UNIVERSIDAD DE BURGOS

ESCUELA POLITÉCNICA SUPERIOR

GRADO EN INGENIERÍA DE ORGANIZACIÓN INDUSTRIAL

BACHELOR'S THESIS

DESIGN OF A DOCUMENT MANAGEMENT SYSTEM FOR A CHEMICAL PLANT

Author:

Carlos del Río Gallego

Tutor(s):

Susana García Herrero

September, 21, 2022

AUTORIZACIÓN PARA LA PRESENTACIÓN DEL TRABAJO FIN DE GRADO

D./Dª Susana García Herrero ....

profesor/a del departamento de ingeniería de organización... ,

área de organización de empresas ....

EXPONE:

Que el alumno D./Dª Carlos del Río Gallego .... ,

con DNI número 53613993G……………………, de la titulación Ingeniería   de

organización industrial .... ,

ha realizado el Trabajo Fin de Grado titulado "Design of a document management

system for a chemical plant" ....

....

....

....

y que dicho trabajo ha sido realizado por el alumno bajo la dirección de quien suscribe, en virtud de lo cual, SE AUTORIZA su presentación y defensa

En Burgos, a 21 de septiembre de 2022

El tutor,

Fdo.: ………………………………

ACKNOWLEDGMENTS

To my friends, who have helped me in difficult times and have put up with all my complaints. To my colleagues at Adisseo, for making my internship a fruitful experience. Also to my tutor Susana, thanks for being there when I needed your help and advice.

To my family, specially to my mother María, for her unconditional support. Even when I couldn´t find the path, when I was going through my most pessimistic stages, you always cheered me up and gave me the answers I didn´t know I needed.

For all of this and whats to come, thank you.

RESUMEN

En este trabajo de fin de grado se lleva a cabo el diseño de un sistema de gestión documental adaptado a las necesidades de la empresa Adisseo Burgos. Para ello se usa como guía la norma UNE-ISO/TR 15489-2:2006 y otras normas relacionadas con la gestión documental.

En la primera parte del trabajo se ha analizado la empresa y sus actividades, y se han creado herramientas documentales de acuerdo con las necesidades de la misma, como es un cuadro de clasificación documental, una tabla de análisis de riesgos y una tabla de acceso y seguridad documental, con el objetivo de complementar el diseño conceptual del sistema de gestión documental.

En la segunda parte del trabajo se han estimado las actividades necesarias para la realización del proyecto de diseño e implementación del sistema de gestión documental, junto con su coste y duración. Se ha llevado a cabo un análisis financiero del mismo para ver su viabilidad y finalmente se han mostrado factores claves útiles en caso de realizarse el proyecto.

ABSTRACT

In this end-of-degree project, the design of a document management system adapted to the needs of the company Adisseo Burgos is carried out. For this purpose, the UNE-ISO/TR 15489-2:2006 standard and other standards related to document management are used as a guide.

In the first part of the thesis, the company and its activities have been analyzed, and documentary tools have been created according to its needs, such as a document classification scheme, a risk evaluation table and an access and security chart, in order to complement the conceptual design of the document management system.

In the second part of the work, the activities necessary to carry out the project of design and implementation of the document management system have been estimated, along with their cost and duration. A financial analysis of the project has been carried out to see its viability and finally, useful key factors have been pointed out in case the project is approved and carried out.

INDEX

List of tables

List of figures

Figure 36. Hard vs soft skills. Source: (Yeh, 2021)   101

1. INTRODUCTION

1.1. OBJECTIVE

The purpose of this project is to apply the knowledge and skills that I have obtained during my studies in the industrial management degree while also making something useful and worth the time invested for the company I´ve been doing my internship in, which is Adisseo.

For this task I have decided to analyze the current documental management situation in Adisseo and propose guidelines for the implementation of a new document management system based on the prototype they already had.

1.2. CONTEXT & BACKGROUND

Finishing my degree, I wanted to take the opportunity that the university of Burgos brings to its students and apply for the extracurricular internships, with the purpose of acquiring experience in a company and learning how the working life really is.

When I first got into technical office, I was told that they were working on a project that would completely change the document management in all the plant. The project consists in a software made for all the plant that can storage documents, plan meetings and create work orders, amongst other functions. To have an efficient document management system, there should be defined policies, followed by all the staff involved with the documentation in Adisseo.

The standardization of the procedures for the document management ensures the adequate attention and protection of the documents and enables the information they contain to be obtained in a more effective and efficient way.

Documents contain information that constitutes a precious resource and are an important asset for the organization. Records management is essential for organizations in order to protect and conserve documents as evidence of their acts, documents are the prove of a company´s actions. Documents are also useful for companies to support future activities or to make choices based on objective data, and at the same time enable the company to be accountable for their acts to their stakeholders.

According to the ("UNE-ISO 15489-1," 2016), documents allow organizations to:

- Carry out their activities in an orderly, efficient, and responsible way.
- Offer services in a coherent and equitable way.
- Bring backup and document the creation of policies and decision-making at a managerial level.
- Give coherence, continuity and productivity to the administration and the management.
- Guarantee continuity in case of a catastrophe.
- Comply with legislative and regulatory requirements.
- Provide protection and support in litigation.
- Protect the interests of the organization and the employees, clients and interested parts rights.
- Support and document investigation and development activities as well as the historical research.
- Provide evidence about personal, cultural and organizational activities.
- Establish a personal, cultural and organizational identity.
- Maintain the corporative memory, personal or collective.

When a company has trouble managing documents, there are some problems that appear in the daily workday. If these problems are clearly recognized, we could say that the company needs a document management system. In our case, the main problems found were:

- Documents named without technical criteria.
- Documents without the correct information.
- No track of the modifications done in a document.
- Time lost looking for documents.
- Lack of coordination between paper and electronic documents.
- Confusion when searching for the latest version of a document.

In Adisseo, until now all the documents have been classified by projects. This is inefficient because if any equipment needs a modification this has to be communicated to the relevant authorities with the proper documentation of that equipment. To find the latest document, the worker should, with the actual state of the document management, know in which project that equipment was installed. Also, if that equipment was substituted in a more recent project, it is possible that the employee may be working with outdated documentation.

Another problem is that not all the information is digitalized, so when the documents of an old equipment are needed, the staff have to search in the archive the dossiers in which the documents are. This situation translates into loss of time and misunderstandings while searching for certain documents.

In my first month I got a glimpse of how things were made and what were the principal problems related to the management of documents. The need for a records management system has been spotted for a while now, but the complexity of it and the budget required have delayed its implementation.

Adisseo is currently working in a document management system called Aditeca, which will address all the company. This Aditeca project still needs its budget to be approved, so with this thesis I will propose useful tools for the creation of the system, the requirements that it should have and the evaluation of the project to have our own management system.

1.3. DOCUMENT AND RECORD MANAGEMENT

1.3.1. Introduction

Even though this may seem confusing for Spanish readers, document management and record management are not the same. In English there are three different terms to express what in Spanish we would call "documentos". The Spanish definition covers the terms record, document and archive. For this reason, is important to define each of them.

1.3.2. Definitions and selection

As the UNE-ISO 15489-1:2016 states, a record is information created or received, kept as information and evidence, by an organization or individual in the course of its activities or by virtue of its legal obligations. An archive would be the same but with a historic component. On the other side, a document has a wider definition, documents are information or objects registered that can be treated as a unit.

Therefore, a record will always be a document, but a document may not be a record. The important thing to bear in mind is that records designate specifically the documents created as proof of the activities that the organization that created them did.

"Document management is a set of practices that organizations use to capture, store, and track documents in paper or electronic format. While records management is a field of management responsible for the efficient control of the creation, receipt, maintenance, use, and disposition of records."(The ECM Consultant, 2019)

To add another comparison:

Records management mainly seek to benefit the company with the preservation of records through their lifecycle, the compliance with regulations and serving as protection in litigation. Document management is meant to control all the useful documents for the company in order to locate them faster, facilitate the workflows and therefore increase productivity.

"Electronic Document Management Systems (EDMSs) are widely used in organizations to provide management and control over electronic documents. Many EDMS functions and facilities overlap with Electronic Records Management Systems (ERMSs). EDMSs typically include indexing of documents, storage management, version control, close integration with desktop applications and retrieval tools to access the documents. Some ERMSs provide full EDMS capability, others only provide a subset. Conversely some EDMSs have incorporated core record management functions. EDMSs often form part of a wider system implementation and contain collaborative working tools to enable a number of users to participate in document drafting."(Serco Consulting, 2008)

EDMS and ERMS are exclusively made for electronic documents, but in our case, we will have to choose between DMS or RMS, since we are also looking to implant standards and policies regarding the treatment of physical documents and the standardization of all the documental practices.

This is a table with the main characteristics of each system, both EDMS and ERMS.

An EDMS…	A ERMS…
• allows documents to be modified	• prevents records from being modified.
• allows documents to exist in several versions	• allows a single final version of a record to exist.
• may allow documents to be deleted by their owners	• prevents records from being deleted
• may include some retention controls	• except in certain strictly controlled circumstances.
• may include a document storage structure, which may be under the control of users	• must include rigorous retention controls.
	• must include a rigorous record arrangement structure (the classification scheme) which is maintained by an administrative role.

• is intended primarily to support day to day use of documents for ongoing business.	• may support day-to-day working but is primarily intended to provide a secure repository for business records.

Table 1. Characteristics of an EDMS and an ERMS. Source:(Serco Consulting, 2008)

Seeing how the Aditeca database is meant to function and the main requirements that Adisseo wants to meet, this project should be classified as a document management system design project, in which we will add functions of a RMS to get some of the benefits and characteristics of the records management.

1.3.3. History of the DMS

Documents in the industrial sector haven´t suffered many changes in the last seventy years. The type of documents used is the same, even though the format has changed, companies still use bills, plans, data sheets, etc.

In a first instance, the only method to work with was in paper, but in the sixties the photocopiers changed that situation.

Later on, in the decade of the 80s, with the introduction of computers and software used in the creation of documents, suppliers started developing software for commercial documents. These first versions also managed images and physical prints.

This software that stored documents in a local computer was called EDM (electronical document manager). One of their best advantages was the implementation of a searching engine in order to access to the documents easily.

Nevertheless, in most companies the paper was the predominant format. The photocopier and its failures were a risk to have in mind when working. Luckily in 1984 Apple introduced Macintosh with its graphic user interface(Wikipedia, 2022b), facilitating the usage of computers.

The company TOWER introduced TRIM Captura in 1998(Wikipedia, 2022a), which can be classified as the first modern DMS.

As the usage of internet grew, so did the DMS, which developed more complex functions such as scanning, storage, indexation, and retrieval of documents.

Nowadays almost every company has some sort of DMS, the reduction of paper and the sustainable development is something important for companies. Cloud storing is widely used by all society thanks also to the internet connection, that goes up to 1Tb/s, facilitating the exchange of heavy documents.

1.3.4. Conclusion

Comparing the definitions of both the document management system and the records management system, the best approach to this project is to consider the final product as a DMS, since it is meant for this program to also include documents that are not necessarily records, and the company´s main goal is to increase the efficiency of document management.

The DMS will contain, apart from the application itself, standards and policies meant to guide the staff and unify the treatment of documents in Adisseo.

2. APPROACH & METHODOLOGY

For this thesis I used both a qualitative and a quantitative research approach, trying to create an understandable document without very dense text. As the main purpose of this thesis is to support the creation and implementation of the Aditeca database along with document management standards and policies, this document should be understandable for anyone, not only staff specialized in documentation management, in order to present it to the high management of the organization.

It has a qualitative approach since it is based in the perception of the problem that we are trying to solve, and some of the requirements are gathered through the use of interviews to find the workers perception of the problems and the solutions that may be implemented.

Most of the information gathered came from colleagues of the technical office department, and it was used to follow the standard "ISO 15489:2001 Records management". Also, as the standard advice, I searched for information in the company´s documental sources and through the internet to find the data needed.

Some other data was extracted from internet pages and works related with the topic.

The first section of the thesis will follow the stages A to F of the ISO standard, so it will start with the preliminary analysis of the company and will end with the design of the DMS, as shown in the next figure.
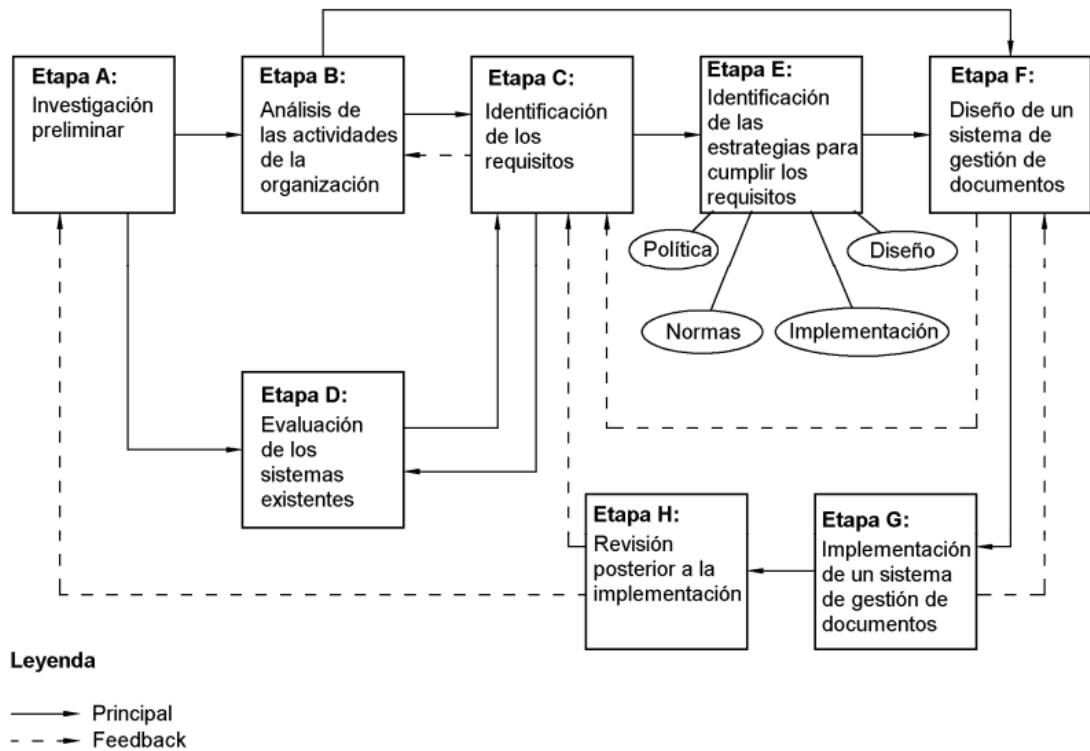
Figure 1. ISO standard process map. Source: (*UNE-ISO/TR 15489-2*, 2006)

The second part will be the implementation, which will consist in the planification of the project and a financial analysis to see the viability of the project.

There were more standards used to complete this thesis, such as the ISO 30300, ISO 30301 or the UNE-ISO/TR 18128, which helped with the document management vocabulary, with the requirements of a records management system and with the identification of risks in document management, amongst other topics.

3. DESIGN.

3.1. PRELIMINARY INVESTIGATION (A)

3.1.1. Introduction

As stated in the UNE-ISO 15489-1:2016, the first step for the design and implementation of a records management system is the preliminary investigation. In this first stage the main objective is to gather information for the company in order to show the context and legal framework in which the company is located.

Using documental sources as well as interviews, it is needed to identify the objective and the purpose of the organization, its structure, its legal and economic framework and its critical factors and weaknesses related with the document management.

This stage will give a vision of strengths and weaknesses of the company related to document management and will define the actual problems that the organization has with documentation, serving as reference in the next steps for the viability and risks evaluations. It will also be useful to evaluate the current document management systems in the next steps.

This chapter will contain the history of Adisseo, the mission and the values of the company, the structure of the Adisseo plant in Burgos and its characteristics, along with the interviews to some technical office workers and a SWOT pointing the important data about documental management.

Another important part of this stage is the study of the legal framework of Adisseo and the scope of the DMS. The legal framework is needed in order to comply with all the stakeholders of the company, and the scope of the DMS will set what products or tools will be required for a satisfactory competition of this thesis.

This phase will serve as an information base to consult and consider in the following stages, such as the creation of the classification scheme.

3.1.2. History and characteristics

Adisseo was founded in Commentry, France in 1939. Its original name was Alimentation Equilibrée. Mr. Marcel Lingot, the founder of Adisseo, when he was graduated from Ecole Polytechnique, established the company in the animal feed industry thanks to the great quality of the methionine produced.

Later on, in 1971 the company is acquired by Rhone-Poulenc for their animal feed Division. The Burgos plant was created in 1975 in the industrial of Villalonquejar, and they started producing methionine by the name of Sodeti until 1990, when Rhone-Poulenc bought Sodeti. In 2000 Rhone-Poulenc merged with Hoechst AG and it Became Aventis. Only two years later, in 2002 the plant is acquired by an investment fund called CVC and it is renamed Adisseo, regaining its independence and adopting rigorous standards.

In 2006, Adisseo joined the Bluestar Group, an affiliated company of ChemChina, facilizing their access to the Chinese market, the world's largest growth market. That means that Adisseo is a company with Chinese stock, even though the decisions made for the European region are still made in France.

Adisseo innovates, manufactures and markets all around the world. The group has over 2,520 employees across all continents and exports constitute over 95 % of the group's sales. Asia's highly promising market which represented 10% of the sales in 2013, represents 30% of the sales today.

Adisseo is among the world leaders in animal nutrition with a turnover of 1.69 billion euros in 2021 and over 3,900 customers.

 Generally speaking, Adisseo produces additives and nutritional solutions for animal feed. In the Burgos plant, the main product is the Rhodimet AT 88, which consists in liquid methionine, an essential amino acid used in animal nutrition for feeding animals such as cows or chickens. The other product is the Rumensmart, the solid version of the AT 88, which is fabricated in the A-DRY section of the plant.

Figure 2. Adisseo Burgos plant products. Source: Adisseo

To estimate the growth of the plant, the annual production of Rhodimet AT 88 is represented in the next figure.

Figure 3. Rhodimet AT 88 annual productions in Burgos. Source: Adisseo

Also, the ammonium sulfate generated in the production of the methionine is sold as a fertilizer. Adisseo does not sell this sulfate as one of their products, since the company is dedicated to the animal feed industry, this product is managed externally.

3.1.3. Mission and values

The values of Adisseo are:

- Results culture
- Responsibility
- Teamwork spirit
- Integrity
- Creativity

The expected behaviors are:

- Respect
- Client orientation
- Commitment
- Courage
- Simplicity

And the mission of Adisseo is to offer the planet a healthy, sustainable, affordable and quality food. In order to accomplish this mission, Adisseo is willing to get involved in the sustainable development of the planet, offer innovative product and services to the sector of animal feeding and distribute equitably the value generated between clients, employees and stakeholders.

The priorities are the security, the sustainable development, the commercial development, the competitivity and the operational efficiency(Adisseo, 2020).

3.1.4. Organizational structure

These activities can include rules, roles, and responsibilities (Kenton, 2021).

Adisseo in Burgos has a functional organizational structure, which seems right since "A functional organization is more suited to the production of standardized goods and services in high volume and at low cost"(Conexión ESAN, 2017). As the names implies, the company is divided by functions, so the areas are divided by the type of job.

In our case management is on the top of the organization chart, and then there are seven areas divided by the function which are maintenance, administration and finances, human resources, supply-chain, purchases, fabrication and HSE-Quality-Technical office. Each one has also its divisions depending on the necessities of the plant. This organizational scheme usually changes from time to time in order to increase efficiency. For example, last year technical office and maintenance were together in the engineering department, but now maintenance has its own area and technical office is with the health, security and environment department along with quality, as seen in the organization chart.
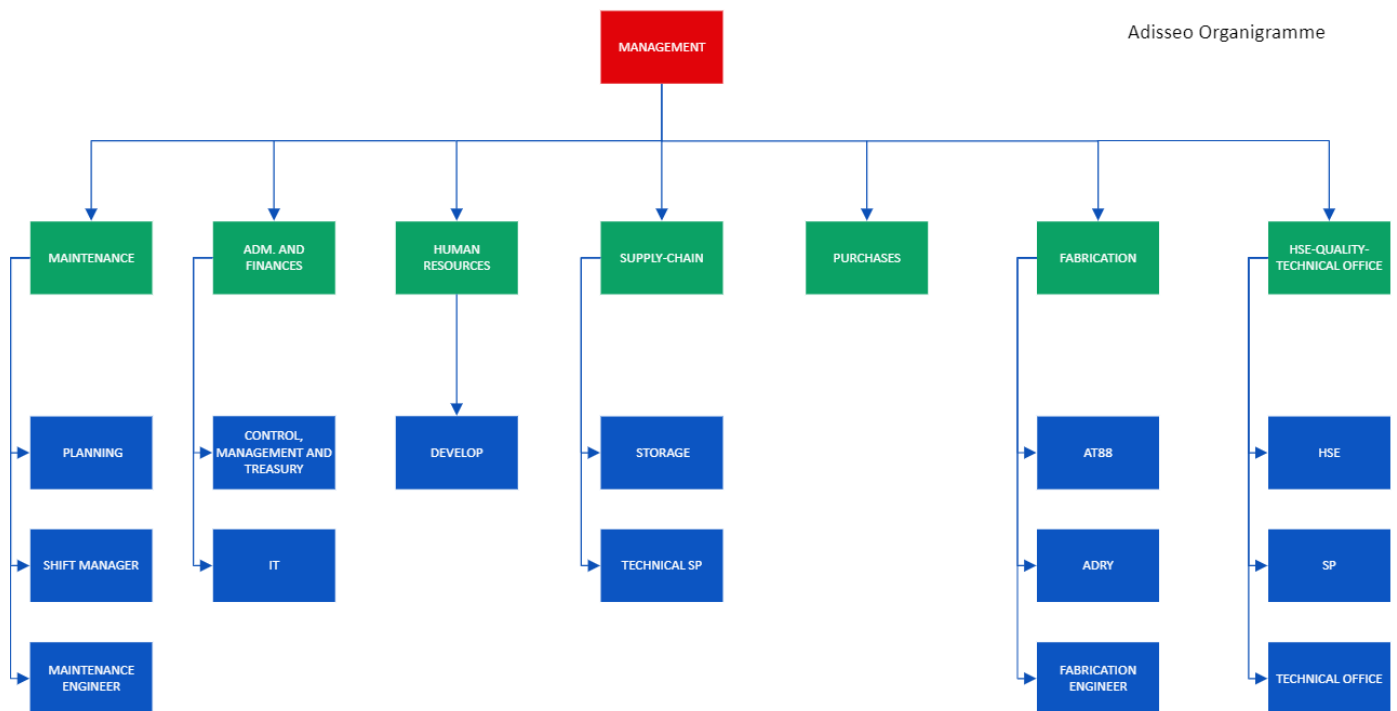
Figure 4. Adisseo current organization chart. Source : Own elaboration.

When designing the document management system, it is important to have in mind the different functional divisions and the fact that this division may change with the time.

3.1.5. Scope of the DMS

"Project scope is a detailed outline of all aspects of a project, including all related activities, resources, timelines, and deliverables, as well as the project's boundaries." A project scope also outlines key stakeholders, processes, assumptions, and constraints, as well as what the project is about, what is included, and what isn't."(Alexander, 2020)

The company has to establish the limits and applicability of the DMS in order to give a scope to the project. Once it is determined, we can consider the proper internal and external factors that affect the documental management.

There are different options that may be more or less suitable depending on the company situation. The DMS can be applied for one or more business processes inside a company, used in all the company, or for various companies that share processes (for example between commercial partners).

In our case, the final objective would be to apply the document management system in the whole plant of Burgos. The DMS should cover the necessities of the whole plant and should also be capable of integrating the information of the SAP program, which is used in some of the areas of the plant, without any problems.

The DMS project should be made by technical office and the IT department, but also with a great support from management and in collaboration with the rest of the departments. If it's going to be a tool for all the plant, everyone should be a participantº in its creation.

3.1.6. Legal framework

Adisseo is a chemical plant located in Burgos, Spain, meaning that we must follow the Spanish legislation to make sure we have the required documents for each equipment. One example is the "Real Decreto 809/2021" which shows the regulations for pressure equipment and its complementary technical instructions.

The legal framework refers to the set of guidelines, rules of conduct and regulations within which any entity operates. Similarly, the corporate legal framework describes the set of laws that govern the conduct of business activities in a country(Jileana Añez, 2022). Any business within this legal space must carry out its activities considering the laws that govern the way of doing business in a country and must be obeyed, since these laws are enforceable in court.

It is important to know the legal framework of a company because this will establish the requirements for the records management system, as the company must record with the documents how they work without breaking this legal framework.

If we want to find the legal framework of Adisseo we must find:

- Laws and regulation of the sector, including laws about documents, security, information, etc.
- Mandatory standards.
- Codes of ethics and good practices.

Also, the sector of the company will help decide which elements are more suitable to apply on the records management requirements of Adisseo.

The economic activities of Adisseo are:

- Chemical Industry
- Manufacture of basic chemicals, nitrogen compounds, fertilizers, plastics, and synthetic rubber in primary forms
- Manufacture of other basic organic chemical products

The laws and regulations that apply to Adisseo are the next ones:

Legislation:

- Real Decreto 809/2021, de 21 de septiembre, por el que se aprueba el Reglamento de equipos a presión y sus instrucciones técnicas complementarias.
- Real Decreto 656/2017, de 23 de junio, por el que se aprueba el Reglamento de Almacenamiento de Productos Químicos y sus Instrucciones Técnicas Complementarias MIE APQ 0 a 10.
- Real Decreto 1215/1997, de 18 de julio, por el que se establecen las disposiciones mínimas de seguridad y salud para la utilización por los trabajadores de los equipos de trabajo.
- Ley 6/2014, de 12 de septiembre, de Industria de Castilla y León. (BOCyL 19/09/2014)
- Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales.
- Real Decreto 39/1997, de 17 de enero, por el que se aprueba el Reglamento de los Servicios de Prevención.

- Real Decreto 559/2010, de 7 de mayo, por el que se aprueba el Reglamento del Registro Integrado Industrial.
- Resolución de 7 de julio de 2021, de la Dirección General de Trabajo, por la que se registra y publica el XX Convenio colectivo general de la industria química.
- Real Decreto 4/2010, de 8 de enero, por el que se regula el Esquema Nacional de Interoperabilidad en el ámbito de la Administración Electrónica.

Ethic codes and standards:

- 86.1:16 Guía para la compra de una máquina. INSHT
- ISO 14001:2015 - Environmental management systems
- ISO 9001:2015 - Quality management systems
- ISO 45001:2018 Occupational health and safety management systems
- FAMI-QS/HACCP
- ISO 50001:2018 - Energy management systems
- Directiva europea SEVESO II

There may probably be more laws affecting the record management, but these one are the main ones and comprise the majority of the legal framework, being valid as it is for the design of the DMS and for using as support in following stages of the thesis.

3.1.7. SWOT

A swot analysis is a tool to gather information and get to know advantages and disadvantages of a company. SWOT means strengths, weaknesses, opportunities and threats. Strengths and weaknesses are internal factors of the company, things that we can change and control, while opportunities and threats are external factors, things that we can´t change but we need to have in mind and be prepared for them.

A SWOT analysis organizes your top strengths, weaknesses, opportunities, and threats into an organized list and is usually presented in a simple two-by-two grid.(Noah Parsons, 2021)

This is how a SWOT should look like:

Figure 5. SWOT scheme. Source: Own elaboration.

To have a better understanding of the strengths and weaknesses of Adisseo within the document management, I will create a swot with the information gathered until now, and after, when I have finished interviewing the staff related with the document management, I will redo the swot with the new information.

This is the swot with the first analysis and the first views of the actual document management system.

	Helpful	Harmful
Internal	**Strengths** • Almost all the documents are stored • We can find where the document is with an excel	**Weaknesses** • Documentation based on projects • Not all the documents are digitalized • Documents are far from working site • No track of who takes the documents • No standard about documents required
External	**Opportunities** • New database on progress • Everyone has a company phone so we could add an app for documents • Easier to keep track of the documents	**Threats** • Technical challenges • Integration with current system • Adverse events (floods, storms, system failures).

Table 2. Adisseo records management first evaluation SWOT. Source: Own elaboration.

Now that we have this first swot it is time to do the interviews, and when it is finished, add a new swot with the information completed. This new information will appear in bold font to find the points added in a simpler way.

Adding the new information gathered with the interviews we have the next swot to work with:

	Helpful	Harmful
Internal	**Strengths** • Almost all the documents are stored • We can find where the document is with an excel • **Employees willing to apply the documentation standards**	**Weaknesses** • Documentation based on projects • Not all the documents are digitalized • Documents are far from working site • No track of who takes the documents • **There aren´t clear policies about records management** • **Duplicated and not updated documents**

			• **Employees not willing to use the new DMS properly (told by one of the interviewees outside the interview)**
External	**Opportunities** • New database on progress • Everyone has a company phone so we can add an app for documents • Easier to keep track of the documents • **Digitalization of all documents** • **Change to an intuitive program** • **Environmental management is on the rise**		**Threats** • Technical challenges • Integration difficulties • Adverse events (floods, storms, system failures) • **Documentation may get lost, without backup**

Table 3. Adisseo records management second evaluation SWOT. Source: Own elaboration.

3.1.8. Interviews

Now to complement this information I will ask brief questions to some of the workers that have relation with the document management, both new and experienced workers in the company.

A research interview is a conversation face to face between the interviewer and the interviewee. With this type of interview, we can get relevant information about a topic through verbal responses. It is more flexible than a questionnaire because the interviewer can explain the questions and the interviewee can also present doubts which can be solved right away.(Mejia Jervis, 2017)

There are three types of research interviews:

- Structured
- Non-structured
- Semi-structured

We will be using the semi-structured interview, as we will have some established questions but with a more open answer possibility. It gives the opportunity to the interviewee to give more natural answers and discuss more topics than the ones planned initially.

To have a successful interview it is required that the interviewer and the interviewee have enough knowledge about the topic discussed and that the interviewer can answer the questions that may arise to the interviewee.

I made three interviews, which were conducted in a similar way. In all of them the interviewee said that there weren´t any clear politic about records management and that it wasn´t easy to find documents.

When I asked if they remembered an occasion when a document went missing, the two interviewees that had been working there more time answered affirmatively to my question and told me that because of the loss of a document they had problems finishing some jobs. It was also translated as a lot of hours lost searching for the documents or redoing plans, and in some cases, they had to solicitate a duplicate of the document to the supplier.

For two of them the number of documents asked to external companies was good and for one of them the documentation asked was simply too much. With that said, they admitted that the lack of documentation had affected the correct execution of a project in the past, and one of them commented that it had also affected the correct functioning of the plant after a project was finished.

When a project is done, they told me that all the required documents are generated, being the codification and accessibility of them the real problem.

When I asked them to value from 1 to 10 the actual documental management system, in any of the cases it got a mark bigger than 4. The accessibility of the documents and the codification where the points which needed more attention, as they told me. In second place reliability was also a problem that needed to be treated, because some documents have old information, and since the documents have been grouped in projects, maybe an equipment has been replaced with a newer one and we are using the data of an old equipment, which can cause problems such as delays in projects or bad data for testing the equipment.

Here is the table with the interviews:

Questions	Interviewee 1	Interviewee 2	Interviewee 3
Is there a clear policy about document management?	No, it doesn´t exist.	I think there are some standards, but it is unclear.	I haven´t been told there is one.
Is it simple to find the correct document?	No, it takes time.	Sometimes, but most of the times it is not.	No, it is not.
Do you know of any time that documentation got lost? Were there any consequences?	No, I have never lost any documentation.	I guess some time, the consequences translate in loss of time and problems to execute some jobs.	I have to ask for a duplicate to the supplier, hours lost searching for documentation, hours lost measuring and redoing plans.
Are companies required the pertinent documents?	I guess we ask for all the documentation needed.	We ask for it but sometimes it comes wrong.	We ask for too many documentations, many of that is useless.
Has the lack of documentation ever affected the development of a project?	Yes, some projects have been delayed because of documents that could not been found.	We have had to pay to legalize some equipment of which there were no documentation.	Yes, after the project, when I had to make modifications in the installation.
What could be done to prevent that situation?	Establishing a clear policy about	Creating a document management	Digitalization of the existing documentation and

	document management	system simple and intuitive but that gathers all the documents. Knowing where all the documents are, without knowing in which project they were made. An efficient searcher.	implantation of a document management system that enables anyone to find documentation no matter the knowledge with the system.
Are all the required documents created when there is a project?	Sometimes. It depends on the situation and the person managing the project.	Almost every time, but I don´t know for sure.	Well, sometimes.
Value from one to ten the actual document management system.	Three.	Four.	Two.
Which aspects of the document management systems need more improvement?	Documents should be easier to find, we should have a codification system. We should know which one is the latest version of the document.	Simplicity to find documents, more standards for codification.	Codification, responsibilities over the documents and reliability.
What would you change to improve document	Changing all the documents to digital format, with	We need a documental manager to tell us	Storing the documentation by the equipment tag

management in the plant?	an easy and intuitive codification. A list with all the documents in the same list. Direct access to the last version of the documents.	how we should manage documentation.	instead of by project. Differentiate the technical information from the certificates and other information that rarely any time will be consulted.

Table 4. Interviews about documental management in Adisseo. Source: Own elaboration.

With this information, the SWOT of the table 2 is updated, including another point that was brought by the third employee outside the interview.

3.2. ORGANIZATION ACTIVITIES ANALYSIS (B)

3.2.1. Introduction

In this chapter we will develop a conceptual model about what Adisseo does and how they do that. Documents should be related with the company processes, contributing later on with the decision making in terms of the creation, storage, control, disposure and access of the documents. This step is especially important in our case because we will be working with an informatic system such as the Aditeca database, so we need to know which documents to include and for how long.

Initially documentation describing the company activities and business operations should be created, in the form of a table with the activities of the company following a hierarchical relationship and a process map showing where the documents are created or received as a product of the company activity.

By using this analysis, the following documentation tools may be created:

- A list of specific words used in the documents of a specific context.
- A calendar defining the conservation periods and the consequent disposition actions for the documents.

3.2.2. Terms and concepts.

To understand the whole of the document we need to create a glossary with all the terms related to the records management systems, the documentation and also the Adisseo plant.

 With this tool even new staff and people not related with the documental management will have it easier to understand the content of this thesis and the DMS involved.

The company can complete this list of terms and concepts in order to show to the external company in charge of the servers for the data of the DMS or the digitalization of the current documents, as it also contains lesser-known terms used only in Adisseo or in the chemical industry sector.

- Access: Right, manner and means to locate, use or retrieve information.
- Accountability: Organizations, people and society are accountable for their actions and can be asked to explain them.
- Action tracking: Process of controlling and setting times to some actions.
- Activity: Task performed by an organization.
- Administrative role: A set of functional permissions allocated to users allowed to perform administrative actions.
- Archival authority: Service or program responsible of selecting, containing and maintaining documents generated and facilitate the access to them and approving its destruction.
- Business process: A business process is an activity or set of activities that accomplish a specific organizational goal. Business processes should have purposeful goals, be as specific as possible and produce consistent outcomes.(M. K. Pratt et al., 2022)
- Classification: Systematic identification and structuration.
- Continuous improvement: Recurring activity to improve performance.
- Competence: Ability to apply knowledge and skills with the purpose of achieving the expected results.
- Conversion: Process of changing documents from a format to another one.
- Destruction: Process of eliminating or wiping documents not being able their reconstruction.
- Data: Group of characters or symbols that have assigned or could have assigned a meaning.
- DMS (document management system): It is the program designed to storage, manage, and control the document and image flow in a centralized way, making it easy and simple.
- Document: Information or object registered that can be treated as a unit.
- Effectiveness: Extent in which planned activities are done and the planned objectives are achieved.

- Evidence: Information that could be used to establish proof about an event or an action.
- G.I.("gestión de ideas"): It is a project that arises from the idea of an Adisseo employee, usually done by the technical office department or the maintenance department.
- Indexing: Process in which access points are established to facilitate the retrieval of documents or information.
- Integrity: Quality of being complete and unaltered.
- Measurement: Process to determine a value.
- Metadata: Information describing the context, structure and content of the documents and their management.
- Migration: Moving documents from one system to another, keeping their authenticity, integrity, reliability and availability.
- Objective: Result to achieve.
- Organization: A person or group of people with their own functions, responsibilities, authorities and relations for the achievements of their goals.
- Outsource: Establish an arrangement whereby an organization performs part of an organization's function or process
- PFD: Process flow diagram.
- Politic: Intentions and guidance of a company, as formally expressed by their high management.
- Preservation: Processes and operations made to ensure that the intellectual and technical information of the documents is conserved.
- Process: Related activities that transforms inputs into outputs.
- Records: Information created or received, preserved as information and proof by a company or a person in the development of its activities or for their legal obligations.
- Records management: Management area responsible of an efficient systematic control of the creation, reception, maintenance, use and disposure of documents, including the processes to incorporate and keep, in form of documents, the information and proof of the activities and operations of the company.
- Records system: System of information that incorporates, manages and facilitate the access to documents over time.

- Registration: Act by which an identifier is assigned to a document at the time it is entered into the system.
- Requirement: Necessity or established expectation, usually implicit or mandatory.
- Rhodimet: The main product of Adisseo, consists in liquid methionine, an essential amino acid for bird feeding.
- Rumensmart: The new product of Adisseo, the methionine used for bird feeding in a solid state.
- Tracking: Creation, incorporation, and conservation of information about the movements and use of documents.
- Transfer (custody): Change of the custody, property or responsibility of the documents.
- Transfer (movement): Movement of documents from one place to another.
- Usability: Property of being able to be localized, recovered, presented and understood.

3.2.3. Process diagram

A flowchart is a type of diagram that represents a workflow or process. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in documenting or managing a process in various fields.(Wikipedia, 2022c)

Adisseo is a chemical plant in constant growth. Each department generates different types of documentation with its own life cycle. Also, we have the count of the Tn of product fabricated each day and the documents generated from sales and logistic departments.

The activities that generate more documents in the engineering area are related with projects and with a feature called G.I., which means "gestión de ideas"(ideas management in English). In the technical office we are responsible of managing most of the projects and the G.I.s, even though the other departments (fabrication, maintenance, etc.) are needed most of the time for some parts of the project.

We get all the documents related with the project and the equipment (pumps, valves, deposits) and we have to know in which activities are those documents generated and when.

I have made the process map for the validation of a G.I. , once it is validated there is no standard project, each one is different and will require different resources. Also,

each one can generate different documents. Even though each time there is a G.I. made all the documents that can be generated vary, we need a list with the most common documents so we can start thinking which of them are really necessary and which ones are valuable enough to keep.
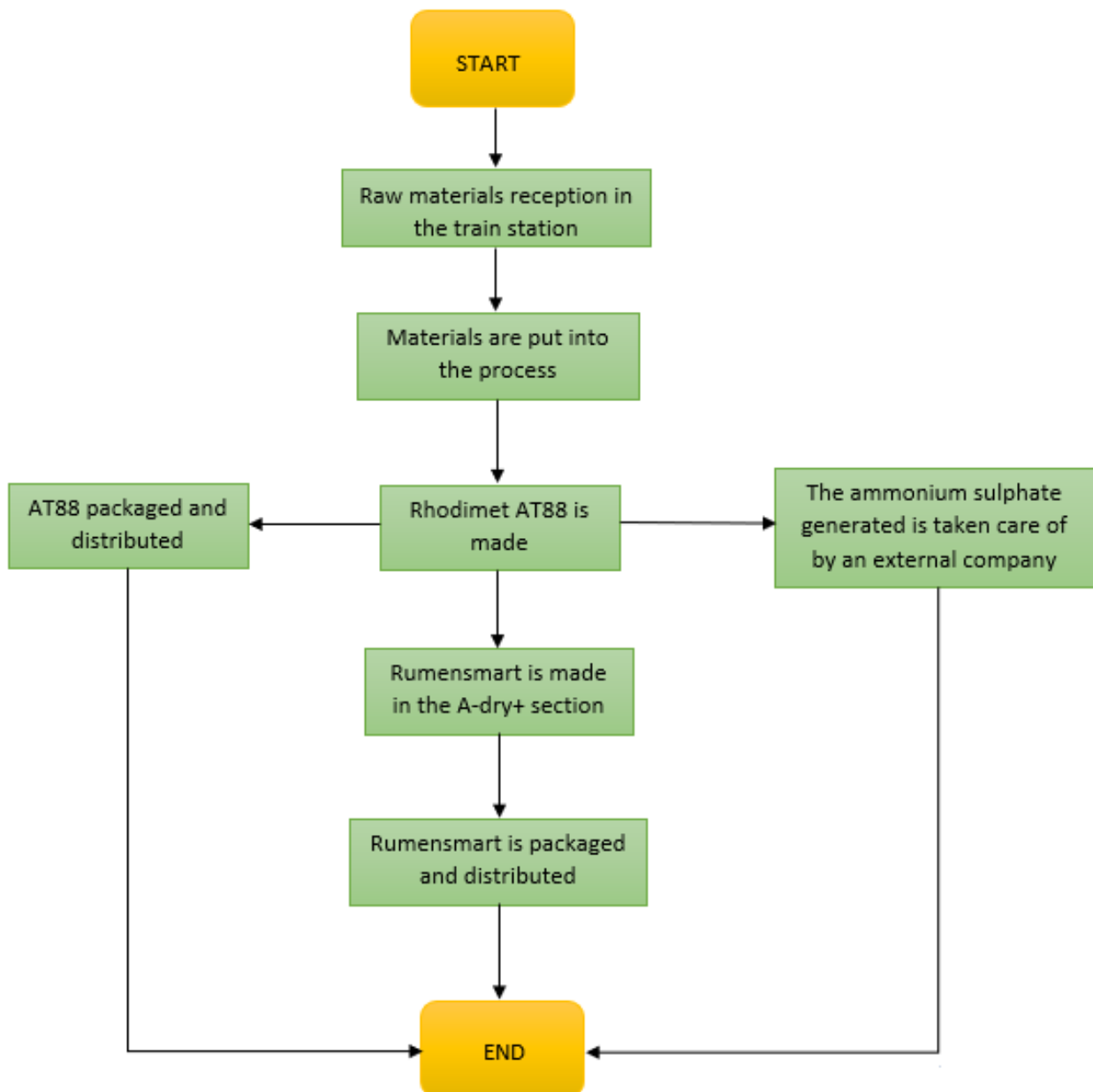
Figure 6. Fabrication process diagram. Source: Own elaboration.

There are many G.I. that can only be done while certain parts of the fabric are stopped, so usually when there is a section of the plant that is on hold, that time is used to complete all the tasks planned, usually in a short window of time, making it hard for the responsible to generate all the necessary documents, so it would be useful to have this in mind when choosing the time workers have to create certain documents.
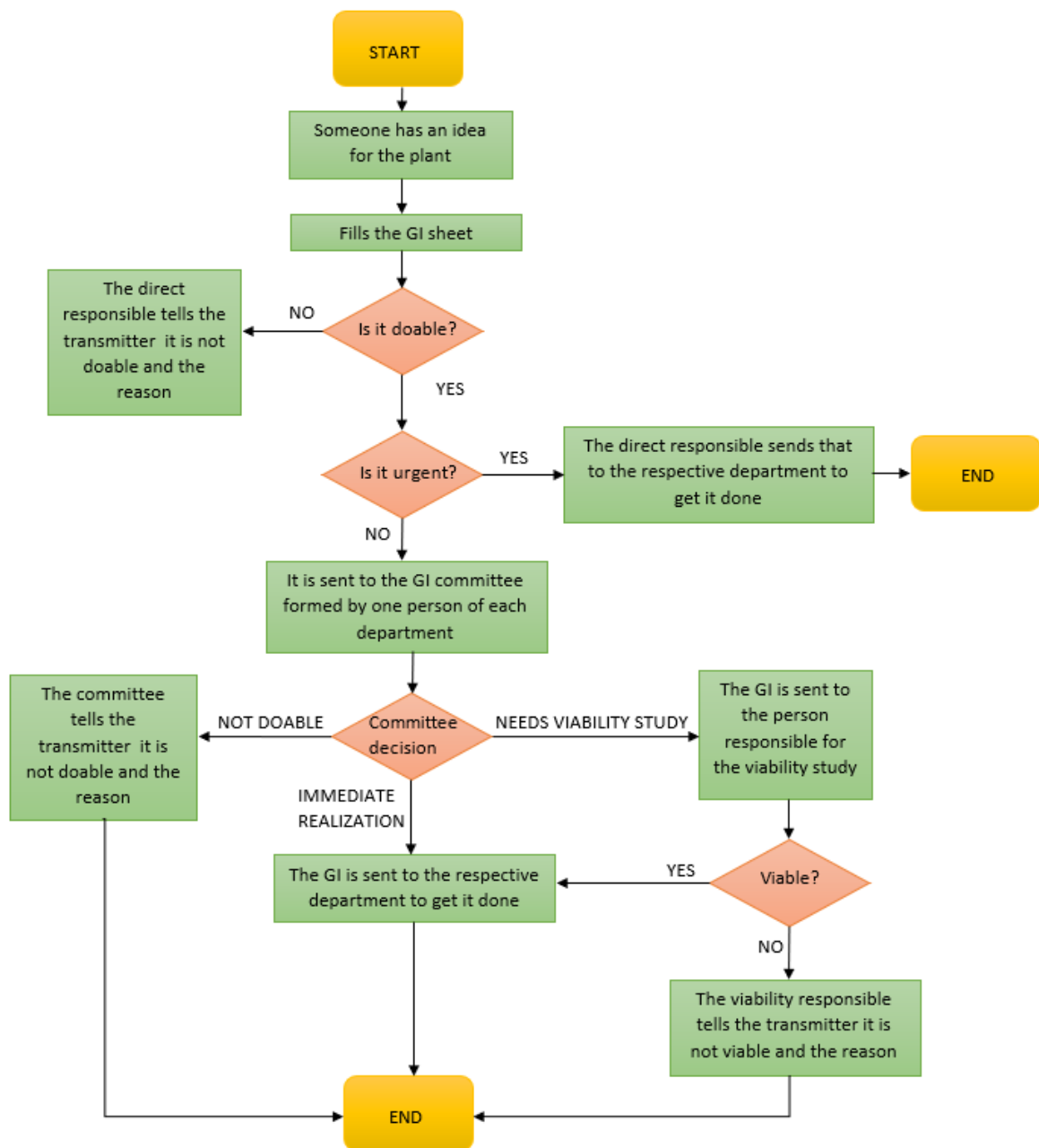
Figure 7. G.I. Validation flowchart. Source: Own elaboration.

In the figure we can see the logistic flow for producing Rhodimet and Rumensmart.
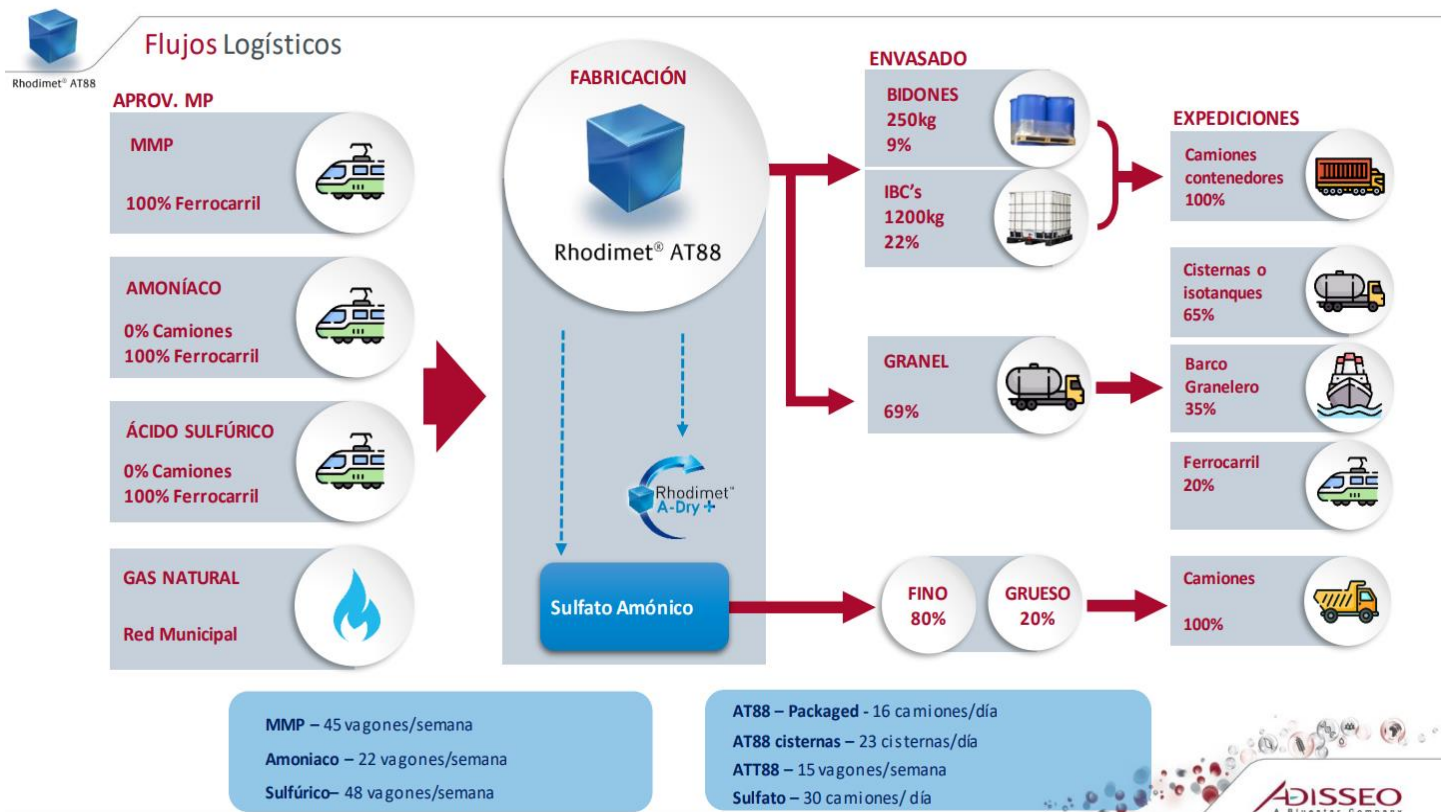
Figure 8. Logistic flow of Adisseo Burgos. Source: (*Adisseo*, 2021)

As Adisseo is a chemical plant there are a few particularities in its fabrication process. First of all, the production master plan is done considering if there is going to be any plant stop. Usually there is one stop each year or so, and it consists in more or less thirty days with the production stopped, used to maintain all the necessary equipment and to implement upgrades that cannot be built unless the production process is off. The production is very predictable, unless there is any problem with some process, so the plant produces Rhodimet and Rumensmart every day during the whole year, even in festivities. That makes the supply of raw materials, which comes by train, also predictable.

The only days that the plant is not producing is when there is shortage of some raw material like the MMP that comes from France, since it is common for them to have strikes in the railway sector.

We can see the daily logistic flow and how it is delivered. As said earlier, once the raw material enters the process there is no contact until it is finished and can be sold. During this process Adisseo also generates ammonium sulfate which is used by farmers to sulfate their fields, and the selling of that product is outsourced by an external company.
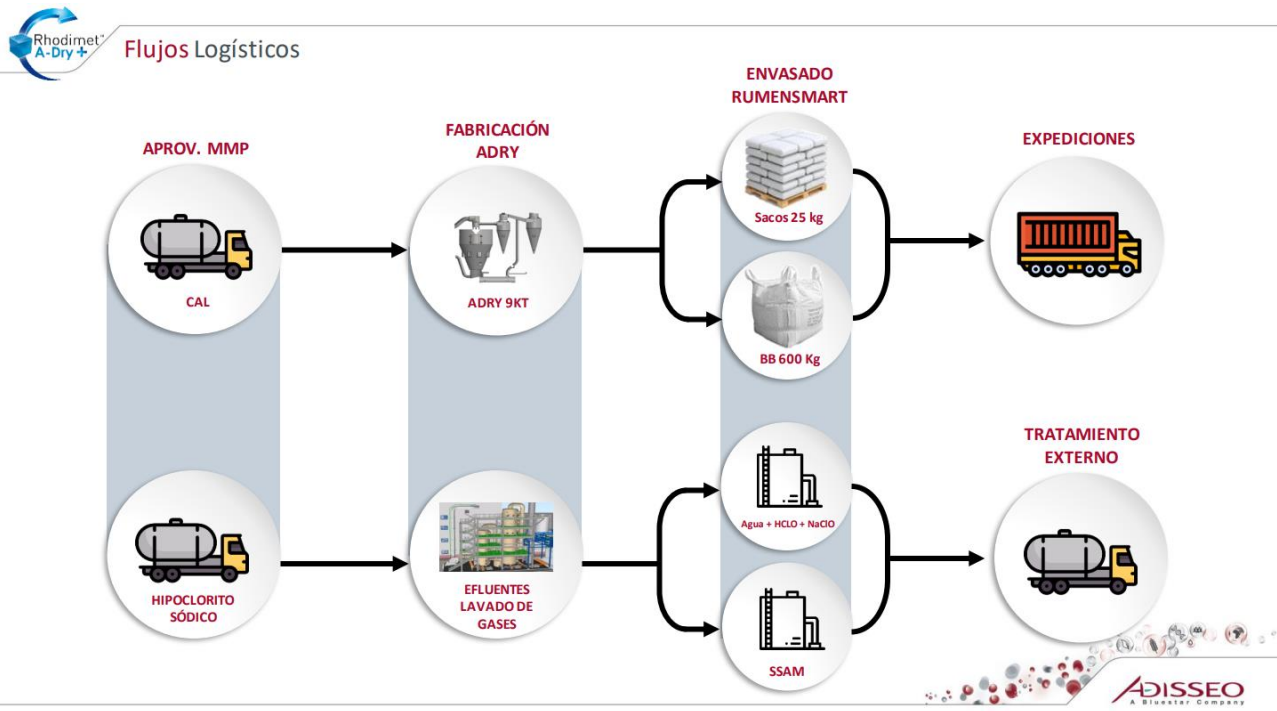
Figure 9. Adisseo logistic flow. Source: (*Adisseo*, 2021)

These processes generate documents mostly through the SAP system, with the functions that the program has available for the company. The folders with the functions of the SAP system are showed down below.

This is a good way of knowing the types of documents generated through the different processes and functions of Adisseo.

Figure 10. Adisseo SAP folders. Source: Own elaboration.

Almost every section of the plant works with SAP for some of their functions, being this the program that generates most of the documentation at Adisseo.

3.2.4. Project document list.

There are lots of documents that can be generated through a project. It is very useful to make a list with the main ones so we can classify them later and put responsibilities and a retention and disposition schedule for all of them. We will focus on the most important ones and on the ones related with the equipment, that will be useful for maintenance and future revisions.

In a G.I. :

1. G.I. sheet
2. G.I. budget
3. Project plans
4. Photos
5. Study

In an inversion:

1. Base Study.
    1.1. Preliminary study
    1.2. Plans
2. Detailed Study.
    2.1. Plans
    2.2. Technical specifications
    2.3. Material list
3. Legalization.
    3.1. Project execution
    3.2. Building permits
    3.3. Industry legalization
4. Purchases.
    4.1. Offers
    4.2. Orders
    4.3. Certifications
5. Technical documentation.
6. Documentation as built.
7. Management.
    7.1. Planning
    7.2. Proceedings

This are the standard folders generated in an inversion. The documents generated through the project will be put in the correspondent destination. For these inversions Adisseo usually does all the engineering work, but for some big projects where more staff is required Adisseo works with an external engineering, so they generate most of the documents with their own codification and their own database.

Here we can see some projects that have taken place in the history of Adisseo. For the Polar and the Pyrenees projects Adisseo worked with Technip, an external engineering which used its own document management system, causing difficulties between them and Adisseo because of the differences in the standards.

Figure 11. Adisseo milestones through the years. Source: (*Adisseo*, 2021)

This information, the project folders, should be used when creating a classification scheme for Adisseo.

3.3. REQUIREMENTS IDENTIFICATION (C)

3.3.1. Introduction

A requirement, according to (IEEE, 1998) ,is:

- A condition or capability needed by a user to solve a problem or achieve an objective.
- A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
- A documented representation of a condition or capability as in definition (A) or (B).

The objective of this chapter consists in identifying the requirements that the company must comply for creating, receiving and maintaining the documents about their activities, and document that requirements with an easy-to-follow method. This will facilitate the correct development of the activities and at the same time it will ensure that people and the company take responsibilities when it comes to administrative and legal matters. It is also a good way to be accountable to both internal and external stakeholders.

The requirements will be identified through a systematic analysis of the company, the legal and regulatory obligations and other general responsibilities. Evaluating the risk that comes from the absence of creation and storing of documents policies can also help identifying its requirements. With this process we can also get reasons for the correct creation and disposal of documents, and the starting points for designing the records management systems with some indicators that we may use to compare the performance of the current systems.

This are the documents that will be created in this stage:

- A list of all the sources containing relevant documental requirements for our company.
- A list of regulatory and legal requirements as well as any other derived from more general needs of the society related with the maintenance of documents.
- An evaluation of risks.

With the risk evaluation we can appreciate which are the most important issues and start thinking solutions for them to apply in the DMS.

The formal document made for the management and staff will be done in Spanish, since that document is meant to be understood by all the people who works in Adisseo Spain.

Requirements are not much different than what we would like to see in an ideal DMS, the differences are:

1) It may be necessary in many cases that the requirements are automated and executable by the system, because even though we would like to have the best DMS with everything automated, it is just not possible as the informatic solution is nearly impossible to get.

2) Reflects the fact we can do a better job documenting recordkeeping in an automated environment.(Bantin, 2015)

3.3.2. Documental requirements sources.

The main stakeholders relevant to the document management system in Adisseo are the society, our clients, investors, the government of Spain, Adisseo and its staff. We will make a list pointing all the possible sources of documental requirements and reasoning why they affect us, to have a general view of where to find the requirements for the record management:

- **Agencia Estatal Boletín Oficial del Estado**. As Adisseo is located in Spain we have to follow this legislation as it can have penal consequences if it is not followed.

- **Ethic code of Adisseo**. Adisseo operations are also controlled by their ethic code, so that all the organization follows a similar path.

- **Adisseo´s management book**. The management book guides the behavior and actions of the staff from Adisseo. It also gives information about the responsibilities of the different role and who can access information and in which situations.

- **Management book of Adisseo**. In this guide there are requirements related with the vision and values of Adisseo that ensure Adisseo's commitment with their stakeholders.

- **Ministerio de Industria, Comercio y Turismo**. The ministry of industry is also a good source of requirements and maybe there are information about requirements for accepting monetary help for new projects from the government .

- **Staff from the company**. People that have been working with documents for a long time will surely know which documents are required and which are expendable.

- **Existing documentation about equipment and projects done in Adisseo by external engineerings**. We can reuse the documental management knowledge of companies that are more used to work with huge quantities of documents so we can extrapolate that information to our situation.

- **MoReq 2 SPECIFICATION.** This is the model requirements for the management of electronic records, made by the European commission in order to help organizations which wish to introduce an ERMS.

- **ISO 15489-1:2016.** This standard regulates records management in both public and private organizations, provides assignment of responsibilities related to records management and regulates the design and implementation of a RMS.

3.3.3. Requirements.

Here we have to list all the requirements found during the development of this thesis taken from the sources mentioned in the last chapter. It is also important to set periodic reviews for this list, so that it stays updated through the years.

Some of these requirements were found by looking for the general requirements of a document management system and then adapting them to the situation and context of Adisseo.

For example, the ethic code of Adisseo states that we must guarantee safety at work and protect personal data. So, every time there is confidential information that must not be leaked and for preventing that information to be known by people not meant to, we need to put control on who can watch and share the information, being that a requirement to fulfill.

That would also be a requirement from the Agencia Estatal Boletín Oficial del Estado but adapted to the context of Adisseo.

Document requirements:

- **Authenticity**: documents should have the proof to show that they are what they claim to be; it's created by the person who claims its creation; it has been created in the date specified in the document.
- **Reliability**: the content of the document should be a complete representation of the activities or facts that are testified.
- **Integrity**: documents have to be completed and unaltered, being protected from unauthorized modifications. There should be policies about what modifications can be done in the documents, when and by who. Also, these modifications should be tracked.
- **Availability:** documents should have the capacity to be located, restored, presented and interpreted. Indications about the context of the document should show the process in which it was created.
- **Identifiability:** Documents should be unique, using a codification system that assures there are no duplicates, no errors in its versions and they are easily located.

System requirements:

- **System reliability:** The DMS should be able to operate continuously through reliable procedures. The modifications done to the system should not

negatively affect the characteristics of the documents. That also means the implementation of a backup copy in case there is any failure.

- **System integrity:** There should be regulations to control the access, the user identification and the security to avoid unwanted access, destruction, modification or disposition of documents without authorization.

- **Compliance:** The DMS should meet all the requirements derived from the activities of the company, from its legal framework and from the expectations of society.

- **Completeness:** the system should manage all the documents coming from all the activities of the organization.

- **Systematic:** Documents should be created, stored and managed systematically. Creating and maintaining documents should be systematize through policies, assignation of responsibilities and methodologies for a good use.

- **Access:** Adisseo has to be able to control the access to the documents by the assignation of roles with different permissions to the users of the DMS.

- **Capture of documents:** The system has to be flexible enough to incorporate into the DMS all the types of documents that may be generated internally or received from an external source.

3.3.4. Risk evaluation.

Not having the proper documents can be very detrimental for the company. Documents are the lifeblood of daily business operations and without them the company would not be able to carry out its activities. The negative impact caused from a bad documental management goes from the worsening of the view people have about the company to a complete shut down in the operations of the plant. It's a must to manage all the records properly because if not, these are some of the consequences:

- Losing customers' trust
- Company status deteriorated
- Bad image to rest of stakeholders
- Minor offenses will be fined up to 60.000€.
- Grave offenses will be fined up to 6.000.000€.
- Very grave offenses will be fined up to 100.000.000€.
- The loss of the possibility of obtaining subsidies.
- The prohibition of having public contracts.

For doing this evaluation we will follow the UNE-ISO/TR 18128:2014 IN report, "Information and documentation. Risk assessment for records processes and systems". made for all kinds of organizations in order to help companies with the evaluation of risks related to records processes and systems.

With this report we are able to:

- Establish an analysis method for the identification of risks.
- Evaluate the risks following shared guidelines.
- Document the risks as preparation for its mitigation.

The risk evaluation table will be made up of three columns, the type of event, the probability and the impact. With this table we can see which the main priorities are to fix and implant them in the new DMS or in the policies of Adisseo.

Firstly, we will identify the risk by assigning it to one of these categories: context, systems or processes.

On one hand, the external context encompasses the political, social and technological environment, also including the stakeholders and other factors which are not in control of the company. On the other hand, we have the internal context which would be any other factors that are not controlled by the person in charge of the DMS, and these factors could be the vision of the company, its structure or the company culture, which can affect the way documents are managed. Both internal and external will be put in the context group.

The next area would be the DMS, as it can generate risks in terms of maintenance, interoperability, continuity or security of the documents.

Finally, we will search for risks in the documental processes. In the document design, in the creation of documents, with the use of metadata or with the disposure of documents. In all of these areas there can be risks which need to be properly identified and evaluated.

For assigning a frequency to the risks we will use the next table:

Probability	Frequency
Very low	Happens once each 10 years or less
Low	Happens once each 3 years or less
Medium	Happens once each year
Very high	Happens at least once each month

Table 5. Risk frequency classification table. Source: Own elaboration.

The last step is to evaluate the risks with the purpose of helping management decide if a risk needs solution, priorities for the correction of the risk, if an activity should be done or which of the possible options should be adopted. The risks will be identified as minor, moderate, and major risks, as shown in the next table:

Minor	Moderate	Major
Rare breach in the access restriction	Unauthorized access to documents	Unauthorized access to documents that
Damage in a few documents	Damage in a significative cuantity of documents	Damage to documents extended to various areas
Limited data loss	Data loss/damage to fiability	Data loss/damage to fiability and reputation
Recoverable loss	Documents recovered with effort, but the processes are not interrupted	Costly recovery effort, interruptiom of more than one process area

Table 6. Risk classification definition table. Source: Own source.

With the classification of the risk and the frequency we are able to determine the severity of the risk and treat every risk accordingly to its importance.

I have made a risk evaluation table to show some of the potential risks of the DMS that the plant could have.

The risk evaluation table is in the annex.

Once we have the table with all the risks and their evaluations, we can communicate them to management through a risk register. The main purpose of this is to select which risks are priority and how to treat them.

The risks would be specified in a risk sheet that would help classifying them, linking them together and as a tool to follow the current state of the risks. This is an example of a risk description sheet for the risk register.

Risk description	
Risk ID	15
Risk name	Uncodified document
Risk type	Codification
Risk owner	Documental management administrator
Identification date	01/06/2022
Last update date	07/06/2022
Description	Time wasted searching for a document because it is not named correctly
Risk manifestation	Necessity of a document for a business process
Cost, if it happens (monetary or other)	Low
Probability	High
Impact	Minor
Strategy to avoid it	Having a codification standard and applying it to existing and new documents
Strategy to treat it	Informing about the error so the document can be renamed
Limit date	01/12/2022
Responsible of the treatment	Documental management administrator
Review date	15/12/2022
Cross-references with other risks	2;5;6
Risk and treatment state	Strategy to avoid it has started
Last evaluation date	07/06/2022

Table 7. Risk description sheet. Source: Own elaboration.

3.4. CURRENT SYSTEM EVALUATION (D)

3.4.1. Introduction

If we want to have a better records management system, we also must know how efficient the current ones are. There may be more than one records management system in the company, so we have to evaluate the systems that affect us and make a list with all of them.

In this step we will analyze the current records management systems to reveal any possible flaw regarding the requirements that we found in the previous stage. This can also help finding new requirements that were not found before. As mentioned in the first chapters, there isn't a completely linear order for the steps to be followed because some of them will bring feedback to others. This method of design and implementation of a DMS should be reviewed from time to time so as not to fall behind the new technologies and make the most out of it.

From this phase we will get a list of the current systems used and a report indicating how well does these records management systems meet the requirements for the company. In addition, to end the chapter there will be a list of Ishikawa diagrams, also known as fishbone diagrams, to show all the flaws detected until know and the possible causes, so that we can get another tool to help us define the strategies in the next step.

3.4.2. Systems description.

Archive system: The archive system consists in a room with cabinets full of dossiers and folders which are enumerated, each cabinet has a number from 1 to 25 and then each folder has a number from 1 to whatever is necessary. Some cabinets are destined fully to a project like the A-dry or ITACA project.

To find the document required we have to look in an excel where the document is. In the excel there is information about the inversion or project to which the document refers, the tag of the equipment in case there is any, the supplier of the equipment or creator of the document and a brief description of the content of that folder.

Supposedly it is only manageable by technical office, but other departments also have the keys that can open the archive door so there is no track of who takes the documents and which ones are taken. There are very old documents that may be from equipment from 1975 and they could be in poor condition.

This is a plan of the archive:
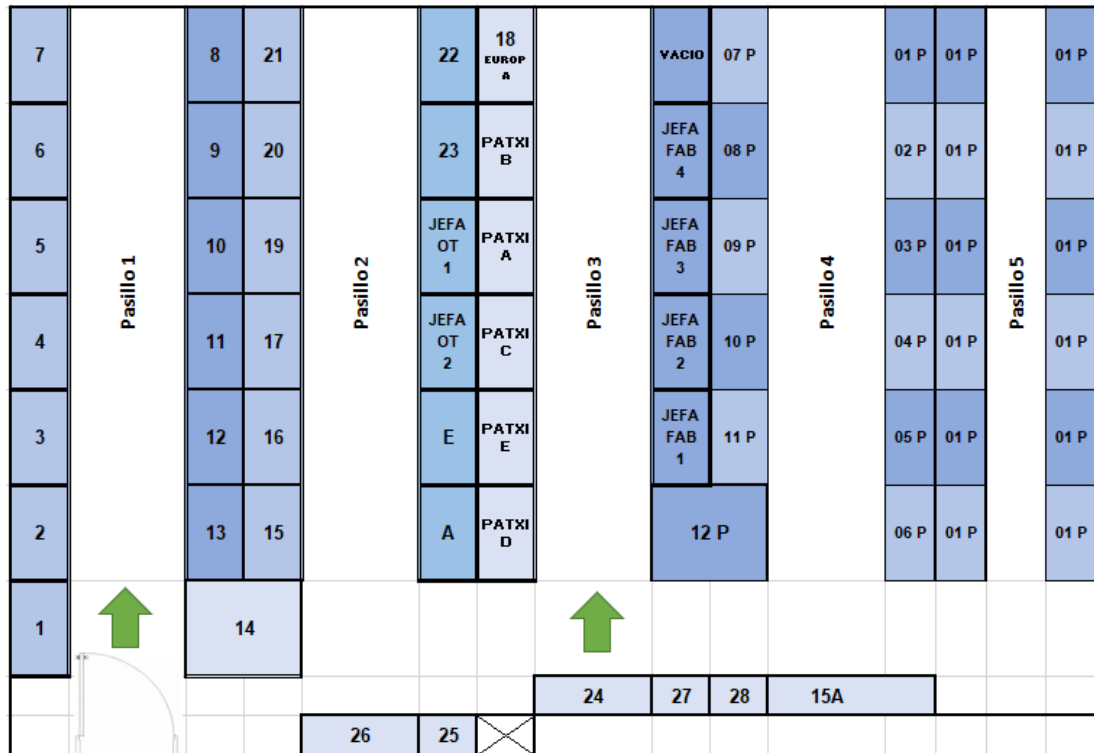
Figure 12. Representation of the archive. Source: (*Adisseo*, 2021)

Adisseo digital system:

In the technical office since 2010 more or less all the digital documents are uploaded in the internal Adisseo network, each department having their own networks and folders in which the documentation is stored. The software used is the software from windows using the standard folders usually named by the projects and containing all the information generated in each one. There is no coding standard so to find something you can either search the folders where the document may be or write key words or the number of the equipment in the searcher.

Figure 13. Current folder organization. Source: Own elaboration.

There is no plan for document removal either. The head of each section may have permission for looking in other sections folders.

SAP system:

In Adisseo everything goes through SAP. Sap is an Enterprise Resource Planning, a software that enables the companies to control the information flows that show up in each department. It is an open coded program and its modifiable by the clients using an ABAP programming language.

There are different folders with the applications needed in each one. Logistic, maintenance, quality management, material management, finances, information systems, human resources, etc.

Each user depending on its job has access to different folders, and by clicking in them and doing the correct steps you can generate the document needed.

For example, technical office staff can see the material available in the warehouse, create a work order and then assign the material needed to the work order, so it is reserved for that specific work. Then you can also modify work orders if any change is needed.

Once you have a work order, there are options to input the materials required, the hours of work needed and more. From there you can make a job authorization to give to any external company contracted.

As all areas are connected, these operations will be shown in the purchase and financial department so they can make the pertinent steps to complete the order. Any user can see the different operations available, and each department manages how to form their staff to use all the tools that SAP offers. This is a capture showing some of the folders with the different functions.

Figure 14. Example of the SAP functions. Source:

The problem comes when working, as the program is not intuitive enough and people who has been using it for a short time needs to stop and ask about its functions all the time.

Anyhow, this program is the center spine of the plant and it wouldn´t function without it.

Aditeca database:

This database is conceived to storage all the documents and to serve also as a guide and calendar for the activities of the company. It has a dashboard where you can search for any document and also see your tasks and which documents have been modified recently. It shows the user if there are pending reviews of documents to do or meetings to attend. You can find diagrams and the history of modifications done to that document.

In the project window you can see all the projects and clicking on one you are able to see the documents, meetings and following tasks. In the meeting icon there will be an option to create a meeting and settle the time , participants and themes discussed.

There is an option to add a new document with its metadata or import them from the Plantsuite server. If it is a new document ,first you have to choose from which area the document is from, and which department is responsible of that document.

There is also a page where you can add new users and assign their role so they will have different permissions depending on their responsibilities.

In other page there is a list with all the types of documents, and you can add more in case it is needed. For creating work orders there will be another page, assigning workers and its duration with a description of the job and the number of the work order. Once it is done there will be an option to input more hours to the job and check when the order is over.

It is meant to work with SAP, taking some of its functions and saving all the documents needed created in SAP.

3.4.3. Systems suitability.

Archive system:

It is a system made for the storage of documents in physical format, there are no digital files except for the excel where people can search the documents. There isn´t a perfect system , there is always room for improvements, so we will find the strongest point and the weakest ones.

One of the best things is that all the files are there, if an equipment needs to be tested you can search the test file in an easy way, as you only need to know how to use excel

to find the document. Also, saving these documents in paper format is very easy to do, just print the documents put them in a folder and forget about them.

Now the problems. It is very easy to lose track of a document, if someone takes it there is no register of that, if it gets lost there is a big chance of not seeing that document again. It wastes a lot of time and paper. When you search in the excel the documents and then the description of the document is not enough, you must search through various cabinets to find the document you are looking for.

The security is bad, just a key to open the door of the archive, a key that can be copied at any time by anyone and there is no list of the people that have one. And even if we had a list there is no record of who takes the documents. There is a list in each cabinet where people should write the documents they take and the date but that is no longer used.

When storing paper documents, it is really important to have in mind the conditions of the environment, as much humidity or dryness could affect the paper.

Another problem is the location. It is in a warehouse more or less 175m away from the technical office so if it's raining the documents can be damaged while being moved to the offices. That and the fact that it is a lot of time wasted moving from one place to another and if the documents are too heavy maybe more than one travel is needed to carry them all.

Adisseo digital system:

In the case of the digital system, one of the strongest points of this system is its simplicity. As the digital files are in the windows standard folders, people already know how to search for any document. With the searcher you can just write what might be in the title and windows will search all folders and documents with those words in its name. Also, people just need to click in the folders to see what is in there in case they want to find something. Finally, as it is a digital system the capacity of storing files is enormous and it is relatively simple to increase the capacity of the system without affecting the normal activity.

Now as an inconvenient we have the problem of not having all the documents digitalized. Most of the documents created before 2010 are not digitalized, forcing the worker to search in the archive if the documents don't appear in the digital folders.

When a document is required, the worker needs to guess its name and its location, losing a lot more time of the necessary just because of a nonexistent codification of the documents. There is no track of the registration of new documents, being a

common mistake to use or to work on a document that has a more recent version, losing time and the reliability of that document.

The removal of documents is not contemplated so there may be also an overload of documents that just waste space and can create confusion.

This records management systems are easy to manage and allows the company to grow but lacks a good accessibility for the documents and reliability which is essential for the system to be used.

SAP system:

SAP is a very useful ERP (enterprise resource planning), it connects the processes of the plant and the departments, being an excellent tool for the communication between departments.

It has the option to add new functions depending on the necessities, so it can grow along with the company necessities simple way.

There is a backup updated regularly to ensure the continuity of the program in case there is any major failure or catastrophe affecting the system.

It has a lot of advantages, but it also has some downsides. It is not intuitive, workers need many hours of formation to use it properly, and even with formation it is very hard to use all the functions it has. To have a good performance its needed constant updates and specific personal working just for SAP.

Aditeca database:

 This app fulfills almost all the requirements that Adisseo has nowadays, this is a theoretical exercise as we don't really know how it will work in reality once it is available to use, but in a first sight it has a lot of upgrades compared with the other systems, as the other systems haven´t been updated for a long time, and Aditeca will complement the functions of SAP in the plant.

The main purpose of this database is to have the documents ordered and accessible at any time, saving time in the search of documents. This database also assures that the documents are complete and safe because every modification is listed, and each user will have the editing permissions for the documents needed. Also, the security is much higher because it is connected with PlantSuite servers in order to have backup files in case there is a failure in the system.

For each department there are different documents required and now with this app the documents are classified by area too, so that it will be easier for each department to control their documents and give the editing permissions to people of the same department for their documents.

The app will be intuitive to use so with a bit of formation everyone will know how to use it without any problem. I think it is easy for the company to grow with this document system, but firstly it needs to be tested and slowly implanted, so that its implementation does not affect any business process. The app is thought to have a calendar with meetings which would substitute the actual use of Microsoft teams for the calendar. The correct use of the calendar will also help making complete and reliable documents, since there is also a time set for creating documents and reviewing them to always have them in the right version.

3.4.4. Ishikawa diagram

Also known as fishbone diagram, the Ishikawa diagram was created by Kaoru Ishikawa in the decade of the sixties as a tool to find the root causes of a problem (Cancian, 2021). The theory behind this states that every problem has its specific causes, and by eliminating the causes the problem will be also eliminated.

One of the great virtues of this method is how graphic the representation is. It can manage a great number of terms, linking the main problem with the different sections and the possible causes, creating more subsections and finding the root causes of the problem. And all of this while keeping the eye on the major problem, so as not to include irrelevant causes that can distort what we need to solve.

It is also meant to help stimulate new ideas and find objective causes, that later on can be easily reviewed and evaluated once the solutions are implemented (encourages continuous improvement).

The most common division used, the one used in this thesis, is the 6Ms of production division, which consist in dividing the problem into 6 categories that can affect a process. It is a mnemonic rule in which the *M* stand for method, manpower, Milieu (mother nature and also environment), material, machines and measurements.

Manpower: Is the operational labor of the people that has to deliver a product or a service, in this case is the document management.

Method: The processes and the delivery. When a process has unnecessary steps, and they don´t create value.

Machine: Systems, tools equipment and facilities used, when not specified or not correctly chosen, are not capable of giving the correct functioning.

Material: The raw materials, components and consumables used for the service delivery or production. If wrongly specified, mislabeled, badly stored or out of date, it is because there could be a better management of that resources.

Milieu: The uncontrollable events caused by the environment or the mother nature, for example floods and earthquakes.

Measurement: Manual or automatic measurements or inspections. They can be inconsistent or difficult to take, so these measures may not be as good as expected and may lead to bad decision making.

This is the Ishikawa diagram, and as the main problem I´ve put "problems with the actual document management systems". Even though it is a very unprecise problem, this gives us chance to put all the problems we consider important and classify them in the six categories explained earlier.
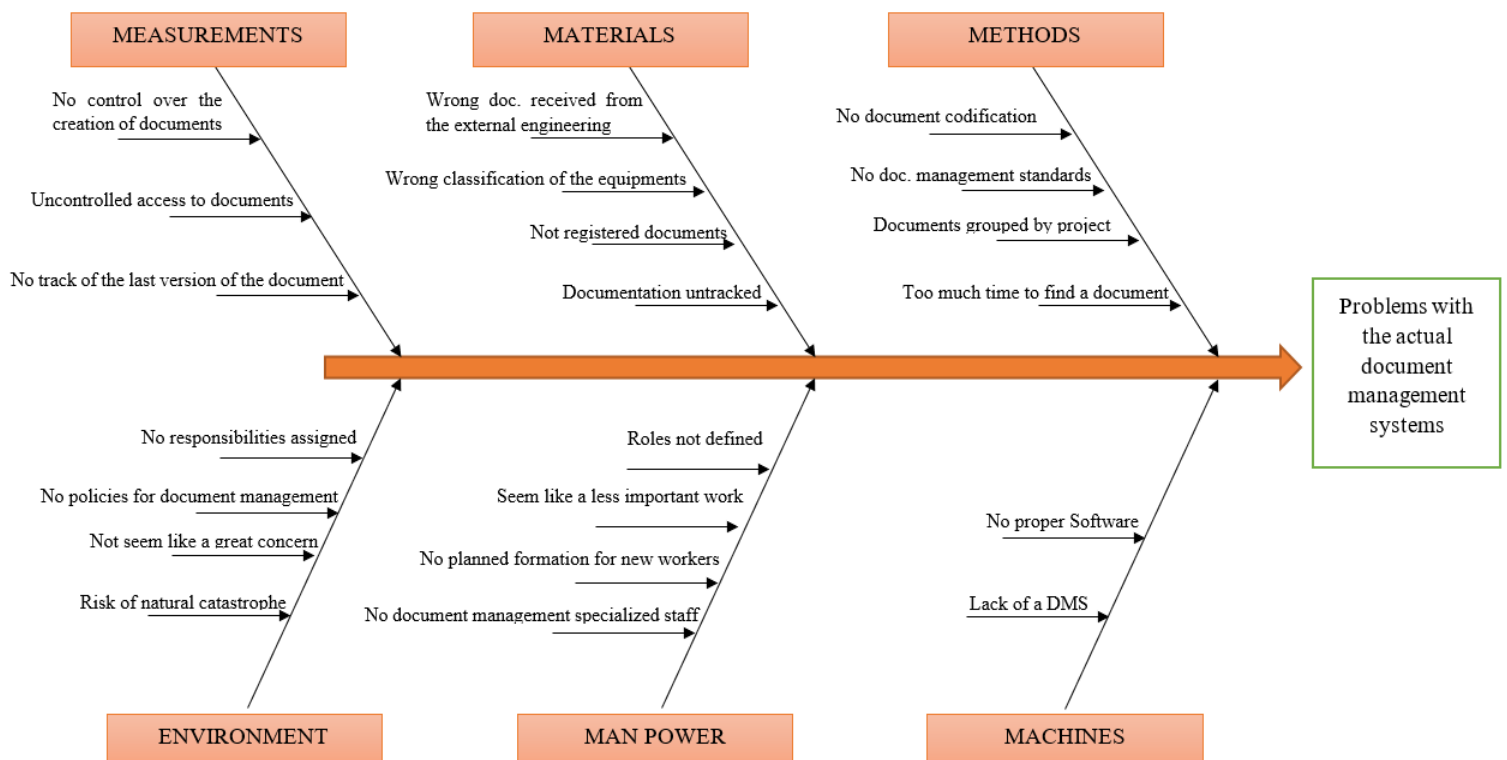

Figure 15. Ishikawa diagram for the DMS. Source: Own elaboration.

The causes found in the measurements section were the lack of control when creating documents, when accessing the documents and to track their versions.

For the materials there were problems with the documents received from the external engineerings. There were also a bad classification of the equipment and unregistered documents, that in addition, made them untracked.

Methods that could cause problems with the actual document management system were the lack of a codification standard and a document management standard. Also, grouping documents by project instead of grouping them by equipment is another factor that may create problems when looking for a document.

An absence of clear responsibilities and policies within in the document management system also creates problems for the management of documents. The risk of natural disasters with the lack of concern in the company for the document management are the main causes of problems with the actual systems in relation with the environment.

As of manpower problems there are various causes affecting the DMS. First of all, the roles are not defined, people manage documentation when it is required, but nothing else. Document management is treated very poorly, as there is no formation time or any plans to introduce new staff to the document management system. We can also add to the list of causes the fact that there is no one specialized in document management.

One last and very important problem with manpower is the lack of commitment to the new standards and ways of working, as people tend to work the same way they have been working.

Finally, related with machinery in this case, what is most missing is the lack of a DMS and proper software to complement it.

3.5. IDENTIFICATION OF STRATEGIES (E)

3.5.1. Introduction

Now that we have the requirements needed and the report with the strengths and flaws of the current system, we can start identifying the possible strategies that will help the company design and implant the new document management system.

The strategies planned must be aligned with the next conditions in order to minimize the possibility of failure in the implementation:

- The history and objectives of the company.

- The type of activities that the company carries out.
- The way in which the activities are managed.
- The technological environment of the company.
- The corporative culture.
- Any other external conditioning.

Strategies for the DMS can be really difficult to set and the objectives may be hard to accomplish, particularly if there are no specialized staff in the company in charge of the documentation management. That´s why specialized institutions in documentation usually help the organizations with tasks such as adoption of policies and procedures, standards development, design of new system components and new systems implementation.

At the end of this stage, we will have a list of the strategies destined to meet the document management requirements which are compatible with the company needs.

3.5.2. Possible strategies.

Business strategies are the fundamentals of any company. A business strategy is a methodology that seeks to achieve an objective through an action plan that is broken down into strategic objectives for each functional area of the organization. That is why we have to keep in mind the corporative culture and the environment of the company, because these strategies will directly affect the culture of the company. Making the best choices for the strategies is a must, and to do that we need to consider the potential of each strategy to reach the expected result and the risk for the company if the approach of the strategy is not good enough.

We have to meet a list of requirements through the identified strategies, but for that we also need objectives that will facilitate the measurement of the realization and effectiveness of these strategies. In 1981 George T. Doran used the term S.M.A.R.T. objectives so as to guide manager about how to set objectives. These letters stand for:

- Specific: Target a specific area for improvement.
- Measurable: Quantify or at least suggest an indicator of progress.
- Assignable: Specify who will do it.
- Realistic: State what results can realistically be achieved, given available resources.
- Time-related: Specify when the results can be achieved.(T. Doran, 1981)

Knowing this we can set the right objectives and measure them, which will be very useful for the implementation and the post-implementation review.

Here are the proposed strategies that we should follow in order to have a more reliable and efficient document management system.

- **Documentation security strategy**

Assignation: Technical office, safety and IT

Goals: Securing the maintenance of the documents and guaranteeing its accessibility and reliability during their life cycle.

Objectives: Implementing a secure storage system and a security access chart to fulfill the requirements of each document, along with a tracking process in order to know the modifications of the document.

Time: We should be able to implant it at the same time as the new DMS, so it should be finished within a year.

To fulfill this strategy, we have to implant the DMS correctly and contract a safe data storage company. This data storage may be done through cloud technology, with periodic backups and an updated security system.

Other point to treat would be the security access chart that with its completion should serve as a guide for the staff to know which documents require more discretion and special measures, as we will see in the next stage.

The last theme to treat would be the tracking process, that in the best case would be automatized in the DMS and would keep track of the versions of the documents, also registering the date of the modifications and the person who modified the document.

- **Digitalization**

Assignation: Technical office

Goal: Have all the documentation digitalized.

Objective: Getting a digital copy of the documents that are only stored in paper.

Time: Six months for its completion.

With the digitalization strategy, if we don't have the resources available in the plant to do this internally, the plan to go with would be to acquire the service of a specialized company.

This company would be in charge of taking the documentation from the archive and scan it, classifying it in files and folder that would be handed back to us, so we can register the documentation in the new DMS.

- **Aditeca implementation**

Assignation: Technical office and IT

Goal: Create, develop and successfully implant the Aditeca DMS in Adisseo.

Objective: Create a functioning DMS to meet the documental requirements of Adisseo and implement formation plans for the staff in order to use the program correctly.

Time: Two years.

This strategy has two years to its completion because it also contains the formation plans that will be made once the DMS is implanted.

In the implementation chapter of this thesis is the explanation of the formation plan, along with other tactics that should be used to properly implement the DMS here in Adisseo.

3.6. DOCUMENT MANAGEMENT SYSTEM DESIGN (F)

3.6.1. Introduction

This is one of the most important stages in this whole project, here is where we will transform al this previous work and research into an actual records management system. We need to take information from all the previous steps, that means that the strategies selected in the step E will be incorporated into a plan made for the records system management , which will also comply the step C requirements and therefore will solve any problem registered in the step D of this same thesis.

This stage includes some previously mentioned topics such as:

- Designing changes in the current systems, processes and practices.
- Adaptation or integration of new technological solutions (in our case the Aditeca database).
- Definition of the most suitable way to implement these changes in order to get a better records management system in all the company.

If we want to succeed elaborating this new document management system, we shouldn´t mix the steps. It is really common to put together this step and the step E, because sometimes it is hard to see where the strategy ends, and where the system design starts. To ensure that all the requirements about the creation and maintenance of documents are viable, coherent and are implanted correctly we have to focus on each stage separately.

There should be professionals of the records management between other experts working with the future users of the new system, in order to elaborate specifications with information about the documental requirements . This "working with the users" practice ensures that the users will feel more comfortable using the system, understanding the new processes and feeling like it is their own program.

As the purpose of this thesis is to give backup to the Aditeca database, I will be conducting the gathering of information, and everything related to field practices.

Guided by the ISO 15489 standard in this stage I may create some of the next documents:

- Project planning defining tasks, responsibilities and lead times.
- Documentation related to changes in the requirements.
- Conceptual design descriptions.
- System operating rules.
- System specifications.
- Architecture and components system diagrams.
- Specifications to elaborate or acquire technological components like software or hardware.
- A classification scheme.
- Planification showing how to integrate the project in the current systems and processes.
- Initial formation and validation plan.
- System implementation plan.

The goal is to tell system designers what types of functionalities need to be created or designed into the system. Our goal is not necessarily to tell system designers how to translate these requirements into automated solutions. However, our requirements must eventually include enough specificity to achieve the desired results.(Bantin, 2015)

3.6.2. Aditeca conceptual design and descriptions.

Thanks to the IT department we have the conceptual design of how Aditeca could look like and its functions.

In first place the login screen in which the user can register to enter to the program with the email and password.
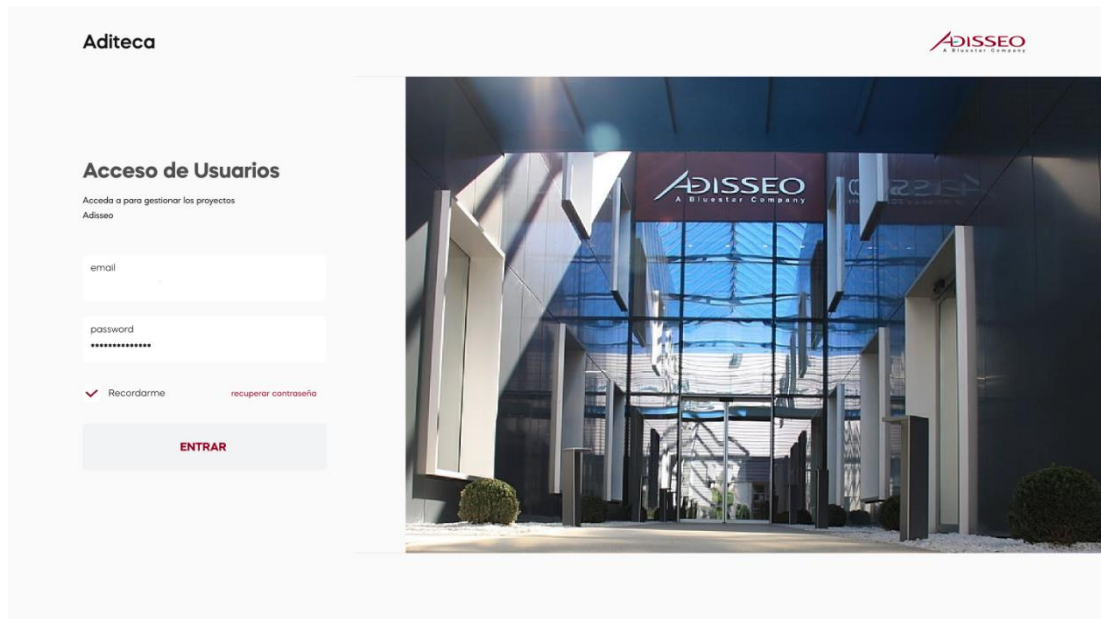
Figure 16. Aditeca login screen. Source: Adisseo

Once the user logs in the program, the first thing to appear is the dashboard, with a searcher from which the user will be able to find the equipment required and all the information related, and just under the searcher there will be four panels. The first one will have the assigned tasks; the second one will show the most recent documents modified from the documents that the user should had knowledge of; the third panel will contain documents that need a revision from the user and the last panel will show the meetings that the user is supposed to attend to.
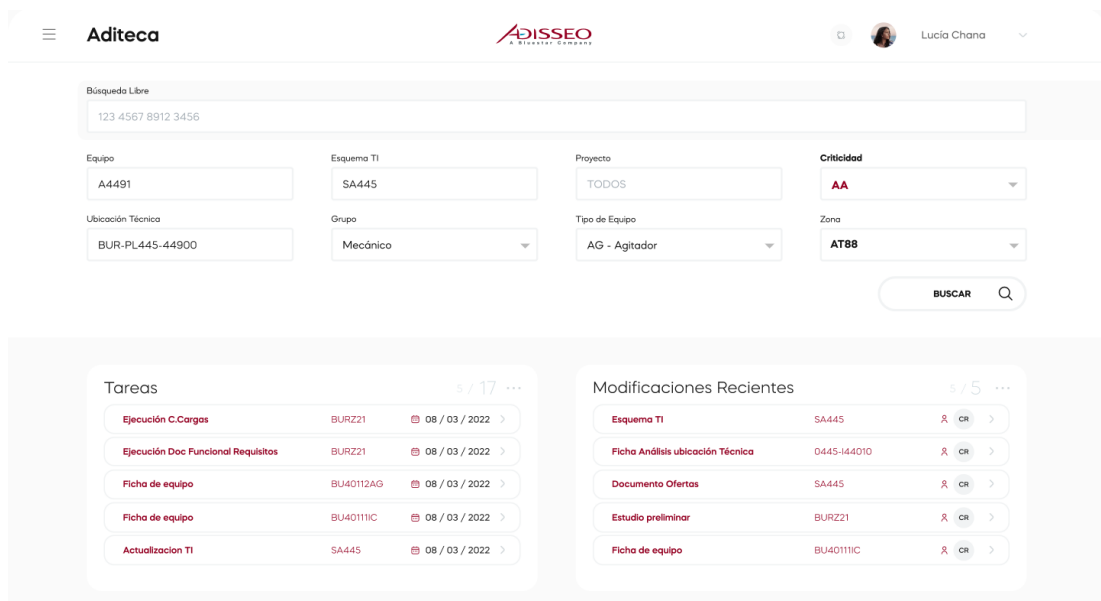
Figure 17. Aditeca dashboard. Source: Adisseo

On the top left of the screen there will be displayed an icon that when clicked, will show the dashboard, projects, documentation, meetings and weekly planning options, and the access and document management options for the administrators.
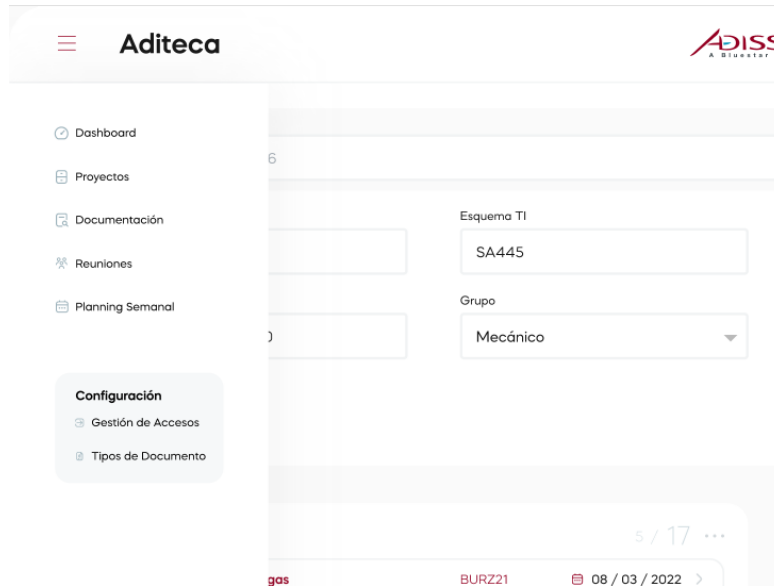
Figure 18. Aditeca menu. Source: Adisseo

By clicking in the access management, the administrator of the DMS will be redirected to a page with the list of all the Aditeca users with their role, name, email, number and the possibility to edit or delete their profiles. In that same page there will be a "new

user" button and by selecting it, a pop-up will appear with the profile characteristics to fill in.

Figure 19. Aditeca new user register menu. Source: Adisseo

The other option for the administrator will be the "types of documents" option in the top-left corner menu, which will open a page to create new types of documents, and there will be options to add the area where the document is generated or needed, the format of the file, if the modifications should be notified, the metadata that should be introduced and the areas interested in the document.

Figure 20. Aditeca new type of document screen. Source: Adisseo

Going back to the top-left menu and clicking in the project's icon, the user will go to the projects page, where there is a list of the projects with their date , the name of the project, the investment id and if civil work is needed in the project.

Figure 21. Aditeca project list. Source: Adisseo

It also works as a searcher where you can look for a project by its name, inversion, estimated date and if there is civil work involved or not. Another thing is the option to create a new project which would start as a project proposal, and the project creator would be able to put there which areas will be working on the project, to keep them informed.

Then in each project the user will be able to see the documents that are being created or modified, the ones that are completed and the ones that are needed. Under that document list the user will see the meetings needed for that project, its state and the next tasks of the user in relation with the project. The user will also be able to see the points of the meeting and the record of the meeting once it is uploaded.

Figure 22. Aditeca detailed study screen. Source: Adisseo

In the meetings list there will be an option in the corner to add new meetings.

Figure 23. Aditeca new meeting screen. Source: Adisseo

When creating a meeting the user has to add the affair, the date, the type of meeting, the participants, the documents attached for the meeting and the points that will be discussed along with the estimated time.

Once it is completed, a pop-up will show up in the screen of the attendants to inform the participants and let them accept the meeting.

In the page of a project or in the document page, there will be an "add document" button, enabling the user to upload a new document, specifying the type of document, its metadata, the revision period, the people that need to be informed of the creation of the document and finally the option to upload the document from the computer or with a link from PlantSuite, a digital repository that will be used to storage the documents.

Figure 24. Aditeca new document screen. Source: Adisseo

By clicking in the meeting icon of the top left menu, the user will access to its list of meetings, along with a searcher in order to facilitate the access to old meetings and the records from those sessions.

Figure 25. Aditeca meetings screen. Source: Adisseo

The last page is the weekly planning, accessible from the top left menu. There the user will have a list with all the weeks of the year and a searching tool to find the week the user is looking for.

Figure 26. Aditeca weekly planning screen. Source: Adisseo

 Once the week is selected there will be an option to add work orders and edit the number of hours estimated for the job, the number of the working order, the description, the initial date and the number of people involved.

Figure 27. Aditeca work order creation screen. Source: Adisseo

In the weekly planning page, the user will see which tasks are finished and which ones are in progress. By clicking in a work order the user will be capable of adding the real number of working hours.

3.6.3. Classification scheme.

Classification is the systematic identification and arrangement of records into categories according to logically structured conventions, methods, and procedural rules(Bantin, 2015).

The classification scheme is a very useful tool for the DMS, because it is a hierarchical and logical method to show the activities and processes of an organization that generate documents. This classification scheme also relates documents, creating what is usually called files.

There are four principles that inspire a classification scheme, and they are delimitation, oneness, stability and simplicity(Cruz Mundet, 2003).

- Delimitation: the purpose of the scheme is the end of it, all the documents generated or stored because of the functioning of the company. To avoid incorporating other documents from outside the company we need to have this delimitation clear.

- Oneness: This scheme is made to classify all the company documentation, regardless of its creation date.
- Stability: The scheme should be created based on the functioning of the company, because this functions usually last over time and the classification is safer and more stable this way.
- Simplicity: It is supposed to have just the precise number of divisions, exceeding this will only lower the quality of the scheme.

To comply with these principles, one of the main requirements is to have a deep knowledge of the functions and processes of the company.

When creating a DMS, there is always room for different variations and strategies. Companies specialized in the creation of document management systems, usually leave this tool as an optional one, only in very specific cases it is completely necessary.

That is why I will make an example with some documents, that could be used if the classification scheme is required in the future as a tool for the accessibility and availability requirements.

It is a decision from management to choose if they want the classification scheme or not. On one hand, this scheme will bring security and facilitate the search and recovery of documents, while also bringing relations between documents and avoiding duplicities in the codification of documents. On the other hand, this is a slow and expensive process, which will need revisions from time to time and the explicit support from management to be a successful project.

The classification scheme example is in the annex.

3.6.4. Codification System.

One of the main problems, as we saw in the interviews and in the preliminary analysis of the company, was the codification of the documents. To minimize the risk of failures with the documents and to find the documentation quickly we should codify the documents.

The correct codification of the documents will save lots of time, misunderstandings and money. I will show the current codification systems, which were made for codifying instruction documents and technical documents respectively. Then I will propose another system, in order to put it in use by all the plant and implement it in the new DMS.

The actual codification system used in Adisseo is applied for the documents of the management system, the documents used to have a better operability and comply with the ISO 9001 standard.

This codification system is unknown by many people of the company because it only applies for the documents of the management system (Sistema de gestión), which is not commonly used.

It is used to codify management manuals, process files, management procedures , technical instructions, specifications and formats.

This code used uses the format VVV XX (ZZ) YY (ZZ), in which:

-VVV are three digits, and the first one shows the level of application of that document. If it is 1VV it is for all the plant, when it is 2VV is for various departments and when the document is applied only to one department the code starts with 3VV.

-XX are two letters that will show the type of document.

-ZZ are two groups of letters that, if necessary, will show more content, about the issuing department in the first case, or about the content of the document in the second case.

-YY are two digits indicating the correlative number of the document issued between the similar documents.

For example, the management procedure document for the elaboration of documents of the management system is: "110 PG 01 Elaboración de documentos del Sistema de gestión".

This system comply with the ISO 9001 standard about documentation, but it is not suitable to classify all the technical documents, so in technical office there was a proposal to create a new codification system just for the technical documentation.

Technical documentation is the most managed documentation in the maintenance and technical office department since it is used to give information about the design, the fabrication and the functioning of a product.

It is also the essential information needed through the course of a business activity. This documentation is generated through various stages of the product life cycle. These documents can be:

- Reports

- Project documentation (project reviews, management, planification, follow-up, etc.)
- Designs, plans, user manuals
- Instructions, product descriptions
- Technical documents characteristics

The codification system proposed is like this:

AA aaa – Bb – CC – DD , where the first five digits represent the place referenced in the document. The first two A refer to locations that are not shown in any P&ID (piping and instrumentation diagram), such as storages, administration buildings or labs, amongst others. If the document refers to something shown in a P&ID, then those three digits will be the number of the diagram referenced.

The second part, the Bb, is a pair of letters destined to show the type of document. The first B will show which part of the work is being referenced and the second one the class of the document. The letters should follow this structure:

B	WORK	b	DOCUMENT CLASS
A	TI	A	Base documentation
B	CCTV / ACCESS CONTROL	B	Detailed documentation
C	AIR CONDITIONING	C	Standards
D	SECURITY	F	Supplier documentation
E	EQUIPMENT	G	Specifications
F	STRUCTURES	L	Lists
G	CIVIL WORK	P	Plans
I	GENERAL	R	Requirements
K	PROTECTION AGAINST FIRES	X	Singularities
M	MACHINERY		
N	INSTRUMENTATION		
O	ELECTRICITY		
P	PROCESS		

Q	AUTOMATION
U	PIPING

Table 8. Identification of document classes. Source: Own elaboration.

Then, in third place is the specific identification with two digits CC, used to differentiate the documents of the same type and place, from 0 to 99. Once the document is specified, the last two digits DD will show the version of the document.

For example, the list of equipment used in the technical building would be:

02000-CL-01-00.

This system is not being used even though the document was created in 2017 and the last modification was made in 2020. There hasn´t been enough conviction to go ahead with this system, so it hasn´t been fully implemented.

One thing that I can see here is that there is not enough precision with the name of the document. If in the P&ID 630 there are 10 different equipment and each one has 10 pieces of instrumentation connected, then only by having one file with the plan of each instrumentation, we would have a hundred files named 63000-NP-XX-01. The XX would be a number from 00 to 99 and it would be impossible to know from which instrument the plan is just by looking at the name of the file.

I will develop a new codification system, based on the last one, made for the technical documents.

The objective for this new codification system is to establish a logical way to name every document while fulfilling some basic requirements in order to assure the accessibility and reliability of the documents.

• The naming of the documentation will follow the same structure: There shouldn´t be more than one codification system since it would difficult the correct registration of the documents into the DMS and it would difficult the comprehension of the name of the files.

• There cannot be two documents with the same name: If all the documentation were stored in a single folder, there shouldn't be any document overwritten by any other.

• Documents should be easy to identify: It should be something between a code and a full description of the document.

- It can´t be too long: The name of the document shouldn't have the content of the document written in its name. For example, "Analysis of the PH in the AT88 tank" would not comply with this requirement.

- It has to be suitable for the new DMS: If we are working on a new DMS the codification system should be helpful for the new application, and not an obstacle in the way.

Now with these requirements, we will try to find the most suitable codification system.

For this new documentation system, to have all the documents of the plant with the same numeration, we will use an alphanumeric codification system.

All the technical documents (engineering, maintenance, technical office, IT, etc.) shall have these components:(1) a five digits number, (2) a brief document description , (3) the date of registration of the document, and at the end (4) the document version .

Example: 81850-Hoja_de_datos-20220819-01

(1) First is the location prefix, with five digits that show the location or equipment that the documents is referring to. If the document is about an instrument or an equipment it will have its tag. If it is a document about a particular zone, it will have the number of the TI scheme or the number of the zone, listed down below.

a	a	a	a	a	LOCATIONS
0	0	X	X	X	TI scheme referenced document
X	X	X	X	0	Equipment referenced document
X	X	X	X	X	Instrumentation referenced document
0	0	0	0	0	General
0	1	0	0	0	Administration building
0	2	0	0	0	Technical building
0	3	0	0	0	Maintenance building
0	4	0	0	0	Multiuse building
0	5	0	0	0	ADRY offices
0	6	0	0	0	Central laboratory
0	7	0	0	0	PDB laboratory
0	8	0	0	0	Crystallization laboratory
0	9	0	0	0	ADRY laboratory
1	0	0	0	0	Warehouse 1 (central)
1	1	0	0	0	Warehouse 2

1	2	0	0	0	Warehouse 3
1	3	0	0	0	Security warehouse
1	4	0	0	0	Documentation warehouse
1	5	0	0	0	AT-88 packing warehouse
1	6	0	0	0	ADRY warehouse
1	7	0	0	0	AT-88 bulk cargo stand
1	8	0	0	0	Train tracks stand
1	9	0	0	0	Transporters room
3	0	0	0	0	Substation
3	1	0	0	0	Technical room 1 / 2
3	2	0	0	0	Technical room 3
3	3	0	0	0	Technical room 4
3	4	0	0	0	Technical room 5
3	5	0	0	0	Technical room 6
3	6	0	0	0	Technical room 7
3	7	0	0	0	Technical room 8
3	8	0	0	0	Technical room 9
3	9	0	0	0	Technical room 10
4	0	0	0	0	Technical room 11
4	1	0	0	0	Technical room 12
4	2	0	0	0	External companies

Table 9. Location coding table. Source: Own elaboration

(2) Secondly, a brief description of the document with no more than four words, separated by "_".

(3) Then, the date of registration of the document, following the format YYYYMMDD in order to order them by date in an easy way.

(4) The fourth and last part is the version of the document, starting by 00 and ending in 99. If the document gets more than 99 versions, the next one should be a new document with the date that moment and starting again with 00.

With this system, we can easily search by equipment, instrumentation or location. We can also see the documents ordered by date and version so we can work with the latest document and review the previous ones and finally we have a brief description of the document that will just enough to know the content of the document.

Here we have a figure of the document management system tutorial in
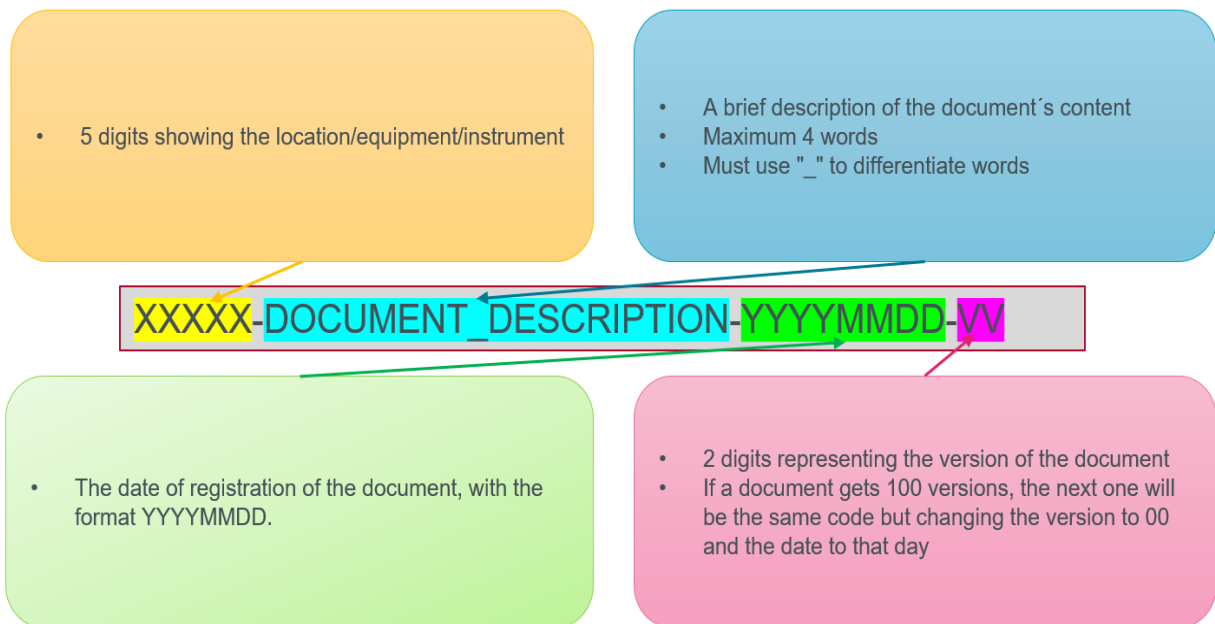
Figure 28. Codification system proposed system. Source: Own elaboration.

3.6.5. Metadata.

Following the Real Decreto 4/2010, a metadata scheme is a tool that defines the incorporation and management of content, context and structure metadata throughout the lifecycle of the electronic documents.

To classify all documents, we should know what data is relevant for each type of document. This data about the data of the documents, is called metadata.

Metadata provides information about the data that might be useful to track and classify document. In a digital image this metadata could specify the resolution of the image, the device from which the image was taken or made and the resolution, for example. Other records could have information about who made them, when, and if they have been modified, for example.

For example, in 280 BC, the Great Library of Alexandria attached a small, dangling tag to the end of each individual scroll(Kennedy, 2013). The tags gave the title, subject, and author, allowing library users to assume the content, without having to unroll each scroll, and so the scrolls could be returned to their proper location. That is one of the first uses of metadata ever used in history.

Nowadays as almost every kind of data is digital, the metadata is also electronic and can be created automatically most of the times. With this information it is possible to preserve the records the time needed, make them trackable and authentic.

For our DMS it is advisable to have a metadata scheme in order to manage all this metadata. According to the Real Decreto 4/2010, a metadata scheme is an instrument that defines the incorporation and management of content, context and structure metadata of electronic documents throughout their lifecycle.

According to the legal framework of Adisseo and in order to fulfill the expectations of the stakeholders, I suggest following the MoReq2 specification, and for the metadata scheme create one based on the recommendation of the "ESQUEMA DE METADATOS PARA LA GESTIÓN DEL DOCUMENTO ELECTRÓNICO (e-EMGDE) Versión 2.0", as it is the official metadata scheme proposed by Spain and it admits modifications depending on the requirements of each corporation.

3.6.6. Access and security chart.

The access and security chart is a tool required for any company independently of the size and the legal framework. For Adisseo this chart will help in the design of the DMS as it is essential for giving the users the proper permissions to access and modify the different types of documents.

It is important to consider the legal framework, the requirements and the risk analysis. A small company could have a password for accessing electronic documents and that would be enough security to fulfill their need, but in our case this security will be much stricter and more diverse, as there are different interested parts, and the risk is higher.

With this chart, once the security measures are implemented, we will be able to protect private information about the staff, intellectual property rights, financial and physical goods, public security and legal and professional rights.

To upgrade this chart, it should be linked with the classification scheme or the thesaurus, so when there is an addition of a new type of document it can be updated instantly.

For completing this chart, we should divide the documents into functional areas and manage the different permissions to the staff. It is very important to properly concede these permissions and a single failure can trigger the leak of very important information.

Once the access and security chart is done, there should be a verification of the access and security categories to see which of them are riskier or which are risk areas.

First of all, I will determine the four levels of security that I think Adisseo should have and show a few examples of what documents I´m referring to.

Public	Internal	Confidential	Secret
Documents made for all the public.	Documents for Adisseo related staff.	Sensitive information only for people related to that particular job.	Confidential information that requires strict control.
Adisseo´s purpose is to give visibility to this information	Adisseo prefers these documents to be private, but they are not a risk if know by external people	If this information is leaked, it might be harming for Adisseo or the responsible person	Leaking this information is very likely to cause harm to the responsible person or to Adisseo
Examples • Public research • Public reports • Security rules and recommendations	**Examples** • Guidelines for staff • Department policies • Standards • Formation material • Applications	**Examples** • Non-public research • Financial transactions information • Technical or architectural information	**Examples** • Passwords • PINs • Health, financial and other information of the staff • Details of security exposures in Adisseo • Patents and trade secrets

Table 10. Levels of access protection. Source: Own elaboration

And now, knowing the different proposed levels of security that the documents should have, I made the security chart in order to classify the documents and put them into one of the four security levels.

Security level	Description	Documents	Control

Public	All the official information emitted, received or processed, that has to be public, no matter if it is because of the laws or the internal rules.	• Documents classified as public	• Free distribution authorized by the creator of the content
Internal	All the information related to the business, which has no risk if it is released to the public, but it should only be managed by people from Adisseo	• By default, every document will be internal unless the administrator says it is private or secret.	• Only for internal use • Distributed to external companies • No encrypted information
Confidential	All the information related to the business, which is catalogued as sensitive and is only managed by a few staff because of their functions in the company	• Documents with information, usually about the plant, that the admin classifies as secret	• Only for selected personnel • No encrypted information • Distributed to external companies with confidentiality contract • Logo for private documents printed

Secret	Similar to private information, but in this case the leak of it will have more severe and even harming repercussions than the private information	• Very important information such as passwords, business information and private personal information	• Only for selected personnel • Encrypted information • Distributed only to approved external companies, encrypted. • Confidentiality contract mandatory • Logo for secret documents printed

Table 11. Adisseo security chart. Source: Own elaboration.

These are the logos that the internal, the secret and the private documents will have on the top right corner of the first sheet. This way all the people working with that information will know how to act in order to maintain the confidentiality.

Figure 29. Adisseo´s internal document logo. Source: (*Adisseo*, 2021)

Figure 30. Adisseo´s confidential document logo. Source: (*Adisseo*, 2021)

Figure 31. Adisseo´s secret document logo. Source: (*Adisseo*, 2021)

This will be applied to all documents except the ones related with HHRR. As they are commonly working with this kind of information, they won't use the logo in all the documents, but they will have a list with the types of documents that need this secret or private treatment.

4. IMPLEMENTATION

4.1. INTRODUCTION

The purpose of this stage is to plan the activities required to implement a new DMS, their duration and the estimated cost of the project.

It can be very difficult to integrate document management systems with existing communicating systems and with the business processes, because there are a lot of financial interests as well as accountability ones. Having a careful planification and a detailed implementation process documented will assure that these problems are minimized.

The implementation of a project consists in executing the tasks that were planned in earlier stages. As this is a theoretical implementation and the aim of the thesis is to support the real implementation of the DMS, I will do an estimation of the costs and evaluate the benefits that the project would bring to the company.

The documents that may be generated in the implementation part of the project are:

- A detailed plan of the project including the conjunction of the selected strategies.
- Policies, procedures and standards documented.

- Formation materials.
- Documentation related to the conversion process.
- Documentation required for accreditation of quality systems.
- Performance reports.
- A report for management.

This documentation should be generated when the real project is done by the corresponding professionals. Meanwhile, just for the first estimations I will propose the activities and durations of the project, the financial analysis, and some key factors for the implementation of the DMS.

4.2. PROJECT ACTIVITIES AND DURATIONS

This is the table with the proposed activities for the DMS and the estimated duration for each one. They were made in blocks of activities, so that sometimes we can start working in more than one task at the same time but to start one block we have to finish the previous one.

To calculate the duration of the activities I set a pessimistic duration, an optimistic one and a most probable duration estimation in order to calculate the real duration by using the next formula:

$$Activity\ duration: (Optimistic\ estimate + 4 * Most\ probable\ estimate + Pesimistic\ estimate) / 6$$

Here is the table with the activities and its durations in working days:

		Optimistic T.	Probable T.	Pesimistic T.	Duration
1	**Project management**	-	-	-	155,1
2	Project management start	0	0	0	0,0
3	**Start**	-	-	-	1,7
4	Project Charter	1	1	3	1,3
5	Stakeholder list	1	1	5	1,7
6	**Planning**	-	-	-	29,5
7	**Scope**	-	-	-	5,2
8	Requirements compilation	1	1	3	1,3
9	Declare scope	2	2	3	2,2
10	Build WBS (Work Breakdown Structure)	2	3	4	3,0
11	**Time**	-	-	-	3,2
12	Activities list	1	1	2	1,2
13	Build timeline	1	2	3	2,0

14	**Costs**	-	-	-	2,0
15	Resources estimation	1	1	1	1,0
16	Budget	1	1	1	1,0
17	**Management plans**	-	-	-	6,2
18	Quality plan construction	1	2	3	2,0
19	Roles and responsibilities definition	2	3	5	3,2
20	Communication plan creation	1	1	2	1,2
21	Risks identification and analysis	2	3	4	3,0
22	Risks response plan definition	1	2	4	2,2
23	**Follow-up**	-	-	-	1,2
24	Follow-up meetings	1	1	2	1,2
25	**Closing**	-	-	-	5,2
26	Closing contracts	2	3	4	3,0
27	Closing proyect	1	1	2	1,2
28	Proyect management finish	1	1	1	1,0
29	**Evaluation**	-	-	-	9,8
30	Technical study	4	5	8	5,3
31	Financial study	3	3	5	3,3
32	Sustainability study	1	1	2	1,2
33	**Requirements definition**	-	-	-	26,5
34	Proyect requirements	1	2	3	2,0
35	Aprobe requirements	1	1	1	1,0
36	Product requirements	3	5	4	4,5
37	Information gathering	5	7	8	6,8
38	Requirements diagnose	3	4	5	4,0
39	Select solution	2	3	4	3,0
40	Define values for the software	1	2	3	2,0
41	Identify possible solutions	2	3	5	3,2
42	**Software selection**	-	-	-	27,3
43	Technical characteristics description	2	4	6	4,0
44	Identify pros and cons	1	1	2	1,2
45	Select a supplier	3	4	6	4,2
46	Equipment set up	5	7	8	6,8
47	Software installation	2	4	5	3,8
48	Testing the interface	1	1	1	1,0
49	Virtual backup creation	1	1	1	1,0
50	Data migration	2	2	3	2,2
51	Integrity tests	2	3	5	3,2
52	**System implementation**	-	-	-	28,4
53	Manual of procedures divulgation	0,2	0,2	0,5	0,3

54	Process definition	3	5	7	5,0
55	Identify scope and sinergy of process	2	3	5	3,2
56	Process description	4	5	6	5,0
57	Functions detail	2	4	5	3,8
58	Resources identification	1	2	3	2,0
59	Adjust system profiles	2	4	5	3,8
60	Detail responsibilities	3	4	6	4,2
61	Function manual compilation	1	1	2	1,2
62	**Staff training**	-	-	-	7,2
63	Training manual elaboration	2	3	4	3,0
64	Training manual hand over	0,2	0,2	0,2	0,2
65	Follow-up and validation	1	1	1	1,0
66	Define indicators and procedures	1	2	3	2,0
67	Aprobe requirements	1	1	1	1,0
68	**Testing**	-	-	-	29,7
69	Testing in focus groups	2	3	4	3,0
70	Integrate processes	3	5	7	5,0
71	Gather data	1	2	3	2,0
72	Data compilation	1	1	2	1,2
73	Diagnose	1	1	2	1,2
74	Define improvement actions	2	3	4	3,0
75	Aprobe improvement actions	1	2	2	1,8
76	Update improvements into the system	4	4	6	4,3
77	Update necessary documents	1	2	3	2,0
78	Run final tests	2	3	5	3,2
79	Elaborate final diagnose	2	3	4	3,0
80	**End of implementation**	0	0	0	0,0

Table 12. DMS Project activities duration. Source: Own elaboration.

To understand better the hierarchy of the activities, here is the WBS (Work Breakdown Structure) of the project.
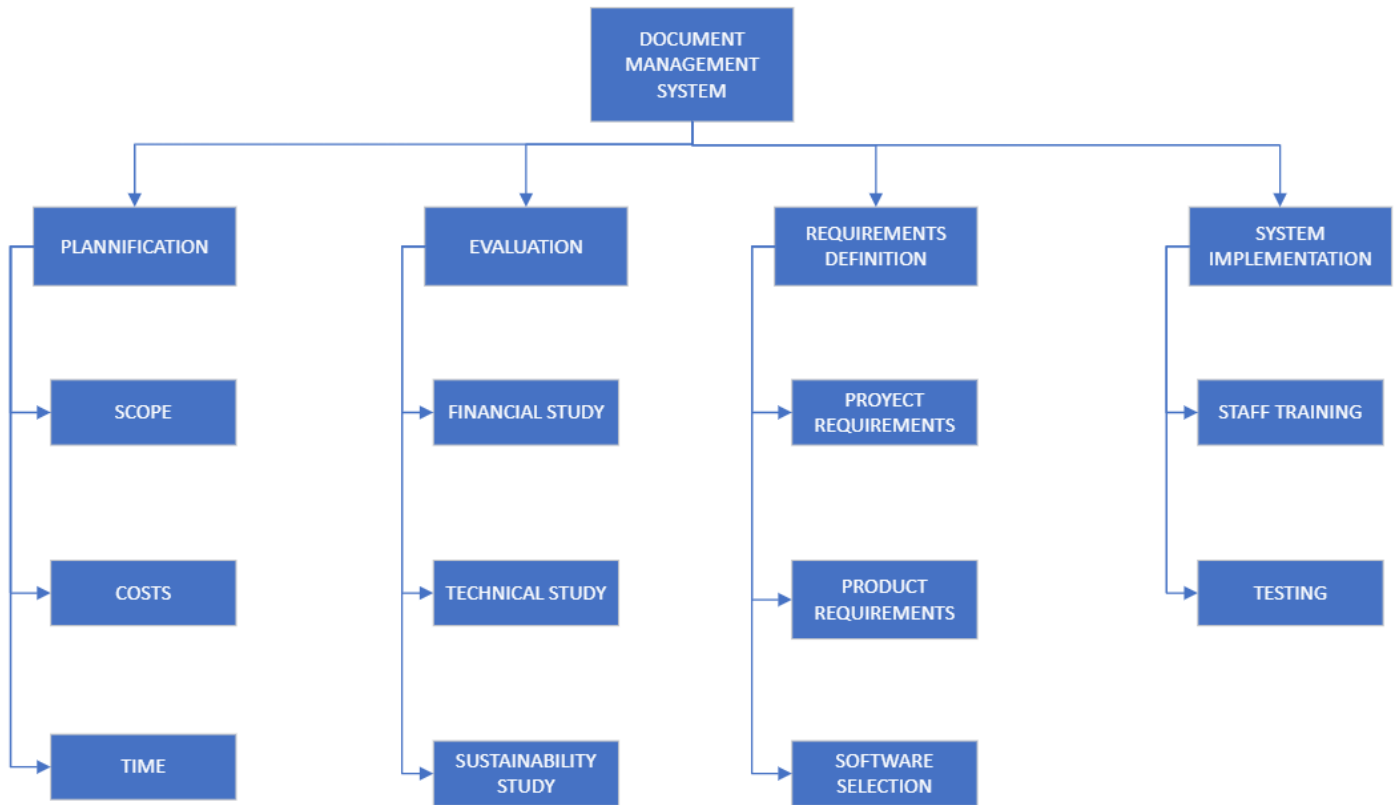
Figure 32. Project WBS. Source: Own elaboration.

4.3. PROJECT CHRONOGRAM

In this section we have the chronogram, made considering the duration of the activities and the non-working days, as we won´t be using free days to advance work. This would be the example if we start the project the 1st of September of 2022.

		Duration(days)	Start Date	Finish Date
1	**Project management**	**155,1**	**01/09/2022**	12/04/2023
2	Project management start	0,0	01/09/2022	01/09/2022
3	**Start**	**1,7**	**01/09/2022**	02/09/2022
4	Project Charter	1,3	01/09/2022	02/09/2022
5	Stakeholder list	1,7	01/09/2022	02/09/2022
6	**Planning**	**29,5**	**05/09/2022**	05/10/2022
7	**Scope**	**5,2**	**05/09/2022**	12/09/2022
8	Requirements compilation	1,3	05/09/2022	07/09/2022

9	Declare scope	2,2	05/09/2022	07/09/2022
10	Build WBS (Work Breakdown Structure)	3,0	07/09/2022	12/09/2022
11	**Time**	**3,2**	**12/09/2022**	16/09/2022
12	Activities list	1,2	12/09/2022	14/09/2022
13	Build timeline	2,0	14/09/2022	16/09/2022
14	**Costs**	**2,0**	**19/09/2022**	21/09/2022
15	Resources estimation	1,0	19/09/2022	20/09/2022
16	Budget	1,0	20/09/2022	21/09/2022
17	**Management plans**	**6,2**	**21/09/2022**	29/09/2022
18	Quality plan construction	2,0	21/09/2022	23/09/2022
19	Roles and responsibilities definition	3,2	21/09/2022	26/09/2022
20	Communication plan creation	1,2	21/09/2022	22/09/2022
21	Risks identification and analysis	3,0	26/09/2022	29/09/2022
22	Risks response plan definition	2,2	26/09/2022	28/09/2022
23	**Follow-up**	**1,2**	**29/09/2022**	25/02/2023
24	Follow-up meetings	1,2	29/09/2022	25/02/2023
25	**Closing**	**5,2**	**29/09/2022**	06/10/2022
26	Closing contracts	3,0	29/09/2022	04/10/2022
27	Closing proyect	1,2	04/10/2022	05/10/2022
28	Proyect management finish	1,0	05/10/2022	06/10/2022
29	**Evaluation**	**9,8**	**06/10/2022**	21/10/2022
30	Technical study	5,3	06/10/2022	14/10/2022
31	Financial study	3,3	14/10/2022	20/10/2022
32	Sustainability study	1,2	20/10/2022	21/10/2022
33	**Requirements definition**	**26,5**	**24/10/2022**	30/11/2022
34	Proyect requirements	2,0	24/10/2022	26/10/2022
35	Aprobe requirements	1,0	26/10/2022	27/10/2022
36	Product requirements	4,5	27/10/2022	03/11/2022
37	Information gathering	6,8	03/11/2022	14/11/2022
38	Requirements diagnose	4,0	14/11/2022	18/11/2022
39	Select solution	3,0	18/11/2022	23/11/2022
40	Define values for the software	2,0	23/11/2022	25/11/2022
41	Identify possible solutions	3,2	25/11/2022	30/11/2022
42	**Software selection**	**27,3**	**30/11/2022**	28/12/2022
43	Technical characteristics description	4,0	30/11/2022	07/12/2022
44	Identify pros and cons	1,2	07/12/2022	09/12/2022
45	Select a supplier	4,2	09/12/2022	16/12/2022

46	Equipment set up	6,8	16/12/2022	22/12/2022
47	Software installation	3,8	22/12/2022	26/12/2022
48	Testing the interface	1,0	26/12/2022	27/12/2022
49	Virtual backup creation	1,0	27/12/2022	28/12/2022
50	Data migration	2,2	28/12/2022	30/12/2022
51	Integrity tests	3,2	30/12/2022	09/01/2023
52	**System implementation**	**28,4**	**09/01/2023**	16/02/2023
53	Manual of procedures divulgation	0,3	09/01/2023	09/01/2023
54	Process definition	5,0	09/01/2023	16/01/2023
55	Identify scope and sinergy of process	3,2	16/01/2023	19/01/2023
56	Process description	5,0	19/01/2023	26/01/2023
57	Functions detail	3,8	26/01/2023	01/02/2023
58	Resources identification	2,0	01/02/2023	03/02/2023
59	Adjust system profiles	3,8	03/02/2023	09/02/2023
60	Detail responsibilities	4,2	09/02/2023	15/02/2023
61	Function manual compilation	1,2	15/02/2023	16/02/2023
62	**Staff training**	**7,2**	**16/02/2023**	23/02/2023
63	Training manual elaboration	3,0	16/02/2023	21/02/2023
64	Training manual hand over	0,2	21/02/2023	21/02/2023
65	Follow-up and validation	1,0	21/02/2023	22/02/2023
66	Define indicators and procedures	2,0	22/02/2023	24/02/2023
67	Aprobe requirements	1,0	24/02/2023	27/02/2023
68	**Testing**	**29,7**	**27/02/2023**	29/03/2023
69	Testing in focus groups	3,0	27/02/2023	02/03/2023
70	Integrate processes	5,0	02/03/2023	09/03/2023
71	Gather data	2,0	09/03/2023	13/03/2023
72	Data compilation	1,2	13/03/2023	14/03/2023
73	Diagnose	1,2	14/03/2023	15/03/2023
74	Define improvement actions	3,0	15/03/2023	20/03/2023
75	Aprobe improvement actions	1,8	20/03/2023	22/03/2023
76	Update improvements into the system	4,3	22/03/2023	28/03/2023
77	Update necessary documents	2,0	28/03/2023	30/03/2023
78	Run final tests	3,2	30/03/2023	05/04/2023
79	Elaborate final diagnose	3,0	05/04/2023	12/04/2023
80	**End of implementation**	**0,0**	**12/04/2023**	12/04/2023

Table 13. Project chronogram. Source: Own elaboration.

To realize this project, we should be working approximately 155 working days, which would be seven months and a half to complete the implementation of the DMS and the finish date would be the 12th of April if there has not been any modifications in the chronogram during its completion.

4.4. FINANCIAL ANALYSIS

This project financial analysis will consist in the cost estimation of the project and the study of different scenarios to know whether this project is profitable or not.

Firstly, to calculate the cost of each activity I made a table with the required jobs for this project and the estimated salary that they would earn by doing this project.

Then, by assigning the different jobs to the activities and with the man-hours required from each job to complete the task, we get the cost of each activity. Adding the price of the material, we can get the final cost of the DMS design and implementation.

The table was made searching online the average wage of each job, doing internal research in the company and then multiplying that salary by 1,25 as the extra paid in common contingencies.

This is the table with the estimation of the salaries used to calculate the cost of each activity:

Job	Salary (€/h)	Salary(€/day)
Project manager	43,75	350
Software engineer	31,25	250
Head of operations	35	280
Internal auditer	31,25	250
Administrative technic	21	168
Requirements analist	30	240
Assistant	20	160

Table 14. Estimated salary for each job of the DMS project. Source: Own elaboration.

And this is the table with the cost of each activity:

		Cost
1	**Project management**	**12.989,63 €**
2	Project management start	- €
3	**Start**	**733,33 €**

4	Project Charter	466,67 €
5	Stakeholder list	266,67 €
6	**Planning**	**8.398,33 €**
7	**Scope**	**1.177,33 €**
8	Requirements compilation	333,33 €
9	Declare scope	364,00 €
10	Build WBS (Work Breakdown Structure)	480,00 €
11	**Time**	**646,67 €**
12	Activities list	326,67 €
13	Build timeline	320,00 €
14	**Costs**	**490,00 €**
15	Resources estimation	250,00 €
16	Budget	240,00 €
17	**Management plans**	**2.505,00 €**
18	Quality plan construction	170,00 €
19	Roles and responsibilities definition	886,67 €
20	Communication plan creation	186,67 €
21	Risks identification and analysis	720,00 €
22	Risks response plan definition	541,67 €
23	**Follow-up**	**1.981,00 €**
24	Follow-up meetings	1.981,00 €
25	**Closing**	**1.598,33 €**
26	Closing contracts	840,00 €

27	Closing proyect	408,33 €
28	Proyect management finish	350,00 €
29	**Evaluation**	**2.053,33 €**
30	Technical study	1.333,33 €
31	Financial study	533,33 €
32	Sustentability study	186,67 €
33	**Requirements definition**	**5.881,33 €**
34	Proyect requirements	480,00 €
35	Aprobe requirements	168,00 €
36	Product requirements	1.080,00 €
37	Information gathering	1.093,33 €
38	Requirements diagnose	960,00 €
39	Select solution	840,00 €
40	Define values for the software	500,00 €
41	Identify possible solutions	760,00 €
42	**Software selection**	**6.331,67 €**
43	Technical characteristics description	1.000,00 €
44	Identify pros and cons	280,00 €
45	Select a supplier	1.166,67 €
46	Equipment set up	1.093,33 €
47	Software installation	958,33 €
48	Testing the interface	250,00 €
49	Virtual backup creation	250,00 €

50	Data migration	541,67 €
51	Integrity tests	791,67 €
52	**System implementation**	**6.027,67 €**
53	Manual of procedures divulgation	40,00 €
54	Process definition	1.200,00 €
55	Identify scope and sinergy of process	886,67 €
56	Process description	800,00 €
57	Functions detail	958,33 €
58	Resources identification	336,00 €
59	Adjust system profiles	920,00 €
60	Detail responsibilities	700,00 €
61	Function manual compilation	186,67 €
62	**Staff training**	**1.440,00 €**
63	Training manual elaboration	480,00 €
64	Training manual hand over	32,00 €
65	Follow-up and validation	280,00 €
66	Define indicators and procedures	480,00 €
67	Aprobe requirements	168,00 €
68	**Testing**	**6.516,33 €**
69	Testing in focus groups	480,00 €
70	Integrate processes	1.250,00 €
71	Gather data	320,00 €
72	Data compilation	186,67 €

73	Diagnose	291,67 €	
74	Define improvement actions	840,00 €	
75	Aprobe improvement actions	308,00 €	
76	Update improvements into the system	1.083,33 €	
77	Update necessary documents	500,00 €	
78	Run final tests	506,67 €	
79	Elaborate final diagnose	750,00 €	**Total**
80	End of implementation	- €	**50.371,63 €**

Table 15. Cost of salaries for DMS project activities. Source: Own elaboration.

Also, to these costs we should add an estimate of 30,000€ as it is the price of the license fee, and each year since the acquisition of the DMS the annual fee for the licenses and the cost of the servers that was calculated as:

$$Annual\ fee = 10€ * Number\ of\ licenses * month = 10€ * 155 * 12$$
$$= 18,600€$$

To see the monthly cashflow here is a table with the costs and the revenues of the first 14 months.

Month	Expenses	Revenue
1	-9.997,04 €	- €
2	-6.163,37 €	- €
3	-6.777,04 €	- €
4	-55.555,37 €	- €
5	-5.508,70 €	- €
6	-5.686,37 €	- €
7	-6.910,04 €	- €
8	-2.373,70 €	4.800,00 €
9	- €	4.800,00 €
10	- €	4.800,00 €
11	- €	4.800,00 €
12	- €	4.800,00 €
13	- €	4.800,00 €
14	- €	4.800,00 €

Table 16. DMS project monthly cashflow. Source: Own elaboration.

Once the project is finished, we would start obtaining the estimated revenue that would come from the usage of the DMS. This estimated revenue was valued at 4.800€ per month. To calculate this revenue, we only used the time loss factor, but as talked earlier there are much more benefits that can´t be calculated this way.

This is how it was calculated:

The average time a person wastes every working day to find a document is on average 15 minutes, that is 0,25 hours. Considering that one working day has eight hours and on average there are 20 working days each month, people lose 0,625 working days each month.

$$
\textbf{Monthly time lost per worker} = \frac{\textbf{0,25 hours}}{\textbf{workday}} * \frac{\textbf{1 workday}}{\textbf{8 hours}} * \frac{\textbf{20 workday}}{\textbf{month}}
$$
$$
= \frac{\textbf{0,625 days}}{\textbf{month}}
$$

Now to calculate the money saved with the DMS, considering that even there are 155 DMS licenses, the number or workers that will exploit this system on a daily basis is 60 and the average salary of them is 128€/day:

$$
\textbf{DMS revenue} = \textbf{workers} * \textbf{salary} * \textbf{time lost}
$$
$$
= \textbf{60 workers} * \frac{\textbf{128€}}{\textbf{worker} * \textbf{day}} * \frac{\textbf{0,625 days}}{\textbf{month}} = \frac{\textbf{4800€}}{\textbf{month}}
$$

This is the monthly revenue that the company would get, just in time that the employees will not lose anymore. On top of that, we will have all the benefits talked earlier, such as the security for the documents, the reduction of paper usage or the ease of complying with legal procedures.

The most problematic month concerning the costs would be the fourth month as it is when the DMS license has to be paid, as shown in this monthly costs and accumulated costs chart.
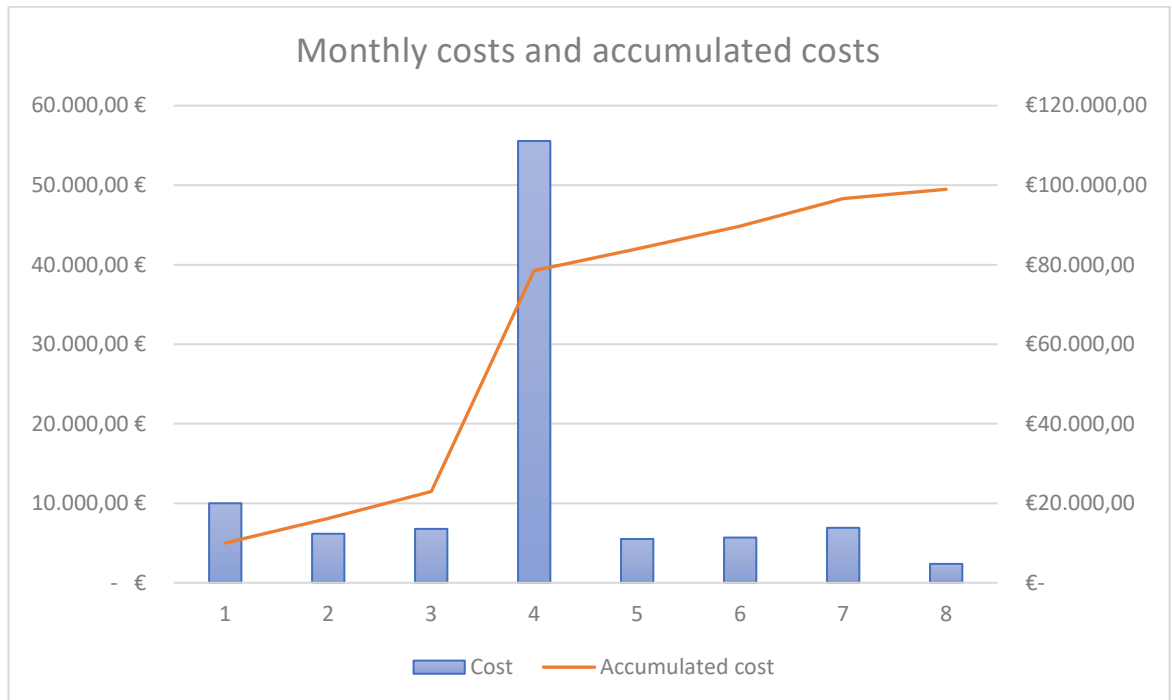
Figure 33. Monthly costs and accumulated costs chart. Source: Own elaboration.

The cost of this project for its first year would be:

$$\textbf{\textit{Project cost}} = \textbf{\textit{Salary costs}} + \textbf{\textit{DMS license fee}} + \textbf{\textit{Annual fee}}$$
$$= \textbf{50.371, 63€} + \textbf{30.000€} + \textbf{18.600€} = \textbf{98.971, 63€}$$

Finally, we will evaluate the profitability of the investment using some indicators such as the net present value (NPV) or the internal rate return (IRR).

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. By contrast, the internal rate of return (IRR) is a calculation used to estimate the profitability of potential investments.(Gallant, 2022)

It is important to know that each one has its own advantages and disadvantages.

To calculate the NPV, we used the following formula:

$$NPV = \frac{\text{Rt}}{(1+i)^{\text{t}}}$$

This is the NPV formula, where t is the period of the cashflow, i equals the discount rate and Rt references to the net cash flow.

Then we have the IRR that will tell us with which discount rate the NPV becomes 0%.

"IRR is used for comparing potential investments, projects and business opportunities. It also helps in analysing various capital budgeting projects. If the internal rate of return exceeds the cost of capital, then the project is profitable. If the IRR is below the cost of capital, then the project shouldn't be considered for investment. However, IRR alone cannot be used to evaluate an investment opportunity."(Chaluvadi, 2022)

That's why we also calculate the NPV, to complement the information and have a more complete analysis.

The formula used for calculating the IRR is the following:

$$0 = \text{NPV} = \frac{\text{Rt}}{(1 + IRR)^{t}}$$

The easiest way to calculate both the IRR and the NPV it´s with their respective formulas in excel.

Here is the table with the results, calculating them in a range of one to ten years and using a discount rate of 3% to calculate the NPV.

Year	Cost	Revenue	Profit	Accum. Profit	NPV	IRR
1	- 98.971,63 €	24.000,00 €	- 74.971,63 €	- 74.971,63 €	-72.787,99 €	-
2	- 18.600,00 €	57.600,00 €	39.000,00 €	- 35.971,63 €	-36.026,74 €	-48,0%
3	- 18.600,00 €	57.600,00 €	39.000,00 €	3.028,38 €	-336,22 €	2,7%
4	- 18.600,00 €	57.600,00 €	39.000,00 €	42.028,38 €	34.314,77 €	26,0%
5	- 18.600,00 €	57.600,00 €	39.000,00 €	81.028,38 €	67.956,52 €	37,4%
6	- 18.600,00 €	57.600,00 €	39.000,00 €	120.028,38 €	100.618,40 €	43,5%
7	- 18.600,00 €	57.600,00 €	39.000,00 €	159.028,38 €	132.328,97 €	46,8%
8	- 18.600,00 €	57.600,00 €	39.000,00 €	198.028,38 €	163.115,93 €	48,8%
9	- 18.600,00 €	57.600,00 €	39.000,00 €	237.028,38 €	193.006,18 €	50,0%
10	- 18.600,00 €	57.600,00 €	39.000,00 €	276.028,38 €	222.025,85 €	50,7%

Table 17. NPV and IRR values for the DMS project. Source: Own elaboration.

As we can see in the last table, the first two years of the project have a negative net present value and internal rate return. That is due to the fact that we start getting the

benefits of the DMS in the eighth month, once it is implemented. From that point, even though there is an annual fee that we have to pay for using the program and for the maintenance of servers, the profits are of 39.000€ each year.

This situation makes the inversion really worth, since the company will get an IRR of 37,4% and a NPV of 67.956,52€ calculating these indicators for the 5th year. Comparing them to the IRR and NPV calculated for the 10th year, we see that the IRR hasn´t grow that much, around 13%, but the NPV shows that the longer the functionality of the system lasts, the company gets more benefits, with a NPV of 222.025,85€.

So, depending on the duration of the DMS, the project will have different NPVs and IRRs. It is not possible to select a particular year to calculate the NPV or the IRR, since this document management system doesn´t have a caducity date.

Finally, if the company is interested, we can calculate the payback period. Payback is by far the most common ROI method used to express the return you're getting on an investment.

"The appeal of this method is that it's easy to understand and relatively simple to calculate. Here's what you do: Take the initial investment and divide it by how much cash you expect the investment to bring in each year."(Gallo, 2016)

In our case, as there are different cash flows and the company has to pay the annual fee, the best way to know the payback period is looking to the accumulated cash flow. For the accumulated cash flow to be positive it takes 35 months. This means that the project has a payback period of 2,92 years, which is an acceptable payback period considering that the DMS is supposed to be functioning in the company for a long time.

The Aditeca design and implementation has to be approved by management. It is a project with a high net present value and the company will benefit from it for a long time. The project will take more or less 8 months to complete, but it will not consume many human resources during that time.

This means that while some people would be working on this project, there could be many others happening at the same time.

It is a profitable project that should be carried out.

4.5. KEY FACTORS

4.5.1. Leadership

Leadership is a process of social influence, which maximizes the efforts of others, towards the achievement of a goal.(Kruse, 2013)

The ultimate goal is to implant the new DMS the best way possible, so here I will give tips for the section chiefs and department heads to ensure that the Aditeca project comes to a good end.

As they are the ones managing the good functioning of the plant, they are the best suited and with the responsibility to assure that the requirements of the DMS can be integrated into the business processes.

For an efficient leadership, the first thing to do is set example of how to work with the new system. In order to do that, it will be required:

- Giving the resources needed for the DMS.
- Assuring the document management policies and making them compatible with the strategic management of Adisseo.
- Transmitting the value of an efficient documental management to all the staff.
- Giving support to the employees (formation, advice, material) in order to facilitate the implantation of the DMS.

Related to the policies talked in the second point, is also a task for management to make sure that these policies about document management :

- Are appropriate for the purpose of the company.
- Include the will to fulfill all the requirements and the will for continuous improvement of the plant.
- Are available as information for all the staff.
- Are properly communicated.

It is also vital to be clear about the responsibilities that each person has in terms of documentation. The department heads should distribute these responsibilities through all the staff that is related to document management. There should be in each area a person with the job of implementing this DMS in an operational level and informing the directors about the efficiency of the DMS (with recommendations for improvement if possible).

4.5.1. DMS Administrator

For a correct implantation of the DMS there should be an administrator managing its use and taking note of how people is using the program.

Having a DMS administrator from the IT department with knowledge on DMS functions, requirements, testing, debugging and implementing new features would be very useful.

Someone able to monitor the stability of the system, diagnosing problems and using scripts to solve them would bring a lot of utility to the company. This person could also make suggestions for changes to implement in next patches, since it would be the one in charge of solving the doubts that staff may have.

Even though is the management of the plant and the policies of the company the ones that decide who should have permissions to different documents, the person with this role would also control the access and permissions people have. This means giving the right permissions to each member of the plant and creating the correct categories for documents and for users.

This job is highly focused on the early stages of the project, when workers are getting used to the new DMS and may have more doubts or suggestions to make for future patches.

4.5.2. Resistance to change

"Resistance to change is the unwillingness to adapt to altered circumstances. It can be covert or overt, organized, or individual. Employees may realize they don't like or want a change and resist publicly, and that can be very disruptive."(Heathfield, 2021)

People instinctively fear the unknown, we are made to have habits. Even with announced changes, people tend to resist them.

A new DMS also means a new way of working, and people may feel that they are falling behind with the new technologies, or that they simply lack the skills needed.

"The good news is, no matter what form it manifests, overcoming resistance to change is possible. However, organizations need to first understand the causes of resistance to more effectively address it."(Spring, 2021)

There is a model that shows how people confront death or nearly death situations.

"The Change Curve, or Kübler Ross' Change Curve Model, was created by the Swiss American psychiatrist Elisabeth Kübler-Ross in 1969. It depicts 5-stages of grief denial, anger, bargaining, depression, and acceptance."(Malik, 2022)

This model has been extrapolated to other sectors such as the business one, creating this table that shows how workers usually confront change.
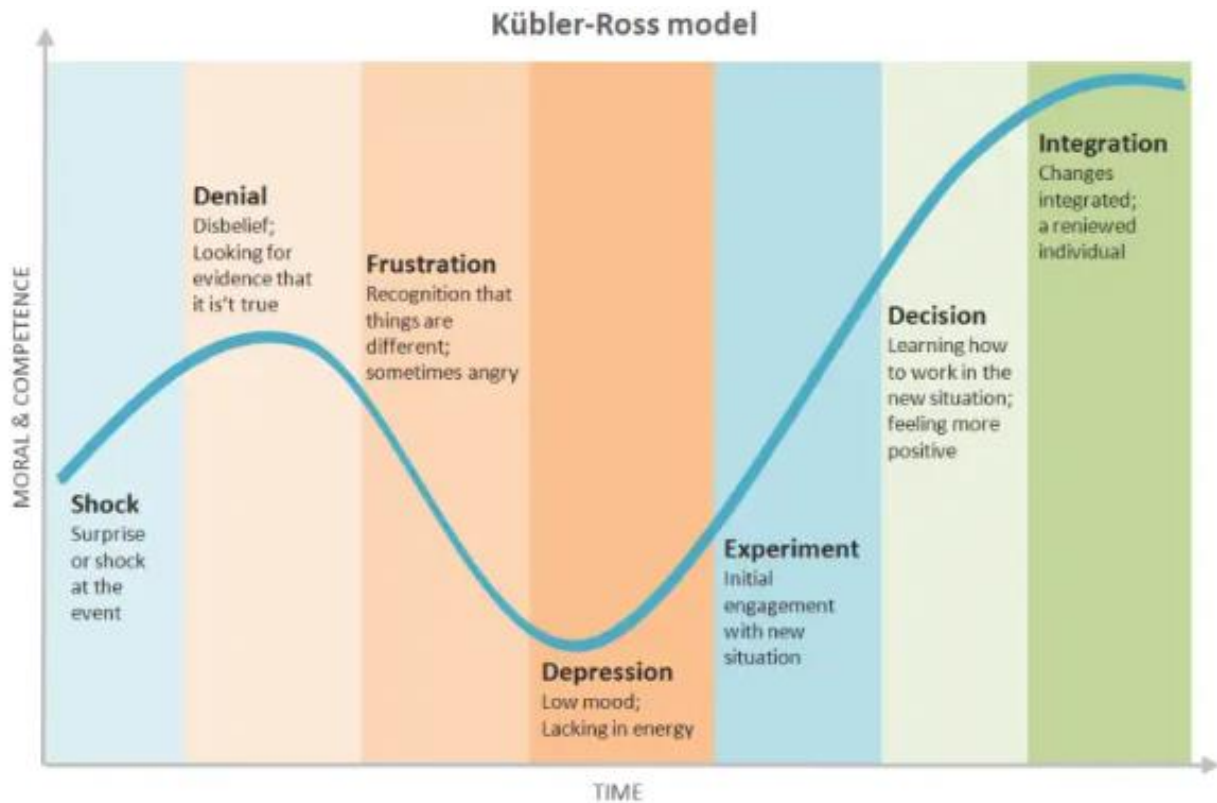
Figure 34. Kübler-Ross business change model. Source: Cleverism (Belyh, 2022)

In our case, the main problem was detected and stated in the point 3.1.7 of the second swot analysis and was the intentional misuse of the new DMS as consequence of this resistance to change.

To solve this problem, we should try Kotter´s 8 steps change model.

"John P. Kotter, professor at Harvard Business School, is known worldwide as the authority on leadership and change.

His best-selling book "Leading Change" which discusses mistakes organizations often make when implementing change and an eight-step process for successfully bringing about change, is widely referred to by managers as the bible of change across the world."(Athuraliya, 2022)

These 8 steps are represented in the next figure:
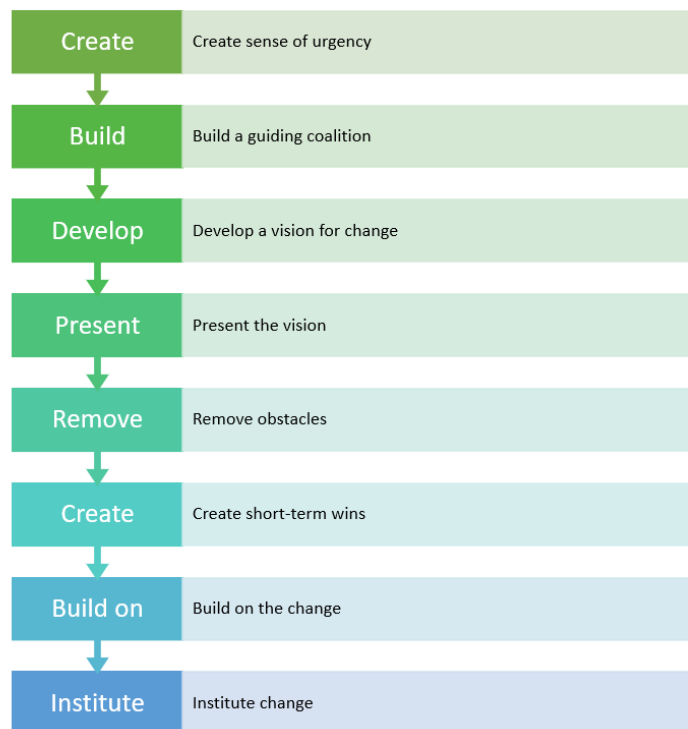
Figure 35. Kotter´s 8 steps change model. Source: Own elaboration

Firstly, we have to create a sense of urgency so that all the staff in the fabric feel the urge to change(in this case the DMS). We have to inform them of the incoming changes and motivate them.

For that purpose, in the communication day (the day when management informs abouts upcoming projects, financial situation and other topics) we should tell them and ask for their opinions, as well as their advice.

Having reports from professionals backing up the change is also a good option.

The next stage is the building of a guiding coalition. Here the objective is to have a team that shares the purpose of the change and know the responsibilities of each other. A team with good communication and able to resolve conflicts. In our case we should get the head of each department or the second in charge, in order to be able to impact in the way of working of each department.

The third stage would be the develop of vision, a vision aligned with the values of Adisseo and if possible accepting suggestion of the staff.

To communicate the vision, we will publish a new in the company intranet called Idoo, as well as emails to the users of the new DMS.

Then in the 5th step, we have to remove the barriers that are impeding the correct implementation of the change. In this stage the guiding coalition can play its part and try to find which are the most important barriers that need to be dealt with.

Maybe recognizing the good use of the DMS and rewarding it would make employees more active in the implementation of the new management system.

Other way would be with the empowerment of the employees. We will talk about this in the next chapter, with the formation plan for the usage of the new DMS.

The next step would be stablishing short-term objectives to complete, so that employees feel encouraged to be part of the change and follow company initiatives. In our case it is hard to set concrete objectives, but the good thing about the document management system is that the benefits will be seen by the employees.

They will see that by correctly using the program, documentation will be much easier to find. There will not be trouble identifying and looking for the latest version of a document. People will surely notice the improvements once they get used to the new system.

These short-term wins should happen between 6 to 18 months after the start of a change. In Adisseo, each year the collection of P&IDs is renewed. This takes one week of labor to complete. We could set as objective to reduce this time. With the DMS working it will be much easier and can be collaborative much easier.

The 7th step would be building on the change. Changes can fail if people get complacent about what has been achieved, losing interest in the news ways of working.

This is very important in our case, as we need all the staff working together for the same purpose. If someone doesn´t use properly the system to upload a document, then it will be much harder to search for it in the database. This is a common effort that we need to maintain to see results in the long term.

Also, analysing what is wrong and what could be done better will help developing the new DMS and the usage habits.

I suggest having a reunion each two weeks between the guiding coalition as well as the DMS administrator (if there is one) to talk about the situation and set new goals.

Finally, the last step is to institute the change. In this last phase Adisseo has to incorporate the change into its core.

This would be made by eliminating processes not aligned with the new DMS, incorporating norms that reinforce the new habits and including the new standards in the basic formation when hiring someone.

Finally, there should be a formation plan made for each department so that each employee knows all the functions that the program has and uses them correctly.

4.5.3. Skills training

The last advice for a correct DMS implementation is the formation or business training for the employees.

There are two types of skills that together make up what a person is capable of. These two skills are hard skills and soft skills. Hard skills are measurable, specific and teachable abilities that people learn in classes, with teaching materials or on the job, for example. On the other hand, soft skills are universal, hard to measure and much more subjective.

Figure 36. Hard vs soft skills. Source: (Yeh, 2021)

A hard skill would be machinery operation and a soft skill would be leadership or patience.

In this section I will talk about the hard skill that will be taught to the employees through different techniques for a better usage of the DMS.

To properly use the DMS, the staff need to have a basic knowledge about the application. There are various ways of doing this, such as presential or online classes, handbooks, video lessons or maybe instructions integrated in the DMS program.

Training employees:

- Prepares workers for a concrete task.
- Boosts employee productivity.
- Shares a common standard for working to the staff.
- Helps reducing the resistance to the change of the new DMS.
- Increases workers self-sufficiency.
- Encourages improvement.

Even though some people have predisposition for some activities, all these hard skills are learnable within more or less time. Certificates, tests and scores are proof of this hard skills knowledge.

"Individuals learn hard skills in various ways, including learning them in traditional schools, colleges and vocational education programs. Individuals can also learn hard skills through apprenticeships, mentoring, on-the-job training and hands-on training. Individuals can teach themselves hard skills too, through books, online platforms and even through trial and error."(M. Pratt, 2018)

Once it is tested and running, the DMS administrator along with the software engineer should make an instructions manual with all the functions of the program. There should be an initial presential course about the functions and how to use the DMS, and a handbook to help employees in case they have any doubts.

The users will be handed this guide and will be asked to pass a test to see if they have the proper level of knowledge about the new application. Once they pass this test, they will be able to work in the platform.

Later on, to keep the staff motivated and with their training, we could ask employees to fill a simple questionnaire. Through that questionnaire and some key performance indicators of the DMS, we should be able to select the main factors that are more valuable to the company and have more impact on the performance of the works with the management system.

As KPIs, even though there are more, I made a list of four that would be useful to have in mind the moment we implement the document management system.

The KPIs could be:

- Average time between the reception of a document and its registration in the system.
- Percentage of employees having passed the DMS test.
- Number of documents found with errors (date, naming, metadata, etc.).
- Time spent in the TI scheme review.

As said earlier, with these indicators and the questionnaires, there would be enough information to make courses about the topics that the employees really need.

With this plan we will make the staff ready to work with the Aditeca software and engaged with the new way of managing documents in Adisseo.

5. CONCLUSION

For any company to operate correctly is necessary to manage documents in a proper way. The lack of standards and policies related to document management generate efficiency losses. To solve this problem the best-fitting option is the implementation of a document management system.

Through the analysis of the company, its activities and its documental requirements, the risks of poor document management were identified and classified in a risk evaluation table.

When evaluating the current systems, the only one that seemed useful to keep was the SAP system as it is the program that generates most of the documents and it is used by all the departments. This showed that the Aditeca database must be able to work with the documents generated in SAP.

The strategies proposed to fulfill the document management requirements in Adisseo were a documentation security strategy; the digitalization of all the documents in Adisseo and the implementation of the new DMS for the plant.

For the design of the management system there were created other useful tools such as the classification scheme, the access and security chart and a proposal for a new codification system to assure the accessibility of the documents.

Concluding, for the correct implementation of the DMS, one of the main identified risks was the resistance to change that some workers may present when changing to this new system.

The recommendation is to follow Kotter´s 8 steps change model and give to the employees a training plan for a better usage of the new Aditeca functions once the program is available.

The results of the implementation part of the project showed that the DMS project should be approved as it would take few human resources, its total cost is close to 100.000€, which is affordable by the company, and the financial metrics NPV and IRR indicate the high profitability of the project for the long term.

6. ANNEX

6.1. RISK EVALUATION TABLE

EVENT			Frequency	IMPACT		
Context	System	Process		Minor	Moderate	Mayor
		Documents unidentified	High	Identify and name the documents		
		Untracked access to documents	High		Unauthorized access to documents	
		No metadata standards	Medium		Less fiability and accesibility	
	Obsolete technology for the company size		Medium	Does the work but needs programming		
New legistation for pressure equipment			Low		Fines if we don´t find the documents	
Catastrophe destroying the documents			Very low			The plant stops; very costly recuperation job
Unwanted access to the DMS			Medium			Could damage the DMS and most of the processes

Disorder with the property of documents			High	Lost time finding or creating duplicates of the documents		
Migration of documents without procedure			Very low			Can create complications in most of the areas
Staff not sure about the tools of the DMS			Medium	Misuse of the DMS; easily fixable		
People related to document managent leaves			Low			Loss of important knowledge; hard to recover
Mismanagement of documents because of lack of information			High	Time lost; easily fixable		
Lack of formation in document management			Medium		Can produce security breaches, time lost; easily fixable	
Difficulties to adapt to new legislation			Low		Costly fines can be applied	
Not having enough financiation for the DMS			Medium		No DMS development, outdated security	

	No metadata in the documents because of lack of standards		Medium		Costly to solve, reliability of the documents doubted	
	Not developing the DMS because there is no administrator		Medium			Outdated DMS, no purpose nor correct functioning
	No documentation about the maintenance of the DMS		Low		Affects the operability of the system for a period of time	
	No standard process for restoring the DMS		Very low			New implementation of a DMS from zero; all areas affected
	Failure of the DMS without contingency plans		Low			Various areas affected; DMS unavailable until its fixed
	Missunderstanding about who have to create the document		Medium	Time lost; can create conflicts		
	No periodical security evaluation		High		Can generate security breaches	

		Needing an uncodified document	High	Time lost; inefficiency		
		Untracked access to documents	High		Makes the documents less reliable	
		External document accepted without comprobations	High	Time lost if they have to make a new one		
		Very variable times for finding a document	High	Not efficient; Can delay a job		
		Unauthorized revelation of a process	Low			Important information security breach
		Losing reliability because of the technological gap	Very low			Important security breach; bad image
		Archive full of documents	Very low	Easy solution; making more room near		
		Disposition without standards	Very low		We could lose important documents	
		Using a document without knowing if it is the last version	Low		Time loss; Imprecise work	

Staff not willing to change the way of working and not using the program correctly			High		Data wrongly storaged; The system loses its utility	

6.2. CLASSIFICATION SCHEME

1. Gerencia
   1.1. Actas
   1.2. Informes
   1.3. Dirección estratégica
      1.3.1. Plan desarrollo sostenible
      1.3.2. Plan estratégico
2. Recursos humanos
   2.1. Selección Personal
      2.1.1. Convenio de Prácticas de Trabajo
      2.1.2. Peticiones Personal
      2.1.3. Contratos
   2.2. Gestión Personal
      2.2.1. Fichas Personal
   2.3. Condiciones de Trabajo
      2.3.1. Calendario de Trabajos
      2.3.2. Turnos de los empleados
      2.3.3. Prestaciones Sociales
      2.3.4. Revisiones Médicas
   2.4. Retribuciones
      2.4.1. Nóminas
      2.4.2. Retenciones
      2.4.3. Bonificaciones
      2.4.4. Anticipos
   2.5. Previsión social
      2.5.1. Seguridad Social
      2.5.2. Liquidaciones Seguros Sociales
      2.5.3. Incapacidad Laboral
      2.5.4. Jubilación
      2.5.5. Viudedad y Orfandad
   2.6. Relaciones laborales
      2.6.1. Elecciones Sindicales
      2.6.2. Comité de Empresa

REFERENCES

Adisseo. (2020). *Adisseo sustainable development report 2020*.

Adisseo. (2021). https://www.adisseo.com/es/desarollo-sostenible/socialmente-responsables/

Alexander, M. (2020, May 15). *What is project scope? Defining and outlining project success*. What Is Project Scope? Defining and Outlining Project Success. https://www.cio.com/article/193441/what-is-project-scope-defining-and-outlining-project-success.html

Athuraliya, A. (2022, August 10). *The Easy Guide to Kotter's 8 Step Change Model*. Creately.

Bantin, P. C. (2015). *IMPLEMENTING AN ELECTRONIC RECORDS MANAGEMENT PROGRAM*.

Belyh, A. (2022, January 20). *Understanding the Kubler-Ross Change Curve*. Cleverism.

Cancian, M. (2021, May 10). *What is Ishikawa Diagram? Learn the 6 M's of production*. What Is Ishikawa Diagram? Learn the 6 M's of Production.

Chaluvadi, S. (2022, July 27). *Scripbox*. What Is the Difference Between NPV and IRR?

Conexión ESAN. (2017, March 17). *La estructura organizacional funcional*.

Cruz Mundet, J. R. (2003). La orgnización del archivo: clasificación, ordenación e instalación. In *Manual de archivística* (pp. 229–240).

Gallant, C. (2022, May 23). *Investopedia*. Net Present Value vs Internal Rate of Return.

Gallo, A. (2016, April 18). *Harvard Business Review*. A Refresher on Payback Method. https://hbr.org/2016/04/a-refresher-on-payback-method

Heathfield, S. (2021, March 1). *What is resistance to change?* The Balance Careers. https://www.thebalancecareers.com/what-is-resistance-to-change-1918240

IEEE. (1998). *IEEE Guide for Developing System Requirements Specifications*.

Jileana Añez. (2022, June 10). *Web y Empresas*. Marco Legal de Una Empresa. https://www.webyempresas.com/marco-legal-de-una-empresa/

Kennedy, P. (2013). *Manifestations of metadata: from Alexandria to the Web – old is new again*.

Kenton, W. (2021, November 10). *Organizational Structure*. Investopedia.

Kruse, K. (2013). *What is Leadership*.

Malik, P. (2022, February 24). *The Kübler Ross Change Curve in the Workplace (2022)*. Whatfix.

Mejia Jervis, T. (2017, September 14). *Lifeder*. Entrevista de Investigación: Tipos y Características. Lifeder.

Noah Parsons. (2021, February 2). *LivePlan*. What Is a SWOT Analysis and How to Do It Right.

Pratt, M. (2018). Hard skills. *TechTarget*.

Pratt, M. K., Roy, M., & Mc Laughlin, E. (2022). *Bussines process*.

Serco Consulting. (2008). *MODEL REQUIREMENTS FOR THE MANAGEMENT OF ELECTRONIC RECORDS*. https://doi.org/10.2792/11981

Spring, K. (2021, October 27). *Overcoming resistance to change within your organization*. BetterUp.

T. Doran, G. (1981). S.M.A.R.T-Way-Management-Review. *AMA FORUM*, *November*, 35–36.

The ECM Consultant. (2019, November 20). *Document Management vs Records Management: The Full Guide*. https://theecmconsultant.com/document-management-vs-records-management/

UNE-ISO 15489-1. (2016). In *Información y documentación Gestión de documentos Parte 1: Conceptos y principios*. AENOR.

UNE-ISO/TR 15489-2. (2006).

Wikipedia. (2022a, January 14). *TOWER Software*. https://en.wikipedia.org/wiki/TOWER_Software

Wikipedia. (2022b, April 25). *Historia de la interfaz gráfica de usuario*. https://es.wikipedia.org/wiki/Historia_de_la_interfaz_gr%C3%A1fica_de_usuario#Apple_Lisa_y_Macintosh_(y_despu%C3%A9s,_el_Apple_IIgs)

Wikipedia. (2022c, June 2). *Flowchart*. https://en.wikipedia.org/wiki/Flowchart

Yeh, A. (2021, August 7). *Hard Skills vs Soft Skills: What's The Difference, and How to Improve Both*. HubSpot.