmol

**ADVISOR:** Jesús Alcober Segura

**DATE:** September, 8th 2023



## ANNEX 1: AGILE MANIFESTO AND AGILE PRINCIPLES

The "Agile Manifesto" is a fundamental document that encapsulates the key principles of agile methodologies. It was developed and approved in 2001 by a group of visionary business leaders [20], whose contributions revolutionized the way software development projects are approached. The founding members of the Agile Manifesto are Kent Beck, Mike Beedle, Arie van Bennekum, Alistair Cockburn, Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith, Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert C. Martin, Steve Mellor, Ken Schwaber, Jeff Sutherland and Dave Thomas.

This manifesto aims to promote values about processes, tools, negotiations and planning in project development, and is synthesized into four core values:

- 1) **Individuals and interactions over processes and tools:** Rather than focusing on rigid processes and tools, more value is placed on collaboration and effective communication among the people involved in the project.
- 2) **Working software over comprehensive documentation:** Instead of creating extensive documentation, the delivery of functional and usable software is prioritized as a measure of project progress and success.
- 3) **Collaboration with the customer over contractual negotiation:** Rather than establishing rigid contracts, active collaboration with the customer is encouraged to understand and meet their changing needs.
- 4) **Response to change over following a plan:** Instead of following a rigid plan, it adapts flexibly to changes and challenges that may arise during project development.

This agile approach seeks to leave behind bureaucracy and traditional, static methods, prioritizing agility and adaptability as key elements in project management.

The twelve principles derived from the Agile Manifesto are based on the four values mentioned above and are as follows:

- 1) **Customer Satisfaction:** The top priority is to satisfy the customer through early and continuous delivery of valuable software.
- 2) **Acceptance of change:** Changing requirements are welcomed, even if they come late, as agile processes adapt to change as a competitive advantage.
- 3) **Frequent delivery:** Working software is delivered in short intervals, preferably a few weeks to a few months.
- 4) **Collaboration:** Business people and developers work together continuously throughout the project.

- 5) **Motivation and support:** Teams are built around motivated individuals, providing them with the opportunity and support necessary to perform their work effectively.
- 6) **Effective communication:** Face-to-face conversation is considered the most efficient and effective way to communicate information within the development team.
- 7) **Working software:** Working software is the primary measure of project progress.
- 8) **Sustained development:** Maintaining a constant pace of development is encouraged indefinitely, involving sponsors, developers and users.
- 9) **Technical excellence:** Continuous attention to technical excellence is essential to maintain agility.
- 10) **Simplicity:** Maximizing the amount of work that is not done is considered an art form, encouraging simplicity at all times.
- 11) **Self-Organization:** The best architectures, requirements and designs emerge from teams that self-organize and collaborate effectively.
- 12) **Reflection and adaptation:** The team regularly reflects on its performance and adjusts its behavior accordingly to continuously improve.

These principles form the basis of agile methodologies and have transformed the way software development projects and, in many cases, projects in other fields are approached. Adopting these values and principles can drive efficiency, customer satisfaction and adaptability in any project environment.



---

## ANNEX 2: SCRUM

SCRUM is one of the most popular and widely used agile methodologies in project management. Its focus on adaptability, collaboration, and continuous delivery of valuable results has made it a leading choice for a wide range of projects, from software development to construction project management. To fully understand how SCRUM is applied in practice, it is essential to explore its structure, roles and ceremonies, as well as the advantages it offers for managing projects in an agile and successful manner.

SCRUM is based on a flexible structure and relies on three key components:

### 1) Roles in SCRUM

- Scrum Master: Acts as the facilitator and leader of the SCRUM team. His main objective is to remove obstacles and ensure that the team can work efficiently and smoothly. In addition, the Scrum Master promotes understanding and adherence to agile principles. His role also includes fostering continuous improvement and ensuring that the team follows SCRUM practices effectively.
- Product Owner: Represents stakeholders and is responsible for defining the product's functionality and priorities. He works closely with the development team to ensure that the product meets customer expectations. The Product Owner also manages the Product Backlog and makes key decisions on what features should be included in the sprints.
- Development Team: A self-organized group of professionals who perform the actual work on the project. They are multidisciplinary and are responsible for delivering product features at the end of each sprint. The team organizes itself and makes internal decisions to meet the sprint objectives.

### 2) SCRUM Ceremonies

- Sprint Planning: At the beginning of each sprint (predefined time period, usually 2 to 4 weeks), the SCRUM team and the Product Owner meet to define what functionality will be addressed during that sprint. Clear objectives are established and the Sprint Backlog is created, which is a list of tasks that the team commits to complete during the sprint. This ceremony facilitates the alignment of objectives and the planning of the work to be done.
- Daily Standup: Every day, the SCRUM team gathers for a brief meeting (usually about 15 minutes) in which each member shares what they have done, what they plan to do, and if there are any obstacles impeding them. This meeting promotes communication and

transparency within the team, allowing everyone to be informed about progress and challenges.

- Sprint Review: At the end of each sprint, a review is conducted in which the team demonstrates the completed features to the Product Owner and other stakeholders. This allows for feedback and adjustment of priorities for future sprints. The review is also an opportunity to celebrate the team's accomplishments.
- Sprint Retrospective: Also at the end of each sprint, the SCRUM team reflects on its performance and looks for ways to improve the process in the next sprint. This promotes continuous improvement and learning, allowing the team to adapt and evolve over time.

### 3) **SCRUM Artifacts**

- Product Backlog: This is a complete list of all the features, enhancements and fixes needed for the product. The Product Owner is responsible for prioritizing and keeping this backlog up to date. The Product Backlog evolves over time as more information is obtained about customer needs and changing project circumstances.
- Sprint Backlog: This is a more specific list of tasks taken from the Product Backlog for the current sprint. The team commits to completing these tasks during the sprint. The Sprint Backlog is an essential tool for managing the work within the sprint and ensuring that the objectives are met.
- Product Increment: This is the tangible result of the work performed during the sprint. At the end of each sprint, the product should be in a usable and potentially deliverable state. This means that real value has been added to the product with each iteration.

The practical application of SCRUM involves running multiple sprints in sequence, each of which produces an incremental product. During each sprint, the team focuses on meeting the sprint objectives and delivering real value at the end of the period. This continuous delivery of partial deliverables allows for greater interaction with customers and stakeholders, which in turn leads to a greater understanding of requirements and the ability to make adjustments on the fly.

SCRUM is especially suited for projects in complex environments, where requirements are changing or loosely defined. The methodology allows for greater adaptability as you learn more about the project and its challenges.

## ANNEX 3: Resources for Assessing Agile Methodologies Maturity

In the context of project management and the adoption of agile methodologies, it is essential to have tools to assess and improve the maturity of these methodologies in a project. The Center for Telecommunications and Information Technologies of Catalonia (CTTI) offers valuable resources for this purpose, which facilitates the process of implementation and monitoring of agile practices in projects. The resources provided by CTTI are described below:

### 1) Agile Methodology Maturity Assessment

The official CTTI website offers support for assessing the maturity of the agile methodology in a project. Through a step-by-step procedure, project teams are guided to carry out this assessment effectively. The following is a detailed description of how to do it:

#### Support per avaluar la maduresa de la metodologia agile d'un projecte



If the project is already underway, CTTI provides detailed support guidance that allows teams to assess and improve the maturity of their agile approach. This guide provides practical guidance on how to adjust and optimize agile practices during project execution. Access to the support document is provided below:

#### Support per avaluar l'enfocament agile d'un projecte



### 2) Requirements Discovery and Analysis with Agile Techniques

CTTI recognizes that, in some traditional projects, specific Agile practices may be desired in certain areas, such as requirements management. To address this need, CTTI offers an approach called "Requirements Discovery and Analysis with Agile Techniques".

This approach covers key aspects of requirements management and seeks to leverage the benefits of agility at this stage of the project. (Key points covered in this approach include): [22]

### Descobriment i anàlisi de requisits amb tècniques àgils

- Revisar o crear la visió del producte
- Planificació dels sprints
- Validació dels lliurables
- Full de ruta
- Refinament
- Retrospectiva

In each of the links provided, detailed information on how to apply these agile practices in requirements management can be accessed. This allows teams to combine agile elements in projects that follow a traditional approach in other areas, thus optimizing the development process.

#### Revisar o crear la visió del producte

##### Revisar o crear la visió del producte

Revisar el document de **Visió i necessitats**, o bé crear-lo si no existeix.

#### Perfils Participants



#### Full de ruta

##### Descripció

Sessió de disseny del roadmap de l'aplicació, durant la sessió es realitzarà un resum gràfic on mostrar la relació de les versions amb els evolutius/projectes que es volen realitzar. Aquests nous requeriments els mostrarem com a èpiques del producte.

##### Tècnica a emprar: Mapatge d'històries

El mapatge d'històries mostra gràficament la relació entre les èpiques, històries i les versions a lliurar. A l'eix horitzontal es mostren les diferents versions planificades i a l'eix vertical les èpiques i/o històries. A l'interior de la gràfica s'afegeixen les històries que s'han de realitzar.



Referència: <https://jpattonassociates.com/user-story-mapping/>

##### Freqüència i durada



##### Assistents



## Planificació dels sprints

**Planificació dels sprints** mitjançant la creació del pla global de sprints (mapa). A tenir en compte que hi poden haver dos possibles escenaris:

- Temps limitat i abast tancat
- Temps limitat i abast flexible, és a dir, es poden deixar requeriments per següents versions.

### Descripció

A l'inici del projecte, el Product Owner amb l'equip **estimen l'esforç a alt nivell** que requerirà el refinament dels requisits de la versió i d'acord amb la disponibilitat el nombre de sprints que es necessitaran. Un cop definits els sprints i la prioritat del backlog del producte, Negoci ho ha de validar.

### Tècnica a emprar: Planning Poker

Una per una es llegeixen i discuteixen les històries d'usuari / Èpiques. Un cop tots tenen clar en què consisteix, cada un tria una carta en funció de l'esforç que preveu requerirà aquesta història d'usuari. Si no hi ha consens, es farà la mitja de les estimacions i s'arrodonirà al valor més alt.



## Refinament

### Descripció

Es realitza el **refinament** dels requisits. Es faran **workshops** (sessions de treball) diàries i amb la tècnica del **INVEST** obtindrem històries d'usuari ben refinades.

### Tècnica a emprar

#### Workshops de User Experience

- Les sessions de treball seran sobre una temàtica concreta.
- Durant la sessió tots els rols involucrats han de compartir informació i punts de vista per així generar sinergies.
- Idealment, les sessions haurien de ser d'entre 3 i 5h.

#### INVEST

<b>I</b>	Independent	Són independents, si apareix la paraula "I" o "o" possiblement es pot refinar.
<b>N</b>	Negociables	Evolucionen durant les converses
<b>V</b>	Amb Valor	Representa valor per Negoci
<b>E</b>	Estimable	S'ha de poder estimar i prioritzar
<b>S</b>	Petita(Small)	Representen una petita part del projecte
<b>T</b>	Testejable	S'ha de poder provar, ha d'aportar la definició de l'escenari i el resultat esperat.



## Validació dels lliurables

### Descripció

Es realitza en finalitzar la iteració i serveix per validar el lliurable revisant la llista de definició de preparat - **Definition of Ready (DoR)**. Es comença l'activitat amb la revisió dels objectius de la iteració i després es presenten els resultats. Negoci fa les seves impressions i si cal, es revisen les prioritats del backlog del producte.

## Definition Of Ready (DoR)

criteri	Descripció	Format/Canal	Validat?
Definició	Especificacions de la User Story amb el següent contingut: <ul style="list-style-type: none"> <li>• Especificacions</li> <li>• Disseny de pantalles (wireframes, no cal disseny detallat)</li> <li>• Disseny d procés, api,... El que apliqui</li> <li>• Model de dades</li> </ul>	ValueEdge	
Acceptació	Estan definits els criteris d'acceptació (BDD)	Informació a ValueEdge amb casos de prova	
Dependències	Dependències amb altres User Stories	ValueEdge	
Criticitat	Importància de la User Story	ValueEdge	
Estimació d'esforç	Story Point	ValueEdge	
Validadors	Product Owners / Validadors assignats a la UserStory	ValueEdge	

## Freqüència i durada



## Assistents



## Retrospectiva

## Descripció

S'ha de treballar una **reflexió** sobre la iteració que ha finalitzat i **possibles millores** pels propers.

## Tècnica a emprar: Estrella



## Freqüència i durada



## Assistents

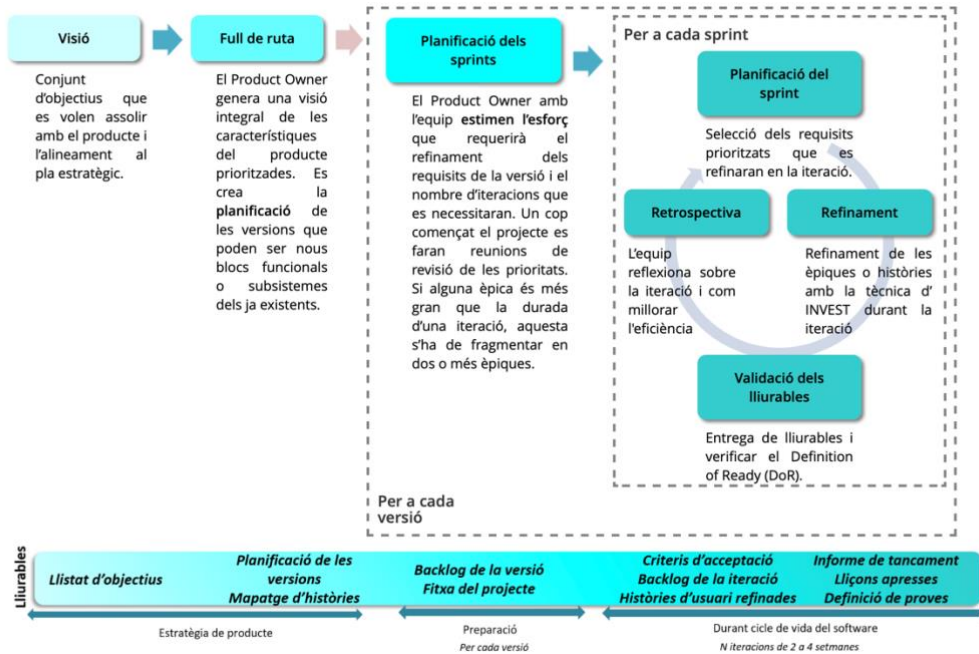


These CTTI resources are valuable for teams and organizations seeking to adopt or improve agile practices in their projects. The flexibility they offer allows you to adapt agile methodologies effectively and benefit from their principles in different project contexts.

# ANNEX 4: Resources for Assessing Agile Methodologies Maturity[23]

Inici > Model de Treball Agile > Detall Discovery Track

## Detall Discovery Track



Inici > Model de Treball Agile > Delivery Track

## Delivery Track

En nous projectes, l'sprint 0 dins del Delivery Track tindrà com a prioritat executar aprovisionar l'entorn de validació.



Delivery Track  
Sprint 0

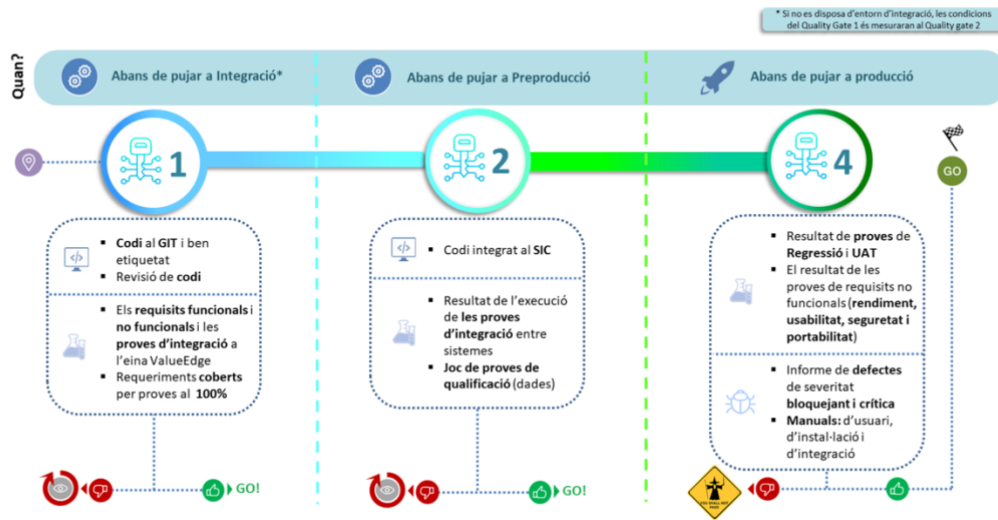




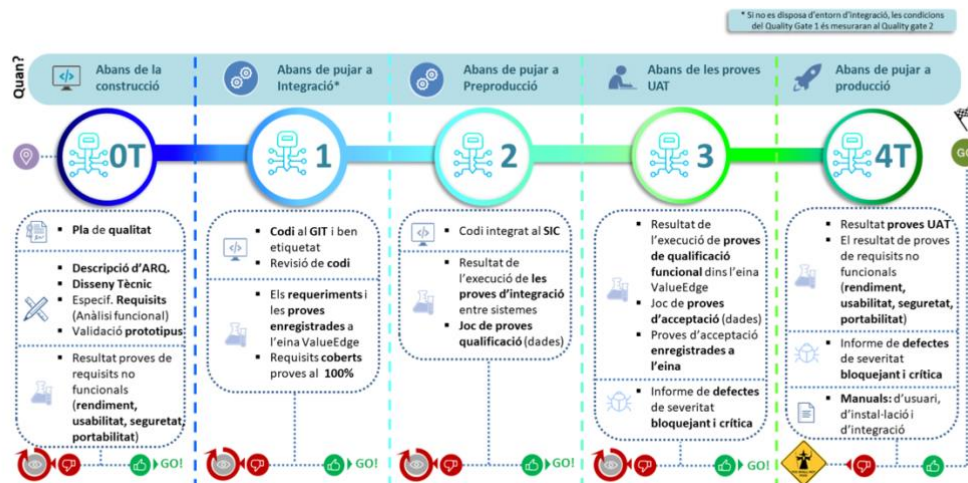


# ANNEX 5: Quality Gates[20]

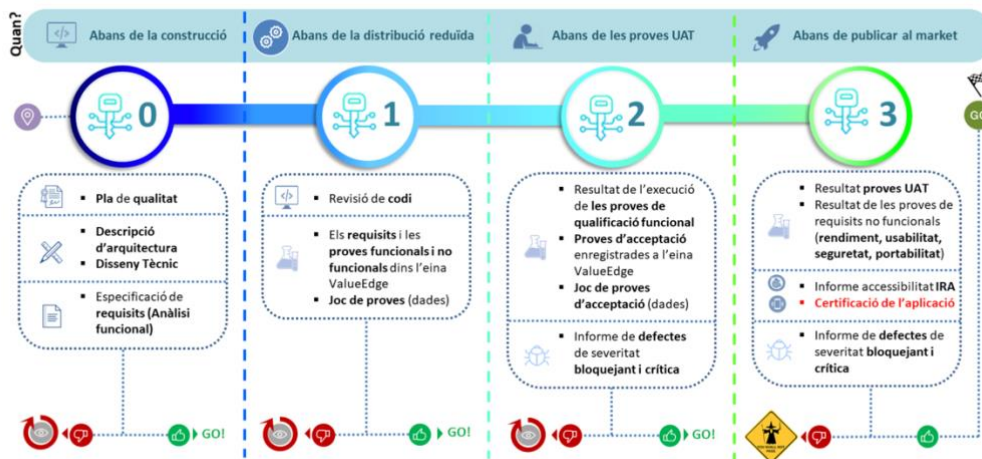
## Manteniment correctiu



## Transformació tecnològica

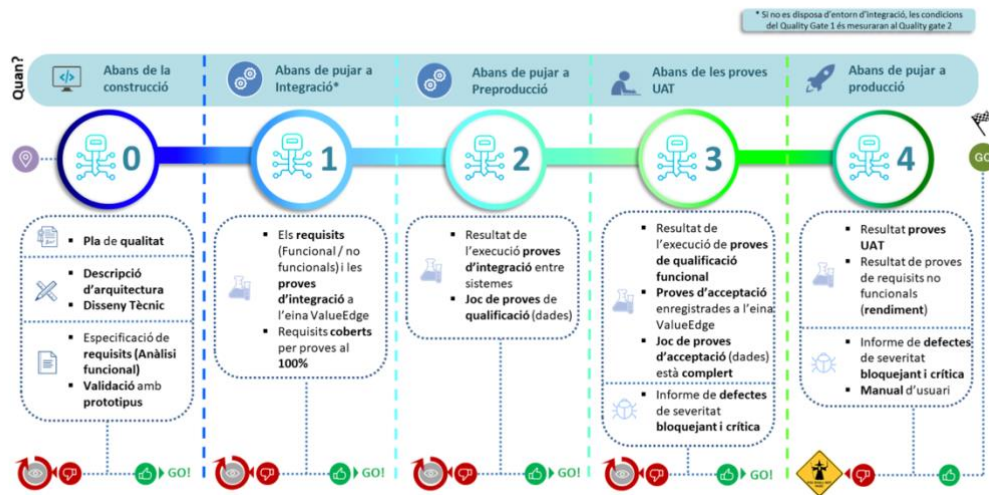


## Aplicacions mòbils

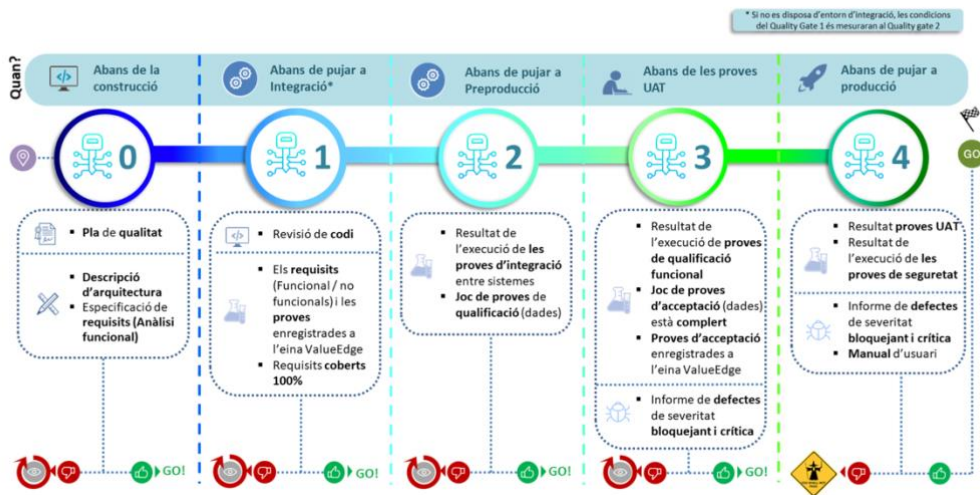


\*En aquest enllaç podeu accedir a la comunitat d'accessibilitat on trobareu tota la informació per a realitzar els informes IRA. D'altra banda, també podeu accedir a la [guia d'accessibilitat](#).

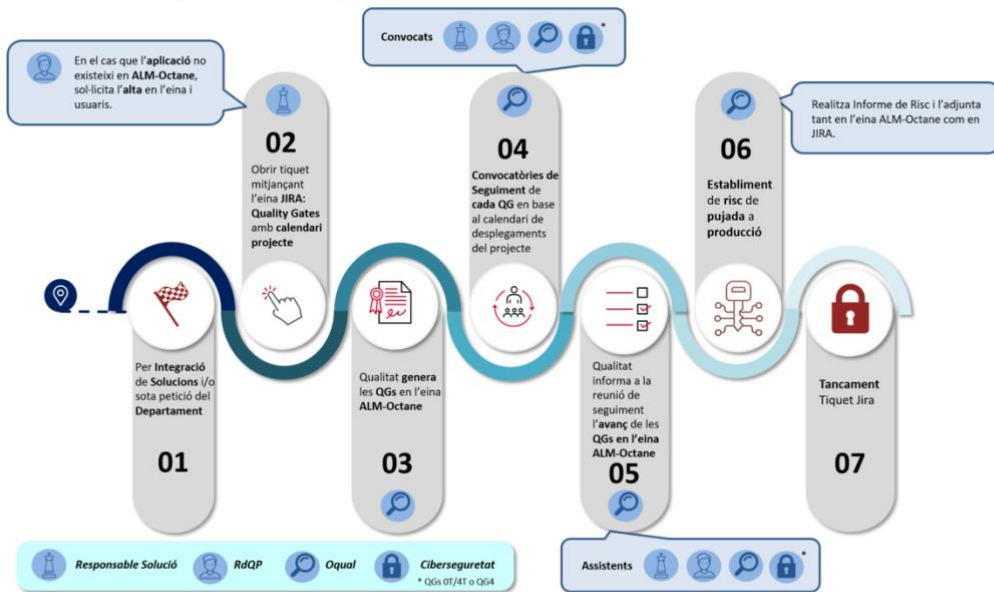
## Low-Code



## Productes de Mercat



## Procediment de seguiment de Quality Gates



Per tal de dur a terme la revisió de les Quality Gates i mantenir als responsables informats, es promou l'ús de l'apartat Release Management d'ValueEdge. Podeu trobar més informació sobre el funcionament a l'apartat d'ValueEdge a [guies](#) i consultar [Quality Gates a ValueEdge](#).



[1] López, J. (2022, octubre 11). *La paradoja de las administraciones: doblan su inversión en TIC pero no encuentran perfiles*. El Confidencial.

[https://www.elconfidencial.com/tecnologia/2022-10-11/desafio-innovacion-administraciones-publicas-digitalizacion-bra\\_3503958/](https://www.elconfidencial.com/tecnologia/2022-10-11/desafio-innovacion-administraciones-publicas-digitalizacion-bra_3503958/)

[2] INAP. (n.d.). *El sector público español invirtió más que nunca en tecnología durante 2021*. Retrieved from

<https://laadministracionaldia.inap.es/noticia.asp?id=1512465>

[3] *Colaboración, innovación y uso de las TIC en el sector público*. (n.d.).

Facultad de Economía y Empresa. Retrieved from

<https://fecem.unizar.es/node/1135>

[4] *Transformamos compañías, anticipándonos al futuro*. (n.d.). Nttdata.com.

Retrieved from <https://es.nttdata.com>

[5] *Inici*. (n.d.). Centre de Telecomunicacions i Tecnologies de la Informació.

Retrieved from <https://ctti.gencat.cat/ca/inici/>

[6] (N.d.-b). Pmi.org. Retrieved from [https://www.pmi.org/pmbok-guide-](https://www.pmi.org/pmbok-guide-standards/foundational/pmbok)

[standards/foundational/pmbok](https://www.pmi.org/pmbok-guide-standards/foundational/pmbok)

[7] Riveros, A. (2020, November 11). *Conceptos básicos para la gestión de proyectos según el PMBOK® Guide*. EALDE Business School.

<https://www.ealde.es/conceptos-proyectos-pmbok-guide/>

[8] EdPM. (2021, May 11). *Breve historia sobre la administración de proyectos*.

EdPM Escuela de Project Management. <https://www.edpm.es/14-breve-historia-sobre-la-administracion-de-proyectos/>

- [9] *No title*. (n.d.). Iso.org. Retrieved from <https://www.iso.org/obp/ui>
- [10] *Norma ISO 21500*. (n.d.). Aec.es. Retrieved from <https://www.aec.es/web/guest/centro-%20conocimiento/norma-iso-21500>
- [11] *PM<sup>2</sup> project management methodology*. (n.d.). PM<sup>2</sup> Project Management Methodology. Retrieved from [https://pm2.europa.eu/index\\_en](https://pm2.europa.eu/index_en)
- [12] Rodríguez, J. (2021, July 9). *Gestió de Projectes - Metodologia PM2*. Consultcat. <https://www.consultcat.cat/gestio-de-projectes-metodologia-pm2/>
- [13] Portal, T. I. C. (2017, June 22). *Waterfall: metodològia para el desarrollo secuencial de tareas*. TIC Portal. <https://www.ticportal.es/glosario-tic/waterfall-metodologia-desarrollo-secuencial>
- [14] Mancuzo, G. (2020, August 7). *Metodología Waterfall: definición, pros y contras*. Blog - ComparaSoftware; ComparaSoftware. <https://blog.comparasoftware.com/metodologia-waterfall/>
- [15] Quick, L. (n.d.). *Key insights from the 2022 state of Agile report*. Knowledgehut.com. Retrieved from <https://www.knowledgehut.com/blog/agile/state-of-agile>
- [16] *Models. CTTI. Generalitat de Catalunya*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/>
- [17] *Model de Qualitat de Solucions. CTTI. Generalitat de Catalunya*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/enfocamentagile/>

- 
- [18] *Model Dual Track*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/enfocamentagile/modeldoubletrack/>
- [19] *Cicle de vida del producte*. CTTI. Generalitat de Catalunya. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/productes/>
- [20] *Nova solució o manteniment evolutiu*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/qualitygates/nou-manteniment/>
- [21] *ValueEdge*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/eines/alm-octane/>
- [22] *Descobriment i anàlisi de requisits amb tècniques àgils*. (n.d.). Gencat.cat. Retrieved from [https://qualitat.solucions.gencat.cat/procediments/analisi-disseny/analisi\\_requisits\\_tecniques\\_agils/](https://qualitat.solucions.gencat.cat/procediments/analisi-disseny/analisi_requisits_tecniques_agils/)
- [23] *Detall Discovery Track*. (n.d.). Gencat.cat. Retrieved from <https://qualitat.solucions.gencat.cat/enfocamentagile/ampliacio-discovery-track/>