UNIVERSIDADE DO PORTO

Mestrado em Engenharia de Serviços e Gestão

Service Design for Information Management Systems

Gonçalo Ornelas Soares

Master Thesis

Supervisor at FEUP: Prof. Lia Patrício

Supervisor at Sumol + Compal: Engenheiro Carlos Moreira

FEUP

Universidade do Porto

Faculdade de Engenharia

Abstract

With the increasing complexity and competition in the current business environment, enterprises and organizations need to be constantly updated in order to benefit from the technology revolution, optimizing their processes, resources, and outcomes, aiming to increase the work quality environment and potentiate a more creative workload.

Due to the large amount of information that most companies currently work with, whether internally or externally, many face serious difficulties in this topic, leading to huge drops in productivity and the wear of their workers with activities that do not complete them.

The present study focuses on the use and integration of service design to enable a company's information management, especially the one related to the core activities that need to be aggregated and clear. It was developed a method following Design Science Research called Service Design for Information that provides a well-structured approach highlighting the importance of a comprehension phase on the design process, based on a qualitative study of the actor's experiences and interactions illustrated using several models and techniques from former Service Design methods which offer a human-centered focus. The method also enhances Information Management enabling methods, mainly focused on the system and content analysis. Combining both topics, the method results in diferent value propositions that serve as a basis for a future system's implementation.

The project was carried out at Sumol+Compal, one of the largest food & beverage companies in Portugal, which deals with large sets of information about its products and their context. Both the process of development of the method and its application and the design artifacts generated are presented and discussed in the current study to demonstrate how service design can support the design and development of an information management system.

Acknowledgments

I would like to start by thanking my family, especially my brother, mother, and father, for all the unconditional support and love they gave me throughout my academic career and life, providing me with a stable environment that allowed me to concentrate on my studies.

To my friends, for all the support and moments they have given me, and to those, I have come to know throughout the various faculties I have been passing through, both at Feup, at Isep, and at Estg, my thanks to everyone, each one was important in my academic path.

Especially, I want to thank my closest friends for all their love and for being there for me whenever I need.

A special thanks to the two essential people for this dissertation, my supervisor Prof. Lia Patrício, for the feedback and guidance during the thesis. Thanks for your enthusiasm and patience, that undoubtedly motivated me to do more and better. To my supervisor at Sumol + Compal, Eng. Carlos Jorge Moreira for believing in me, providing me with an excellent working environment, helping me with everything I needed, and for all the experience and knowledge he passed on to me during the internship. Thanks to the rest of the Digital Transformation team at Sumol+Compal team that accompanied me on this project, your support was fundamental.

Gonçalo Ornelas Soares.

Table of Contents

List of Tables

List of Figures

List of abbreviations

DT	Digital Transformation
IM	Information Management
IS	Information Systems
SD	Service Design
DSR	Design Science Research
DSRM	Design Science Research Methodology
S+C	Sumol+Compal
IT	Information Technology
SDIM	Service Design for Information Management
SD4VN	Service Design for Value Networks
MSD	MultiLevel Service Design
MINDS	Management and Interaction Design for Service
IIM	Internal Information Management
ECM	Enterprise Content Management
BI	Business Intelligence
SAP	System Applications and Products
KM	Knowledge Management
DM	Document Management
PIM	Product Information Management
DAM	Digital Asset Management
WCM	Web Content Management

1 Introduction

1.1 Research Context

Due to technological development, companies currently deal with a lot of information daily, internal or external, and of several different types.

The emergence of new technologies on the market, such as new information systems dedicated to information management, opens the debate on how to design and think about a system that has a significant impact within the company, in its processes, performance, organization, and structure. of systems (Prajogo et al., 2018). Although there are some enablers of information management and strategies for designing them, none highlights the focus on a human-centered, holistic, and co-creative design of a solution that fits the needs and characteristics of the organization and its actors. The service Design approach appears capable of guiding and supporting the development and implementation or adoption of an information management system, privileging the understanding of the organization, its processes, its information flows, and the actors' experiences and defining value proposition(s).

The Sumol+Compal case reported a problem in its product information management and was the "house" where this project stood conducted. Sumol + Compal is a well-known Portuguese manufacturing company currently transforming several processes and tasks, and adopting digital/business transformation projects, increasing the job efficiency and productivity in multiple sectors and business activities of the company's group.

As one of the biggest manufacturing companies in the food & beverage Portuguese industry, Sumol + Compal has a vast amount of information and content stored daily by workers in their teams, with different activity areas and external entities. Included in digital transformation projects, the company felt that their information is currently widely dispersed, which leads to a decrease in efficiency and productivity in multiple processes and several other problems across all the company's activity areas.

Sumol + Compal has multiple brands, sub-brands, external products, raw materials, support materials, and other products. That information is currently disaggregated into various systems and artifacts like Excel, SAP, etc. Therefore, the company needed to solve its product information problem, aggregating all the information and content about each product, product family, materials, etc., in a unique platform that can hold up all the business activities' needs and support the everyday tasks from their workers.

1.2 Motivation

The world is changing every time and, after the industrial revolution, is evolving and transforming even quicker than ever. However, the word "transformation" only became a catchphrase in the '90s regarding various practices and organizational changes (Muzyka et al., 1995).

During the past decades, one of the intriguing questions in transformation, `how to replace humans with computers, has changed to `how to support humans effectively with computers,' making the need for transformation a clear priority for most companies expecting to survive in

the market. However, the companies need to be innovative and not get into solutions too futuristic that do not fit into their organization's culture and people, and that's why a human-centered and holistic approach to Service Design (SD) needs to support the design and implementation of Digital Transformation projects, contributing for a business transformation and increasing strategic contribution for their overall business (Basole, 2016).

Information Systems and Big Data have an essential role in organizations, and it's important to develop methodologies that enhance and uses this concept to achieve strategic objectives and improves the overall organizational processes.

This project and dissertation are engrossed in a Digital Transformation project in Sumol + Compal that has, as the primary objective develop a solution that can bring value to the company and increase the overall performance of the people that will use it, digitalizing the product information flows of the entire company and business. Therefore, it is critical to design a system that co-creates value with the users and gives it to the organization. For this, involving different actors across the main stages of the project is essential.

This thesis explores how service design principles of human-centeredness, participation, creativity, and holistic and visual thinking were applied to design and support solutions for information management-related problems. However, the goal is to help other projects use a service design approach to think and leverage a solution for their issues related to information and content management.

Working with the Digital Transformation team of S+C and especially on the product information project allowed me to consolidate my Service Design knowledge and understand a big company's business environment and processes.

1.3 Originality / Value

This thesis consolidates the service design research, applying it to digitalization and business transformation context, organizing concepts and tools to develop a model that uses SD in an Information Management System project. It also identifies application areas for future service design research and pathways for advancing service design in the manufacturing sector by using new interdisciplinary bridges, methodological developments, and theoretical foundations.

In addition, it gives awareness and focuses on the importance of the workers' involvement in digital and business transformation processes. It also enhances the vital role SD can have in achieving the best solution possible and the importance of information, data, content, and knowledge management in 21st-century companies.

1.4 Research Objectives

The main objective of this dissertation is to support the development and/or adoption of an information management system that deals with a lot of content and information and incorporates a lot of different actors. Service design methods and tools were used to achieve this objective, with some information management strategies. It combines frameworks and models of IS research. Both focus on designing a solution in a human-centered way.

The research objectives of the study are the following:

- Application and integration of SD and information management, using similarities and complementarities in terms kike models and tools;

- Development of a new method, through Design Science Research (DSR) methodology, that combines models and techniques from both SD and information management fields;
- Application of this method in a business environment to create new human-centered information services;

1.5 Report outline

This dissertation paper is structured in eight chapters, illustrating and presenting all the work stages.

Chapter 2 exposes the methodology this study is based on and has followed in developing the new method.

Chapter 3 presents the theoretical framework based on the literature review that has been conducted and serves as a basis for further work.

Chapter 4 explains the problems(s) faced by the company and the problem(s) in developing a new interdisciplinary method.

Chapter 5 introduces the development of the new method and explains the different stages, as well as the techniques and tools used in each one.

Chapter 6 presents the result of applying this new method in a business environment, with the work process, the outputs generated and the visual models used during this process.

Chapter 7 focuses on evaluating the method, looking at the feedback from the company's administration and people involved in the project.

Chapter 8 concludes the document and presents this study's contributions, proposing future research and work.

2 Methodology

This chapter provides the rationale for the choice of the methodology adopted to conduct this dissertation by analyzing the different possible approaches and their advantages, disadvantages, and adaptability in order to be able to carry out this research.

Firstly, the approaches and the reasons for choosing one of them are explained. Secondly, the methodology chosen is described, and the research design is detailed.

2.1 Design Science Research and why it is suitable for the project.

There are a few different methodologies and approaches to conducting a project like this one, like the Qualitative and Quantitative approaches of research or the Design Science Research, and all of them with different advantages and disadvantages regarding the current context.

Design Science Research (DSR) is slightly different from the other ones, defined as a problem-solving paradigm with a notable application in information systems and other fields related to engineering and IT (vom Brocke et al., 2020).

This methodology gives a pragmatic view, concentrating on the analysis and understanding of the organizational context and on advancing the research field, leading to creating and evaluating artifacts, models, methods, and instantiations that are innovative and valuable for solving organizational problems (Hevner et al., 2004).

As a methodology, DSRM has three main objectives: be capable of carrying out scientific research, define a body of knowledge based on a set of literary references that support the research, and define a mental model of the researchers and results of the investigation.

In order to address these objectives Peffers et al., (2007), presents an iterative process with six steps:

1. Identify problem and motivation
2. Define the objectives of a solution
3. Design and develop
4. Demonstrate by using the artifact to solve the problem:
5. Evaluate
6. Communicate

Also, A. R. Hevner et al., (2004) present some guidelines in order to conduct the DSR well:

- Design as an Artifact: Produce a visual artifact like a construct, model, method, or implementation;
- Problem relevance: Develop a solution to a relevant business issue;
- Design Evaluation: The quality and efficacy of the developed artifact need to be evaluated by methods;
- Research contributions: DSR must provide valuable contributions in the areas studied;
- Research rigor: DSR is based on rigorous methods in both the construction and evaluation of the design artifact;

- Design as a search process: the search for an artifact and solution requires the use of available forms to reach desired ends;
- Communication of research: in both technology and management-oriented;

Design Science Research seems to be the more suitable one because is an approach that works like a "bridge" between design, rigor, and relevance, aggregating both qualitative/quantitative methods with a strong emphasis on problem-solving through the development of valid knowledge (van Aken et al., 2016).

With a strong background in supporting Information Systems research, DSR can also support different other areas like services or management, supported by consistent literature that started in the Information Systems field (Winter, 2008; Gregor & Hevner, 2013) and is spreading to Service Research (Ostrom et al., 2015); (Grenha Teixeira et al., 2017). Normally DSRM focuses on developing theories to solve the problems (Buchanan, 2001; van Aken, 2004). However, the dissemination among other areas reveals that it might be used for doing this as well, SD4VN presented by Patrício, Pinho, et al., (2018) or MINDS presented by Grenha Teixeira et al., (2017) are great examples of how can DSR be important to develop theories and new methods.

The DSRM uses the knowledge base (theories, frameworks, models, etc.) and the environment (people, organizations, technology, etc.) to build new artifacts (methods, systems, etc.) and evaluate them (vom Brocke et al., 2020).

2.2 Design Science Research applied to Service Design

As exposed before, the methodology used was the Design Science Research, widely used in IT, engineering, etc. and, seems to be the best fit to be a crucial agent to support this research.

The present dissertation aims to develop a new artifact (method) that supports SD in Information Management (IM), extending the DSR theoretical foundations and contributing to the DSR knowledge base. The new DSR method developed combines SD techniques and models with other IM and IS development techniques to address the problem described.

DSRM is useful in addressing the main goals of this research because it is well-documented and well suited for cross-disciplinary research providing a structured step-by-step approach and has already been applied in service design research. The DSR six stages have been condensed to four, followed as presented below:

2.2.1 Identifying the research problems and the solution objectives.

This first phase involves defining the main research problem and justifies the value of getting a solution.

For this project is important to distinguish two types of problems that have their specific and shared objectives. The first one is the output of the literature review (chapter 3) on service design and information management, supporting the identification of research gaps on the topic. Following the theoretical framework from the literature review, the objective is to develop a new method that integrates the two fields, advancing the field of service design by using this approach to sustain information management projects while building on future research opportunities from the IS field: offering a holistic and human-centered approach, using redesigned models and tools derived from SD methods.

The second one is related to the organizational problems regarding the information management in Sumol + Compal and the objectives they want to achieve with this project.

The problem characterization is exposed in chapter 4 and presents this topic even more deeply.

2.2.2 Design and development of a solution that addresses the identified problem and accomplishes the defined objectives.

A solution can be expressed by many different artifacts that are well suited to Service Design Research, as SD has a solid connection to using visual models (Blomkvist & Holmlid, 2010).

SD based on multidisciplinary contributions that bring a rich set of knowledge that can be built upon also has the potential to be crucial in other areas (Teixeira et al., 2019). The DSR artifact of this project is a method that uses SD approaches combined with IM techniques to support different information management projects. This artifact is presented in chapter 5.

The new method is grounded on different visual models and techniques from SD and IM that can build a set of steps that support other projects like this. Furthermore, this method is based on concepts, such as service innovation, systems, and knowledge/information management processes, which stem from service and information research. Basically, this not only combines several service design models to the information management context but also adapts them to be a solution for this and other information management problems, thus contributing to an improvement over previous research.

2.2.3 Applying the artifact and evaluating.

The application of the artifact involves using it to solve one or more instances of the problem by resorting to experimentation, simulation, case studies, or other suitable methods (Peffers et al., 2007), demonstrating the viability of the design process and the design. The evaluation is also a crucial step of DSR (Hevner et al., 2004), being highly connected to the designed artifact and must be adapted regarding the type of artifact developed.

Regarding this, these two steps also use some qualitative methods. Corbin & Strauss, (2012), say that qualitative research "can be many things, but it is not a process that can be rigidly codified," defining it as something contextual that tries to describe what exists. Being explanatory, analyzing the reasons that led to something, evaluating the effectiveness of what exists, and helping the development of theories, strategies, or actions. Qualitative research has some usual data collection processes like interviews, observation, and text.

Peffers et al., (2007) divide what others name evaluation into two activities, demonstration, and evaluation. The demonstration is like a "lightweight" version of evaluation and demonstrates that the artifact feasibly works and solves one or more instances of the problem in at least one context. On the other hand, evaluation is more formal and extensive, focusing on understanding how well the artifact supports a solution to the problem or related problems.

The new method developed was demonstrated in a business environment, supporting a solution for the product information management problems and needs of a manufacturing company of food & beverages.

In the evaluation phase, Venable et al., (2012) differentiate the process into two different ones. There are artificial and naturalistic evolutions. The first is related to a more scientific dominance including field experiments, simulations, criteria-based analysis, etc. The artificial is always empirical and focused on exploring the performance of a technological solution in its real

environment, like in an organization, with real people and systems. On the other hand, naturalistic evaluation methods include case studies, field studies, surveys, ethnography, phenomenology, hermeneutic methods, and action research. Further, Venable et al., (2012) noted that more than one method could be used, mixing artificial and naturalistic evaluation, being crucial, as explained before, to notice the type of the artifact evaluated. The two evaluation processes were used to evaluate the new method, the artificial evaluation focused on the performance of the solution, was used to know if the method works and if it returns an interesting output or not. To perform this, it was exposed to selected stakeholders the mapping journeys and the value propositions, and it was evaluated through the viability to support the implementation of the project.

The naturalistic evaluation was related not to the output of the method but to the process until getting there. It was evaluated if the people involved in the project and directly or indirectly faced with the method developed. Interviews and questionnaires were used to have feedback about the process and whether people thought it was better to use this method. The evaluation will be deeply explained below.

The results are exposed in chapter 7.

2.2.4 Communicating

DSR methodology includes communicating the results to scholarly and practitioner audiences through different research topics.

Communication to these audiences aims to ensure that the contribution of DSR is added to the knowledge base. Also, the application context is an important integration in the communication phase in order to ensure that the solution to the real-world problem arrives at those who experience it. To effectively communicate the DSR project in different places Gregor & Hevner, (2013) developed a publication outline with the following sections: introduction (problem and objective definition), literature review (existing knowledge base about the topic), method (DSR work), artifact description (showing how it contributes to the knowledge base), evaluation (showing how the worth of the artifact was assessed), discussion and conclusion.

This project has been spread to enterprise and academic audiences. Regarding the nature of the method developed, the involvement of different stakeholders in multiple co-creation sessions, like in-depth interviews or walkthroughs/workshops, are ways of disseminating the method in an “indirect way”.

Regarding academic communication, the work developed followed the publication outline exposed by Gregor & Hevner, (2013) serving as a basis for the publication of this thesis at FEUP.

3 Literature Review / Theoretical Framework

This Literature Review was conducted following a set of good practices exposed by Snyder, (2019), being a semi-systematic review. The semi-systematic or narrative review is used to collect relevant information from the literature available about multiple topics related to a project. Generally, this review approach desires to identify and understand all potentially relevant research points and concepts that have implications for this topic. This review provides a vast understanding of pertinent sub-topics, methods, tools, and techniques related to service design and information management systems. This literature is important to reinforce and expand the foundations of service design and information management, articulating multiple perspectives and dimensions. The selection of the analyzed articles was a natural process of searching for keywords, using the references of other articles that led to others and external recommendations.

3.1 Information Systems

Information plays a crucial role in 21st-century enterprises. Concepts like big data, knowledge management, and information sharing are increasingly present in many research, papers, articles, etc., as a vital thing for companies, giving them a competitive advantage and also leading opportunities for increasing the overall performance and the work quality. Moreover, t role of information in the enterprise's processes has become increasingly more important and today's information management has become crucial for process management (Prajogo et al., 2018).

Due to the increasing need for digitalization among organizations, technology-enabled systems, service systems, and information systems are key enablers for the challenges and opportunities of the current complex world, where the effects of digital technologies on complex socio-technical systems present an important opportunity for information systems (IS) research (Benbya et al., 2020).

Most recently, the concept of "digital business strategy" has been introduced to reflect a fusion between IT with business strategy (Bharadwaj et al., 2013), where the IS strategy is the business strategy. This view acknowledges that IS can shape business models and impacts the customer and worker's interactions and experiences, business operations, supply chains, and the products /services provided. Furthermore, with the increasing digitization of business processes, organizations now seek to build digital platforms like digital information systems to change their companies, environment, performance, etc., changing their business models.

In Information Systems (IS) research, there are several related challenges in the areas of knowledge management, information/content management, and document management, and each one has related sub-topics. In the latest developments appeared the notion of enterprise content management (ECM) in order to fulfill the challenges that organizations face when they are adopting or implementing a solution to manage their information and content, providing a ''modern, integrated perspective on information management'' (Päivärinta & Munkvold, 2005).

3.2 Information/Content & Knowledge Management

Modern information technology allows enterprises to capture and store a large amount of internal and/or external information, making Information Management (IM) crucial for almost every organization. IM is subdivided into Internal Information Management (IIM), which includes integrating, distributing, and coordinating data and information inside an organization through appropriate IT (Wong et al., 2011), and External Information Management (EIM) related to all the information captured by the company based on external entities' information.

Prajogo et al., (2018) validate and extend other studies that relate information, processes, and performance, enhancing the importance of information management as an enables of process management and increased performance.

As such, IT and information systems are essential factors that determine information management, being crucial for its effectiveness in integrating information infrastructure and facilitating the correct and accurate sharing of timely information in support of cross-functional processes inside a company (Hammer, 2001). Also, the success of a particular Information System, especially an IM system, may reside in how knowledge is managed and how that knowledge can be shared among the steps of that implementation and usage.

Knowledge has become an essential concept in the business sector, having more attention among academics and managers, and how crucial it is in capturing, storing, sharing, and using knowledge, calling it Knowledge Management (Lee & Kim, 2001).

Knowledge Management (KM) processes are fundamental to improving a particular technology's capabilities. Therefore, such technology's successful adoption and implementation increasingly depend on efficiently using these processes (Colomo-Palacios et al., 2018). There are three different KM processes:

1. Knowledge acquisition or capture is defined as the institution processes that utilize the current knowledge and capture new knowledge (Wu & Lee, 2007), helping in the implementation and usage process of the enterprise.
2. Knowledge sharing or transfer is the central process of KM. The successful implementation of an IS highly depends on this type of knowledge (Assegaff et al., 2011), disseminating knowledge among all individuals taking part in the activities of a particular process, being more likely to use the IS system (Migdadi & Abu Zaid, 2016).
3. Wu & Lee, (2007) defined knowledge application as the institution processes that enable the institution to access the knowledge smoothly via its efficient storage and retrieval techniques. Therefore, institutions that stimulate the knowledge application are highly qualified to adopt and implement a successful IS (Migdadi & Abu Zaid, 2016).

Analyzing the review conducted by Al-Emran et al., (2018), knowledge sharing is the process that affects the adoption, acceptance, and implementation of new technologies, mainly information systems inside an organization. Also, the acquisition process significantly influences the adoption of these systems.

It is crucial to enhance knowledge sharing and understand the phenomenon in order to develop and adopt the best solution possible for problems related to willingness and commodity.

In some examples of these systems, IS, one type of them emerges as one of the most interesting regarding the problem of this project described in this paper. An Enterprise Content Management is a type of information system that involves a significant amount of collaboration

between employees, being especially important processes like sharing content and knowledge (Päivärinta & Munkvold, 2005).

3.3 Data vs Information vs Content

Before getting into detail about what ECM is and how it can enable information and content management is essential to distinguish these concepts. Data is related to "raw" values, attributes, or meanings that can be measured in some form, ordinarily objective things. Also, the metadata is data about that data, and typically, this term is generally used in digital communications.

Information is a set of data but is normally subjective, depending on the person or system that receives the data. Information is classified as when a data set provides relevant meaning or knowledge to its recipient. When this "goal" is not achieved is not classified as "information" but something "noise," mainly the provided data must have some value to the person delivered.

As with information, content is also a data set but is much more objectively used to deliver a particular message.

Every aspect of the message we deliver to our audience is content like words, images, and other media. Information is related to the subjective part of the content, for example, if it's clear, pertinent, easily shareable, etc. However, both are commonly used (Leibtag, 2010).

3.4 Enterprise Content Management

As explained above, organizations nowadays face many challenges regarding their information and knowledge management because they have a massive amount of it shared and stored daily by multiple persons, entities, and systems. ECM has been developed in order to supply the need for a specific type of solution to these and related challenges, being an important enabler of information management, as it supports the creation, storage, retrieval, and retention processes of organizational documents and their content (vom Brocke & Simons, 2014, p. 5).

The Association for Information and Image Management (AIIM) defines ECM as the ''strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes".ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists, is an enterprise-wide approach to information management (vom Brocke & Simons, 2014, p. 5).

The framework presented by Päivärinta & Munkvold, (2005) exposed in figure 1, suggests that ECM research includes not only technologies but also content and processes, all of them involved in the enterprise context.

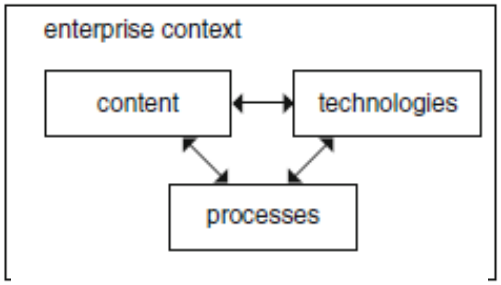


Figure 1 - 4 perspectives on ECM research

Regarding the enterprise context, many authors in the field identify regulation and technological pressures (systems adoption, hardware, etc.) as two of the significant external ECM drivers (Andersen, 2008). Still, there are other ones like establishing a modernized image of the enterprise and improving external collaboration (Päivärinta & Munkvold, 2005). However, typically the companies look firstly for the internal ECM drivers, including the reduction of paper/file-based processes, better decision-making, more efficient information processing, improved competitive intelligence (Smith & McKeen, 2003), enhanced internal collaboration, more meaningful knowledge work, and better information quality (Päivärinta & Munkvold, 2005). In addition, adopting an ECM system can lead to mitigation (Dilnutt, 2006) and increase efficiency in information distribution (Pullman & Gu, 2008).

Regarding the process perspectives related to ECM, one is the software-related processes (the design, development, implementation, and maintenance of an ECM system), and the other lifecycle-related processes, which means the creating and capturing, storing and retrieving, editing and reviewing, and retaining and deleting content.

Fundamentally, ECM is not just the aggregation phenomenon of all the enterprise information and content, it also extends over organizational borders and communicates with external systems, so it's a little bit unclear to define and restrict the type of content/information that an ECM can support. There are multiple types of information assets and flows, including, for example, products, marketing materials, reports, any kind of documents, images/video files, etc. Typically ECM is related to unstructured information across the enterprise (vom Brocke & Simons, 2014).

The notion of ECM emerged as an "umbrella" term for multiple different technologies and applications in the market, with different components, functionalities and focus, supporting the execution of all the activities in the content lifecycle and the distribution of content.

3.4.1 ECM Technologies

Technologies are one of the pillars of ECM and are spread across the market in multiple variations with different purposes. (e.g., for document management, content management, etc). Grahlmann et al., (2010) present holistic architecture (figure 2) for ECM systems to determine the functional ambits of different ECM cases they studied. This approach goes beyond functionalities at the process level (e.g., collaboration, communication) to distinguish ECM components at the presentation level (e.g., intranet, extranet), the service level (e.g., imaging, e-mails), and the infrastructure level (e.g., storage, library services). Also, this scope illustrates a couple of functionalities that are being included in modern ECM systems. Focusing strictly on what is on the market, the major software segments are:

- ECM as process-oriented Document Manager (DM): This technology covers all sorts of content along the information life-cycle, this approach seems to be the broadest one, includes fir example Product Information Management (PIM) and Digital Asset Management (DAM).
- ECM as web content management (WCM): Focus on generating, administering, and publishing content for the intranet or internet.
- Other adjoining market segments: Refers to supplements that can be incorporated in a "classic" ECM solution, typically included in further steps of implementing the ECM strategy.

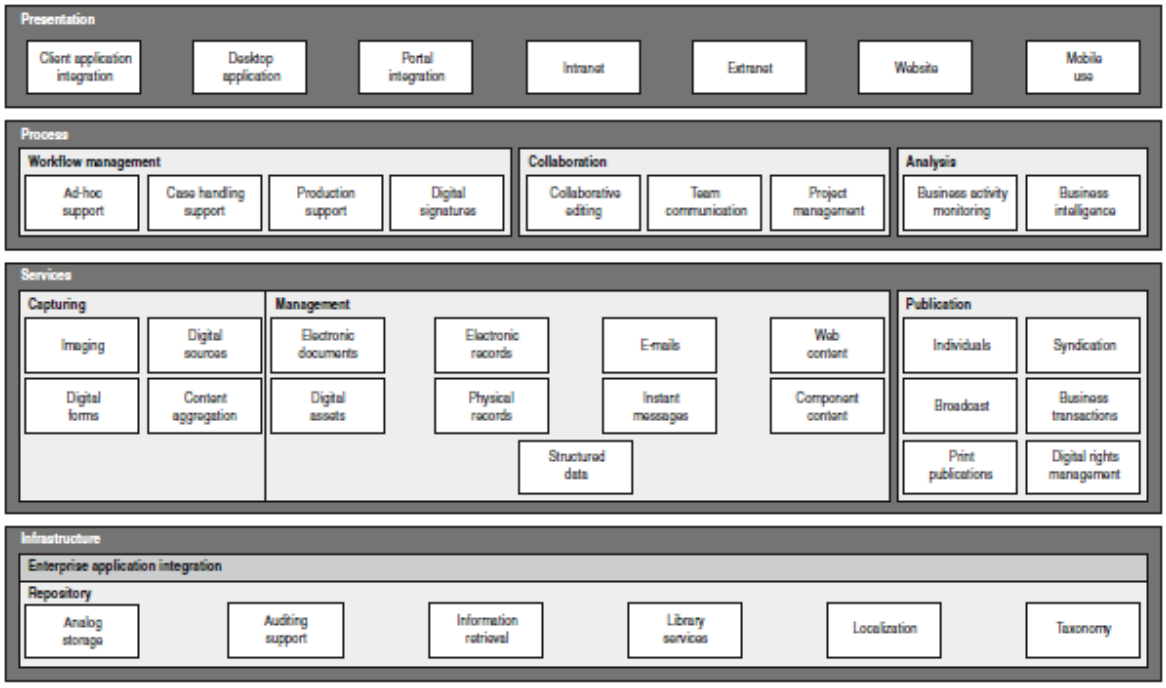


Figure 2 - Scope of ECM systems

As we can see, there are multiple types of ECM technologies with different sizes, integrations, or purposes, however, the ones important for this research are the product-related systems (vom Brocke & Simons, 2014).

3.4.2 ECM Frameworks/Methods/Strategies

Organizations today deal with an amount of information and create another amount. So it's a challenge for them to have a unique place where it can be found again when needed and where it’s all well-structured because usually, these data are unstructured and not in a format that can be found efficiently. Also, they typically have a variety of systems and databases in a complex ad-hoc architecture, making it even more difficult to achieve quality data on time for everyone when needed (vom Brocke & Simons, 2014).

Focusing on the process of content creation and its distribution, Gupta et al., (2001) presents this process in five stages, as represented in figure 3, which starts with the creation of information from an existing source and finishes by making the content easily accessible for target users or distributed by different workflows.

One way to support the creation and management of information, enabling ECM is to design and develop a central repository that unifies content structure and content access (search, retrieve, version, index, and archive), this includes defining the content structure standards (types, metadata) and content organization standards (taxonomy, indexes, cross-references).

The following functionalities are crucial to an ECM system playing as a central repository:

- Unified content structure: How content is organized and must be standardized across all data sources;
- Unified organization: The organizational schema used to access content/information (e.g. roles) must extend to any place the content is stored;

- Unified access: How content is extracted and used must be the same across all data sources (vom Brocke & Simons, 2014).

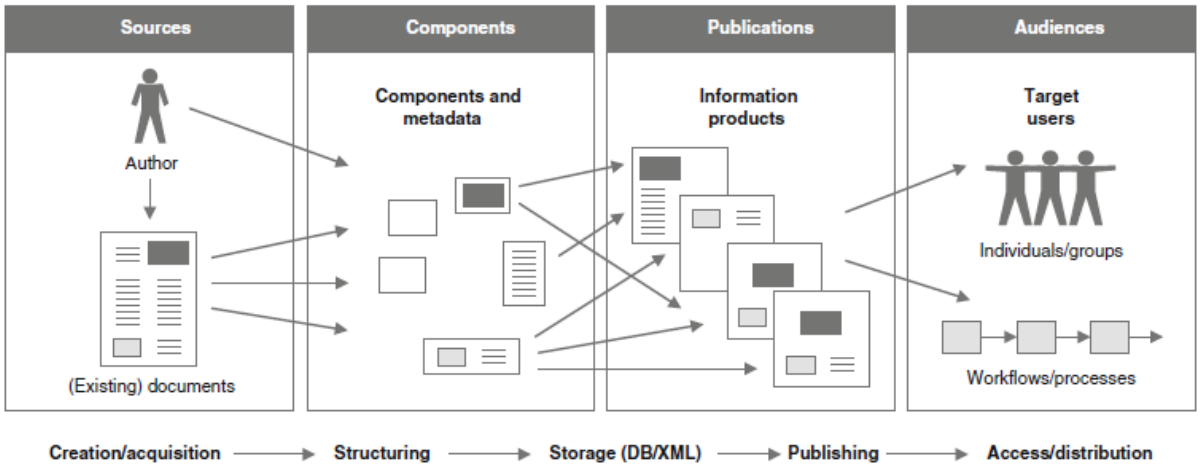


Figure 3 - Content creation process

Another critical challenge for organizations when designing their ECM system is deciding which data must be included under some kind of system or workflow (Gupta et al., 2001). This problem has both a business and a technology perspective. The first involves analyzing information and content needs in organizational units and deciding which content will be managed and how it will be managed. Regarding the technology perspective, it's essential to analyze the existing systems currently providing content management and their potential interconnection in an overall architecture to meet the content management needs. The framework for ECM strategy development by O'Callaghan & Smits, (2005) exposed below addresses not only these business and technology perspectives but also provides a framework to help develop content and information management strategies and their fundamental architectures (vom Brocke & Simons, 2014).

3.4.2.1 Framework for ECM Strategy

Multiple ECM strategies are adaptable regarding the organization and its needs or context. The ECM strategy development process starts by analyzing existing needs and how they are being fulfilled, for example, who needs what information, how information supports users and when, how it is produced and what processes and technology are currently being used to create content. The ECM strategy consists of three components (Rockley & Kostur, 2003, p.16,17):

- Content Management system: a platform that manages content in a single source.
- Reusable Content: Once registered, the content can be used multiple times.
- Processes: involving people and collaborative processes enables the creation of a single, definitive source of information. The goal of defining unified processes is to ensure that all departments know what content exists, that all authors can reuse existing content, and that all procedures are repeatable and transparent, regardless of which department and which authors follow them.

In figure 4 is exposed an overview of the ECM strategy framework presented by O'Callaghan & Smits, (2005) and aims to support the process of developing an ECM strategy for any type

of organization. This framework was tested in a large manufacturing firm in the high-tech sector, specifically the product development process and the marketing strategy process, which were identified as critical business processes that needed an ECM.

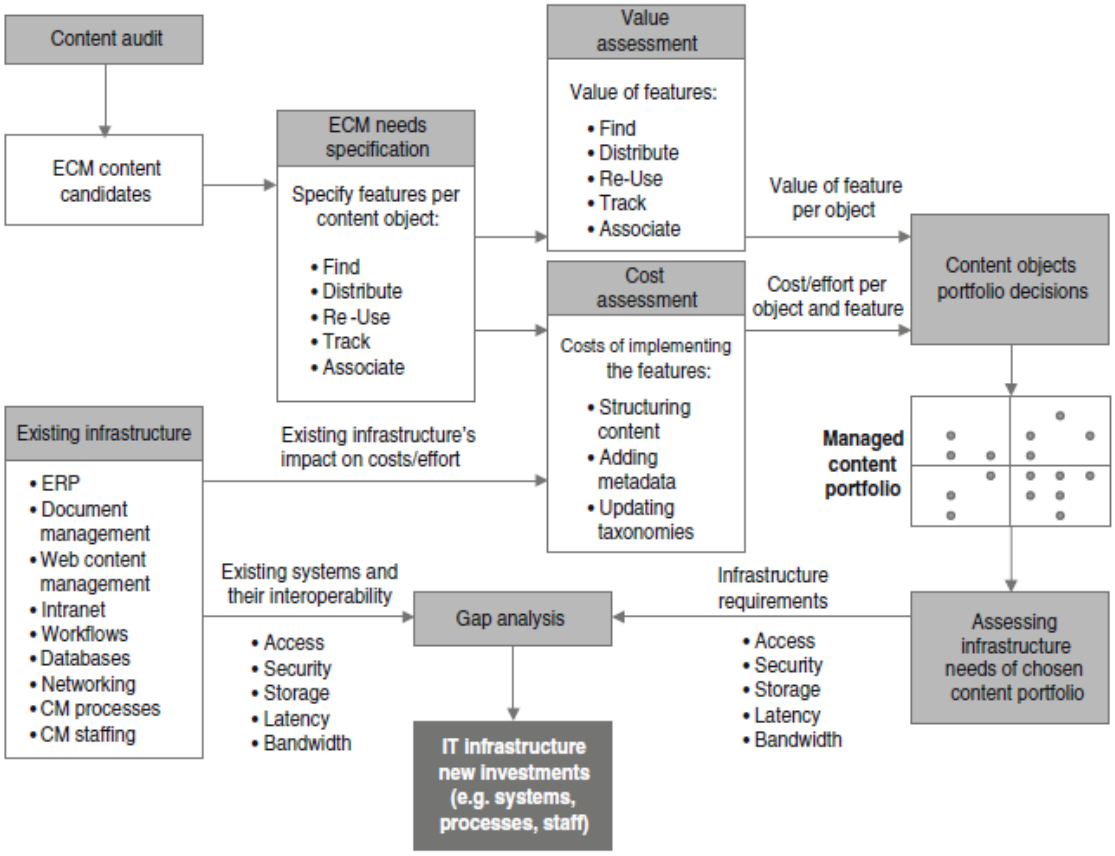


Figure 4 - ECM strategy overview

The upper part of it (content audit, specifying ECM needs, business value assessment, cost/effort assessment, and content portfolio decisions) focuses on selecting the most valuable enterprise content objects to be included in a managed content architecture. The lower part of the ECM strategy framework focuses on deciding on the IT infrastructure needed to realize content management.

- Content Audit: An overview of all of its content and how it is used and delivered to the target users, revealing which content objects are potentially relevant to be included in a future solution and for who is important;
- Specifying ECM needs: Specifying for each type of object if it needs to be made findable, distributable, reusable, traceable, and associable, also which content will be accessible for each target user;
- Business Value Assessment: Refers to the value of making a given object findable, distributable, reusable, traceable, and associable. It can be achieved by surveying key users and based on their insights, and it is possible to define priorities and give value to the different content objects;
- Cost/Effort Assessment: This is highly related to the cost/effort with how the features of a solution are implemented (find, distribute, register, creation, etc);

- Content Portfolio Decisions: In the final step, the author promotes the use of a scatter diagram, measuring the Business Value and Cost/Effort Assessment performed before, listening to the users and information specialists to represent a decision concerning whether to implement an ECM feature for a given content object based on its value and the effort required (vom Brocke & Simons, n.d.).

3.5 Conclusions

Information management is an extensive topic in IS research. As explained above, it is divided into internal and external information and adjacent to a wide range of approaches and concepts. Enterprise content management appears as one of them, however, unlike other approaches in the information management field, ECM acknowledges the necessity of managing information over its entire lifecycle, that is, from creation to deletion (Munkvold et al., 2006). As a result, ECM is considered an integrated and contemporary approach to information management (Päivärinta & Munkvold, 2005). Moreover, many authors see it as the next step in the evolution of earlier approaches in the field (Alalwan & Weistroffer, 2012).

ECM comprises a broad set of interrelated issues: objectives and impacts, content and enterprise models, infrastructure, administration, and change management (Päivärinta & Munkvold, 2005).

Regarding this ECM proves to be an exciting solution to enable Information Management. However, before considering adopting or implementing any ECM technology, it is necessary to understand the experiences and interactions of people who deal with information, whether they are creating, recording, or consuming. It is at this point that ECM strategies fail, there is no understanding of the different actors, there is no co-creation, and the importance of developing and clarifying value propositions for the company is not praised, leading to several problems and risks. Service design appears as an answer to this need.

3.6 Service Design

Service design (SD) is well established as a field in design research with its own distinct relevance, defined as: “a human-centered, creative, iterative approach to the creation of new services (Blomkvist & Holmlid, 2010), incorporating multiple contributions from service marketing, operations, and information technology, all integrated through design-based methods and tools (Patrício & Fisk, 2013). However, the idea of designing services is not new and was first introduced inside the service marketing literature by (Shostack, 1982).

SD is based on multidisciplinary contributions from different service and design research that are not well integrated, leading to new research areas like Service Innovation, Service Science, or Service Systems (Patrício, Gustafsson, et al., 2018). However, before getting into some of these concepts, there are some main characteristics that service design aims to achieve:

- User or Human-centered: Aiming to understand all user’s treats and needs, SD uses qualitative research to focus on them in order to lead to a solution that would support their activities and goals;
- Co-creative / Participatory: To ensure that the solution fits the different needs and priorities of stakeholders, SD involves all the relevant ones in the design process, including them in the various decisions through interviews, participatory workshops,

co-working approaches etc. Also contributing to legitimate the design decisions among different stakeholders;

- Sequencing / Iterative: The service design process involves several iterations for each stage and the entire process, breaking complex systems into separate processes and user journey sections. This iterative approach allows testing and having feedback with different stakeholders along the design process, exploring new ideas, and aiming to find wrong decisions early in the development process;
- Creative / Visual Thinking: Uses dedicated visualizations and tools to go through the design thinking stages (exploration, ideation and reflection, and implementation of the service). These models support the design of the new/improved service concept, service system, and interactions at each specific interface with a clear and simple visual to make it tangible and easier for users to understand;
- Holistic: SD approach disseminates over all touchpoints throughout experiences, across networks of users and interactions. Instead of focusing on the isolated design of a specific system, trying to understand how a system fits in different stakeholders' overall activities and context (Grenha Teixeira et al., 2019).

In the last few years, a lot of research has been conducted about service design, different approaches, concepts, and other emergent topics. Concerning it, the service design concept has been developed by scholars in three main contexts: Traditionally, it referred to a subset of New Service Design processes, aggregating specific tools and activities in order to specify a service's concept, structure, or infrastructure (Johnson et al., 2012). Secondly, with more research being conducted, it has also been defined as a set of collaborative and cross-disciplinary activities for service innovation (Ostrom et al., 2010; Patrício et al., 2011). And finally, within design communities, Service Design has been conceptualized as design-centered contributions to service innovation based on a human-centered perspective and creative methods (Polaine et al., 2013; Wetter-Edman et al., 2014), serving as an integrative approach to collaborative and cross-disciplinary service innovation.

The growth of other sub-areas like the Service Science (Chesbrough & Spohrer, 2006) and the infusion of design thinking (Brown, 2008) across several disciplines have fostered the emergence of service design as an interdisciplinary field. SD integrates different contributions into a holistic approach to creating and improving new services (Patrício et al., 2011). First, however, it is crucial to understand the contribution of each discipline and how it connects with other fields to create new services.

The focus is not only on creating and improving services but also on how this can be conducted: through understanding, visualizing, designing for user experiences (Blomkvist & Holmlid, 2010), and experimenting through prototyping.

There are several models to illustrate the SD iterative process but commonly with the same base, with a first step related to an exploration and research phase and a final step associated with the delivery and implementation of a solution (Foglieni et al., 2018).

The double diamond design process is a relatively well-known methodology, developed by the Design Council in 2005 and defined as "a simple graphical way of describing the design process." (Gustafsson, 2019). The method consists of four phases, empathize, define, develop and deliver, varying with divergent and convergent moments during the iterative process. This model is not static; the design council suggests that it must be customized regarding the

typology and needs of each project. Each phase incorporates iterative loops in which exploration and testing can occur (Gustafsson, 2019).

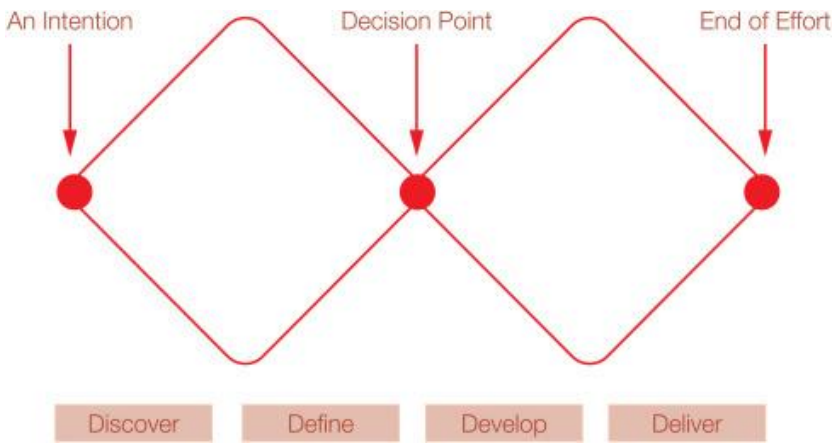


Figure 5 - Double Diamond Model

Patrício & Fisk, (2013) and Stickdorn & Scheinder also present a service design process based on a design thinking approach, with four main phases:

- Exploration involves the research part of the project, studying the subject, the market, and the stakeholders who will make part of the project, their experiences, and behavior in a human-centered approach;
- Ideation, as the name refers, is the process of generating and ideating new solutions and ideas for a particular set of objectives;
- Reflection includes the visual part of the design with the prototyping of service concepts previously ideated and testing with potential users. Being extremely important to have a more concrete idea of the service concept;
- Implementation refers to the planning, implementing, and reviewing processes to operationalize the new service concept and offer it to customers.

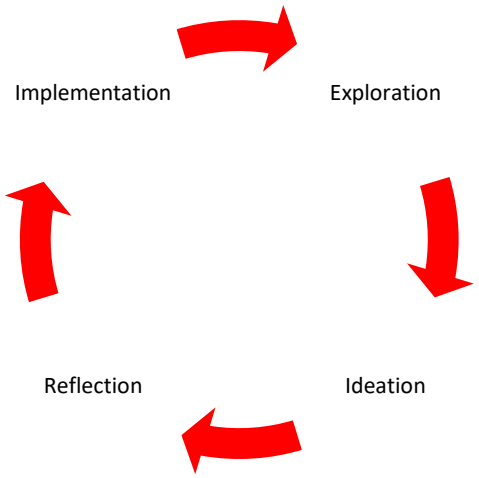


Figure 6 - Service Design Process

In each of these steps, some notable tools and models help create visual objects that systematize complex information, discuss different interpretations and explore future service possibilities. In addition, some special tools and processes have already been tested and researched for visual support. Also, the broader scope for service design and the challenges/opportunities triggered by technology requires integrating methods and tools from various fields. As exposed before there are multiple types of contributions to service design and, technology-oriented fields are one of the main ones, for example, interaction design (Grenha Teixeira et al., 2017), information systems (Patrício et al., 2020), and software engineering (Glushko, 2010).

3.6.1 Service Design Methods and Tools

Multi-level service design (MSD**),** presented by Patrício et al., (2011), is an interdisciplinary method that synthesizes contributions from interaction design, service science, management, and engineering. This method allows the integrated design of service solutions at three hierarchical levels, the service concept, the service system, and the service encounter with two different visions, understanding the customer experience and the service offering. The MSD process consists of four main steps:

1. An in-depth study of the customer experience is performed at three levels: the value constellation experience, the service experience, and the service encounter experience;
2. Based on the previous customer experience study, the customer value constellation (CVC) model enables designing the service concept properly, enabling co-creation processes.
3. Concerning the service experience, the company's service system is designed using two artifacts, the service system architecture (an integrated view of the multi offerings and support processes across the service experience) and service system navigation (which offers a dynamic view of service system mapping the alternative paths customers may do in the different service encounters in the service experience);
4. Finally, service encounters are the "touchpoints" between the customer and the company and may occur in different interfaces. The MSD suggests using the service experience blueprint to design and expose these service encounters.

Using the MSD method, with this multilevel approach, another service design characteristic is achieved, the holistic, designing for all touchpoints throughout experiences, across networks of users and interactions, instead of focusing only on one specific system in isolation. As a result, MSD can be helpful in supporting any SD project, even when applied to a broader topic such as information systems or information management.

MINDS method presented by Grenha Teixeira et al., (2017) combines management and interaction design. The method improves other existing methods and models, also built upon the three levels of MSD (service concept, system, and encounter). Focusing in the management field, it concentrates on delivering value proposition and the backstage components of the future service. The value proposition canvas is a well-known framework that helps develop and deliver value propositions. This tool is helpful to illustrate the pain points, needs, and jobs to be done by the customer and ensure that there is a fit with the new product-service idea. It gives a detailed look at the relationship between customer segments and value propositions, highlights roles involved, pains and gains, and how the service eventually matches with the proposal and its pain relievers (like features) and gain creators.

Now and concerning that the main objective of using service design techniques for information management is in the empathize and research phase, other useful service design tools focus on representing a given context, concept, system, service experience, etc (Giordano et al., 2018).

Focusing on the context, the comprehension of the multiple information flows and interactions between the users is fundamental. After some user interviews, the User (or Customer) Journey Map guarantees the visual representation of the user's interactions and experiences, combining storytelling and visualization. This tool help empathize with users and identify needs, pain points, and opportunities for thinking about a better experience in the further project phases. A customer journey map can focus on a single task or experience, such as mapping out a payment flow, or can cover the entire life cycle of a customer's engagement and continued interaction (Kaplan, 2016).

Since the map is meant to be an adjuvant tool, not a conclusion, the outcomes provide an opportunity to use other tools to capture and organize the opportunities, pain points, needs, and other insights. The User Stories Map promotes brainstorming about new solutions in the context of end-users and the benefit they'll receive. It can be seen as a complement to the users journey map, however, they have key differences. A customer-journey map takes the user's perspective, showing her steps to complete a goal, coupled with her thoughts, emotions, channels, and devices used along the way. A user-story map takes the perspective of the product. It aims to guide the planning and implementation of features and functionality to solve users' problems (Kaley, 2021).

3.7 Service Innovation

Nowadays, firms are operating in increasingly interconnected contexts, taking them to lead with transformational pressures on their business and processes. This pressing need to create and transform some internal processes requires new ways of innovation, design, and understanding of internal processes and their specificities (Ismail et al., 2017).

Service design is crucial to service innovation and new service development because it brings a service organization's strategy and innovative service ideas to life, however, the distinction between the two is sometimes blurred (Patrício & Fisk, 2013). Service innovation can be defined as the creation of new and/or improved service offerings, service processes, and service business models (Ostrom et al., 2010). Therefore, it plays a crucial role in new service development processes for value co-creation through a holistic understanding of user experience, codesigning practices, prototyping, and aligning system actors with the user experience. However, there are some differences between the two concepts. For example, new service development focuses on developing a new offering, while service innovation tends to focus on the outcome of the process (Patrício, Gustafsson, et al., 2018).

Sometimes service innovation may be vague because it can mean many different things. For example, product innovation is highly connected to a new product, while a service innovation is a much broader set of things, like an innovation of business models, service offerings or process and organizational changes (Martin et al., 2016).

In the literature, service innovation is described from three perspectives: assimilation, focusing on new technology as the main driver for service innovation; demarcation, separating the service from the product innovation; and synthesis perspective, aggregating all types of innovations (Coombs & Miles, 2000).

Innovation and service design play crucial roles in creating new forms of value co-creation with customers, organizations, and societal actors in general, involving new processes or service offerings that create value, bringing new ideas to life. Both can be the deal breaker in finding a solution or not. (Patrício, Gustafsson, et al., 2018).

User involvement is a key principle in service design and service innovation, also, technology has repeatedly been identified as a game-changer in service research, and it opens a variety of opportunities to innovate services (Ostrom et al., 2015).

The intensive involvement of end-users in research, ideation, prototyping, testing and implementation results in innovative solutions more focused on the people who will use them. The stakeholder's map, user journeys, and service blueprints are useful SD tools that help represent the users and their thoughts and work as "conversation facilitators". They can be used collaboratively to trigger discussion in a design process, supporting the collaboration of different people in multiple ways (Sangiorgi, Patricio and Fisk, 2017).

3.8 Service Systems

Service systems are configurations of people, technology, and other resources that interact with other systems to co-create value (Vargo et al., 2008), typically connected by value propositions and shared information. It may be a whole system or a part of a larger service system, depending on the level of aggregation (Siltaloppi et al., 2016), being complex to define the range and the "borders."

Institucional rules connect service systems, or they can be connected via 'systems of service systems' (or service ecosystems), playing a central role in how value co-creation occurs within and among services (Lusch et al., 2016). This concept of co-creation, as explained before, is a major concept when we talk about services and how to design and use them, leading to a change of paradigm from a goods-centered vision (GDLogic), to a service-centered dominant logic (SD-Logic) (Lusch et al., 2008).

Alter, (2008) define service systems as "work systems" in which human participants and machines conduct work using information, technology, and other resources, to produce value for internal or external customers. Information systems and supply chains are examples of work systems. For example, an information system, the relevant one for this topic is a working system in which all the work is devoted to processing information (Alter, 2008), using technology to support operations, management, and decision-making.

Also, it's crucial to explore how a system perspective is essential not only in the problem solving but also in problem seeking, from prototyping to modeling and abstracting relationships, and from prototyping solutions to understanding how potential solutions will perturb the system (Forlizzi, 2013). To explore and understand how potential solutions (systems, rearranged business processes, workflows, etc.) will perturb the system (the organization, people, etc.), some interesting tools like ecosystem and stakeholder's map provide a general overview of the current context. Others like journey maps or user stories are helpful to go deeper into the interconnections.

The ecosystem map turns out to be a pivotal piece to represent and capture all the key roles that influence the organization and the service environment. The ecosystem map is built by displaying all the entities and then connecting them based on the type of value they exchange.

The stakeholder map is a service design tool that overviews network relations (Stickdorn et al., 2018). When developing a stakeholder map, the usual steps are identifying all the involved or which stakeholders might be involved, mapping them visually, and analyzing their relationships. Sometimes called "Value Network Actor Map" as in the SD4VN, a stakeholder map is a tool for visualization, to understand the service and identify potential issues and challenges" (Altuna & Thomas, 2014). Also, in recent management literature, mapping stakeholders is related not only to identifying people but also measure or predict their potential influence and impact (Bourne and Walker, 2005; Walker, Bourne and Shelley, 2008).

3.9 Service Design into Information Management

Emerging technologies and new concepts like big data or knowledge management offer many opportunities for organizations, but the potential of new technology and information solutions remains largely unfulfilled. It is important to rethink and redesign the different service systems and processes to leverage technology and empower people in co-creation (Kellermann & Jones, 2013).

Designing and implementing new technologies is challenging for most companies, especially when the problem is related to their daily tasks and business processes for years. Adopting or developing new tech solutions like an ECM system or other information management system is a complex task. That's why integrating service design approaches and techniques is important in an information management project offering support and guidance.

People know the core activities and processes of daily business but sometimes don't have the necessary understanding of the "big picture", so it's crucial to follow methodologies and examinates all the knowledge and information provided by them, to understand the global perspective. Service design appears as an approach that can support the successful design of new/ improved systems and business models, contributing toward digital transformation and the adoption of new systems. This approach provides a human-centered, holistic and iterative approach to the creation of new solutions (Blomkvist & Holmlid, 2010), understanding human experiences and translating this by actively engaging people in transformation processes through participatory design approaches (Meroni & Sangiorgi, 2016) as well as, fomenting a creative and transformative approach.

There are a few examples and literature involving service design and information systems, however, there's clearly a lack of literature and method about information management that was its own characteristics as a topic. This means that it's important to evaluate and demonstrate if SD can have a crucial role in dealing with knowledge-sharing processes, information flows, human interactions, etc., and help choose a solution.

Service design brings a human-centered, participatory, holistic, creative, and visual approach to IS development through an iterative process of exploration, ideation, reflection, and implementation, fostering stakeholder participation and co-creation of the solution. (Grenha Teixeira et al., 2019). Several studies enhance the importance or the lack of involvement of people interested in a new platform to support what they do related to information. The people need to be involved in the decision-making and understand that they are essential to finding the best solution for their problem. Kurtmollaiev et al., (2018) expose that adopting SD's human-centered, participatory and holistic approach influenced the organizational mindset and practices contributing to a more collaborative and innovative company. Also, Grenha Teixeira et al., 2019 explain in their paper about the Portuguese EHRs that service design goes beyond

viewing stakeholders as passive recipients of the functionalities provided by EHRs, to viewing them as active cocreators in both the service design process and the usage of these systems.

Regarding the nature of the project, the information and knowledge shared between the different actors is crucial to developing a solution that fits their needs and knowing what information needs to be up and registered in a future system. So, listening to stakeholders and allowing them to co-create is essential. With its holistic and systemic perspective, service design can involve and support diverse stakeholders in complex environments, to help them accomplish their activities and goals (Patrício, Pinho, et al., 2018). Furthermore, service design follows a design thinking approach, involving an iterative process of exploration, ideation, reflection, and implementation, and offers methods and visual tools, like the multilevel, that support this process and promote stakeholder's creativity and communication (Brown, 2008). Service design can answer the call for an increased user and organizational involvement in developing information management systems.

Although, as mentioned before, there is no specific methodology that combines service design with information management, and that's the aim of this project. It combines different literature on SD and IM to create and propose a new method capable of being the key factor and the leader of other information system developments.

4 Problem Characterization

Following the DSR methodology, the problem analysis is a crucial step to address, identifying the problem regarding the research and the company where the project took place.

In this following chapter, the problem lightly introduced in the first chapter is deeply exposed and explains the difficulties of S+C in achieving a solution for their product information management problems. Also, the gaps identified in the literature are addressed in this chapter, serving as a foundation for developing the new DSR method presented below.

4.1 Company Context & Objectives

Sumol + Compal is a Portuguese food and beverages company that owns different brands and focuses on manufacturing, bottling, selling, exporting, and distributing multiple types of beverages. Such as juices, soft drinks, water, beer, tomato soup, and other related products in different markets worldwide (S+C, n.d.).

Concerning that, this company has a considerable number of different products, brands, sub-brands, etc. Therefore, S+C and their collaborators daily deal with a lot of information related to their products. The product information is spread around the activities performed in the company, from creating a new product to discontinuing another. However, the information and content related to their products are currently disaggregated in different sources and systems and are not accessible or visible to everyone.

The company has different product types, like the finished product, 'PA' (*produto acabado*), raw material, support materials, etc. Product information at sumol+compal is highly complex given the company's nature. Therefore the need for a methodology that can support the entire process from creating a new product to discontinuing through its production and marketing.

Taking into account the lack of a solution that aggregates and delivers all the information clearly and with the correct view for the target users, this project aims to achieve some practical objectives:

- Understand all the information flows related to the product content/information;
- Analyze how the different stakeholders interact with the product information (how, where, for what);
- Develop a value proposition for each additional product information stage (creation, register, development, commercialization, discontinuation).

4.2 Problem Analysis

After a company's presentation, the challenges they are currently facing, and some practical objectives of the project, it is time to explain the problems and gaps arising from the research carried out in the literature review chapter.

Chapter 3 exposes two main topics: information management systems, their strategies, tools, and techniques, and service design with their concepts, models, techniques, etc. The first one tapers to another concept of ECM, exposing how an ECM strategy can lead to a solution for information management problems in an organization. The other is the Service Design, with its holistic, human-centered, and inter-disciplinary approach, which includes different fields like

service innovation or service systems and multiple methods that use this approach to innovate and develop new things in/with other areas.

There is some literature about service design and information systems trying to bring SD and IM together; however, IS research is a vast topic that can navigate through different issues. Regarding this, comparing a system that focuses exclusively on the processes of centralization or clear distribution of information and content across a whole company with other types of information systems is difficult. For example, information management systems like enterprise content management systems have particular challenges and characteristics. Also, there's no literature with a step-by-step method that uses SD to lead a project of design and development of an information management system.

So, there is a clear gap in Service Design leading and supporting an information management enabler project. It is essential to understand the information flows deeply, how the people interact with it, and how the value co-creation decreases the risk related to the people's acceptance of a new system in their workload.

4.2.1 Research Questions

- How can Service Design support an Information Management project?
- How can Service Design enable the co-creation and participation of the stakeholders in the design of a new IS solution?

5 Service Design for Information Management Method

This chapter presents the method developed based on the integration of Service Design methods and Information Management processes and tools presented before in the theoretical framework chapter. Service Design plays a crucial role in designing and developing solutions to manage information because of its human-centered and holistic characteristics, supported by visual tools and models.

Service Design for Information Management (SDIM) is an interdisciplinary DSR method that follows the framework of O'Callaghan & Smits, (2005) to enable ECM and incorporates a Service Design perspective to allow co-creation processes and achieve the best solution possible for and with future users of it.

SDIM is a service design method based on the double diamond design thinking stages, exploration, ideation, reflection, and implementation, varying with divergent and convergent moments during the iterative process (Brown, 2008). This method concentrates a lot of effort on the two first steps, enhancing the empathize methods and the importance of profoundly comprehending all the actors involved and context. The ECM strategy in this method concentrates on more technical issues, starting with a market cost/effort analysis and involving a content audit and an infrastructure analysis in the further SDIM stages. The ideation stage involves the importance of brainstorming through understanding the exploration phase by generating ideas and, developing service concepts, defining value prepositions.

In order to address the challenges of integration between SD and Information Management, SDIM builds on previous SD and IM methods as follows. The method is built upon four stages that integrate the design thinking stages and address the ECM steps: *Exploration* entails by 1. mapping the relevant stakeholders, exploring the tools available on the market, and 2. understanding multiple actors' interactions, focusing on their activities and problems faced. *Ideation* includes the brainstorming process and definition of service concepts through clear value propositions. To address the actor's needs and identify the challenges, it is also important to integrate the ECM steps of a content audit and analyze the existing infrastructure to clarify what content will be included in a concept and which infrastructure can be used or re-designed. These outputs are crucial to measuring the viability to advance for the development and implementation phase or not. Also, the actor's feedback is essential to know if they are comfortable with a co-creation approach and with sessions where they are fully highlighted.

It is possible to see that SDIM focuses essentially on an earlier stage of a project, enhancing how it is essential to listen to the stakeholders, promote knowledge sharing and map all the processes related to the different information flows. This understanding is precious and sometimes neglected in the business context, leading people to adopt tools and solutions they do not identify and do not meet what is necessary to perform their work. This method changes this paradigm, praising this process, culminating in defining some value propositions.

Table 1 shows the four stages, detailing the process and the tools/models/techniques.

Table 1 - SDIM stages

Stage	Process	Tool(s) / Model(s) (topic)
1. Mapping the ecosystem, relevant stakeholders, and	Understanding all the entities, flows, and relationships	Stakeholder's map (SD) Ecosystem Map (SD)

systems available in the market	Exploratory study Benchmark analysis	Benchmark document (ECM)
2. Understand the multiple actor experiences and interactions (information flows)	Exploratory Study Understanding user experience and information flows through conceptual models Identification of pain points, insights, and opportunities to leverage a solution	Interview Guide (SD) Observation Notes/Synthesise Wall (SD) Journey Map (SD) Service Experience Blueprint (SD) Problem Analysis and User Stories Map (SD)
3. Identify the content and existing infrastructure	Analyzing which content is essential and where it is (systems, files, etc.)	Content Analysis (ECM) Constraints Analysis (ECM)
4. Design the Service Concept(s) (value proposition)	Generate ideas based on previously gathered insights Feedback meetings with users for evolving or validating the generated ideas Developing a value preposition	Opportunities Map (SD) Requirements per activity area (SD) (ECM) Value preposition Canvas (SD)

5.1 Mapping the ecosystem, the relevant stakeholders and systems available in the market

Finding the best solution for an information management problem requires a systemic view of the information management ecosystem and relevant stakeholders working with the information and their interactions. Also, it is essential to know the available solutions market to start looking for what is already done and operating in the market.

SDIM starts with a high-level understanding of the content, processes, and technologies, as in figure 1 in chapter 3. For this, it is crucial to clarify the typologies of the information where the method will be applied because product information will be different from customer

information, for example, so a broad view of this must be developed, offering a visual object able to represent it. In addition, mapping the ecosystem allows having a general view of the different players and their core activities. Also, some characteristics and life cycles of the type of information shared and managed.

By mapping the stakeholders, their relationships, and activity areas, SDIM can support a human-centered approach to information management projects. The use of a stakeholder's map, for example, is crucial for the further steps to clarify who are the people, directly and indirectly, involved in information management and the different phases (creation, register, use, etc.), even where they are situated in the information flows.

Also, the market analysis, usually conducted in ECM development strategies, identifies what the different market players offer to solve and support information management problems. Through a benchmark analysis, it is possible to have the first look at established solutions on the market, their main features, and pros & cons.

5.2 Understand the multiple actor experiences and interactions related to the information

The second stage is crucial to understand who handles the information and how and where. An in-depth study of the experiences and interactions of the priority actors that were previously identified is required.

This stage is subdivided into three steps to simplify the comprehension and guide the work to achieve the complete understanding required to continue through the other stages of the method.

Firstly, it starts with a qualitative study with relevant actors previously or during the study identified. It is essential to develop an interview guide, even if the interviews were semi-structured, to collect the best data possible, considering the pre-established objectives for these sessions. Also, the observation notes written and organized in synthesis walls during the interviews help capture pain points, insights, and needs that will support the rest of the method.

After, mapping the experiences is a key part of a human-centered approach. It is essential to include both perspectives, what the person experiences and interacts with, and what went on outside of their view to trigger it. Journey mapping and service blueprinting are complementary methods that can help see both sides of a service (Erin Miller, 2016). Journey mapping illustrates the end-to-end customer experiences, comprising all their interactions with the business, in this case, information management.

Service blueprinting shows a picture that includes the breadth of what happens along the journey and the depth that makes up the substance that the journey traverses across. (Erin Miller, 2016)

SDIM suggests using one of these tools or both, depending on the typology of the problem and previous understanding. If a deep understanding is needed of what the users are experiencing, journey mapping is excellent to uncover it, being considered an empathizing method. However, suppose it's already clear the actor's experience or has identified a set of particular pain points. In that case, the blueprinting is great, allowing to address organizational pain and breakdown of processes internally. Together they can provide focus not only on the actor's activities and connections but also on the artifacts and information shared.

Finally, with the comprehension of the organizational context and the actor's experience is feasible to identify the main pain points, insights, needs, or opportunities from the information

collected in the two previous steps. Again, the observation notes and the synthesis walls may be the best ally at this point, supporting the organization and systematization of this step in different User Stories Map.

5.3 Identify the content and existing infrastructure

Based on the ECM strategy framework, the content audit and the existing infrastructure are crucial to clarify and analyze the information used by the actors exposed, revealing which content is potentially more relevant to be included in a future solution. It is also essential to understand which content is important to be shown for each group of users. For example, people from marketing may be interested in some logistic information but not in all the details of that specific sector, being crucial to organize the information and analyze it to be clear each content/information is essential for each user.

A content audit aims to determine how content is used, reused, and delivered to various audiences and how information (and the processes that create it) can be unified, providing the organization with an overview of all of its content and how it is used.

These two notions can be exposed as a list of the organization's information or a dynamic chart. The objective is to clarify the number of content objects that have to be scrutinized and organize thousands of documents or content objects by business unit or process, also defining which fraction of these should be analyzed in depth. During this process, it needs to be identified the systems that are "hosting" the information.

5.4 Design the Service Concept(s) /Develop a Value Proposition

As exposed before by MSD and MINDS, the service design has three levels (service concept, system, and encounter). Which one illustrates different view levels, the service concept represents the highest level of the service designed and the encounter the lowest one, closest to the specificities. Since the SDIM method mainly emphasizes the understanding process and not the development process, the level of granularity at this stage won't be so much since the objective and the final output are the development of several service concepts. All phases presented so far enable creative exploration of new concepts through brainstorming and organizing the outcomes in the form of coherent value propositions. The models are structured and focused on developing new value propositions at the service concept level. Still, they do not cover further specifications of service characteristics, such as the processes or the technologies for creating this new service, which are left out of this strategic level (Grenha Teixeira et al., 2017).

MINDS exposed by Grenha Teixeira et al., (2017) is a great example where the management perspectives cross into the SD methods, enabling creative exploration of new concepts in the form of coherent value propositions.

In this stage are developed different value propositions aggregated, contributing to a macro-level value proposition for this new service system. Each value proposition can be considered just a proposal of value like Ballantyne & Varey, (2016) argue, or can be part of a macro level scenario, seeing the value proposition as a "wild card" for the enterprise transformation and disruption. This metaphor is used widely within the computing and software sector (Boehm & Turner, 2005), arguing that strategic planning and value propositions are the main enhancers for corporate growth and change.

The service concept defines the service benefits that form the value proposition to customers (Grenha Teixeira et al., 2017), however, a VP is much more than that, also covering the customer's needs, pain points, and jobs performed, also in the service offering the features are included.

Thus, the definition of value propositions is only possible through the previous use of Service Design methods and tools, understanding all the experiences and interactions of the different actors and set of actors with the information flows. Also, the ECM strategic steps like content analysis, infrastructure, and ECM needs are crucial to improve the proposal on the service side.

5.5 Conclusions

Finally, the SDIM method focuses on problem comprehension, the people involved, the processes, and future technologies, which are seen as fundamental for future development. The correct understanding of the actors, tools, and processes allows the development and implementation according to what users need, which is the added value of this method. Using SD methods, especially the empathize ones, to understand the actors and context, together with techniques and strategies that enable ECM, serve as a basis for technological development or adoption.

6 Application

This chapter presents the DSR demonstration phase (applying the newly developed method in a business environment), including the outputs generated and how they were performed in the business environment. SDIM was involved in an information management project in Sumol + Compal. The project was already lightly introduced in the previous chapters, however, before getting into detail about how the method presented was applied in this business context, the project context and environment are explained.

The objective of this application was to apply the method previously presented in a business context and model it regarding the complex environment of a big manufacturing company. S+C has massive information and content and aims to create innovative value propositions and leverage a solution fitting the actor's needs and business constraints.

6.1 Work Environment

The project followed a double diamond approach, organizing it through three stages: *Discover*, *Define*, and *Develop*.

The method, as exposed before, consists of four phases starting with a long process of discovering and comprehending the different actors, technologies, and processes involved and ending with the delivery of a solution. This model is not static concerning the design council's suggestion of customization regarding the typology and needs of each project. Each phase incorporates iterative loops in which exploration and testing can occur (Gustafsson, 2019).

The method focused mainly on discovering and defining stages regarding the project's typology. These two stages were considered extremely important to support the development, testing and delivery of the best solution for the proposed problem.

So, the two first method stages are related to the *discover* phase of the project and the DD model, where we pursue to deepen the knowledge about enterprise context, different actors, and existing tools in the market. The other two are included in the *define* phase. In figure 7 are exposed the SDIM steps in the double diamond model and is connected with the tools used in each one.

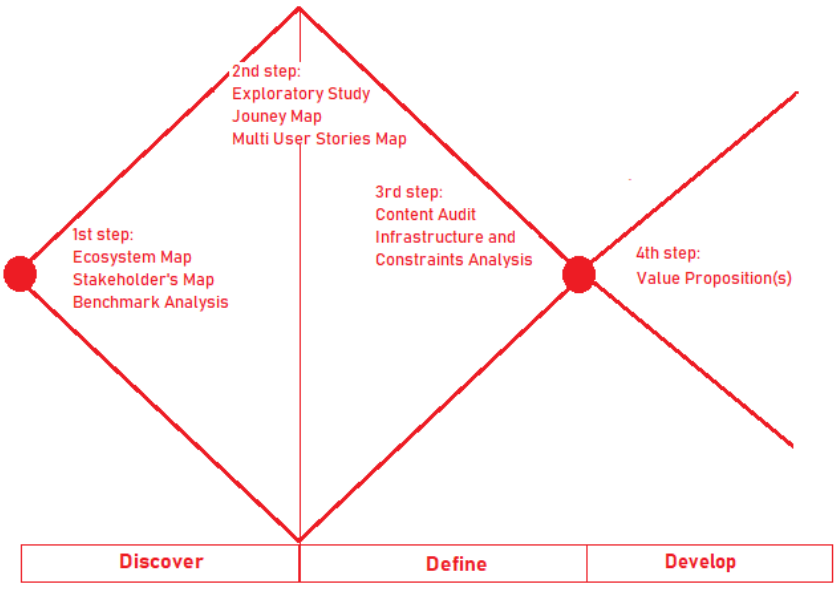


Figure 7 - SDIM steps

6.2 Mapping the ecosystem, relevant stakeholders, and PIMs available in the market

Defining the priority actors and understanding their context was crucial for a complex project that includes multiple companies' sectors and stakeholders. Also, starting to identify and understand the product management ecosystem in the company and identifying the main tools and solutions in the market provides an excellent basis to rip out the next steps of the SDIM method.

The product information management ecosystem in figure 8 clarifies the taxonomy of Sumol+Compal's products and the set of information and data that serves as the basis for the company's information flows. This graph corresponds to an initial high-level understanding of the ecosystem, where the product band is at the top, and the raw materials and package information are at the bottom. The visualization shows that a single product has a lot of related information distributed among different activity areas. Also, it illustrated the product information lifecycle, which means the various stages of a product life at Sumol+Compal, starting with the product creation or change, after its production and commercialization, and finally, its distribution. In each lifecycle stage, multiple activity areas and stakeholders are involved, deeply exposed in further steps of the method.

After, two sessions were conducted with key persons to develop the stakeholder's map for the product information management system. These sessions involved managers from S+C departments (IS, production, sales, logistics). They represented each major group of actors included in their areas and also had a comprehensive view of the main problems of Sumol+Compal.

Figure 8 - Ecosystem's Map

This process was conducted through three sessions where the pilot project was presented, and everyone had the opportunity to share their thoughts. After that, everyone started to bring some other intervenient names for the session, helping map the stakeholders. Figure 9 exposes the stakeholder's map for the product information management project. This map helps identify the people who need to be involved, which is crucial for the next stage. The figure is a short version of a long organizational chart of the company (in the appendix). It was used to clarify the stakeholders and their roles, specifying their relationships, peers, and hierarchical position. This understanding was crucial for a correct approach during the interview and co-creation processes.

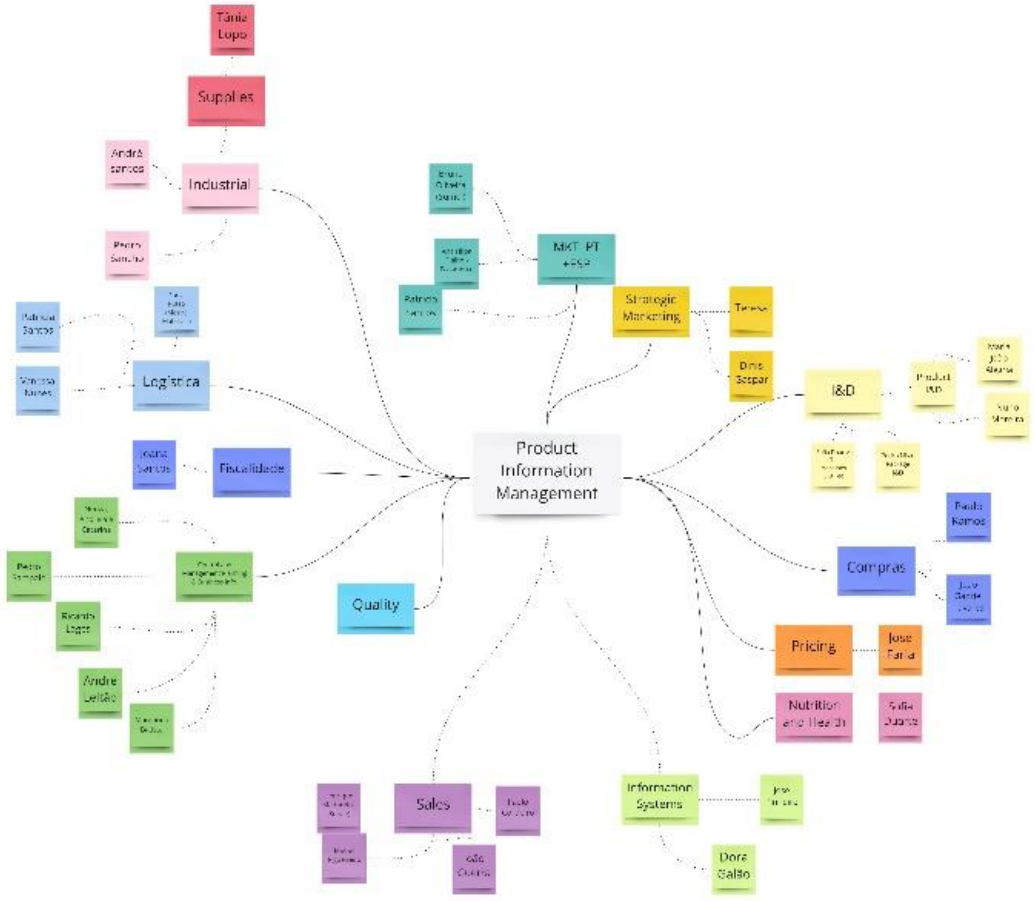


Figure 9 - Stakeholder's Map

Finally, a benchmark analysis was conducted, identifying which platforms and solutions are running in the market, reinforcing the stakeholder's previous study. The recognition and analysis of different tools and platforms provide an expansive view of the available features in those solutions and a perspective on emerging trends, which is an important step to support the further steps of SDIM. The benchmark analysis started with research across the web, identifying the leading players offering solutions for product information management. Based on this, five different sessions were accomplished with other platforms where the company's problem was exposed and discussed the integration degree of each platform regarding the company's

characteristics and needs. From those sessions' results, a deep benchmark analysis is present in Appendix A.

6.3 Understand the company's actor experiences and interactions related to the product information

This step was crucial and took a long time to be concluded. It started with a couple of exploratory sessions through different activity areas of S+C, where the people were questioned and promoted to show what tasks they usually do relate to the product information.

Based on this and other observations and field notes during the months of collaborating with people, it mapped all the experiences and interactions with the product information of all the different activity areas.

Also, the pain points, insights, and opportunities were identified to leverage a solution and understand their usual problems and needs, not just the activities they perform related to the information.

Table 2 - Stage 2 steps

Stage	Process	Model / Technique
Understand the multiple actor experiences and interactions (information flows)	Exploratory study through interviews and observation	Qualitative approach: Interview Guide Observation Notes/Synthetise Wall
	Understanding user experience and information flows through conceptual models	Journey Maps Service Experience Blueprints
	Identification of pain points, insights and opportunities to leverage a solution	Problem Analysis User Stories Map

6.3.1 Exploratory Study

For this study, 30 semi-structured interviews were conducted, encompassing almost all the Sumol+compal departments, followed by other semi-structured interviews to go even deeper with key identified actors (employees of the company). As semi-structured interviews, it means that the interviewer had a guidance file with key questions but only asked a few of them, while the rest of the questions were not planned and conducted regarding the session's environment. Appendix B presents the interview guide used, but the session was divided into three parts. Starting with personal questions about their daily tasks and role at the company, then going into the product information-related questions, and finally asking to show their screen and start an observation stage about key tasks. In that part of each session, the interviewee was asked to show what normally s(he) does related to product information and also asked for files that are usually used.

The people or the sample was defined following the guidelines of Qualitative approaches (Charmaz, 2006), considering the significant actors. The people that participate directly or indirectly in the different product information processes, the relevance of these actors in the process, and their availability in the data collection period.
Figure 5 presents the different teams and activity areas interviewed and their interconnections, covering almost every activity area identified in the first stage. Each color corresponds to an activity area with one or more teams. For example, I&D has three different teams (Product, Process, and Package). The interconnections were identified with the sharing system (email or shared folders). However, some of them were not identified at the time.

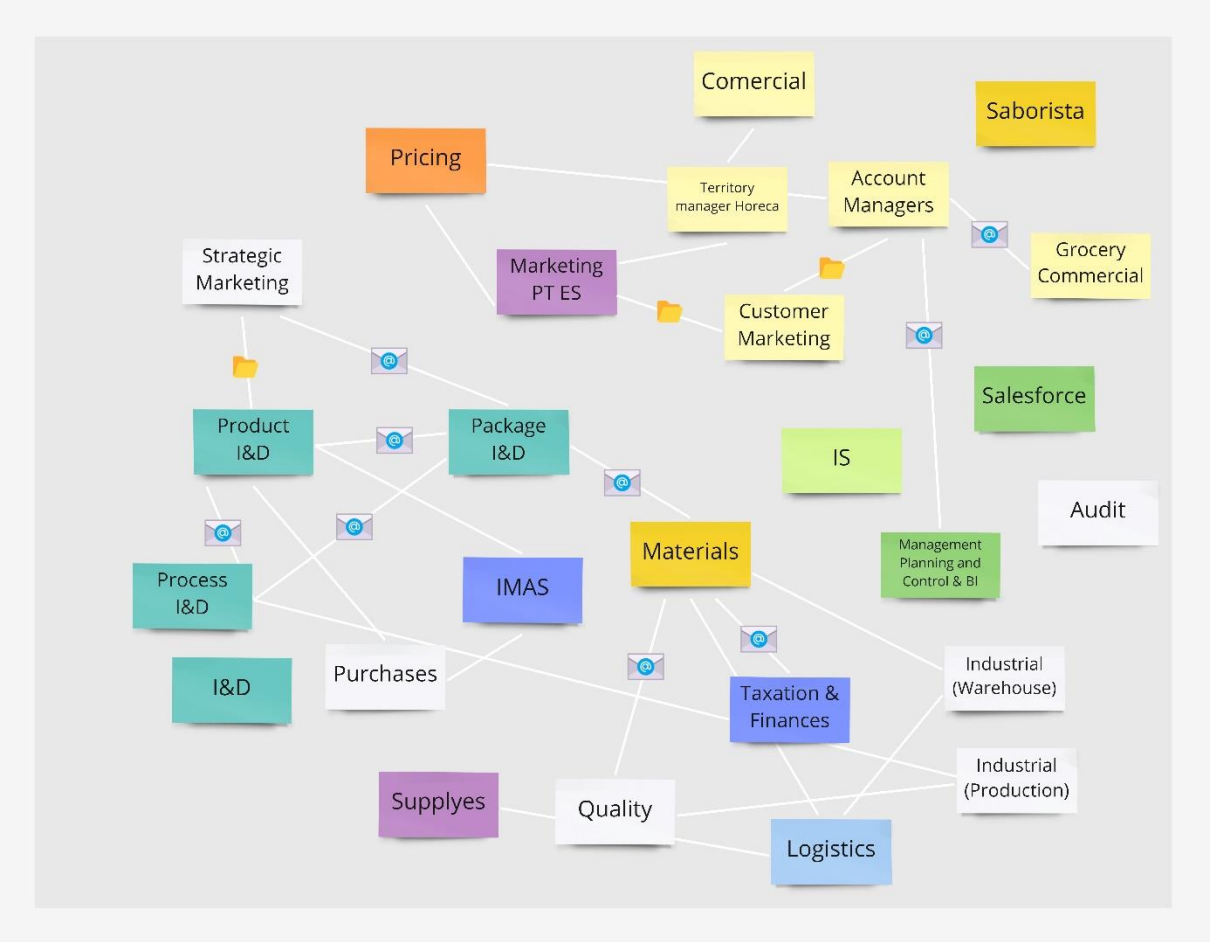


Figure 10 - Interview's map

The data was collected using observation and interview notes, organized in synthesis walls during each session. This tool was a key support in the moment of debriefing and analysis of the research outcomes. The team wrote down all the relevant notes from the research on single post-it notes and organized them on the wall to start identifying issues, flows, relevant themes, and important insights that can inform and inspire the design process. The walls were structured, listing all the notes under each interviewee. Figure 11 illustrates an example of a wall. They were crucial to supporting the next step of this stage.

The notes in synthesis walls and the meeting record of each interview were analyzed, separating the captured notes into their product information-related experience, their usual tasks, and pain points/opportunities and needs. For each interview it was developed a new journey map or included in the team's one.

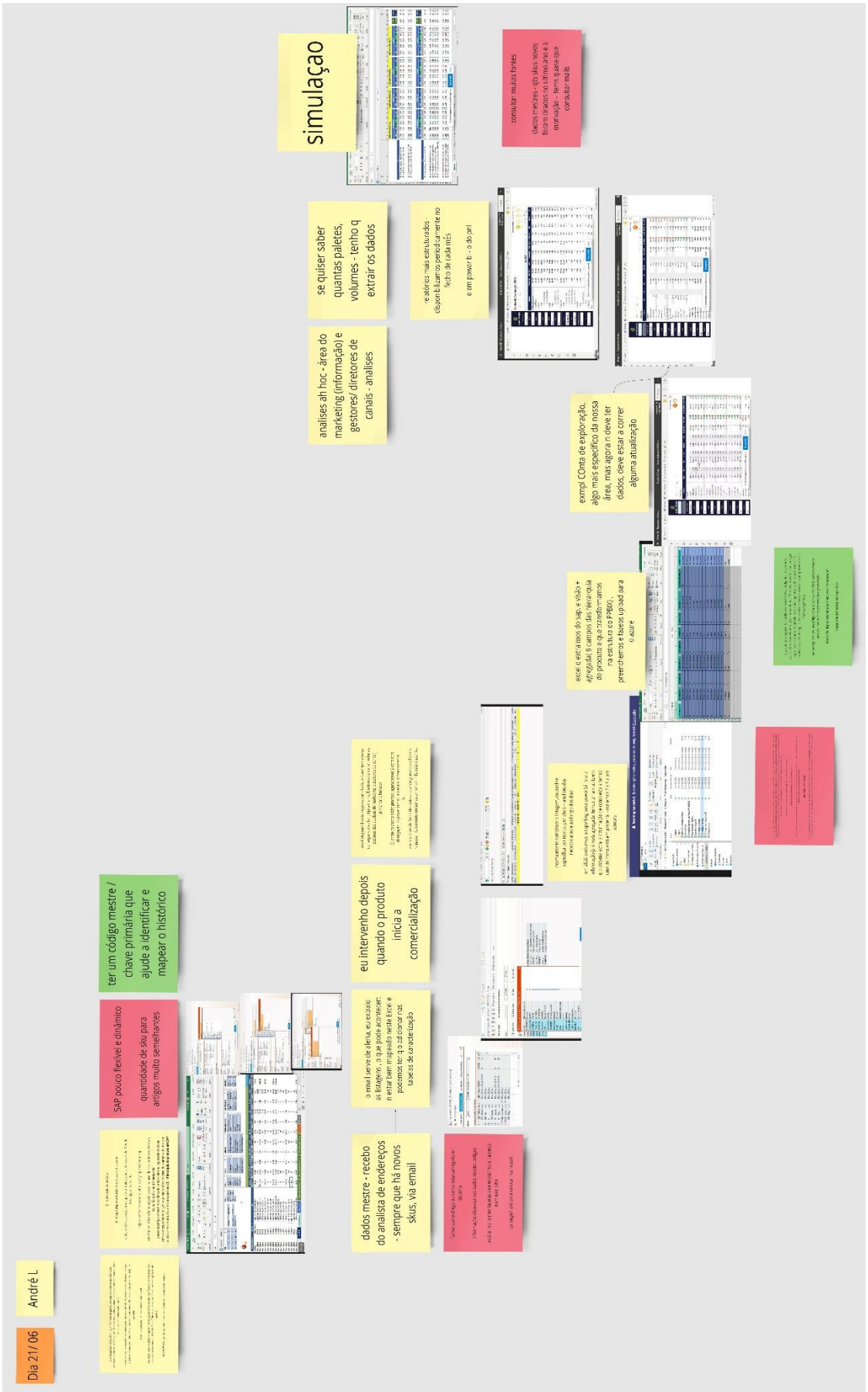


Figure 11 - Synthesis Wall example

6.3.2 Understanding user experience and product information flows

This step is the moment when the first diamond starts to taper into the definition part of the model After and during the interview, multiple journey maps were developed, illustrating the experiences and interactions between actors regarding the product lifecycle. Each interviewee was included in their team's journey map or created a new one regarding the necessity.

The ultimate goal was to aggregate the actors involved in each lifecycle stage. For example, all the users involved in the creation/register of the product were aggregated in a unique map, the people involved in the production, commercialization, or discontinuation stage did the same thing. This differentiation was crucial to focusing intensely on each product stage, leading to better concepts and solutions. Due to the complex degree, the Sumol+Compal digital transformation team decided to focus on each product lifecycle stage, so all the further steps were applied only to the creation/register of the product. However, figure 12 illustrates a general view of the work conducted by analyzing multiple persons, teams, and activity areas, giving a broad comprehension of where every team is situated regarding the product information lifecycle.

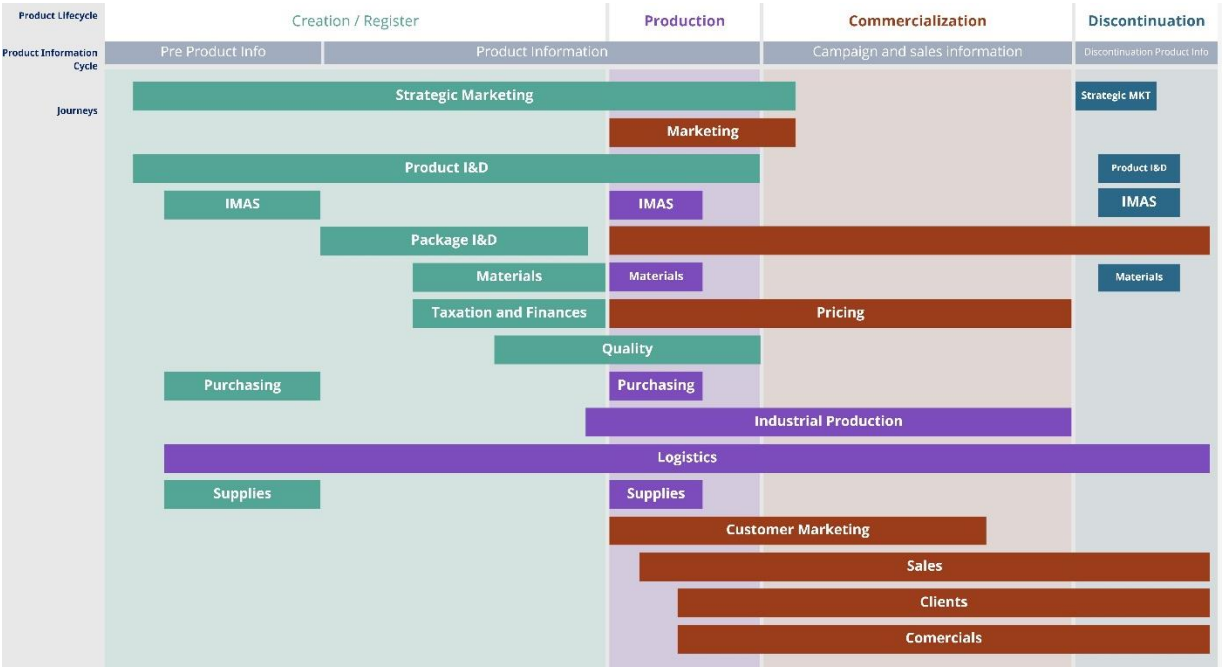


Figure 12 – Journeys overview

Looking for this overview is possible to notice some activity areas that are present in the product lifecycle, being crucial to analyze even deeper. Also, the areas involved in the creation/ register product stage are deeply analyzed in figure 13, which presents a blueprint involving all these actors and areas. The blueprint covers multiple journeys from the ideation and requirements definition for a new or improved problem until the creation/register of this product in the SAP system. The blueprint also illustrates the actor's experiences and connections, the most important outcome of the interviews and previous research. The figure presents a short version only including the flows, journeys and actors, but the long version (in the appendix) also includes the "back-end" operations and systems/artifacts that support them. The complexity of each product information phase (creation, production, commercialization, and discontinuation) led to the need to split and focus on the creation/register part for the following stages.

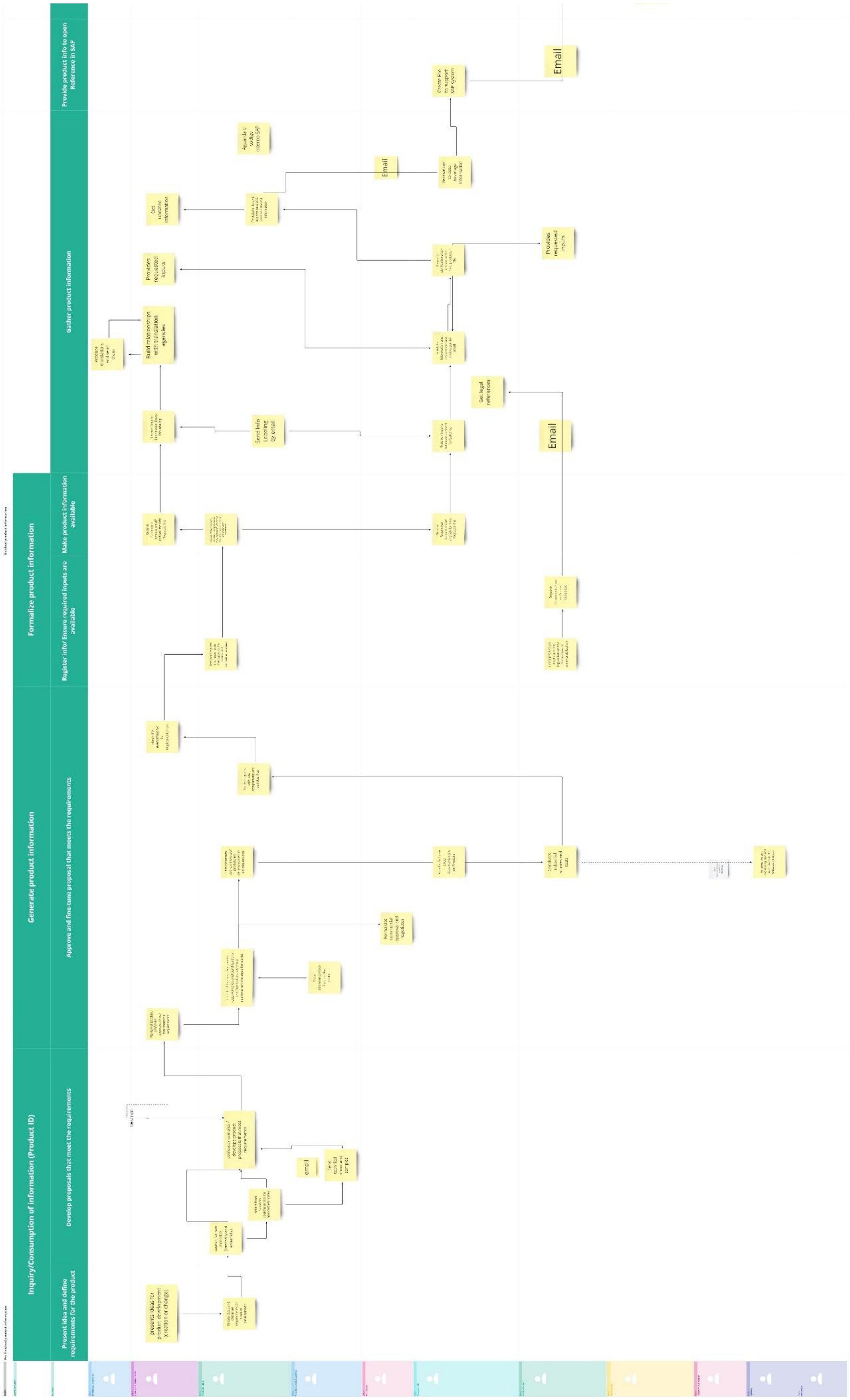


Figure 13.1 - Creation/Register Blueprint

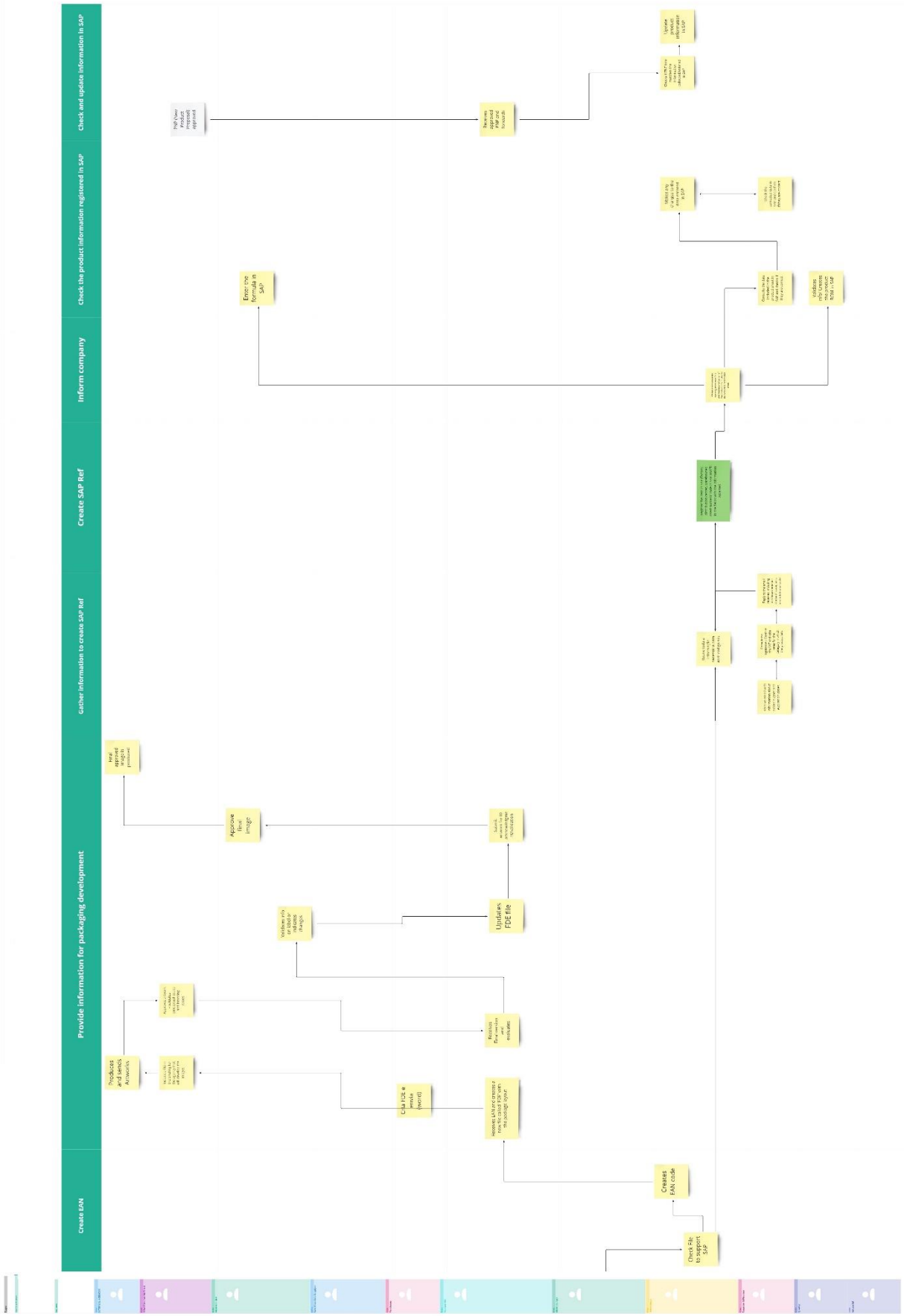


Figure 14.2 - Creation/Register Blueprint

Figures 13.1 and 13.2 illustrate a short version of the product creation and registration blueprint, one of the main problems is clearly the number of times someone requests a file or information. Or it waits for some validation or email, leading to a colossal efficiency decrease. This pain point and many others were prioritized and are exposed in the next sub-chapter, as well as in the value proposition, where they correspond to the features that intend to solve them.

6.3.3 Pain Points, Needs, and Opportunities

During the previous steps of understanding the user experience and the different product information flows, the pain points of each actor were registered, as well as the opportunities and some insights from the interviews, again using synthesis walls (in appendix D). Then an analysis was conducted to determine the main pain point (s), needs, and opportunities of each team and activity area regarding the product information exclusively. Using a human-centered approach, the analysis was essential to measure their work's difficulty and support a solution that fits their needs and problems.

Figure 14 shows an example of the main pain points identified for the creation/register product cycle by activity area. The other product lifecycle stages are exposed in appendix B.

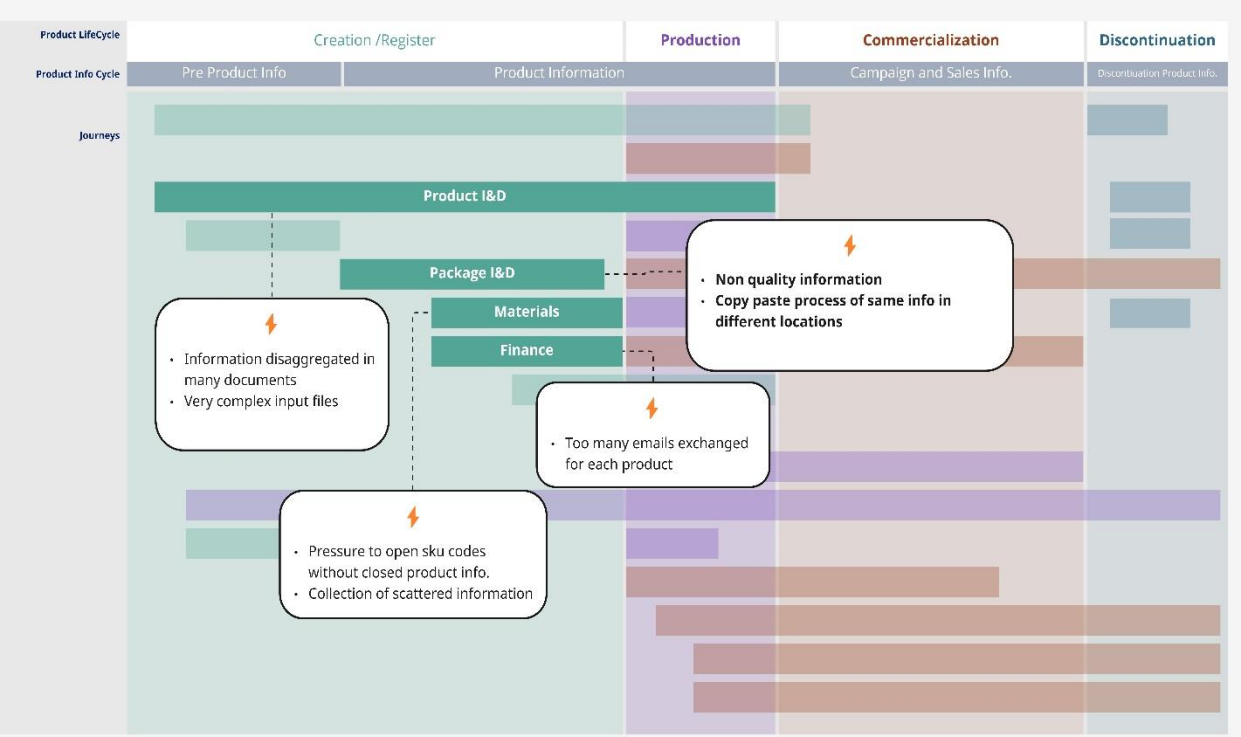


Figure 14 - Pain points Creation/ Register overview

6.4 Identify the product information content and where is it stored

With all the information provided by the multiple actors interviewed and mapped in the previous stages, it was possible to identify which product information content is used, by who, for who, and where it is stored. Firstly, all the documents and files provided were aggregated

by activity area identifying the origin and destination of each file. After and based on the ECM strategy framework, an Excel file was made (exposed in appendix C) where the origin, the recipient, the place hosting, the file name, and all the content were identified.
The aggregation of all the content in one table provided an overview of the product information used. It also allowed analyzing some particularities using filters, revealing, for example, which content is present in one or more files and for who that content is important, supporting the next step of this stage, mapping the content and its infrastructure in different views.

6.5 Service Concept(s) through Value Proposition(s)

This final output was only focused on one stage of the product lifecycle, the creation and register of a product.

With the journey mapping, the pain points/needs/opportunities analysis, and the content/ infrastructure audit, the design team brainstormed over these and developed different and innovative service concepts. The Alex Osterwalder (2012) value proposition canvas was used to organize the concepts into coherent value propositions. This tool is adaptable and includes several bits of thinking from the lean startup movement, such as "jobs to be done" and "customer pains", is an interesting tool for use in this situation

The three "fields" on the customer side, in this case, all the people and areas involved in this particular cycle, are filled in based on a prioritization of pain points, needs, and opportunities (in appendix D). This work is based on stage 2 of the method and almost directly corresponds to the offered service. That is, for each pain point, there are one or more features that intend to solve it and one or more benefits that come from implementing that feature, the same applies to the needs. Therefore, the tasks and the system are essential to understand the activities corresponding to this phase of the product life cycle and what the system is specifically about, which will incorporate these same features and deliver the benefits exposed.

In short, this value proposition serves as the basis for future implementation of a system that responds to pain points and needs and supports tasks on the customer side. This system will have to incorporate the necessary features exposed in the service side that will benefit the user with:

- Aggregated information
- Standardized and clarified information
- Security and privacy
- Timely information
- Collaborative environment
- Easy access and use
- Efficiency in the processes of consultation, collection, and approval of the information
- Decrease in % of human error

Considering that figure 14 illustrates one value proposition, the idea is to continue the work and cover the other product lifecycle stages, aggregating it into a leading value proposition for the company. This step is the base for the future development and implementation part of the project.

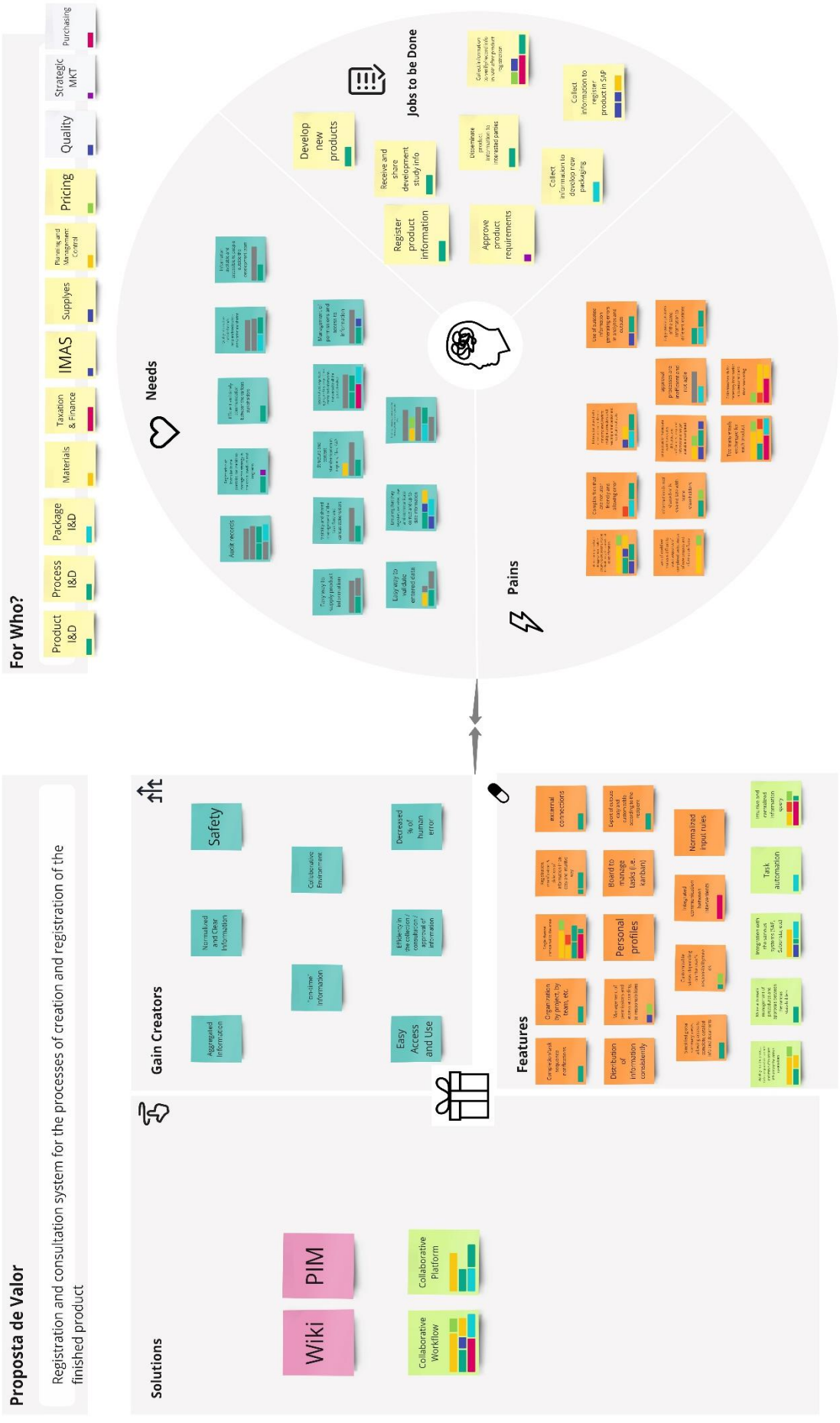


Figure 15 - Value proposition

7 Evaluation Method

Finally, following the DSR methodology (A. Hevner & Chatterjee, 2010), the SDIM method was evaluated in terms of work and relevance/efficiency for the business environment in which it was exercised.

Venable et al. (2016) suggest four-step conduct of the DSR evaluation process, naming FEDS, firstly is required to explain and clarify the evaluation goals, secondly, choose the evaluation strategy, thirdly determine the properties to evaluate and finally design the individual evaluation episodes.

Regarding the typology of the artifact, a method to support the design of information management systems with an SD approach involves co-creation and so many people. Therefore, the main goal of the evaluation process is to manage the uncertainty and reduce the risk. It means evaluating if the artifact fits nicely into the use or social situation and, therefore, if it does not work or causes some problems, it also is essential to know if the method can lead to a solution adequate to the problem.

Also, since the artifact is not a technical system but a method that led a project that could have the goal of developing a system post, the evaluation strategy must be different from the one used to evaluate a system using, for example, prototypes, experiment sessions, etc. So, something like the Human Risk & Effectiveness strategy exposed by Venable et al. (2016) would be most appropriate, focusing on the user and the utility of the method.

Therefore, it is important to understand if the way the project was conducted, using the method, was the most correct and if it caused inconvenience to those who participated throughout the various phases.

The evaluation method is fundamentally focused on the applicability of the method's output(s) in the organization and on the feedback given by those who participated in the various moments of this project on how it was conducted, and it focused a lot on in the human component of comprehension and co-creation.

1. According to feedback from the company, the results of the application are going to be implemented, validating the artifacts created through applying the method in a business environment, which is a good indicator of the potential of applicability of the method; All the graphs exposed were validated with the company and some were even used in presentations to the administration, giving them validity in terms of results.
2. After the sessions of understanding and comprehension for stage 2 of SDIM, some people were randomly questioned to give /her honest opinion about the sessions. The questions were the following:

- Do you feel that the approach used was the right one? Do you think spending your work time on these sessions makes sense?
- Do you feel that both exploratory and clarification sessions took too much time and effort?
- Do you think it makes sense to be involved in the company's digital transformation processes?

And an additional question for the people that had access to the intermediate results:

- From what you have seen, do you consider that the mappings of processes and information flows are close to reality?

All feedback is exposed in appendix D but, in general, was positive, concluding that:

- The participants feel that the approach was useful and that spending time on this makes sense.
- The participants did not think that this study was too time-consuming, keeping them from executing their typical tasks;
- The participants think that it is important to be included in DT company projects and decision processes, mainly because they are projects that will affect them directly.
- And for the ones that had access, the materials and intermediate results presented were considered relevant, providing a good understanding of the process;

8 Conclusion and Future Research

This dissertation presents the Service Design for Information Management method that brings Service Design methods and tools to a manufacturing company's product information management problem. The method developed integrates SD and Information Management strategies and techniques, giving a new approach to the two fields and suggesting other research opportunities. Therefore, it offers a multidisciplinary, technical-focused, and human-centered approach, generating value for those who integrate this process and the people involved in the information flows.

Following a DSR methodology, the method represents the generated artifact, helping to solve some organizational problems. By applying it in a corporate and real-world context, the method adapts due to the constraints and generates new outcomes, improving the overall project and method. SDIM uses a qualitative approach and builds upon previous SD methods and IM enabler strategies, offering a well-structured tool that can be useful for any project that wants to design and develop an Information Management system. In fact, the method doesn’t focus on the development process of a new service system (an information system) to manage information. Instead, the value of this method is to give attention to the previous stages. The analysis and empathize component brings together an exploratory study and mapping models in order to identify the actor's experiences and interactions regarding the information flows and the problematic points, necessities and opportunities, while the design component covers modeling on the service concept level.

The method finishes with several possibilities of conceptualization, delivering it into value propositions concerning the users involved in each phase of the information lifecycle. Therefore, SDIM involves the SD and IM methods for better comprehension, involving the users and offering a human-centered approach to typically more technical projects, providing better design and development stages and bringing solutions that respond precisely to the organization and user's problems.

Its application in a big player in the food&beverage market and its respective outcomes shows that service design techniques can be helpful in the research and empathizing process for a project that involves a considerable amount of information. In fact, the method responded precisely to the objectives of the organization's problem, understanding all the information flows related to the product content/information and the different stakeholder's interactions with the product information, illustrated in the journey maps and the overview. Also achieved the ultimate goal of developing a value proposition for a specific product information stage (and for the actors involved).
Considering the initial research objectives, the positive outcomes were included in the company's project, proving that the method was applied successfully in a business environment, supporting the information management digitalization project of Sumol+Compal. Furthermore, the service design showed that it could support an information management project involving the people in co-creation and analysis processes, which is crucial to an information management system's design and development processes.

The process of SDIM involved different stakeholders and actors (of a future solution) in the project, privileging listening and understanding processes and including the participants in this process, too, asking for opinions and insights about the journeys and other mapping processes. Although several models and artifacts were generated, there are two that stand out: the general blueprint, aggregating multiple teams and actors and their experiences, as well as the systems, the main activities, the pain points, needs, and opportunities, which gave a deep understanding

about one product lifecycle (creation/register), responding precisely to the organizational objectives of understanding all the information flows related to the product content/information and analyze how the different stakeholders interact with the product information (how, where, for what). The other relevant artifact was the value proposition canvas, the ultimate output at the service concept level and responding to the other organizontal objective of developing a value proposition for each additional product information stage (creation, register, development, commercialization, discontinuation).

The method generally enhances the importance of including and listening to people in any type of system development. In a project that hopes to develop an information management system, this need becomes even more critical because the information is a super valuable asset in an organization and present in multiple processes of the same, if a new system is not developed based on the knowledge of people's experiences and interactions and pain points and needs, it is much less likely that the new system will be able to respond to the organization's problems and be used by the actors.

For future demonstrations, it would be essential to follow the system implementation process based on the results of this project and see if the value propositions can be reflected in the system developed. Also, it could be interesting to apply this method to other information management types of projects and see if it can be useful. For future research, exploring new ECM strategies and incorporating them into the method could increase even the quality of it and explore ‘hot’ technologies like artificial intelligence and blockchain in the ideation process.

Refrences

Alalwan, J. A., & Weistroffer, H. R. (2012). Enterprise content management research: A comprehensive review. *Journal of Enterprise Information Management*, *25*(5), 441–461. https://doi.org/10.1108/17410391211265133/FULL/PDF

Al-Emran, M., Mezhuyev, V., Kamaludin, A., & Shaalan, K. (2018). The impact of knowledge management processes on information systems: A systematic review. In *International Journal of Information Management* (Vol. 43, pp. 173–187). Elsevier Ltd. https://doi.org/10.1016/j.ijinfomgt.2018.08.001

Alter, S. (2008a). Service system fundamentals: Work system, value chain, and life cycle. *IBM Systems Journal*, *47*(1), 71–85. https://doi.org/10.1147/sj.471.0071

Alter, S. (2008b). Service system fundamentals: Work system, value chain, and life cycle. *IBM Systems Journal*, *47*(1), 71–85. https://doi.org/10.1147/sj.471.0071

Altuna, A., & Thomas Jun, G. (2014). *The Applicability of Online Communities in Health Service Co-Design*.

Andersen, R. (2008). The Rhetoric of Enterprise Content Management (ECM): Confronting the Assumptions Driving ECM Adoption and Transforming Technical Communication. *Http://Dx.Doi.Org/10.1080/10572250701588657*, *17*(1), 61–87. https://doi.org/10.1080/10572250701588657

Assegaff, S., Hussin, A. R. C., & Dahlan, H. M. (2011). Perceived benefit of knowledge sharing: Adapting TAM model. *2011 International Conference on Research and Innovation in Information Systems, ICRIIS'11*. https://doi.org/10.1109/ICRIIS.2011.6125744

Ballantyne, D., & Varey, R. J. (2016). Creating value-in-use through marketing interaction: the exchange logic of relating, communicating and knowing: *Http://Dx.Doi.Org/10.1177/1470593106066795*, *6*(3), 335–348. https://doi.org/10.1177/1470593106066795

Basole, R. C. (2016). Accelerating Digital Transformation: Visual Insights from the API Ecosystem. *IT Professional*, *18*(6), 20–25. https://doi.org/10.1109/MITP.2016.105

Benbya, H., Nan, N., Tanriverdi, H., & Yoo, Y. (2020). *Complexity and Information Systems Research in the Emerging Digital World*. https://ssrn.com/abstract=3539079

Bharadwaj, A., Sawy, O. A. el, Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. In *Source: MIS Quarterly* (Vol. 37, Issue 2).

Blomkvist, J., & Holmlid, S. (2010). *Service Design Research*.

Boehm, B., & Turner, R. (2005). Management challenges to implementing agile processes in traditional development organizations. *IEEE Software*, *22*(5), 30–39. https://doi.org/10.1109/MS.2005.129

Brown, T. (2008). *Design Thinking*. www.hbr.org

Buchanan, R. (2001). Design Research and the New Learning. *Design Issues*, *17*(4), 3–23. https://doi.org/10.1162/07479360152681056

Chesbrough, H., & Spohrer, J. (2006). A Research Manifesto for Service Science. *Communications of the ACM*, *49*(7), 35–40.

Colomo-Palacios, R., Fernandes, E., Soto-Acosta, P., & Larrucea, X. (2018). A case analysis of enabling continuous software deployment through knowledge management. *International Journal of Information Management*, *40*, 186–189. https://doi.org/10.1016/J.IJINFOMGT.2017.11.005

Coombs, R., & Miles, I. (2000). *Innovation, Measurement and Services: The New Problematique*. 85–103. https://doi.org/10.1007/978-1-4615-4425-8_5

Corbin, J., & Strauss, A. (2012). Basics of Qualitative Research (3rd ed.): Techniques and Procedures for Developing Grounded Theory. *Basics of Qualitative Research (3rd Ed.): Techniques and Procedures for Developing Grounded Theory*. https://doi.org/10.4135/9781452230153

Dilnutt, R. (2006). Enterprise Content Management: Supporting Knowledge Management Capability. *The International Journal of Knowledge, Culture, and Change Management: Annual Review*, *5*(8), 73–84. https://doi.org/10.18848/1447-9524/CGP/V05I08/50146

Erin Miller, M. (2016, March 9). *The difference between a journey map and a service blueprint | by Megan Erin Miller | Practical Service Design*. https://blog.practicalservicedesign.com/the-difference-between-a-journey-map-and-a-service-blueprint-31a6e24c4a6c

Foglieni, F., Villari, B., & Maffei, S. (2018). From service to service design. *SpringerBriefs in Applied Sciences and Technology*, *9783319631776*, 5–26. https://doi.org/10.1007/978-3-319-63179-0_2/COVER/

Forlizzi, J. (2013). *Relating Systems Thinking and Design*. http://openresearch.ocadu.ca/id/eprint/2166/

Giordano, F., Morelli, N., de Götzen, A., & Hunziker, J. (2018). *ServDes2018-Service Design Proof of Concept Politecnico di Milano 18th-19th-20th*. https://www.la27eregion.fr

Glushko, R. J. (2010). *Seven Contexts for Service System Design*. 219–249. https://doi.org/10.1007/978-1-4419-1628-0_11

Grahlmann, K., Hilhorst, C., van Amerongen, S., & Brinkkemper, S. (2010). *Impacts of implementing Enterprise Content Management Systems. IT regie management View project Data Governance Maturity Model-empirically validated View project*. https://www.researchgate.net/publication/221409948

Gregor, S., & Hevner, A. R. (2013). Positioning and Presenting Design Science Research for Maximum Impact. In *Source: MIS Quarterly* (Vol. 37, Issue 2).

Grenha Teixeira, J., Patrício, L., Huang, K. H., Fisk, R. P., Nóbrega, L., & Constantine, L. (2017). The MINDS Method: Integrating Management and Interaction Design Perspectives for Service Design. *Journal of Service Research*, *20*(3), 240–258. https://doi.org/10.1177/1094670516680033

Grenha Teixeira, J., Pinho, N. F. de, & Patrício, L. (2019). Bringing service design to the development of health information systems: The case of the Portuguese national electronic health record. *International Journal of Medical Informatics*, *132*. https://doi.org/10.1016/j.ijmedinf.2019.08.002

Gupta, V. K., Govindarajan, S., & Johnson, T. (2001). Overview of Content Management Approaches and Strategies. *Electronic Markets*, *11*(4), 281–287. https://doi.org/10.1080/101967801753405571

Gustafsson, D. (2019). *Analysing the Double diamond design process through research & implementation 2 Content*.

Hevner, A., & Chatterjee, S. (2010). *Design Science Research in Information Systems*. 9–22. https://doi.org/10.1007/978-1-4419-5653-8_2

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. *MIS Quarterly: Management Information Systems*, *28*(1), 75–105. https://doi.org/10.2307/25148625

Ismail, M. H., Khater, M., & Zaki, M. (2017). *Digital Business Transformation and Strategy: What Do We Know So Far?* www.cambridgeservicealliance.org

Johnson, S. P., Menor, L. J., Roth, A. v., & Chase, R. B. (2012). A Critical Evaluation of the New Service Development Process: Integrating Service Innovation and Service Design. *New Service Development: Creating Memorable Experiences*, 1–32. https://doi.org/10.4135/9781452205564.N1

Kaley, A. (2021). *Mapping User Stories in Agile*. https://www.nngroup.com/articles/user-story-mapping/

Kaplan, K. (2016). When and How to Create Customer Journey Maps. *Nielsen Norman Group: UX Research, Training, and Consulting*. https://www.nngroup.com/articles/customer-journey-mapping/

Kellermann, A. L., & Jones, S. S. (2013). What it will take to achieve the as-yet-unfulfilled promises of health information technology. *Health Affairs*, *32*(1), 63–68. https://doi.org/10.1377/HLTHAFF.2012.0693/ASSET/IMAGES/LARGE/2012.0693FIGEX1.JPEG

Kurtmollaiev, S., Fjuk, A., Pedersen, P. E., Clatworthy, S., & Kvale, K. (2018). Organizational Transformation Through Service Design: The Institutional Logics Perspective. *Journal of Service Research*, *21*(1), 59–74. https://doi.org/10.1177/1094670517738371

Lee, J. H., & Kim, Y. G. (2001). A stage model of organizational knowledge management: a latent content analysis. *Expert Systems with Applications*, *20*(4), 299–311. https://doi.org/10.1016/S0957-4174(01)00015-X

Leibtag, A. (2010). *Content Strategy: Understanding the Difference Between Data, Information and Content*. https://www.cmswire.com/cms/web-engagement/content-strategy-understanding-the-difference-between-data-information-and-content-009088.php

Lusch, R. F., Vargo, S. L., & Gustafsson, A. (2016). Fostering a trans-disciplinary perspectives of service ecosystems. *Journal of Business Research*, *69*(8), 2957–2963. https://doi.org/10.1016/J.JBUSRES.2016.02.028

Lusch, R. F., Vargo, S. L., & Wessels, G. (2008). Toward a conceptual foundation for service science: Contributions from service-dominant logic. *IBM Systems Journal*, *47*(1), 5–14. https://doi.org/10.1147/SJ.471.0005

Martin, D., Gustafsson, A., & Choi, S. (2016). Service innovation, renewal, and adoption/rejection in dynamic global contexts. *Journal of Business Research*, *69*(7), 2397–2400. https://doi.org/10.1016/J.JBUSRES.2016.01.008

Meroni, A., & Sangiorgi, D. (2016). Design for Services. *Design for Services*. https://doi.org/10.4324/9781315576657

Migdadi, M. M., & Abu Zaid, M. K. S. (2016). An empirical investigation of knowledge management competence for enterprise resource planning systems success: insights from Jordan. *Https://Doi.Org/10.1080/00207543.2016.1161254*, *54*(18), 5480–5498. https://doi.org/10.1080/00207543.2016.1161254

Munkvold, B. E., Päivärinta, T., Hodne, A., & Stangeland, E. (2006). Contemporary Issues of Enterprise Content Management. *Scandinavian Journal of Information Systems*, *18*(2). https://aisel.aisnet.org/sjis/vol18/iss2/4

Muzyka, D., de Koning, A., & Churchill, N. (1995). On transformation and adaptation - Building the entrepreneurial corporation. *European Management Journal*, *13*(4), 346–362.

O'Callaghan, R., & Smits, M. (2005). A Strategy Development Process for Enterprise Content Management. *ECIS 2005 Proceedings*. https://aisel.aisnet.org/ecis2005/148

Ostrom, A. L., Bitner, M. J., Brown, S. W., Burkhard, K. A., Goul, M., Smith-Daniels, V., Demirkan, H., & Rabinovich, E. (2010). Moving forward and making a difference: Research priorities for the science of service. *Journal of Service Research*, *13*(1), 4–36. https://doi.org/10.1177/1094670509357611

Ostrom, A. L., Parasuraman, A., Bowen, D. E., Patrício, L., & Voss, C. A. (2015). Service Research Priorities in a Rapidly Changing Context: *Http://Dx.Doi.Org/10.1177/1094670515576315*, *18*(2), 127–159. https://doi.org/10.1177/1094670515576315

Päivärinta, T., & Munkvold, B. E. (2005). Enterprise content management: An integrated perspective on information management. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 96. https://doi.org/10.1109/HICSS.2005.244

Patrício, L., de Pinho, N. F., Teixeira, J. G., & Fisk, R. P. (2018). Interactions in healthcare. *Service Science*, *10*(1), 76–87. https://doi.org/10.1287/serv.2017.0201

Patrício, L., & Fisk, R. P. (2013). Creating new services. In *Serving Customers: Global Services Marketing Perspectives*.

Patrício, L., Fisk, R. P., e Cunha, J. F., & Constantine, L. (2011). Multilevel service design: From customer value constellation to service experience blueprinting. *Journal of Service Research*, *14*(2), 180–200. https://doi.org/10.1177/1094670511401901

Patrício, L., Gustafsson, A., & Fisk, R. (2018). Upframing Service Design and Innovation for Research Impact. In *Journal of Service Research* (Vol. 21, Issue 1, pp. 3–16). SAGE Publications Inc. https://doi.org/10.1177/1094670517746780

Patrício, L., Sangiorgi, D., Mahr, D., Čaić, M., Kalantari, S., & Sundar, S. (2020). Leveraging service design for healthcare transformation: toward people-centered, integrated, and technology-enabled healthcare systems. *Journal of Service Management*, *31*(5), 889–909. https://doi.org/10.1108/JOSM-11-2019-0332

Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems*, *24*(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

Polaine, A., Løvlie, L., & Reason, B. (2013). *Service design : from insight to implementation*. Rosenfeld Media. https://books.google.com/books/about/Service_Design.html?hl=pt-PT&id=NHo3DwAAQBAJ

Prajogo, D., Toy, J., Bhattacharya, A., Oke, A., & Cheng, T. C. E. (2018). The relationships between information management, process management and operational performance: Internal and external contexts. *International Journal of Production Economics*, *199*, 95–103. https://doi.org/10.1016/j.ijpe.2018.02.019

Pullman, G., & Gu, B. (2008). Guest Editors' Introduction: Rationalizing and Rhetoricizing Content Management. *Http://Dx.Doi.Org/10.1080/10572250701588558*, *17*(1), 1–9. https://doi.org/10.1080/10572250701588558

Rockley, A., & Kostur, P. (2003). *Managing Enterprise Content: A Unified Content Strategy*.

S+C. (n.d.). *Quem somos - SUMOL+COMPAL*. Retrieved July 4, 2022, from https://sumolcompal.pt/quem-somos

Shostack, G. L. (1982). How to Design a Service. *European Journal of Marketing*, *16*(1), 49–63. https://doi.org/10.1108/EUM0000000004799/FULL/PDF

Siltaloppi, J., Koskela-Huotari, K., & Vargo, S. L. (2016). Institutional complexity as a driver for innovation in service ecosystems. *Service Science*, *8*(3), 333–343. https://doi.org/10.1287/SERV.2016.0151

Smith, H. A., & McKeen, J. D. (2003). Developments in Practice VIII: Enterprise Content Management. *Communications of the Association for Information Systems*, *11*(1), 33. https://doi.org/10.17705/1CAIS.01133

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Stickdorn, M., Hormess, M., Lawrence, A., & Schneider, J. (2018). *This is service design doing: applying service design thinking in the real world.* O'Reilly Media, Inc.

Teixeira, J. G., Patrício, L., & Tuunanen, T. (2019). Advancing service design research with design science research. *Journal of Service Management*, *30*(5), 577–592. https://doi.org/10.1108/JOSM-05-2019-0131

van Aken, J., Chandrasekaran, A., & Halman, J. (2016). Conducting and publishing design science research: Inaugural essay of the design science department of the Journal of Operations Management. *Journal of Operations Management*, *47–48*, 1–8. https://doi.org/10.1016/J.JOM.2016.06.004

van Aken, J. E. (2004). Management Research Based on the Paradigm of the Design Sciences: The Quest for Field-Tested and Grounded Technological Rules. *Journal of Management Studies*, *41*(2), 219–246. https://doi.org/10.1111/J.1467-6486.2004.00430.X

Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, *26*(3), 145–152. https://doi.org/10.1016/J.EMJ.2008.04.003

Venable, J., Pries-Heje, J., & Baskerville, R. (2012). A comprehensive framework for evaluation in design science research. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *7286 LNCS*, 423–438. https://doi.org/10.1007/978-3-642-29863-9_31

Venable, J., Pries-Heje, J., & Baskerville, R. (2016). FEDS: A Framework for Evaluation in Design Science Research. *European Journal of Information Systems*, *25*(1), 77–89. https://doi.org/10.1057/EJIS.2014.36/TABLES/2

vom Brocke, J., Hevner, A., & Maedche, A. (2020). *Introduction to Design Science Research* (pp. 1–13). https://doi.org/10.1007/978-3-030-46781-4_1

vom Brocke, J., & Simons, A. (n.d.). *Progress in IS Enterprise Content Management in Information Systems Research Foundations, Methods and Cases*. http://www.springer.com/series/10440

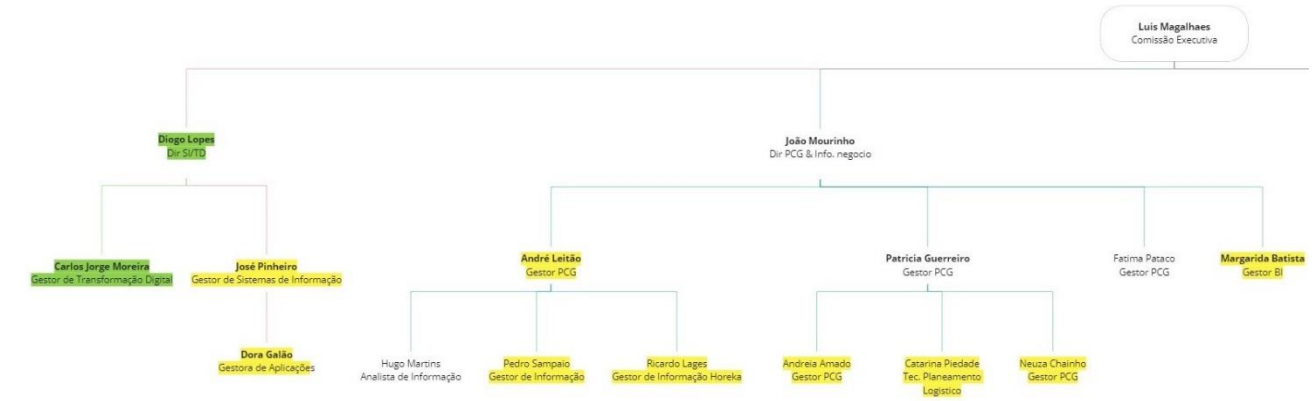
vom Brocke, J., & Simons, A. (2014). *Progress in IS Enterprise Content Management in Information Systems Research Foundations, Methods and Cases*. http://www.springer.com/series/10440

Wetter-Edman, K., Sangiorgi, D., Edvardsson, B., Holmlid, S., Grönroos, C., & Mattelmäki, T. (2014). Design for Value Co-Creation: Exploring Synergies Between Design for Service and Service Logic. *Service Science*, *6*(2), 106–121. https://doi.org/10.1287/SERV.2014.0068

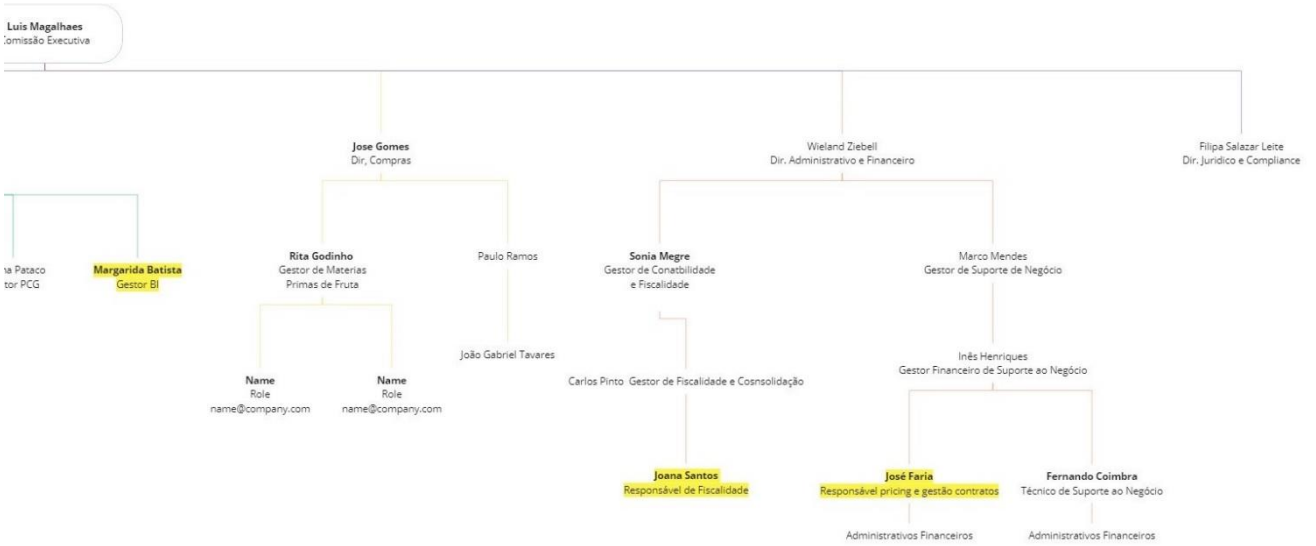
Winter, R. (2008). Design science research in Europe. *European Journal of Information Systems*, *17*(5), 470–475. https://doi.org/10.1057/EJIS.2008.44/FIGURES/3

Wu, W. W., & Lee, Y. T. (2007). Selecting knowledge management strategies by using the analytic network process. *Expert Systems with Applications*, *32*(3), 841–847. https://doi.org/10.1016/J.ESWA.2006.01.029

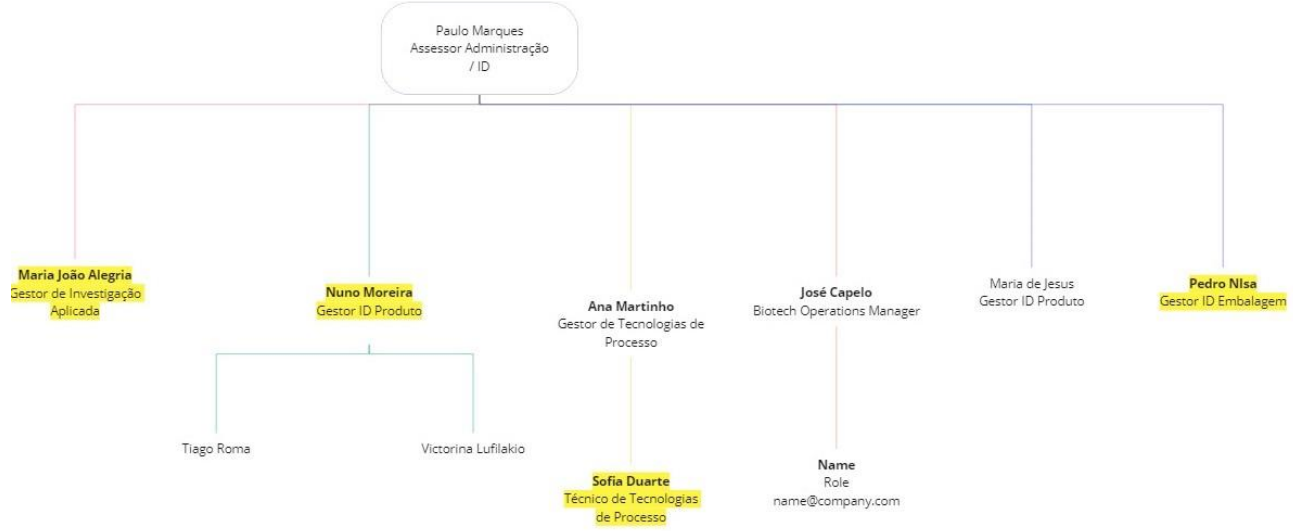
APPENDIX A: Company and market context



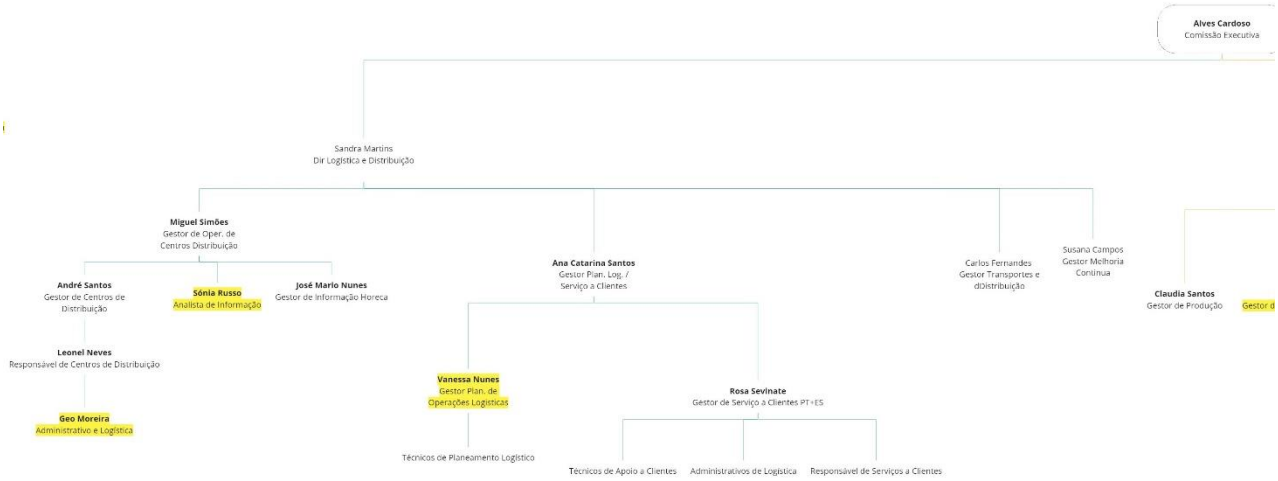
A 1.1: Organization Chart – IS and Management Planning and Control & BI



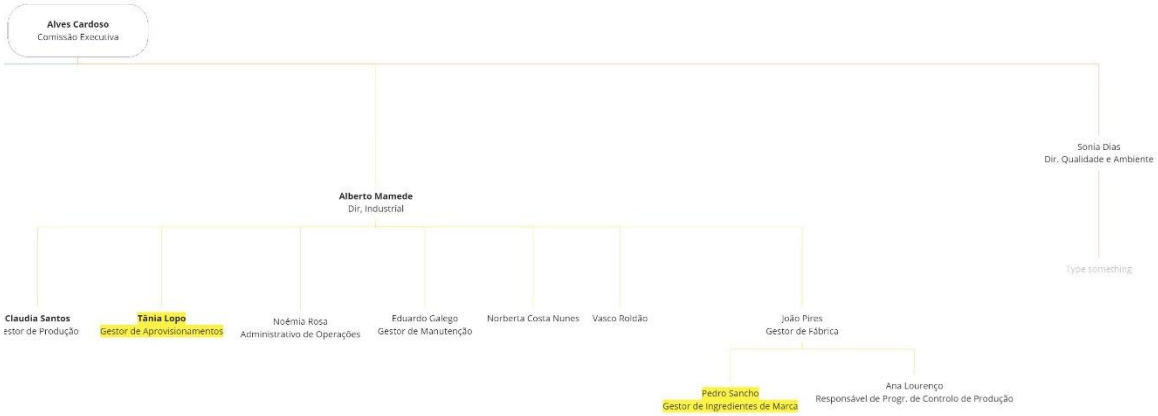
A 1.2: Organization Chart - Purchases and Finance



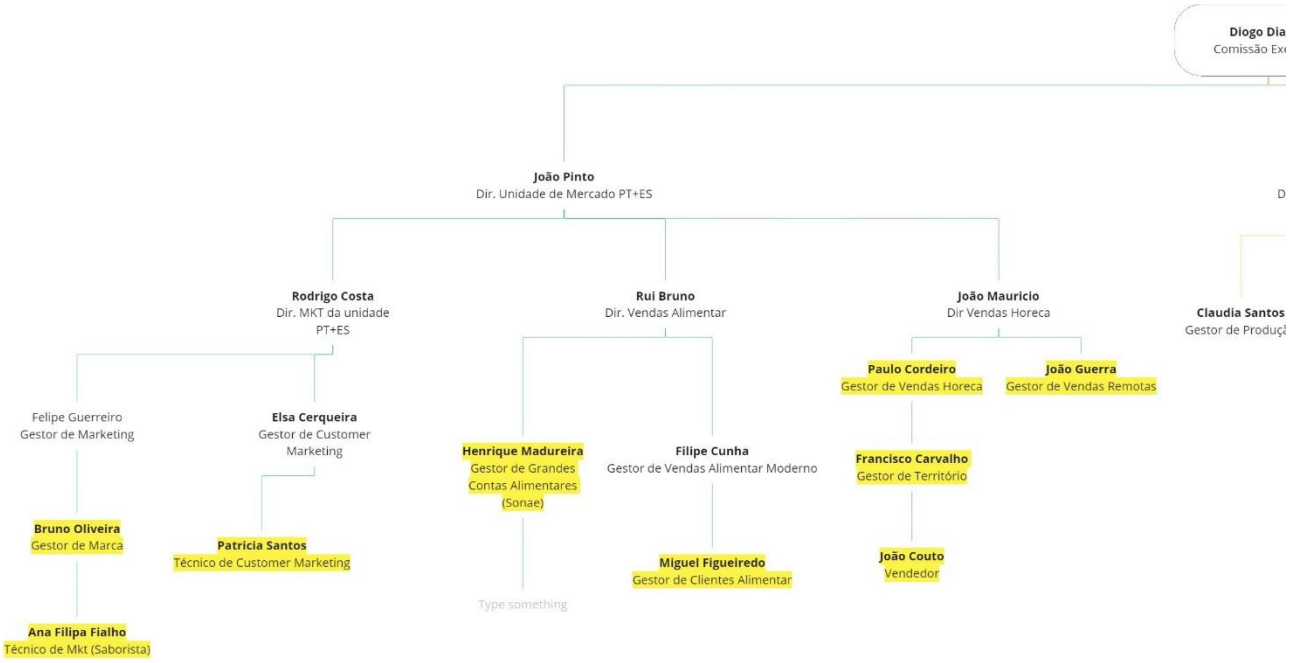
A 1.3: Organization Chart - I&D



A 1.4: Organization Chart - Logistics and Distribution



A 1.5: Organization Chart - Industrial and Quality



A 1.6: Organization Chart - PT+ES Unite Market

A 1.7: Organization Chart - Export Markets Unit and Strategic Marketing

A 2: Benchmark Analysis

Benchmark Analysis

Due to the increase in market competition and the dependence on data and information, the companies need to store and organize such information to make better and correct decisions. (Brunner et al. 2007)

However, such information is incomplete and inconsistent across many systems. For example, some information can be stored in Excel or Word documents in different places and with other accesses. Even more complicated, due to these inconsistencies, a single product can have different codes and descriptions in the various markets it is sold. The same data is captured many times, in many other systems, without a proper governance strategy.

For example, according to Vermeer, BHPJ (2001), "an average of 30% of the information in retailer systems is incorrect, and studies have shown that as much as 63% of product descriptions can diverge in supplier and wholesaler systems".

To address this problem, many platforms aggregate a company's information like ERP, MDM, DAM, or PIM.

PIM VS DAM VS PXM

Various solutions have been developed over the last few years to process, manage and store product information.

At the high level of enterprise management, solutions like MDM software or ERP systems are commonly used. For example, at Sumol+Compal, the ERP's SAP is the "backbone" of the business, integrating all the enterprise's data and managing critical business functions and processes of the organization.

However, a complex platform like an ERP system can be challenging to manage for all the enterprise sections and collaborators. It means that is desired a simple solution that works directly with the product databases (that only focuses on delivering and managing the product information, on performing this, the market offers three leading solutions, Product Information Management (PIM), Data Asset Management (DAM) and Product Experience Management (PMX).

PIM

Correct and complete product information is crucial to the well-functioning of various business processes. The enterprises are no longer satisfied with basic descriptions for product categories, like dimensions or weight. That's where the product information management system comes into play.

Product information management (PIM) provides all the necessary product data, like descriptions, photos, videos, hierarchies, etc. And it serves as a single source of truth for cross-

functional teams, promoting the enrichment of the platform through adding dozens of images, rich content, and many other things into a system in a standardized way. Moreover, PIM can be integrated with other systems like ERPs, Databases, or marketplaces.

The product-focused approach of PIM might need the cooperation and involvement of various company departments to enrich the system with quality information.

DAM

A digital asset management solution is a software and systems solution that provides a systematic approach to efficiently storing, organizing, managing, retrieving, and distributing an organization's digital assets. Digital Asset Management (DAM) can refer to both a business process and a form of information management technology or a digital asset management system. DAM functionality helps many organizations create a centralized place where they can access their media assets. (IBM)

The digital asset management system is the most comprehensive, up-to-date, accessible, and secure storage of digital files related to products, including documents, presentations, audio, video, meta-information, etc. (and they're not necessarily directly product-related). One of the significant benefits of digital asset management software is that it helps all the company's employees take advantage of existing digital assets.

The main difference is that Digital Asset management deals with all the digital assets that an organization controls, while Product Information Management focuses on the lifecycle of a product

"PIM and DAM systems are neither replaceable nor mutually exclusive because they serve different purposes. Digital asset management tools will be valuable even for companies that do not sell any products at all but handle a lot of media content for other purposes" (Gepard)

PXM

PXM, i.e., product experience management, is the software that gathers and produces product content to engage customers and trigger buying decisions. The purpose is to stage a unique product experience that customers would enjoy. Accordingly, PXM involves standardization, optimization, distribution, and customization of product data in all the channels the company employs.

PIM system is WHAT business uses to describe products, whereas PXM is HOW customer's product selection and buying experience are orchestrated. It means that PXM can be a part of the PIM solution

Recap:

- **MDM** serves as a company's database for all master data and is accessible to each employee.
- **ERP** systems focus on the company's resources and business process optimization.
- **DAM** software is a convenient and reliable source of the company's media assets, easily accessible by all its employees.
- **PIM** system is an irreplaceable tool for managing all kinds of product data.
- **PXM** software delivers products at the right time into the right place and creates mechanisms to keep customers satisfied, loyal, and willing to make further purchases in stores.

Tools / Platforms

Akeneo

Akeneo is one of the world leaders in terms of platforms for managing product information, providing different solutions and integrations of its main product, PIM.

The platform is *Cloud Based* and *Open Source* based on *Symfony3 technology*. It is possible to modify and change several features of the tool, for which extensive documentation is available on the web. An *API* for possible integrations is also provided.

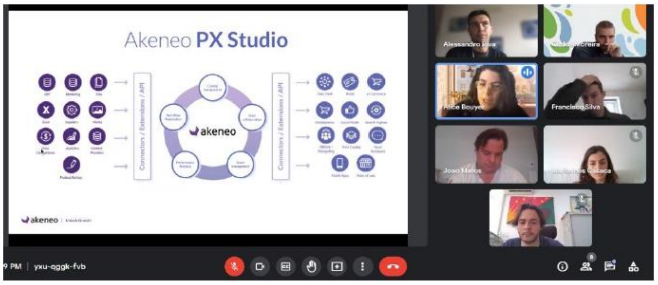
The company defines its platform as one that not only serves to manage product information but as one that goes further and offers a wide range of experiences that cover the company's needs, improving efficiency in the execution of various tasks, improving the user experience, improving the quality of product information, etc....

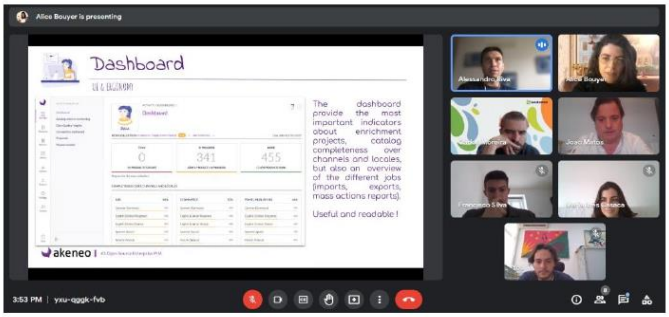
Pros:

- highly customizable
- Easy to use
- Compatible with various *web services*
- Large user community
- Easy integration with other applications
- technological independence

Cons:

- Integration and customization lead to the need for development
- annual subscription
- Specialization in technology





PimCore

PIMCore is one of the market's pioneers and best-known PIM solutions, offering product information management and other types of control such as *Master Data Management* (MDM) and *Digital Asset Management* (DAM).

The company offers three different licenses, one being *Open Source* (Community Edition) and the other two with an annual subscription. The community version lacks a series of *features* and integrations that the different versions have. However, the enterprise versions are also based on Open Code, so you can customize them to meet your needs.

The company provides Cloud and On-Premises versions.

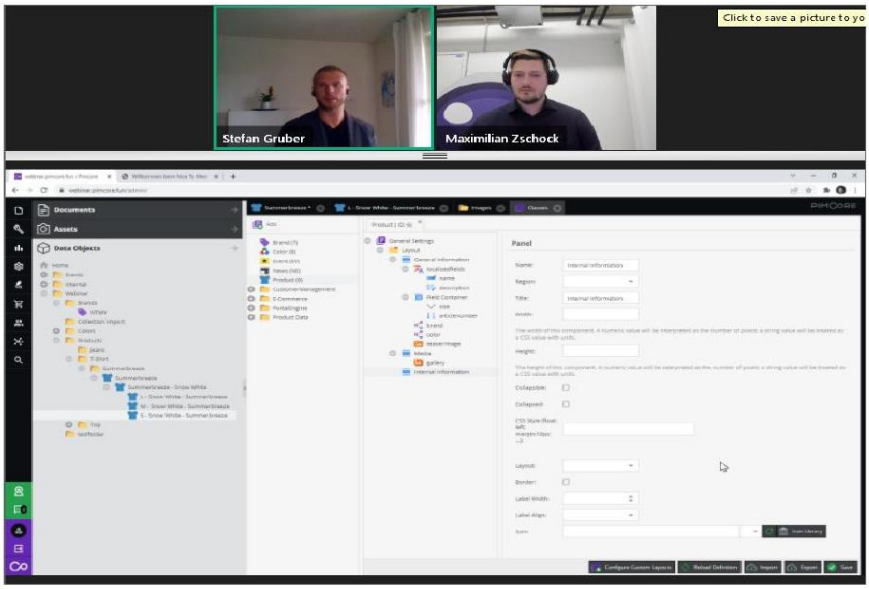
Pros:

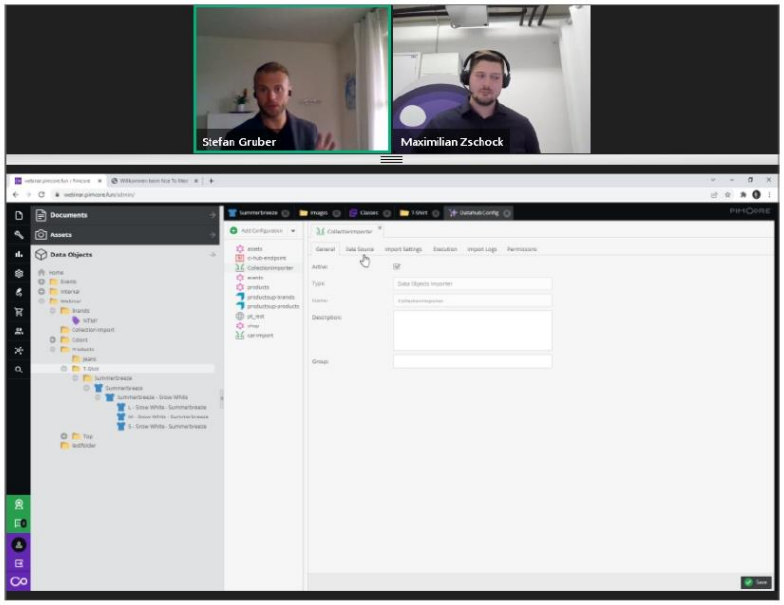
- highly customizable
- complete

- Great community and documentation
- Open Code

Cons:

- lack of support
- learning difficulty
- Development team needed
- Annual subscription (Enterprise Editions)





B_Create

B_Create is a Portuguese company specializing in the beverage market for Wines.

The company offers a solution that allows the storage of product information and much more, offering a platform that enables users to collaborate on a product development process, creating *pipelines* that start with *brainstorming* and creativity because of the development of a new product. After the idealization phase, it can become a project within the platform, enabling integration between different members and distributing responsibilities and tasks among them.

In addition to developing ideas and projects, the platform allows storing all information regarding a specific product and its *packaging*, combining all the stakeholders and all the information they need on a single platform.

The platform is based on .NET and uses SQL Server to store the information.

Pros:

- Portuguese company
- Enterprise-side customization (No development is needed to get a solution that satisfies needs)
- Collaboration within the platform
- Dashboards (PowerBI)

- Possibility to replace Monday (?) -> PNP

Cons:

- Tailored solution for NPM (New Project Management) (Depends)
- Use of machines under our responsibility
- expensive
- Dependency on a company

PimWorks

PimWorks is an American company known for the multiple integrations it has fundamentally for the eCommerce area (eBay, Amazon, Shopify, etc.)

The company offers a SaaS solution, that is, in which the system is allocated and maintained by the company. After an initial conversation with the company, it is understood that the platform already has some essential features integrated into the "base" solution and that the company is willing to customize the software to the needs of the company.

Pros:

- Enterprise-side customization (No development is needed to get a solution that satisfies needs)
- Multiple integrations

Cons:

- Focused on e-commerce
- Some dependency on the company

Widen

The solution offered by Widen focuses more on the management of *digital assets, in a* logic of

Create-Manage-Distribute-Analyze (Workflow, Assets, Portals, Templates, Insights).

After an initial meeting with the company, it was understood that the solution is very much related to the management of digital assets, that is, images, video, etc., and not so much to the management of product information, being an exciting alternative if a PIM+DAM solution.

Pros:

- Enterprise-side customization (No development is needed to get a solution that meets your needs)
- Multiple integrations
- Intuitive
- Excellent for asset management

Cons:

- The solution offered does not seem to fit our needs
- Lack of business logic and processes within the system

APPENDIX B: Comprehension research and analysis

B 1: Interview Protocol

S+C - TD

Digital Transformation - PIM

Interview Protocol

Apr 2022

Target: Managers, Commercials

Purpose

Diagnose the current situation regarding the management of product information at S+C. It is intended to survey and validate the experiences and behaviors of *stakeholders* regarding information management throughout the life cycle of a product, identifying their needs and motivations, to discover what are the current *pain-points* and future opportunities, to development a value proposition in this area.

To identify the most critical aspects of managing product information, as well as informing future opportunities and helping to achieve this goal, the S+C TD Team and the Ernst & Young (EY) Business Transformations team will conduct semi-structured interviews, collaborators
with managerial profile and commercial profile that perform relevant functions in the scope under study.

Goals

By talking to these interviewees we intend to:

- Deeply understand the tasks performed on a day-to-day basis and how they relate to product information, characterizing your experience as a manager or salesperson at S+C; what they value most and least; how, when and why did they adopt compensatory behaviors? • What is the manager's or salesperson's perception of the product's life cycle and

  respective information that accompanies it?
- What support needs do you feel S+C can respond to to improve the work/tasks related to product information?

logistical aspects

- The S+C TD Team in collaboration with the EY Team will identify all participants for these interviews, scheduling the convenient dates/times.
- Interview sessions can be conducted face-to-face or remotely (via Teams)
- Interviews are expected to last 60-90 minutes. • One member of the EY Team will moderate each interview and another will take notes. • Elements of the S+C TD Team, may be present at the time of the interview to observe and take notes.
- With the approval of the participants, sessions will be recorded to help with annotations and data analysis for the research team. Recordings will not be shared outside the project team and will be destroyed within a maximum period of 1 month.

The following four sections describe the topics to be addressed during the interviews, along with follow-up questions:

1) Introductory questions about the background and role of the interviewees;
2) Exploratory questions about the validation of the Current State
3) Developmental questions regarding pain points and opportunities
4) Demonstration of activities, processes or tasks performed in context

The questions are intended to be a guide to the discussion, and their order may vary based on the flow of conversation and new areas of exploration that may arise.

Protocol

DATE: **HOUR:**
INTERVIEWER: **NOTEBOOK:**
PARTICIPANT ID:

Introduction / Introduction

Good morning/Good afternoon [name of participant]. My name is [moderator name] and I am a Business Transformation consultant at Ernst & Young.
We are working with S+C's Digital Transformation team to help identify ways to improve product information management throughout the product lifecycle at S+C.

To this end, and in order to inform future opportunities in this area, the objective of our conversation today is to understand your experience as a manager/commercial, raising the most critical aspects and the procedures adopted in the tasks related to the management of product information that plays in your daily life.

Before we begin, I would like you to be aware of the following important aspects:

1) There are no right or wrong answers. We are genuinely interested in knowing, as much as possible, the experiences you had, in the 1st person.
2) I understand that you may have already spoken, on other occasions, on similar topics. Still, we'd like you to consider this the first time you're talking about these topics with someone.

3) All information collected during this session will be later anonymized during its analysis phase and presented in aggregate form during the synthesis and report phase. At no time will we use data or information that can be linked to you.

We want to record our session so that it is easier to take notes and review in the analysis. Recordings will not be shared outside the project team and will be destroyed within a maximum period of 1 month. So, would we like to ask your permission?

[If authorized, START RECORDING]
[If you do not authorize] We understand, no problem. We will do our best to take notes.
Any questions before we start?

[Introductory Questions] **Background & Role**

Just to start, let's understand a little better the nature of your work.

1. **Tell us a little about your day-to-day at S+C.**
   - The. What is your function?
   - B. Where do you spend most of your time?
   - ç. What are the main activities/tasks you perform?
   - d. What kind of skills do you need to do your job?

[Exploratory Questions] **Current Status Validation**

Thanks for sharing your background and context.
Now we want to explore the day-to-day tasks that are related to the management of product information.

2. **How does product information appear in the tasks you perform on a daily basis?**
   day?
   - The. What product information do you use in carrying out your task(s)?
   - B. What is the source of the information you use?
   - ç. From whom/how do you get the necessary information?
   - d. How and where do you manage this product information?
   - and. Are you responsible for generating new data/information about the product? which and in what moments)?
   - f. With whom/how do you share the information you use and/or generate?
   - g. What is the importance/usefulness of the product information you use and/or generate?
   - H. Do you miss any information about the product necessary to carry out the your tasks?

3. **Tell us about an experience/situation related to product information management that went very well?**
   - The. [Review] What was the most relevant part of this experience? Because?
   - B. Do you have another positive experience/situation you want to share? Which one? Because?

4. **Now describe another experience that went wrong?**
   - The. [Attitude towards dissatisfaction] When you have experiences like this, what do you usually to do? [claims]
   - B. [Review] What was the most relevant part of this experience? Because?

ç. What were the main consequences of this situation?

d. Do you have another positive experience/situation you want to share? Which one? Because?

[Development] **Pain Points and Opportunities**

Pain Points

5. What are the biggest challenges you face in managing product information?

The. What, in your experience, causes these challenges/obstacles to exist?

B. Are these challenges related to processes, data processing, systems, tools, employees, decision making, etc.?

ç. How do you feel about these challenges you face?

d. How do you solve these obstacles/challenges to achieve the results? desired?

6. What is the part of your job related to the management of product information that consumes more time? Because?

The. What kind of information, tool or data could best support you?

Because?

Opportunities / Future State

7. In your opinion, how could the management of product information at S+C be be improved, to facilitate your activity?

The. What improvement points are most important for your tasks?

B. What tools, means, procedures, etc., do you most need for your tasks?

[Demo] **Performing tasks in context**

Thanks for sharing your experience and opinions. Finally, we ask you to:

8. Simulate the circumstances of your daily activity, demonstrating the accomplishment of your tasks related to the management of product information.

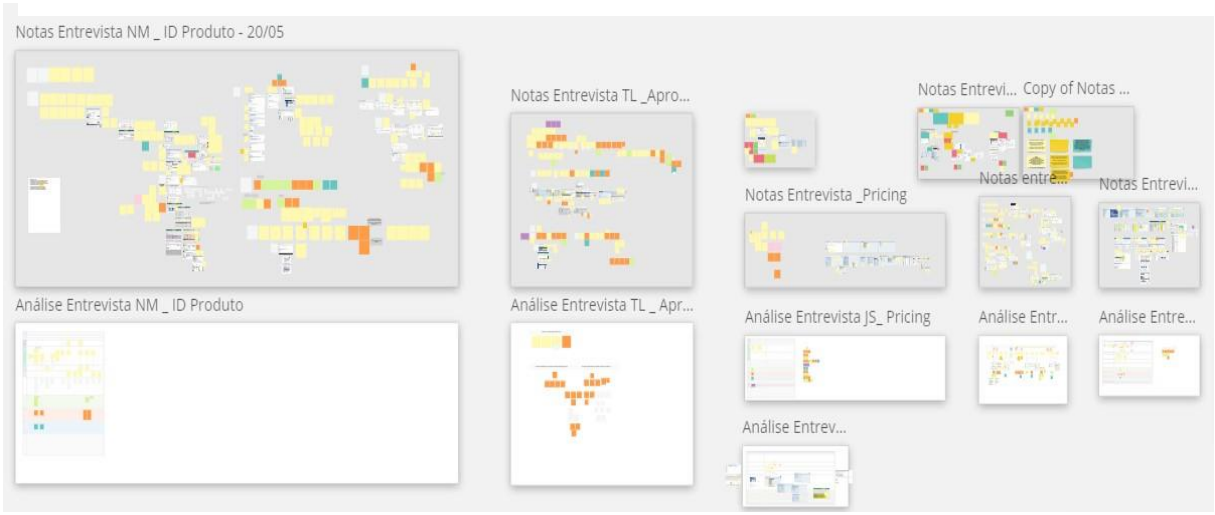
The. Please think aloud, explaining aloud each step you take.

Conclusion

We asked all the questions we had for you today. Thank you very much for your availability.
In addition to what you have already mentioned, do you have any other considerations you would like to make?

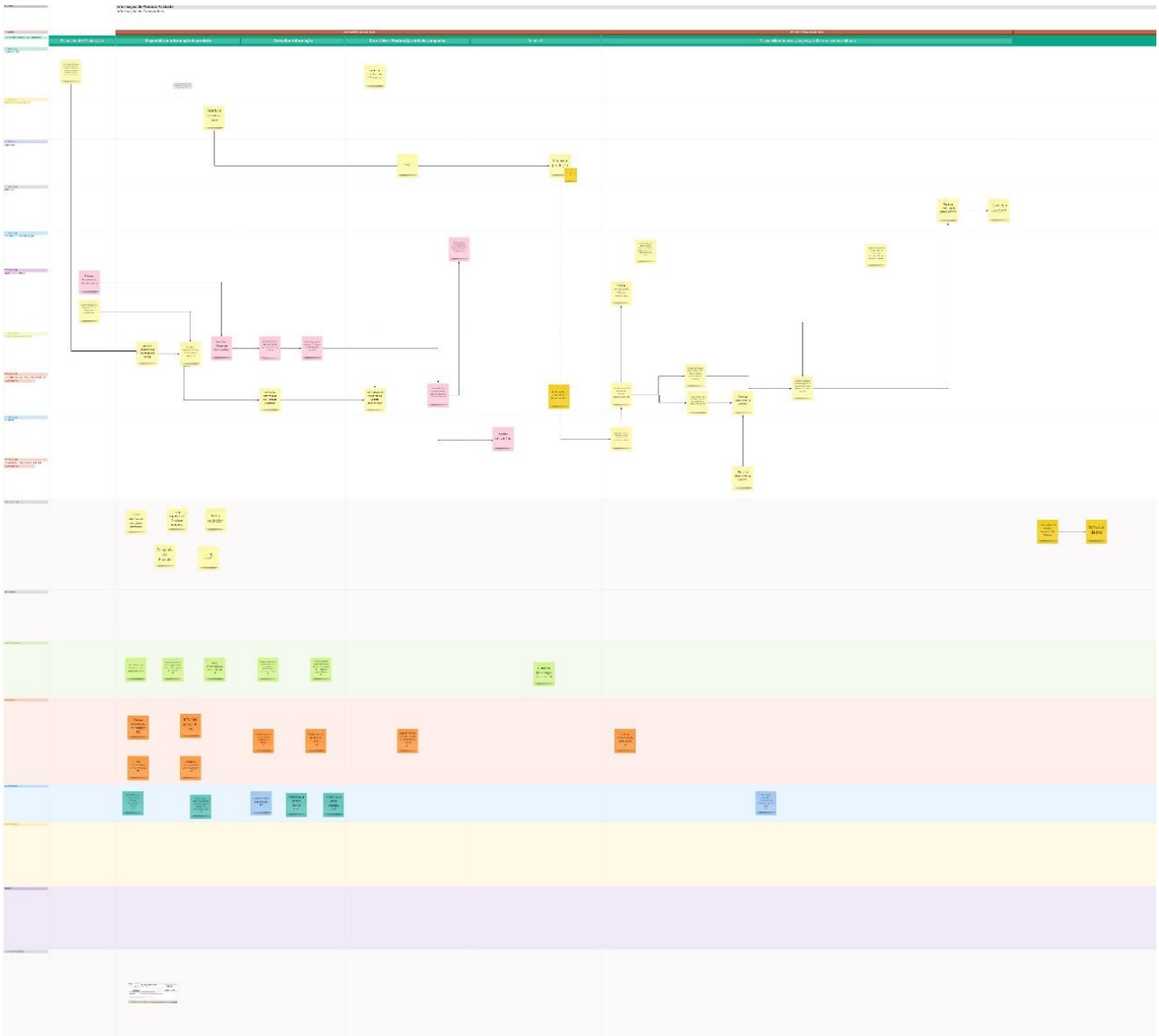
Thanks again and have a great day.

B 3: Observation Notes / Synthetise Walls

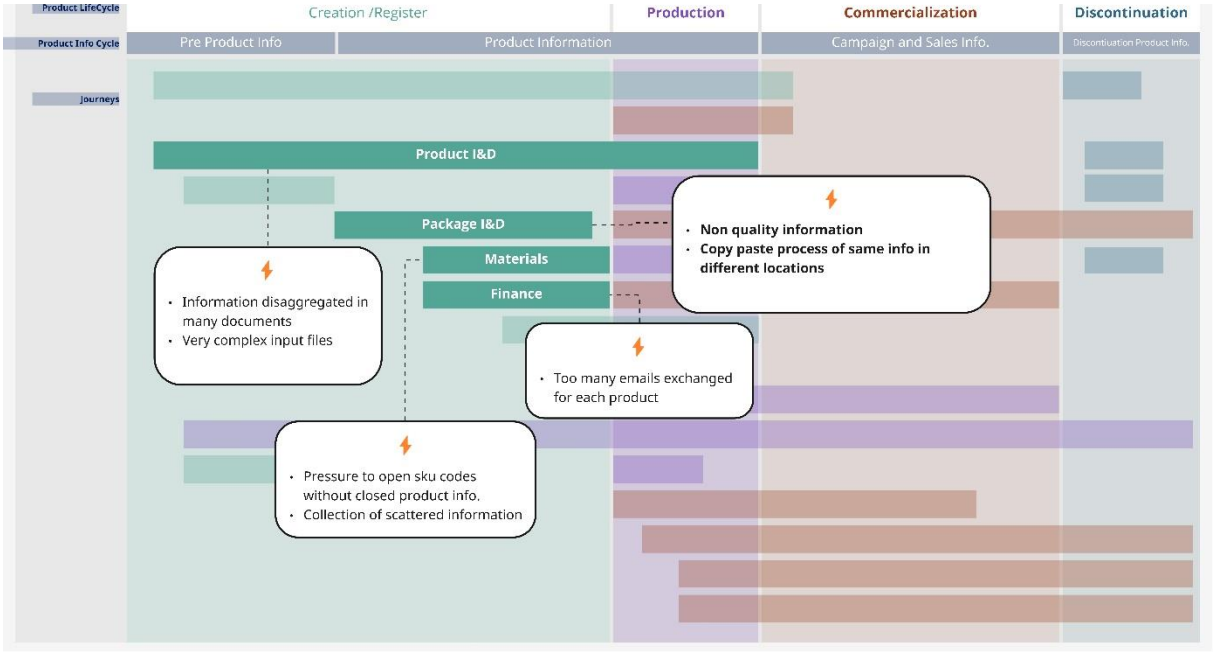


B 2: Sinthethiz Wall Management Planning and Control

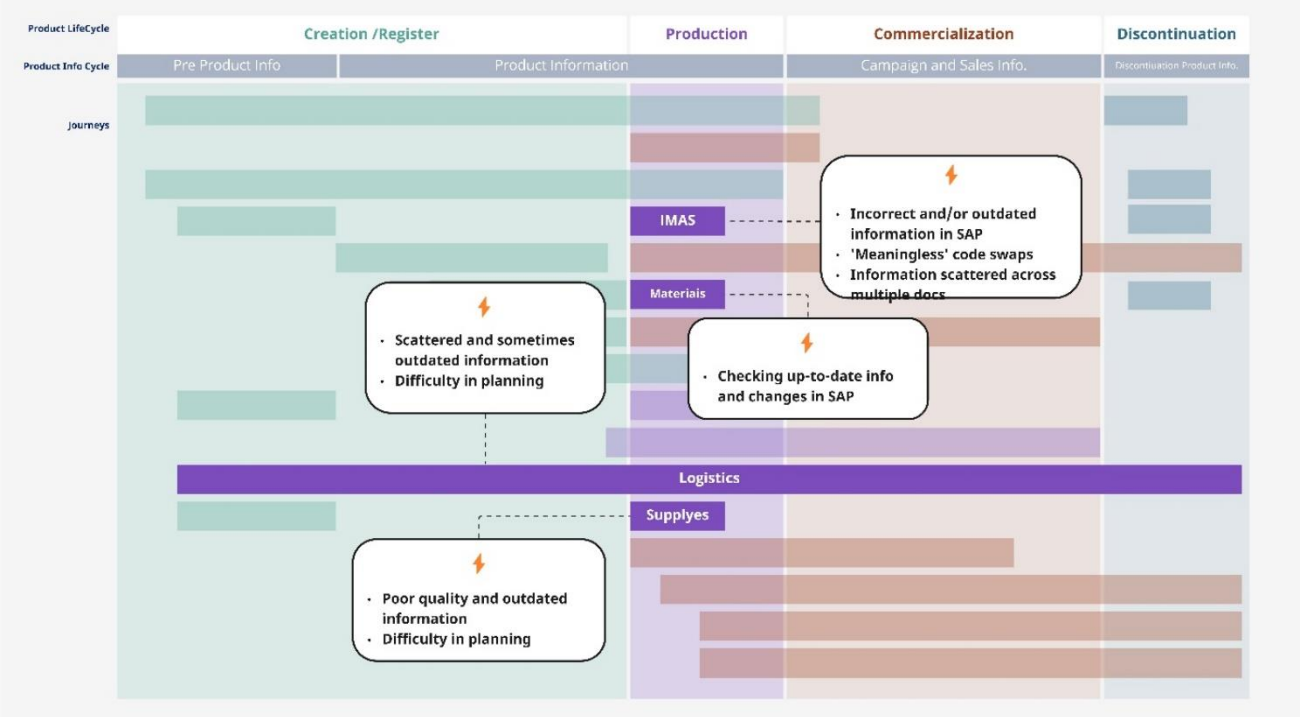
B 4: Commercialization Blueprint



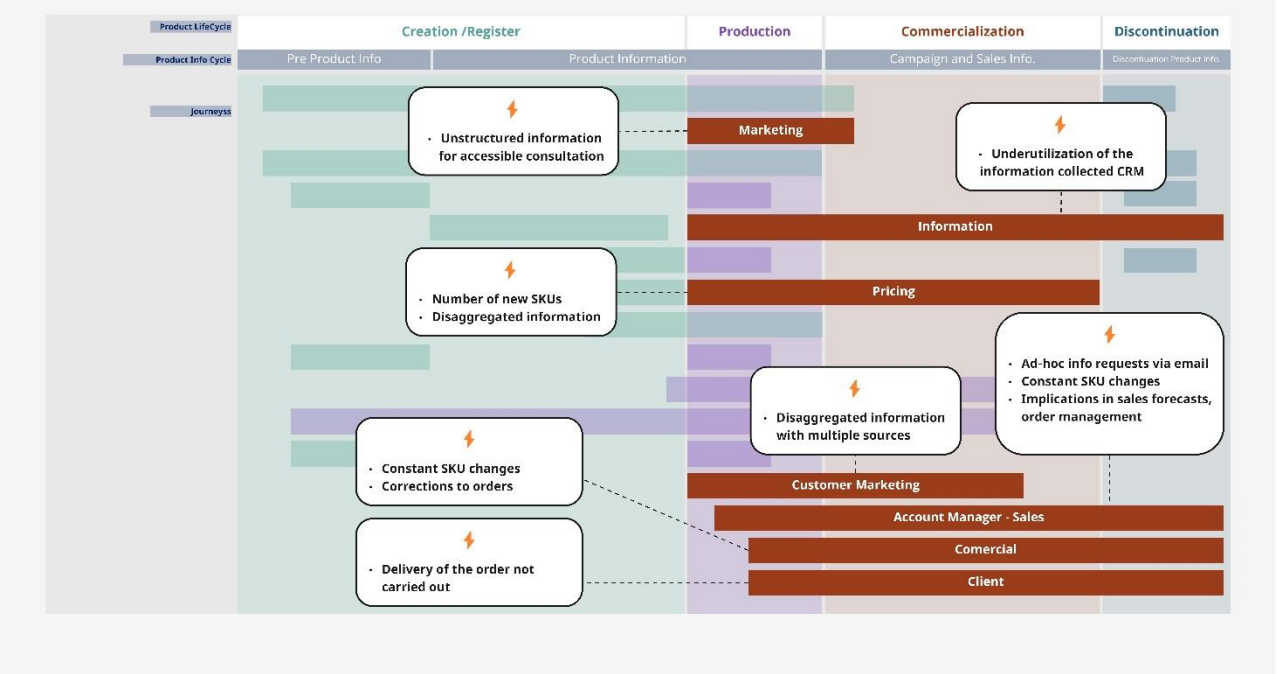
B 5: Creation/Register Pain Points Overview



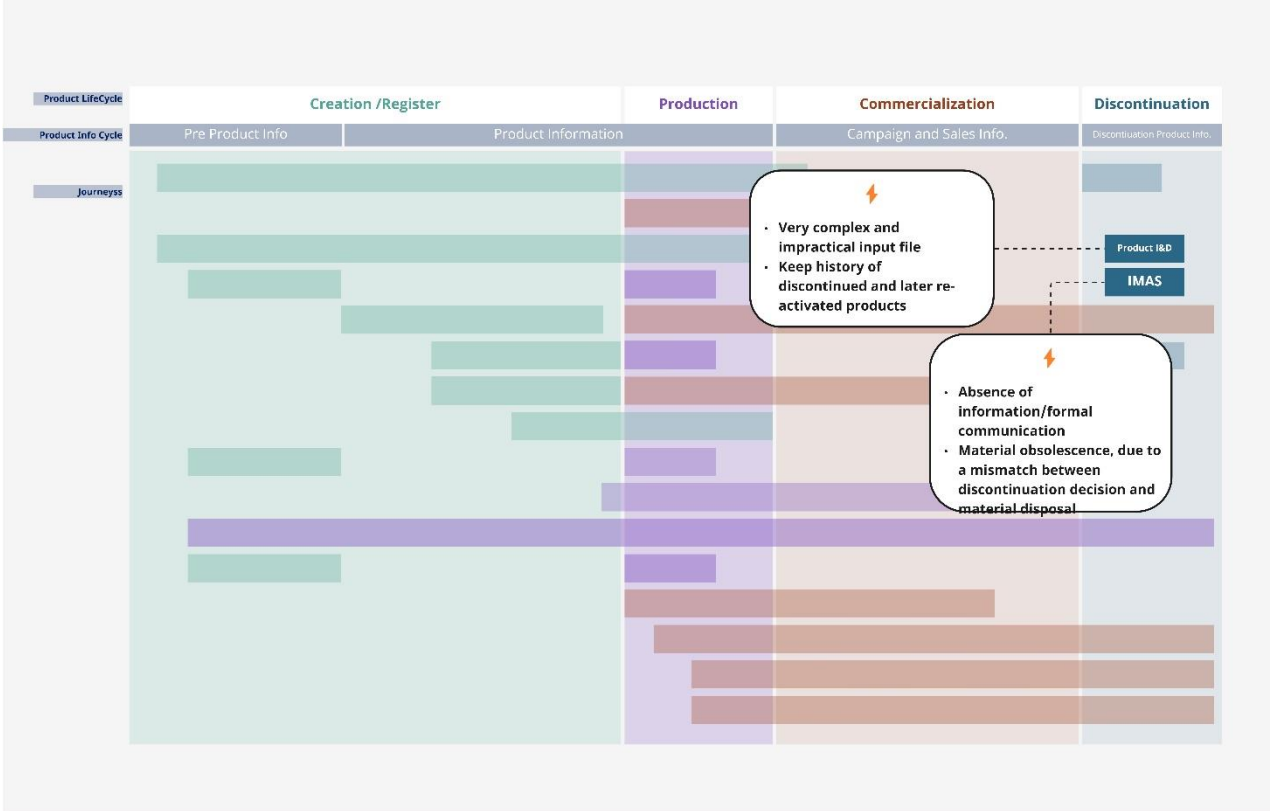
B 6: Production Pain Points Overview



B 7: Commercialization Pain Points Overview



B 8: Discontinuation Pain Points Overview



APPENDIX C: Content & Infrastructure Audit

Localização Nossa	Teams	Teams	Teams	Teams	Miro	x	Teams	Teams	Teams	bloqueado	x	Teams	Teams	Teams	x	Miro	Teams	Teams	Teams	Teams
Destinatários	SAP?	ID Emb, Clientes, Logística, Vendas	Marketing Estratégico	Marketing Estratégico	Cliente	Equipa Projeto	Parceiros Enchimento	Equipa de ID	Direção Fabril/Qualidade	Direção Fabril	Parceiros Enchimento	Parceiros Enchimento	Parceiros Enchimento	Qualidade	DF e Parceiros Enchimento	?	Trade Marketing?	ID ?	Mestre de Materiais	Qualidade? Transporte?
Origem	**?**	**Id Produto**	**Id Embalagem**	**ID tecnologias de processo**	**ID embalagem**	**?**	**IMAS**	**Id produto**	**IMAS**	**IMAS**	**ID**	**ID**	**ID**	**IMAS**	**ID Embalagem?**	**Mestre Materiais**	**Mestre Materiais**	**ID Processo**	**ID embalage**	**IMAS**
Local	Servidor?	Servidor (por Marca/grupo de Marcas)	Servidor	Servidor	Servidor	Servidor	SIG	Servidor	SIG	SIG	Servidor	Servidor	Servidor/SIG	SIG	Físico	Servidor	Servidor	"Projetos Embalagens" e "Projetos Produtos")	Servidor	SIG
Informação / Documentos	**Hierarquia Materiais**	**Info-Produtos (Base Excel)***	**FDE**	**Condicionantes Industriais**	**Ficheiro GS1**	**Ficheiro Caraterização**	**Especificações Ingrediente**	**Desenvolvimento Novos**	**Especificações Ingredientes**	**Formulações**	**Formulação Processamento**	**Manual Requi Tecni (externa)**	**PROCESSO PARA PRODUÇÃO EXTERNA**	**Ficha Segurança**	**Padrão Imagem**	**Ficha Logística**	**Ficha Cria. Produto Manipulado**	**Estudo dos Riscos Microbiológicos**	**Apoio à Criação**	**Condições de Transporte do IMA**
Categoria	x							?											x	
Segmento	x							?											x	
Códigos EAN					x												x		x	
Nome	x	x	x	x		x	x	x	x	x	x	x	x					x	x	
Descrição			X	x	x												x		x	
Marca	x	x	X		x		x	x											x	
Submarca	x		X		x		x	x											x	
Sabor	x	x	X	x	x		x	x											x	
Formula		x		x		x														
Código/Chave INFO_Produto			X														x		x	
Ref CE (Componente de Embalagem)			x															x		
Conceito Técnico / Denominação Venda		x			x															
Lista Ingredientes		x	x	x	x	x	x	x												
Lista MPF (Materias Primas Fruta)						x				x										
Teor Sumo		x			x			?												
Menções/Alegações		x	x		x									x						
Info alergeneos		x	x	x	x															
Identificação Fornecedores CE			x																	
Caraterísticas / Descrição CE	x	x	x																x	
CE comuns a produtos já existentes																				
Identificação Fornecedores Ingred																				
Caraterísticas / Descrição Ingred				x			x													
Matéria Prima específica ou de Campanha						x											x			
Tempos de estágio da Matérias-primas e Descongelações							x			x										
IMA (a desdobrar)																				x
Caraterísticas / Descrição PA																			x	
Caraterísticas FQ/ Especificações Ingred (a desdobrar)				x		x	x		x		x	x		x						
Caraterísticas FQ/ Especificações PA (a desdobrar)		x						x	x		x	x								
Caraterísticas Micro/ Especificações Ingred (a desdobrar)						x	x		x		x	x		x						
Caraterísticas Mico/ Especificações PA (a desdobrar)		x							x		x	x						x		
Declarações /Tabela Nutricional (a desdobrar)		x	x		x															
Info Acucar adicionado (a desdobrar)		x																		
Info teor alcoolico		x			x															
Outras Declarações		x	x		x									x				x		
Código Barras			x																	
Símbolos rotulagem			x																	
Condições Armazenagem Ing (a desdobrar)		x				x	x													
Condições Armazenagem CE (a desdobrar)																				
Condições Armazenagem PA (a desdobrar)		x	x		x															
condiçõestransporte específicos														x					x	x
condições de manipulação específicos														x						
Limitações no posicionamento no ponto de venda/evolução do aspecto do produto (Vulnerabilidade à luz, temperatura,...)														x						
Impostos		x																		
Acondicionamento (Packs) Ing						x	x					x								
Acondicionamento (Packs) PA		x										x								
Volume/Capacidade	x	x	x																	
Validade Ing							x													
Validade PA		x														x				
Custo Formula						x		x												
Ref Métodos Ensaio									x		x									
Formulação										x										
Processamento										x	x		x							
Requisitos controlo																				
Revisão requisitos																				
Verificação requisitos																				
Validação requisitos																				
Avaliação Risco SA		x																		
Impacto HACCP		x																		
Compatibilidade com outros produtos																				
Impacto Qualif Forn		x																		
Avaliação Risco																				
Mercados Destino		x																		
Consumidor Alvo		x																		
Textos Marketing		x																		
Referencial legislativo		x																		
Codificação												x								
Quarentena																				
Embalagem adequada a Transporte Internacional/Marítimo			?											?						
Operador			x		x															
SKU SAP																	x			
Unidade Fabril				x																
Regulamento Europeu			x																	
Identificação de Perigos														x						
Informação sobre Componentes (a desdobrar)														x						
Outras Informações de emergencia														x						
Caracterização da ação (a desdobrar) - Datas, quantidades,canal de vendas																	x			
Constituição da palete (a desdobrar) - nº de fiadas, pesos, produtos..																	x			
Custos de Transporte																	x			
Materiais a utilizar (tipo de palete, embalagem, acondicionamento, etc)																	x		x	
Tipo de estudo a realizar				x														x		

C 1: Excel Content Audit

APPENDIX D: Evaluation Questionaires

Questions:

- Do you feel that the approach used was the right one? Do you think spending your work time on these sessions makes sense?
- Do you feel that both exploratory and clarification sessions took too much time and effort?
- Do you think it makes sense to be involved in the company's digital transformation processes?

User involved 1

1. Yes, I think this sharing of knowledge is important with the various colleagues involved in the process because this way, it is possible to approach the themes from different perspectives and find solutions for both;
2. I think the session was well-timed as the topic is complex;
3. Yes, because we know the users and suppliers/producers of information that can help in this transformation process, we say what they do and what they need to find the correct way to obtain the best performance.

User involved 2

1. I feel the approach was good because I think it's important to talk to those who work with the themes directly, not just with higher hierarchical levels. Concerning time, it is a topic that deserves the investment of time, as it significantly impairs the quality of information, causes entropies;
2. It took a normal period for a first approach;
3. Yes, I think this involvement makes sense.

User involved 3

1. Yes, the initial approach, having started with a large gathering, perhaps created some entropy because they weren't all thinking about the same kind of information;
2. Yes;
3. It seems to me that they will be reasonably close - the next challenge is to map out what we would like to have.

User involved 4

1. Yes, I think the approach was correct. On the topic in question (SKU creation process) I have no direct intervention, I am just a user, but it is helpful to include employees who do not have a direct intervention to identify improvements in the process / available data;
2. No. I think the time was adequate for the case (with 3 participants). As for the effort, on my part, it was none. The session was a conversation about the general lines of my tasks and the impact of the subject on them;
3. Yes. In Planning and Management Control, we work with a lot of data. We contact several company areas with transversal knowledge of the processes, so it makes perfect sense to include this area.