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Implementation of product information management systems: Identifying the challenges of the scoping phase

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Abstract

In the digitalization era, companies are offering more and more products online to their customers, increasing the need to provide accurate product descriptions in the form of technical specifications, images, videos, and so on. Such product information is offered via a variety of channels, such as web pages, mobile phones, tablets, stores, and printed catalogs. Sometimes, different IT systems are used to provide information for different sale channels, potentially leading to inconsistency of information across these systems. To address this issue, an increasing number of companies engage in the use of product information management systems (PIMSs), which are systems focused on centrally managing customer-oriented product information. Although such systems are being increasingly used by companies, the academic literature on the topic is sparse. Moreover, the challenges companies face when implementing PIMS have hardly been addressed. To contribute to this area, the present paper explores the challenges that arise during the scoping phase of PIMS projects through a case study of a multinational company. Eighteen main challenges and their causes were identified.

Keywords: *Product Information, Product Information Management Systems, Scoping Phase, Industry 4.0.*

1. Introduction

In the digitalization era, companies are offering more products online to their customers, increasing the need to provide accurate product descriptions in the form of technical specifications, images, videos, and other types of information (Abraham, 2014). Aside from the need to manage product information internally within companies, there is also an increasing information demand from customers. Because of the rapid growth of e-commerce and online stores, companies have to collect and manage clear, basic product information that customers can understand (Abraham, 2014; Toews, 2012). In addition, customers expect product information to be comprehensive, complete, and accurate; therefore, the quality and completeness of product information are imperative (Ventana Research, 2017). Product information can be offered through different channels, such as web pages, mobile phones, tablets, and printed catalogs (Hagberg et al., 2016). However, companies often use different information technology (IT) systems to provide information for different sale channels. Thus, product information is often registered in different IT systems managed by different departments, which can cause information inconsistencies across these systems (Abraham, 2014).

Hence, ensuring information quality and, more specifically, its consistency across such systems can be challenging. In fact, a 2018 survey conducted by Ventana revealed that only 16% of organizations trust their product information (Ventana Research, 2018). The challenges that impede the adoption of a single version of product information are typically related to incompatible data integration, data quality, and data tools (Ventana Research, 2018).

To address the barriers that impede the adoption of a single version of product information, many companies are implementing product information management systems (PIMSs). PIMSs are a category of software systems focusing on centrally managing product information to support business processes that involve customer-oriented product information (i.e., the data required to market) (Abraham, 2014; Ventana Research, 2018; Dury et al., 2012). The global PIMS market size is expected to grow from USD 7.0 billion in 2019 to USD 11.4 billion by 2024, at a compound annual growth rate of 10.2% during the forecast period (Markets and Markets, 2020). Multinational companies, such as Samsonite, Heineken, Pandora, Carrefour Market, Nikon Europe, etc. (Abraham, 2014; Eppinger, 2017), have implemented a PIMS in the last decade, and major IT software companies, such as IBM, Informatica, SAP, Oracle, etc. (Abraham, 2014; Markets and Markets, 2020; Eppinger, 2017), are offering a PIMS solution in their portfolios.

While the PIMS market is growing (Abraham, 2014; Markets and Markets, 2020; Ventana Research, 2017, 2018), many PIMS projects fail (Abraham, 2014). The exact reasons many PIMS projects fail have not been addressed in the academic literature, as the academic literature on PIMS is very limited. However, understanding why PIMS projects fail is needed to develop methods and frameworks that support practitioners in successfully implementing PIMS. Abraham's (2014) study represents the only systematic practice-based presentation of PIMS—and he noted that although the theoretical benefits of PIMS are numerous, building a business case to implement PIMS proves to be more difficult in practice, which is the primary reason PIMS projects fail to start at all. Consequently, the PIMS project scoping phase, which is where a PIMS project is framed, and its business case is constrained regarding the scope of the project, results in the phase in which a PIMS project's success or failure is built. Unfortunately, we do not know the challenges that affect the scoping phase of PIMS projects. By knowing these challenges and their causes, the chance of stopping inappropriate PIMS projects before their start will be improved, and better PIMS business cases could be developed, thus reducing PIMS projects' failures.

This study's aim is to enhance academic and practitioner knowledge of PIMSs by analyzing the initial phases of a PIMS project, focusing on its scoping phase. More specifically, this study (a) describes in detail the scoping phase of a PIM project, (b) systematically explores the challenges that affect the scoping phase of a PIMS project, (c) relates these challenges to their underlying causes, and finally, d) draws some implications on how the knowledge of the challenges and related causes can reduce PIMS failure.

The remainder of this paper is structured as follows: Section 2 summarizes the relevant literature. Section 3 describes the case study research method. Section 4 describes the findings of the case study. Section 5 discusses these findings, and finally, Section 6 provides the final conclusions.

2. Literature review

This section first defines and positions PIMSs regarding IT systems. As the literature on PIMSs is limited and sparse, we draw on the general IT literature to provide a foundation for understanding the challenges of implementing PIMSs.

PIMSs are IT systems used to manage customer-oriented product information by unifying and synchronizing disparate product information (Abraham, 2014; Boyd, 2006;

Informatica, 2019). The main idea is that product information can be stored in PIMS, from which it can be subsequently distributed without the need to re-enter information in different systems manually. The benefits of implementing PIMS include shorter time to market, expanded product assortment, uniform customer experience across channels, better managing complexity, controlled content distribution, and legal compliance in addition to reduced costs, speed of information retrieval, data cleaning, and logistical errors alongside fewer returns and information enquiries (Abraham, 2014; Ventana Research, 2017; Informatica, 2019).

PIMSs, although closely related to product data management systems (PDM) (Do, 2018) and product lifecycle management systems (PLM) (David and Rowe, 2016), differ by mainly focusing on sales and marketing as compared to product development, which focuses on PDM and PLM (Abraham, 2014; Dury et al., 2012). Hence, PDM and PLM systems typically include data related to the manufacturing and development of a product (see, for example, Cheung and Schaefer, 2010; Anišić et al., 2013), while PIMSs include sales and marketing information excluded in the former (Dury et al., 2012; Hakkarainen, 2016).

For PIMS, as for all software applications, the implementation process is crucial. Abraham (2014) described PIMS implementation in four phases for the development of PIMSs (as opposed to acquiring standard software): (1) scoping, (2) elaboration, (3) realization, and (4) in-service (Figure 1).

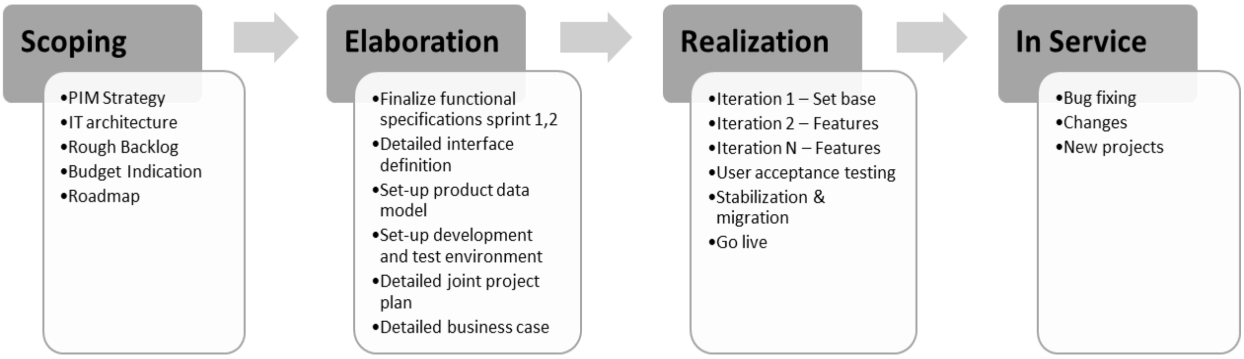

Figure 1. Phased implementation of a PIMS (*Source*: Abraham, 2014)

Although the implementation process presented in Figure 2 is relatively similar to that for other IT systems, the implementation of PIMSs differs from most other IT systems, as some information cannot readily be implemented but considerably needs to be constructed. Also, some of the most demanding aspects of implementing a PIMS do not concern integration and customization of the system but rather populating the PIMS with information (Abraham, 2014). This is because PIMSs include generic product information models that are typically unavailable in companies (Abraham, 2014). This induces some special challenges regarding scoping and other implementation phases. The comparison between the implementation of typical IT and PIMS projects is illustrated in Figure 2.

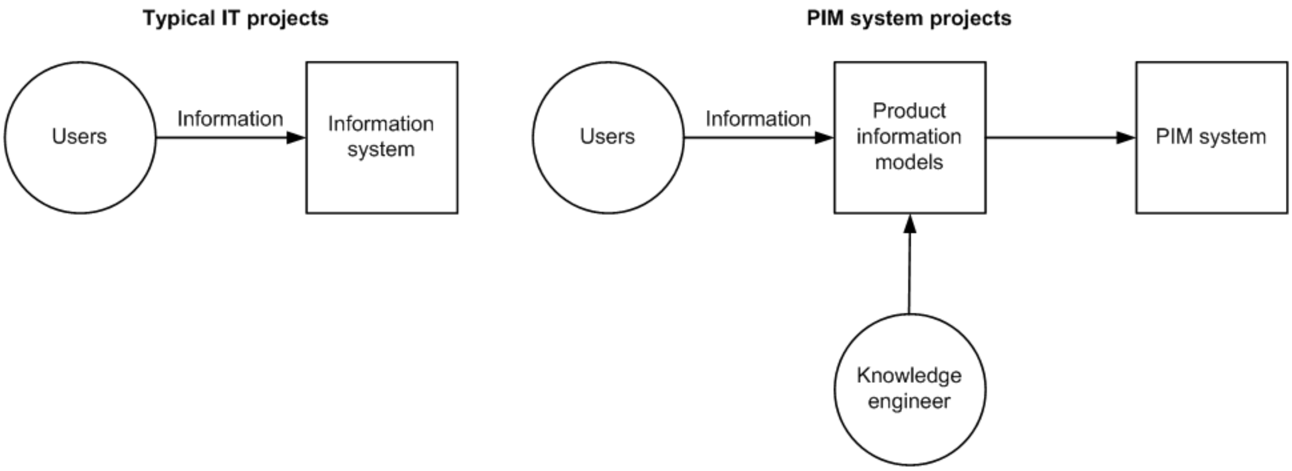

Figure 2. IT implementation

As illustrated in Figure 2, while most IT systems do not require knowledge engineering, PIMS do. For example, enterprise resource planning (ERP) systems typically do not differentiate between products and variants (Abraham, 2014, p. 48), i.e., they do not involve generic information models. Specifically, instead of defining instances of items, products, or bills of materials, a generic product information model describes a solution space from which the user can generate product variants (Haug, 2010). A much-simplified example of a generic product information model is shown in Figure 3.

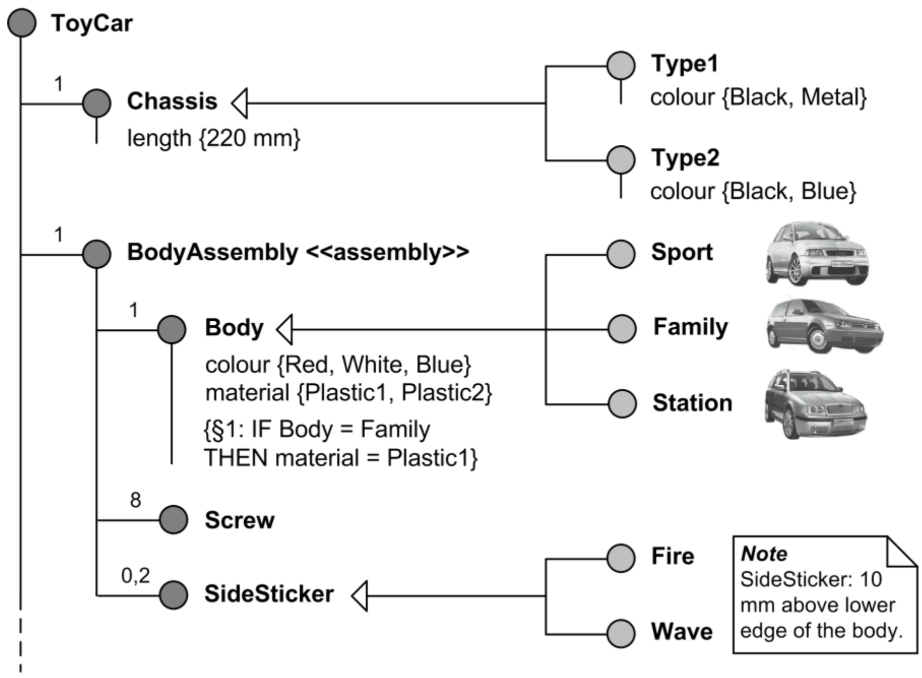

Figure 3. A simplified example of a generic product information model (Haug, 2010)

The challenges associated with creating generic product information models have also been identified in product configurator projects (Haug, 2010; Haug et al., 2019). There are, however, major differences between PIMS and product configurators regarding their purpose and use. Specifically, while PIMS aims to document and share product information, product configurators are knowledge-based systems that identify product specifications based on user inputs (Haug et al., 2019; Forza and Salvador, 2002).

Given the lack of literature on PIMSs, we focus on the IT literature to lay the foundation for understanding the challenges associated with the implementation of PIMSs. Generally, in IT projects, project failures can typically be placed into one of the following categories (Whitney and Daniels, 2013):

1) Not meeting the defined schedule
2) Not achieving cost objectives
3) Not conforming to the defined project scope

Lyytien and Hirchheim (1987) also offered a classification of the reasons such failures occur:

1) Correspondence failure: The design objectives or specifications of the system not met
2) Process failure: Unable to develop the system within the defined budget or schedule
3) Interaction failure: Lack of correspondence between user satisfaction, attitude, and use frequency and system usage level
4) Expectation failure: The system is unable to meet stakeholder expectations, requirements, or values

Meanwhile, Barki et al. (2001) classified the causes of IT project failure as follows:

1) Technology newness
2) Application size
3) Application complexity
4) Experience shortcomings
5) Organizational environment

Focusing on risk, Ewusi-Mensah (2003) described some factors related to the abandonment of software projects:

1) Unrealistic project goals and objectives

2) Project team, management, and control issues
3) Lack of technical expertise and technology problems
4) Inadequate executive support and commitment
5) Change requirements
6) Cost overruns and delays in schedule

In companies analyzed by Abraham (2014), the most common challenge during the implementation of PIMSs was creating a shared product data model. In many cases, the companies underestimated the complexity and time needed to develop the model. The other challenges identified were underestimating the time required to collect all product data, connecting the (ERP system to the PIMS, underestimating the storage space needed and believing that the old solution was better, easier, and more complete.

Challenges such as those described above seem likely to be found during the PIMS scoping phase as well. However, as previously mentioned, we expect PIMS projects to involve particular challenges due to the peculiar characteristics of the PIMSs.

3. Research Method

The objective of this study was to identify and explain the challenges associated with the scoping of a PIMS project. Given that the literature does not provide much insight into the implementation of PIMSs, an explorative approach was used. Such an approach is generally considered appropriate when constructs of a phenomenon are yet to be identified and delineated (Eisenhardt and Graebner, 2007; Yin, 2009). More specifically, a longitudinal field study was selected as the research method. In this type of study, the researcher gains insight into the studied phenomena and discovers the most crucial aspects affecting the object of inquiry. Also, the study is conducted long enough to understand the causal links among events and constructs (Åhlström and Karlsson, 2009), for instance, regarding the implementation of new technology (Leonard-Barton, 1988). In this case, the process of scoping a PIMS was observed real-time and in-depth over a 3-month period.

For the setting of this study, the researchers sought a company that had chosen to invest in a PIMS project in which the process of interest would be transparently observable during the entire implementation period (Sanday, 1979). The selected company was a mineral wool production company located in Europe. The company had not yet started the scoping phase and had only conducted a preliminary analysis, determining the PIMS project as a task of primary importance. It has a market-leading position in the building material industry and operates over

20 global production facilities with over 10,000 employees. It comprises 18 individual business units (BUs) operating in 39 countries, with each BU managing its product assortment.

Due to the nature of the research approach, the main method for data collection was participant observation (Sanday, 1979; Åhlström and Karlsson, 2009). The researchers participated in all the project meetings, taking notes on relevant aspects, such as the challenges, limitations, needs, results, etc. In this way, the researchers had the opportunity to learn the language of the group under study and acquire the necessary know-how, giving a foundation for the interpretation and analysis of the collected data (Becker and Geer, 1957). Participant observation was with interviews and studies of documents. While interviews helped to understand the process being studied deeply, documents, such as business cases and meeting protocols, and official reports, were used to keep track of events occurring before the study and events that the researchers did not observe. The researchers used the time between the meetings to understand and note the challenges of the scoping phase and to write down whatever impressions had occurred (Barley, 1990; Eisenhardt, 1989). The participant observation was conducted for over three months, during which 33 meetings were conducted: two workshops with all the stakeholders, 10 weekly catch-up meetings with the project team, two steering group meetings with the steering committee, and 19 meetings with individual stakeholders.

The collected notes from the observations and transcriptions of the interviews were analyzed. The data analysis was conducted in three different stages: data reduction, incident identification, and incident coding (Åhlström and Karlsson, 2009). Multiple investigators were involved in these steps to enhance the creative potential of the study and to enhance confidence in the findings (Eisenhardt, 1989).

4. Case Study

The process used for scoping a PIMS in the case study was based on the general theory of implementing IT systems (Pryke and Smyth, 2016; Dvir et al., 2003; Sulgrove, 1996) and scoping product configuration systems (Forza and Salvador, 2007; Shafiee et al., 2014) alongside industry experience. The process included the four macro activities in chronological order:

1) Stakeholder identification
2) As-is analysis
3) To-be proposal

4) Sharing results and system scope

4.1 Stakeholder Identification

A PIMS has different users and can be used by the entire value chain. Thus, in the scoping phase, it was important to include representatives of all the stakeholders. The aims of this macro activity were to (1) define the group of people who would provide guidance, direction, and control of the project; (2) define the project organizational structure and main responsibilities within the project; (3) provide an overview of who is involved in the project and the impacts across the company; and (4) create awareness-based knowledge of PIMSs.

The PIMS project team was the core group that managed the full scoping phase. It comprised the project manager, the PIMS specialist, and the project business owner. An external consultant was hired for the role of PIMS specialist. He had a knowledge base of PIMS and experience in the implementation of IT systems. The steering committee comprised five people: the Group Marketing Senior Vice President, a business units' representative, the Chief Information Officer, the Chief Financial Officer, and the Product Management Director. Four different classes of stakeholders were identified (Figure 4).

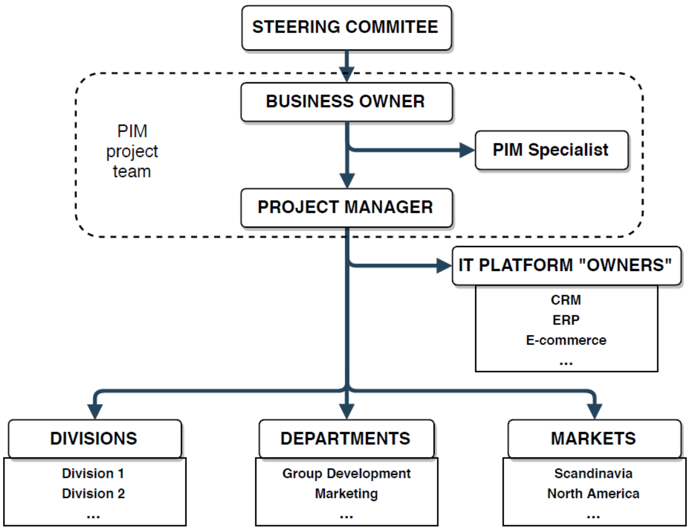

Figure 4. Project organizational structure

Once the classes of stakeholders were identified, questions were directed to the project team: What are the different types of information that a PIMS is supposed to store? Who are the (internal) stakeholders of the digital platform? How is product information related to the stakeholders? To face these challenges, a tool was developed to relate the types of stakeholders to the types of information (Table 1). We identified three groups of stakeholders: 1) those who use the information (output, O), 2) those who produce the information (input, I), and 3) those who provide support for managing the information (support, S).

Table 1. Types of stakeholders/types of information

		TYPE of STAKEHOLDER			
		Product Manager	Sales Manager	ERP Specialist	…
TYPE of INFORMATION	Master Data	O		I	
	Price	S	O	I	
	Marketing Data	I/O	O		
	…				

Eighteen different stakeholders were identified: the product managers of the six divisions, the product managers of the three markets selected for the pilot test, the software specialists to be integrated into the PIMS (such as BIM, e-commerce, ERP, and DAM), and a representative from each department (i.e., finance, group development, operations, digital, and marketing). Due to the nature of the information, Table 1 confirms the necessity of having marketing representatives from the different divisions and markets.

A 5-hour workshop with the project team and main stakeholders, called the kick-off meeting, was conducted. The PIMS project team explained the organizational structure, roles of each member, and functionalities and limitations of PIMSs. It was crucial to establish a common understanding of the benefits and limitations of PIMSs and to gather the general problems the company faced in managing product information. To simplify the learning process, the project team presented some examples of how other companies addressed similar issues through the use of a PIMS. The kick-off meeting helped the project team engage in individual dialogs with the stakeholders in the next phase. Managing the different backgrounds and levels of understanding and ensuring that each stakeholder could contribute and be integrated into the overall scheme, was very challenging. Another challenge during this phase was planning the kick-off meeting. The different stakeholders were based in different areas of the world, although most could participate physically in the workshop.

4.2 As-Is Analysis

The as-is analysis was aimed at providing a better understanding of the current working processes. It was divided into four steps:

1) Organizational business introduction
2) Identification of stakeholders' requirements
3) Data localization and ownership
4) Product model identification

The four steps listed comprised one or more direct interviews with the stakeholders. The duration of the interviews varied among the stakeholders. The first aim was to understand how marketing information was managed across the company. The company is organized into individual BUs, independent of both global and localized product assortments. The product assortments have individual information models and cater to local requirements for product information. Each BU has siloed marketing operations and relies largely on manual processes or steps.

During the identification of the stakeholders' requirements, the PIMS project team first collected the issues and unmet needs of the stakeholders regarding product information management and described the functionalities of the PIMS that were relevant to them. The main problems that the stakeholders faced in managing product information were related to customer experience, the marketing process, digital transformation, and market development (Table 2).

Table 2. Issues in managing product information and consequences

Area	Problems	Consequence
Customer experience	The customer experience was challenged due to inconsistency in product information and access to the relevant product documentation. Product information was not updated and did not include a full range of relevant data.	Could potentially endanger the company's position as a premium brand
Marketing process	The marketing enrichment of product information was inefficiently supported and relied on manual services. Marketing was prone to redundant processes using local Excels and repositories to comply with growing needs for enrichment and documentation.	Could reduce capabilities to scale and improve synergies between the individual business units

Digital transformation	The digital roadmap was insufficiently supported by a service architecture to provide enriched and structured product information. The individual touchpoints were supported by individual repositories with limited integration and governance of data distribution.	Could slow the digital transformation and result in broken services
Market development	There was no shared customer information model to guide product positioning or ambitions to deliver solution selling. Limited capabilities for supporting transition in the dealer market and the growing scope of relevant market services.	Could reduce agility and readiness to adapt to new changes in customer behavior

The collected requirements for the PIMS varied across stakeholders. However, the common needs were identified: having access to updated product information; having a shared product information HUB; sharing information across the company to maximize content use in other areas, such as certificates and test results; and defining a clear ownership and governance of product information across divisions and markets. During the identification of the stakeholders' requirements, the MoSCoW (must have, should have, could have, and won't have this time) prioritization technique was used. Based on the collected data, the project team created a list of the stakeholders' needs, which is summarized in Table 3.

Table 3. Common needs of the stakeholders

Area	Need description
Enrichment of products	General capabilities to provide each BU and local market with a predefined product information structure: • Centralized access, overview, and organization of all areas of product information customized to the individual product categories • Empowering marketing to enrich product information to comply with local requirements, digital channel consumption, and customer focus • Full support for localization and translation needs
Sourcing and integrations	PIMS must be based on a flexible platform that enables full connectivity of key product information areas through an upstream enrichment process: • Sourcing product data from ERP to create and populate products in individual business units and markets • Access and availability to all relevant digital assets in both PIMS and other repositories • Open service architecture with capabilities to provide a shared information model across systems
Marketing process support	Integrated tools for better process support of marketing enrichment, automation, and tooling of marketing product ownership: • Process support of the production of marketing materials and campaigns

	• Overview of the general completeness and quality of product information • Distribution of tasks and personalized workspaces • support of marketing PLM responsibilities
Distribution & governance	Services to provide the company channels with relevant and updated product information: • Integrated tools to produce and distribute localized marketing catalogs • Standardized methods to distribute structured information to standard service interfaces • Integrated governance services to ensure compliance with role-based rights, internal controls, and reporting

The challenges in identifying the stakeholders' requirements were related to the timing and organizational complexity of the company. A limited time was available for this step, forcing the project team to quickly establish the levels of detail achievable in a short timeframe. However, the company wanted to select a system that could be uniformly accepted and utilized across the group. Thus, the project team built a user case contemplating the company as a whole; otherwise, a sharing agreement would not be reached. Ultimately, the complexity of the organization was reflected in the as-is analysis: All the BUs and local markets had different requirements, steering the focus in different directions.

The data localization and ownership step had the goal of analyzing the current IT architecture involved in the product information processes. In particular, understanding where product data are stored, how they are currently managed, and who owns them. To obtain a comprehensive overview of the current situation, a flow diagram was derived from the information gathered in the interviews (Figure 5). The product data enrichment was considerably based on a manual ad-hoc process with multiple market localizations and limited support of digital touchpoints. Consequently, there was inconsistency in product information and documentation, and marketing was prone to redundant processes using local Excel sheets to comply with growing needs for enrichment and documentation. Also, the individual touchpoints were supported by individual repositories with limited integration and governance of data distribution.

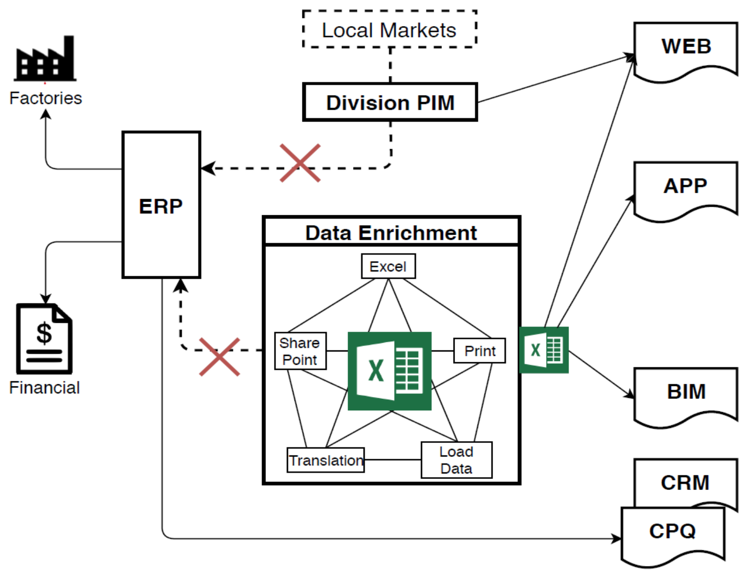

Figure 5. As-is product information data flow

The main challenge here was that the same information could be either stored in the same IT system but with different tags in different countries or even stored in two different systems. Once again, a lack of consistency and a harmonized approach was evident.

In product model identification, the goal was the identification/creation of the existing product models of the different divisions/segments. During the interviews, a collection of 502 different product attributes was gathered. This assortment was the starting point for estimating the size of the PIMS to be implemented. The main challenge was to detect and solve repetition. The attributes were collected in English; hence, stakeholders tended to add new ones without realizing that the attributes already existed under a different tag. These problems were exacerbated even more during the mature phases of the project, mainly due to the lack of an underlying master data management (MDM) system and an official dictionary defining the attributes. Also, employees struggled to understand which attributes they had to list as part of the data model. Moreover, some BUs delayed the process because they did not have time to share data as they were busy with their ordinary workload. Thus, PIMSs are a new type of software that the stakeholders lack experience in; therefore, providing the requirements and data for an application unfamiliar to them was complex and time-consuming. The reasons for not attempting to operate with multiple language layers, thus allowing different departments to use their own terminology for various product attributes, included ambitions to promote a common terminology across the enterprise; finding it too time-consuming to maintain multiple language layers, and associating multiple language layers with an increased chance of misunderstandings and errors.

4.3 To-Be Proposal

The to-be phase concerns the preparation of business processes and IT architecture for the implementation of a PIMS. This phase was conducted by the project team, with some interaction with stakeholders when clarification was needed. It was divided into the following three steps:

1) Mediation of conflicts of interest among stakeholders
2) Development of a proposal for a future IT architecture for PIMS implementation
3) Development of the frame of a single product model

While the stakeholders' common needs were previously identified (Table 3), the project team had to mediate the conflicts of interest in this step. Some trade-offs were necessary considering the needs prioritized by different stakeholders. Smaller divisions were more focused on automatizing printing processes, such as printing technical datasheets or brochures (processes that are normally managed internally), while larger divisions were more focused on prioritizing the means of distributing relevant attributes to a client PIMS solution. Local BUs aimed to control the delivery of product information to individual markets, while global divisions were oriented toward a standardized and uniform solution. Moreover, the BUs were in a different position to start the implementation. For example, one BU already had a local PIMS solution. They saw the implementation of a new PIMS as a problem and preferred to improve their existing solution. As mentioned, the main challenge was trying to find a common solution among numerous stakeholders who essentially had conflicting requirements.

The second step comprised the development of a future IT architecture for the implementation of a PIMS, that is, clarifying the role of the PIMS and how other IT resources should interface it. Considering stakeholders' needs, the project team suggested a to-be IT architecture where the PIMS would function as a centralized product marketing HUB, distributing product catalogs to individual digital touchpoints through standard publishing services (Figure 6).

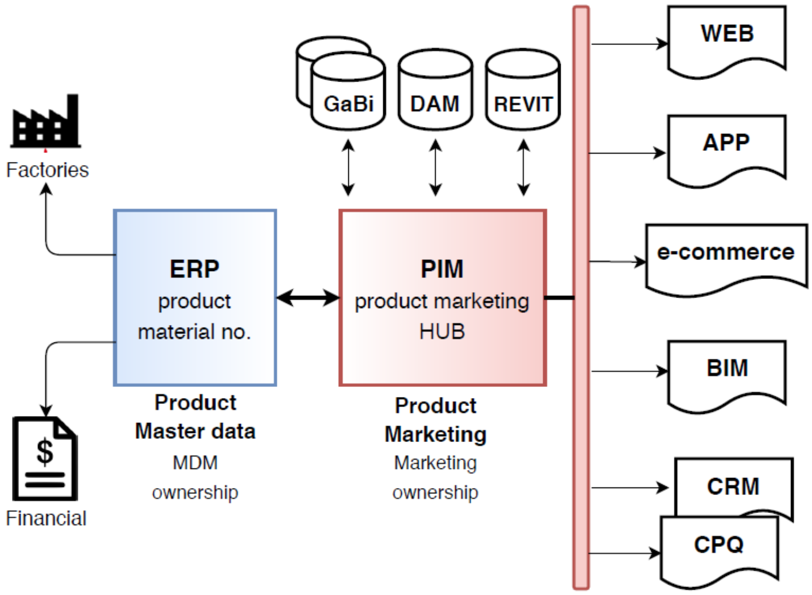

Figure 6. To-be product information data flow proposal

The proposal shows how the product information data were planned to be exchanged between systems and applications after implementing the PIMS. Specifically, PIMS sources master data from the ERP system, such as material numbers, product characteristics (dimension, properties, etc.), performance values, sales data, logistic data, and digital assets from other systems, such as DAM and Revit. It is built on an upstream-sourced data model, where the ERP owns the product entity, and PIMS owns the further enrichment in a federated model. Part of the data enrichment will be done through manual processes, although systematically. To ensure that only good, properly structured data can be entered into the system, best governance practices will be adopted. PIMS will deliver process support and tools to produce product marketing information on an aggregated level. It will be responsible for a collective and role-based overview and the publishing of consistent product information across digital touchpoints in each market. The main challenge in this step is related to governance. As mentioned, some data will belong to the ERP system and others to the PIMS, but everything will be connected to avoid redundancy. The digital department seemed to lack a governance process in the ERP system and did not fully trust their data. However, this department was also averse to being depended on for data that they did not fully control.

The next step was to frame a centralized product model with the flexibility to embrace the full range of BUs and divisions within the company. The product model was designed to organize the multiple levels needed to logically enrich and manage product variations for a related range of products. It comprised six levels: business unit/division, product line, product family, product, product variation, and material number (Figure 7). In the model, the product variation layer should be noted, which sets PIMS apart from most other IT systems, i.e., its attributes can be customized, after which it is sent to the ERP system (in this case, SAP), which assigns a stock-keeping unit (SKU) number to it.

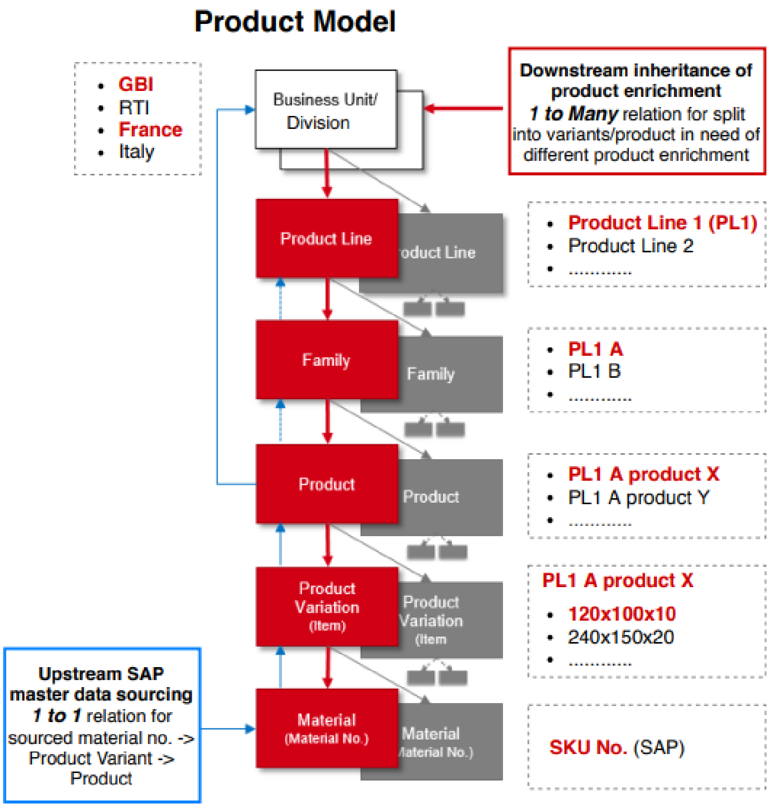

Figure 7. Centralized product information model

Each level comprised several attributes that define its characteristics. The attributes were divided into different categories, such as dimensions, thermal properties, product advantages, etc. After analyzing and screening the collected data, the number of attributes was reduced from 503 to 350. The project team spent a lot of time on the screening process because of the poor quality of the attribute data. Several clarifications with the stakeholders were necessary. The main challenges related to the data were language issues, ambiguous data, and incorrect data. Duplicate, mistranslated, and incomplete data were often found in the material provided by the stakeholders.

Figure 8 explains the centralized product information model developed in the company. The model comprises an attribute model that enriches all the levels of the product taxonomy model with the commercial attributes. The attributes describe the functionality and features of the products. The relations between the products, the product families, and the product lines are maintained within the generic product model. The generic product model enriches the part view contained, for example, in the ERP system, with a commercial model that represents the customer viewpoint.

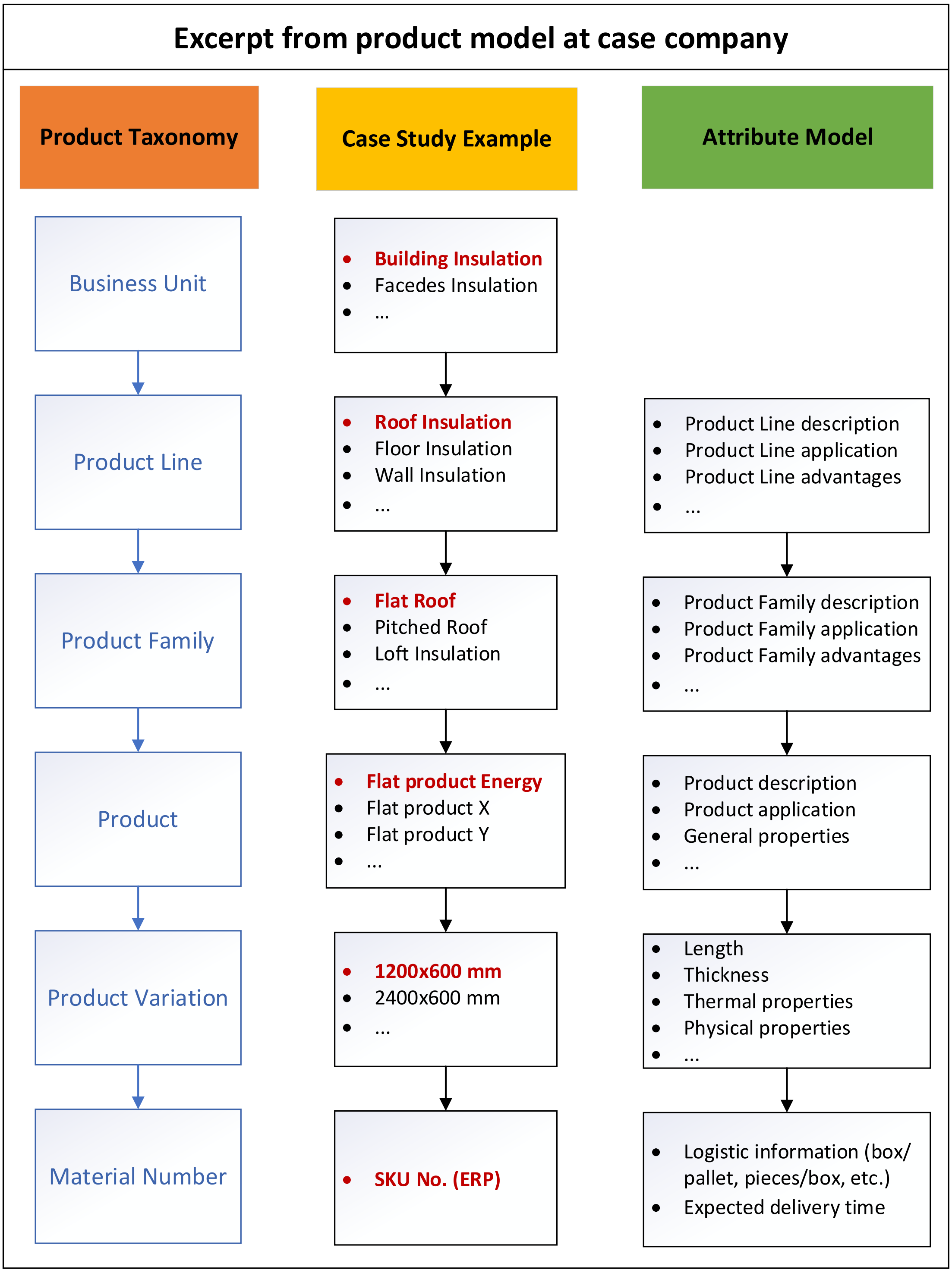

Figure 8. Excerpt from product model at the case company

4.4 Sharing Results and System Scope

The last macro activity aimed to communicate to the stakeholders the work done in the previous activities (as-is analysis and to-be proposal) and the characteristics of the scoped PIM system and introduce them to the next phase: system selection. A new workshop with all the stakeholders was conducted to share the results. As the scoping phase was reaching its end, it was considered relevant that all stakeholders agree upon the outputs of the to-be proposal.

During the workshop, the project team presented a final list of functional requirements from a business and IT architectural perspective. A long discussion between the marketing and IT departments arose, and a mutual agreement was difficult to establish. The marketing department clearly favored user-friendliness and experience more than advanced IT features, whereas the IT department preferred more advanced technical solutions to the detriment of user-friendliness.

To complete the scoping phase, an ideal roadmap of the PIMS implementation was created, and the system selection phase was introduced to the stakeholders. Finally, the project team conducted a 3-hour training session on how to evaluate a PIMS (interface, implementation, IT performance, PIMS functionalities, etc.).

The characteristics of the software scoped in the project are described in Table 4. The following requirements were collected during the scoping phase to be used as the basis for conducting the vendor selection. By implementing a PIMS with the identified features, the studied company aims to remove the issues in managing product information and to prevent the negative business consequences reported in Table 2.

Table 4. Characteristics of the scoped PIMS

	Scope	**Success Criterion**
1	PIM Product model	The PIM system must support a centralized product model with the flexibility to embrace the full range of business units within the case company.
2	Integration to SAP & data sourcing	The PIM system must build on an upstream sourced data model, where SAP owns the product entity and PIM owns the further commercial enrichment in a federated data model.
3	Enrichment	The PIM system must ensure an intuitive and user-friendly interface to enrich and localize products. The enrichment templates should be mainly configurable, and it must be possible to have specialized fields for each business unit, product type, and market.

4	Bundling and relations	The PIM system must ensure an intuitive and user-friendly interface to create and update relations. The definition of relations should be mainly configurable, and it must be possible to have specialized relation-types for each business unit and product type.
5	Business taxonomy	The PIM system must ensure a user-friendly and intuitive use of predefined tags to enrich products. The taxonomy should be mainly configurable, and it must be possible to have specific values for each business unit and product type.
6	Asset management	The PIM system must ensure effective and intuitive tools to find and set assets relations. It should be possible to filter assets on business unit and product type.
7	Creation and distribution of product catalogues	Local marketing must have the possibility to easily create and maintain catalogues for multiple channels.
8	Release and publish to digitals channels	The PIM system must provide a wide array of scalable publishing services in support of global and local catalogs.
9	Personalized workspace	The PIM system must empower the individual user and provide a personalized overview and ease-of-use.
10	Product lifecycle management	The PIM system must support the marketing responsibilities for specifying products and managing the classification of products over time.
11	Productions of marketing materials	The PIM system must provide efficient tools to automate and improve the production of marketing materials process.
12	Support of multiple channels	The PIM system must support the growing demand for delivering enriched, updated, and structured product information to dealers and partners.
13	Governance	The PIM system must provide the needed role/rights model to support optimized user views and ensure the right distribution of data ownerships.

5. Discussion

As the case showed, the implementation of PIMS projects can be complicated from the start, with several challenges identified during the scoping phase. Table 5 summarizes the challenges identified during the four macro scoping activities.

Table 5. Challenges and causes identified in the scoping phase

Phase	Identified challenge	Cause of challenge
1. Stakeholder identification	Lack of clarity of the information the PIMS should store	Unclear organization process/structure
	Lack of clarity of who the internal stakeholders are	
	Lack of clarity of how product information relates to stakeholders	
	Difficulties in achieving a common understanding of the project	Different backgrounds and levels of understanding of the stakeholders

	Difficulties in defining stakeholders' roles	
	Difficulties in the organization/planning of the physical kick-off meeting	Stakeholders based in different parts of the world
2. As-is analysis	Too little time to conduct the project	Overly ambitious planning
	Same information stored with different identifiers in same or different systems	Lack of consistency and a harmonized approach
	Attributes exist multiple times in different languages	Language issues
	Employees struggled to understand which attributes they had to list as part of the data model	Problems understanding the PIMS
	BUs delayed the process because they lacked time to share data	Failure to reserve BU resources
	Not knowing which data to supply	Lack of system understanding
3. To-be proposal	Global markets and local markets had different or even conflicting requirements	Differences between local and global markets
	Different BUs was in a different position to start the digitalization journey	Differences between BUs
	Deciding if data should be native of PIMS or other systems	Lack of data governance and data structure
	Same product attributes with different names in existing systems	Lack of data structure and language issues
	Information quality problems	Lack of focus on information quality
4. Sharing results	The marketing department favored user-friendliness, while IT department favored advanced features	Different needs of the departments

The causes of the challenges seem to be related to each other and affect the whole scoping phase rather than a single activity. Implementing software in a company is always challenging, and the complexity of implementing a completely new type of software in an extended enterprise is even higher. However, when comparing the challenges described in Table 4 with the general challenges of IT projects (Lyytinen and Hirschheim, 1987; Barki et al., 2001; Ewusi-Mensah, 2003), it is evident that there are also several challenges particular to PIMSs. Specifically, there are several challenges related to populating these systems with information, i.e., information can be hard to identify, understand, and agree upon, and it must be decided whether to include certain information or not. Such challenges have a higher resemblance with the challenges found in product configurator projects (Haug, 2010; Haug et al., 2019) as compared to, for example, the ones in PDM, PLM, and ERP system projects. However, as mentioned before, PIMS and product configurators are two different systems regarding their purpose, architecture, and use, so their challenges also differ in other areas.

As possible explanations of the challenges identified, an analysis of the case data revealed four main factors influencing the scoping phase, which are shown in Figure 9, and subsequently explained.

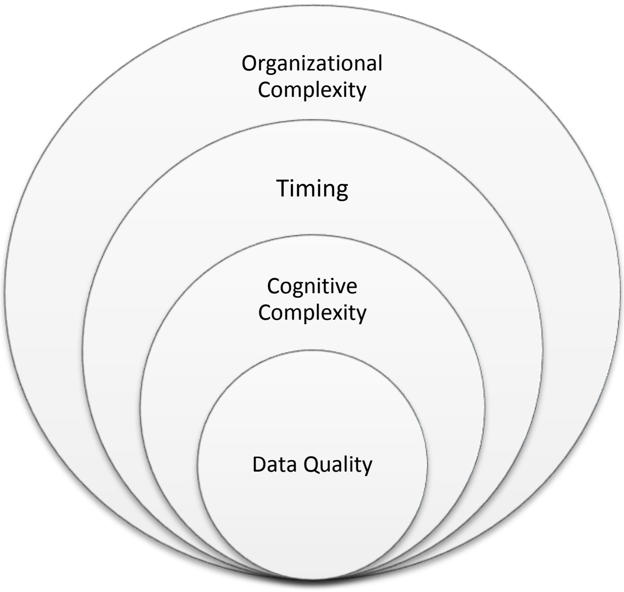

Figure 9. Factors influencing the scoping phase of a PIMS

First, organizational complexity was reflected in the implementation process. The identified stakeholders were from different BUs, characterized by distinct sizes, markets, portfolios, and countries. Consequently, during the scoping phase, we observed language issues in addition to conflicting needs between departments, local and global BUs, and markets. Through implementing a PIMS, the company wanted to achieve a shared way of managing product information. We observed that the current processes for managing information in the BUs were not clear or well documented. Therefore, it was difficult for the project team to define the information needed and involve the stakeholders. Socio-cultural factors also affected the development of the implementation process.

Second, regarding timing, the scoping phase is the initial step in the project implementation process, and a short amount of time is usually dedicated to it. Considering the goal of the project, the size of the company, and unclear organizational processes and structure, we observed that three months was an overly ambitious timeframe. Also, the stakeholders involved in the project were doing their daily work and often lacked time to search for or share data, thereby delaying the process.

Third, concerning cognitive complexity, it should be noted that PIMSs are a new category of applications focused on centrally managing product information. The implementation of this technology requires a large change in the management processes of an organization. Considering that information on PIMSs is still limited and that most stakeholders had not used such a system before, providing the right information and requirements was challenging.

Fourth, regarding data quality, we observed that data governance, documentation, and structure were lacking. The product information process was based on manual ad-hoc processes or steps with multiple market localizations. Also, the data governance was not clear or documented, making identifying the required data more challenging. During the development of the shared product model, several data quality issues were observed due to language issues, ambiguous data, and the lack of metadata and data structure. Also, the lack of data consistency and governance in the ERP system, the main source of information for PIMs, made the as-is analysis complex and time-consuming. Therefore, we recommend implementing an MDM system before implementing a PIMS.

At this point, a reflection can be done on the implications on how the knowledge of the challenges and related causes may have on PIMSs projects success. It is evident from the reported description of the scoping phase that stakeholders better understand what PIMS are, how they can be implemented in their organization, and how they can support the processes they superintend. It is also evident that some conflicts, trade-offs, and divergent views emerged and have been handled. Also, the construction of a generic data model is needed to scope the project. Overall, these challenges produced a change in the organization: the organization adapted itself to the adoption of PIMS. Concurrently, the specification of the needs with the resolution of trade-offs and the discarding of unnecessary requests or too-heavy requests for the current status of the organization has paved the way for the selection of a software solution more fitting the needs. This is because the needs have been elicited and formalized in that some big and problematic uncertainties have been removed without pretending to design everything in detail. This is a big result for the success of a PIM project because, in the scoping phase, it has been performed following a mutual adaptation between organization and technology. This result follows what has been found and is increasingly considered for ERP implementation: to increase implementation success and reduce implementation failures, companies can act on a mutual adaptation of ERP and organizations (Hong and Kim, 2002; Li et al., 2017), and this adaptation can, in part, be managed as making the organization ready for the ERP implementation (Ahmadi et al., 2015). This result justifies Abraham's (2014) view of the scoping phase as a crucial phase that highly influences the success or failure of a PIMS project.

6. Concluding Remarks

The number of companies implementing PIMSs to manage their product information centrally is continuously increasing (Abraham, 2014; Markets and Markets, 2020). However, the literature research conducted by the authors revealed that information on PIMS implementation is limited and sparse. Although PIMSs have some resemblance to other systems (Abraham, 2014; Dury et al., 2012; Informatica, 2019; Hakkarainen, 2016), they also have some special features (Abraham, 2014; Dury et al., 2012; Informatica, 2019; Hakkarainen, 2016) that produce unique challenges, including the need for a centralized generic product information model, which is typically unreadily available in companies (Abraham, 2014). Thus, this study provides a detailed illustration of the scoping phase of a PIMS through a longitudinal case study aiming to contribute knowledge to this field on the challenges of the scoping phase and their causes. Such experiences are valuable since PIMS implementation processes are not reported in the literature.

In particular, 18 challenges that PIMS projects may encounter during the scoping phase were identified, and a corresponding set of causes was identified for each challenge. These causes were reduced or clustered into four major factors influencing the PIMS project scoping phase: data quality, cognitive complexity, timing, and organizational complexity. Future research may use these findings as a point of departure for a more in-depth investigation of PIMS implementation or the development of PIMS implementation methods and guidelines. Hence, this study constitutes a first step in the development of guidelines for implementing PIMSs, considering the development of implementation guidelines as a "research endeavor specifically designed to transfer accumulated (specific field) knowledge into practice" (Suzic et al., 2018). Our results suggest including a robust scoping phase in these guidelines to increase the fit between the organization and the PIMS and to prepare the organization for a PIMS project.

This study informs practitioners of the possible challenges that may appear in the scoping phase or the first phase of PIMS implementation. These findings can be used to guide PIMS project scoping and help practitioners prepare for several challenges in advance. In particular, by having an overview of the main challenges and their causes, companies can know which pitfalls to avoid and which issues to be aware of during the scoping phase, which is especially important, considering that most PIMS projects fail to start (Abraham, 2014).

The main limitation of this study is that it pertains only to a single case, raising questions about its generalizability. Hence, the company had common characteristics with other large manufacturing companies with different offered products, alongside issues with product information scattered across multiple systems. Thus, there seem to be some grounds for expecting similar challenges in similar contexts. However, this study represents only the first step in exploring PIMS implementation. To gain a deeper understanding, more cases need to be examined to compare the challenges facing different companies and the solutions adopted.

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