

LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT
School of Engineering Science
Degree Programme in Industrial Engineering and Management

Irene Laplaza Osta

**INTERNAL DATA MONETIZATION OPPORTUNITIES FOR AN INDUSTRIAL
COMPANY UNDERGOING DIGITAL TRANSFORMATION**

Master's Thesis

Examiners: Professor Ville Ojanen
D.Sc. (Tech) Ilkka Donoghue

ABSTRACT

Lappeenranta-Lahti University of Technology LUT
School of Engineering Science
Degree Programme in Industrial Engineering and Management

Irene Laplaza Osta

INTERNAL DATA MONETIZATION OPPORTUNITIES FOR AN INDUSTRIAL COMPANY UNDERGOING DIGITAL TRANSFORMATION

Master's thesis

Academic Year 2020/2021

75 pages, 10 figures, and 7 tables

Examiners: Professor Ville Ojanen and D.Sc. (Tech) Ilkka Donoghue

Keywords: Data monetization, internal data, Big Data, digital transformation, business models

The speed, the variety, but above all the volume of data has grown exponentially in the last decade. This giant wave of information is known as Big Data. Together with the emergence of new technologies, it has implied a total disruption in many industries and ways of handling data, giving rise to numerous opportunities and new business models. One of the practices that has become more powerful is the use of corporate data as a source of income. The challenge is that, although many companies are aware of the benefits that this activity entails, they lack the knowledge and/or tools to make the most of it in their business decisions. This report provides an opportunity to learn, research, and analyze the concept of internal data monetization, besides discovering and recognizing the value of information, and identifying the opportunities that this data can generate.

To meet all these goals, a detailed investigation of both the theoretical framework and the empirical part has been carried out. The last one has been developed in collaboration with a Finnish industrial company. The methodology was based on interviews both with its different departments, aiming to collect the available internal information, as well as with potential clients, who were essential to validate the monetization opportunities found. Carrying out empirical analysis in a real organization has improved the veracity and accuracy of the results.

Introducing data monetization into the core activities of a traditional company implies changes not only at a technical but also at an organizational and cultural level. Moreover, the fact that this process involves internal data, something that legally belongs to a company, makes it challenging for department heads to consider monetization as a primary project. This drastically impacts the demand for data offerings. The results show the importance of integrating technology and innovation into business processes and activities, as well as leveraging data as a key business resource to be able to develop data monetization projects. Overall, the results of this study leave a wide scenario for future research, showing how the analyzed organization could thrive if its internal data was commercialized.

ACKNOWLEDGEMENTS

As in any project carried out during a university degree, the organization, structure, and methodology are essential for its proper development. However, it is equally important to surround yourself with key people who help and guide you through the process.

I would like to begin by thanking absolutely ALL personnel of the case company for their kindness, willingness, and collaboration, especially to my supervisor Panu. Firstly, thank you for giving me the unique opportunity to discover how a leading company in the locking and security industry operates both internally and across boundaries. Thanks for inspiring discussions and ideas, for giving me vital feedback on drafts and guiding me in the right direction with such a broad topic. It has been a pleasure working together to discover new revenue stream possibilities using internal data.

To Ville Ojanen, director of this Master's Thesis, for his dedication and patience and in general to all the people who have influenced my training. Thanks to your insights and guidelines during the research process, the ideas and findings were much more structured, refined and explicit.

Finally, I would like to acknowledge my friends from Lappeenranta who have supported me from the very first moment during these two years, and my friends from Spain. But above all, I want to thank my family for making all my training possible. The fact of studying today is, unfortunately, a gift that not everyone can afford, much less be able to do it in a foreign country. I will eternally be grateful for your support and motivation throughout my exciting academic journey.

28.06.2021

Irene Laplaza Osta

LIST OF CONTENTS

Abbreviations.....	6
1 INTRODUCTION.....	7
1.1 Background	8
1.2 Scope and delimitations	11
1.3 Research questions and objectives.....	12
1.4 Structure of the study	12
2 DATA MONETIZATION: THE DRIVERS	14
2.1 Data as an asset	14
2.1.1 What is data?	14
2.1.2 What is internal data?.....	16
2.1.3 Data value creation.....	16
2.2 Digital revolution and beyond	17
2.2.1 Industry 4.0.....	18
2.2.2 Big Data.....	19
2.2.3 Internet of Things	21
2.2.4 Digital Platforms and Ecosystems	22
3 DATA MONETIZATION: THE COMPLETE VISION	24
3.1 Data monetization	24
3.2 Opportunities.....	26
3.3 Limitations	28
4 RESEARCH DESIGN	31
4.1 Research setting, process, and methodology	31
4.2 Collection of ideas	33
4.3 Analysis and filter of preliminary ideas.....	36
4.4 Consolidation of business potential ideas	38
4.5 Validation of business potential ideas.....	40

5	RESULTS	43
5.1	Master Key System	43
5.1.1	Business Model Canvas	43
5.1.2	Customer feedback	46
5.1.3	Feasibility analysis	47
5.2	Time and Attendance	48
5.2.1	Business Model Canvas	49
5.2.2	Customer feedback	51
5.3	Smart locks.....	52
5.3.1	Preventive maintenance purposes	53
5.3.2	Status of the buildings	54
5.3.3	Next steps	55
6	DISCUSSION	57
6.1	Results interpretation	57
6.2	Managerial implications.....	61
7	CONCLUSIONS	64
	REFERENCES	67

LIST OF FIGURES

Figure 1. Traditional transactions paradigm.....	9
Figure 2. Current transactions paradigm	9
Figure 3. Structure of the study	13
Figure 4. 5Vs of Big Data.....	20
Figure 5. Same-side vs. Cross-side network effects (Tiwana, 2014, P. 35).....	23
Figure 6. Research process from practical perspectives.....	32
Figure 7. Thesis topic plan	34
Figure 8. Business Model Canvas template (Osterwalder & Pigneur, 2010).....	39
Figure 9. MKS Business Model Canvas.....	44
Figure 10. T&A Business Model Canvas.....	49

LIST OF TABLES

Table 1. Total people interviewed in the first round	35
Table 2. Total people interviewed in the second round.....	37
Table 3. Total business potential ideas	38
Table 4. Real Estate Managers benefits	45
Table 5. Real Estate Managers feedback.....	47
Table 6. Multiservice companies benefits	50
Table 7. Multiservice company feedback.....	52

Abbreviations

3Vs	Volume, Velocity, and Variety
5Vs	Volume, Velocity, Variety, Veracity, and Value
AI	Artificial Intelligence
BM	Business Model
BMC	Business Model Canvas
CAO	Chief Analyst Officer
CDO	Chief Data Officer
CPS	Cyber-Physical System
CRM	Customer Relationship Management
DNA	Deoxyribonucleic acid
ERP	Enterprise Resource Planning
GAFA	Google, Amazon, Facebook and Apple
GDPR	General Data Protection Regulation
HR	Human Resources
i4.0	Industry 4.0
ICT	Information and Communications Technology
IFB	Invitation for Bid
IoT	Internet of Things
IT	Information Technology
M2M	Machine-to-Machine
MKS	Master Key System
O2C	Order to Cash
PRIO	Priority
PSD2	Payment Services Directive 2
REM	Real Estate Managers
RFQ	Request for Quotation
T&A	Time and Attendance
YTJ	Yritys-ja yhteisötietojärjestelmä

1 INTRODUCTION

“Where knowledge is power, data is wealth. It is not an intrinsic value in the data, but it is derived from what you do with it ” (Bruce Daley, 2015). Although data analytics and its commercialization are not a new concept, the way data is processed and used has evolved over the years. The appearance of social networks, online purchases, or even the sale of transport tickets, have inevitably increased the volume, variety, and speed of data (Davenport et al., 2012; Hartmann et al., 2016; Laitila, 2017; Hanafizadeh & Harati Nik, 2019; Faroukhi et al., 2020). Hence, numerous practices and expertise for handling these amounts of information are required. All this has led to the emergence of a new trend that is gradually transforming the industrial world: Big Data.

Rouse (2016) defines Big Data as “an evolving term that describes a large volume of structured, semi-structured and unstructured data that has the potential to be mined for information and used in machine learning projects and other advanced analytics applications”. Since Big Data and similar technologies such as Internet of Things (IoT) or Cloud services were developed, their use has been on the rise in most organizations, especially in the largest ones. This makes the data gain relevance, going from being a secondary to a primary strategic asset that must be properly managed. Consequently, various data exploitation solutions as well as new utilization possibilities are emerging as a sustainable source of competitive advantages (Alonso, 2018). One of these solutions is the monetization of information.

Monetizing data means discovering and harnessing the potential of a company's data in order to obtain opportunities, benefits, and extra income. It is about building a strategy and a suitable business model for selling the data to other companies (Logicalis, 2016). The fact that the market of the data is not yet a mass market, the incipient adoption of new technologies, and the constant changes in the environment, push organizations to adapt and/or disrupt core activities to remain competitive and assuring a thriving future. The main problem is that, generally, they assume that the greater the amount of data collected, the higher the benefits. This data must be classified and categorized so that it is possible to determine whether it really adds value to the company. However, many companies lack the necessary knowledge to get the most out of their data and, therefore, few have begun to strategize and seek economic opportunities in it.

The purpose of this thesis is to address the existing research gap on the way organizations generate business value from their data. More specifically, analyze the main opportunities that may derive from utilizing internal data as an asset. The data monetization literature is rather immature, and there is still ambiguity between related definitions and terms. For solving it, it is necessary to study the concept thoroughly. The theoretical part consists of a review of the literature that covers the concept of data monetization, as well as the practices and challenges that affect it, with a special focus on the internal data side to offer the best possible fit to the empirical part. The empirical part of this research is carried out in collaboration with a Finnish industrial company undergoing digital transformation. The objective is to find opportunities that can be a source of income from the company's internal data, and for this, not only have interviews been conducted (both with the different case-company's employees and customers segments) but also a detailed study of the surroundings of each opportunity has been performed. This first chapter includes the introduction to the project. The background and reason why this area is worth studying is presented first. Then the research problem and the different delimitations of the study are defined. The research question and sub-questions are indicated together with the objectives and, finally, the structure to be followed is introduced.

1.1 Background

The way organizations operate and do business has changed in the last ten years and is expected to keep changing hand in hand with new technologies and processes. The use of digital technologies is considered a viable solution for many industries to disrupt their traditional business models and provide new revenue and value-producing opportunities (Gartner, n.d.). On the other hand, Fourth Industrial Revolution (or Industry 4.0), where technologies intertwine and interact physical, digital, and biological fields (Kurt, 2019), has facilitated the speed and efficiency of many of these processes.

Nowadays, many industries are going through a gap (disruption) between the consumer and the brand, and special attention must be paid when approaching the market and customers. According to Hernández (2015), the elements involved in transactions have been the same throughout history: product, product information, and purchase decision. However, the transformation of the environment has simultaneously changed who influences and manages

them. Traditionally, the product and its characteristics were controlled by the seller, and the purchase decision by the client (see **Figure 1**).

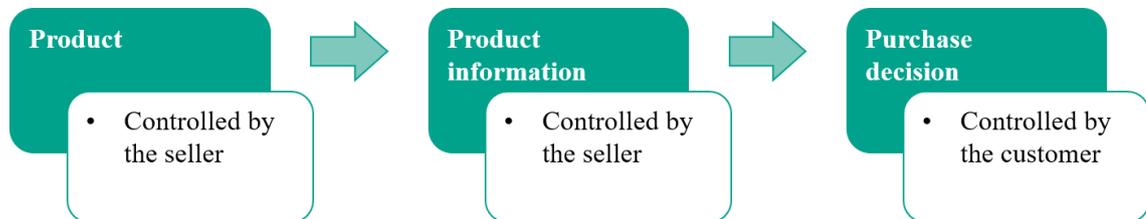


Figure 1. Traditional transactions paradigm

Nevertheless, this ever-changing ecosystem has simultaneously altered who currently manages them. As shown in **Figure 2**, in some organizations the product continues being managed by the seller, but they no longer decide on the product information. The consumer is now in charge of selecting the product's features, the journey experience, and the purchase decision, which indicates that companies are facing a new consumer profile, more informed, selective, and perfectly aware of the information they are acquiring.

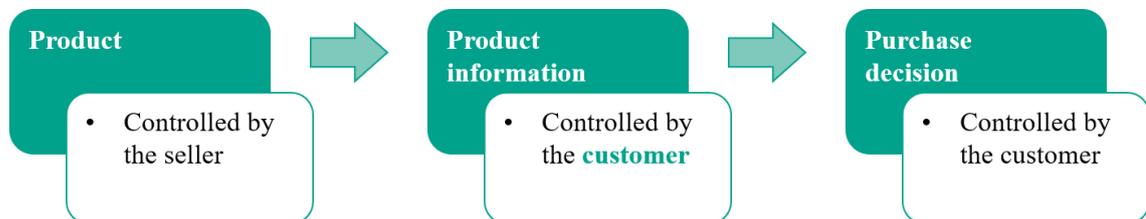


Figure 2. Current transactions paradigm

One of the sectors where the product information is controlled by the customer is the data market (Hernández, 2015; Logicalis, 2016). The growth of e.g. e-commerce, social networks or the use of mobile devices and applications has led to an exponential increase in the amount of data generated within organizations, which offers a wide array of new opportunities and business possibilities (Chen et al., 2012; Opresnik & Taisch, 2015; Yousif, 2015). According to Wyman (2017), more data has been created in the past years than humanity has created in its entire history. In 2015, businesses created 2.4 zettabytes on their own, which is equivalent to 2.4 trillion gigabytes of data. Moreover, its collection has always been assumed as an iterative and compulsory process necessary to obtain information on specific variables in an established system, which then allows answering relevant questions and evaluating results (Fred, 2017). Therefore, the perspective on the data has been that of a simply raw material whose value could

not be squeezed beyond the capture of quality evidence that allows convincing and credible answers to the questions that are posed.

However, the value given to data has also taken a turn and now is seen as a powerful tool for gaining competitive advantage in the markets. Due to the data volume, velocity, and variety growth, as well as thanks to the adoption of Big Data and new technologies that allow data management, today it is possible to monetize corporate information (Logicalis, 2016). There is greater availability of structured and unstructured data. It is possible to access them in a massive way as a result of the self-service promoted by user-friendly technology in real time. The storage costs presented are the lowest in history and the return on investments in Big Data and analytics proves their value and encourages companies to continue developing new capabilities. These opportunities are found when studying and understanding data monetization. This phenomenon has numerous interpretations, conceives many definitions and, although it is not a new concept, the lack of related studies and its novelty make data monetization ambiguous nowadays.

Starting from the term coined by Doug Laney (cited in Alonso, 2018) as *Infonomy*, which refers to the theory, study and discipline of assigning economic relevance to information like any other asset, creating processes of “data, information and knowledge logistics”; data monetization refers to the use of data for measurable economic benefits. This includes methods such as exchanging and selling information to third parties or creating new products and services based on the data. Monetizing data represents a great business opportunity and another step in digital transformation. The transition and opportunities that this massive generation of data can create have been anticipated for several years. The technology consultancy International Data Corporation (2017) already stated that "by 2019, 40% of companies would have created new business lines around data." In addition, Gartner (n.d.) also assured that "by 2016, 30% of companies would have already directly or indirectly initiated the monetization of their information assets through sale or exchange actions."

Data has become essential for businesses (Alfaro, 2019; Faroukhi et al., 2020; Zemsania, n.d.; Sisense, n.d.). But are these companies really making the most of the available data and aligning their monetization with corporate strategy, structure, and culture? Is this process successful, for example, in companies whose digitalization is in the early stages? What is the data that can be

monetized? Can internal information be monetized? These questions are going to be the epicenter of this project.

1.2 Scope and delimitations

Understanding monetization, its practices, as well as the benefits it brings and the limits that hinder its implementation, makes it easier for companies to engage their businesses in monetization activities, as well as improve the use of their data assets. This in turn enriches the understanding of the monetization environment, which is totally disconnected from current and highly relevant concepts such as Big Data and its use, new business models, multifaceted platforms, legislation, and naturally strategic issues and techniques. (Laitila, 2017) Although there are currently many tools to do this, it is a complex process that must gather large amounts of information from different sources. The literature on this subject is indeed very immature and scarce, and much research leading to multiple questions and interpretations has not yet been put into practice.

The data monetization landscape is evolving, and companies are at a transition point where more research and case studies are needed on the benefits and implications involved. For example, internal data is very sensitive and confidential information that normally no one wants to touch or share because it is considered as the DNA of the company. It belongs to and is the sole and exclusive custody of the company. But what would happen if that internal data could generate income by creating new services or by selling them directly? So far, there have been some works that theoretically define the concept and its derivatives, but there is no work that has combined theory and a practical approach. Considering all this information, it is necessary to carry out a project aimed primarily at studying the use of company's internal data as a source to generate income. The process will be research-oriented, so the objective of the theoretical framework is to give context to the project and explain the concept of data monetization from a perspective focused on the use of internal data for commercial purposes. The existing internal data sources within the case company will be collected through interviews with employees and potential clients. Discovered opportunities will be analyzed and filtered, but no development or implementation work will be done.

1.3 Research questions and objectives

The relevance of this problem has generated a line of research whose results are currently very promising, and this master's thesis is part of it. The main challenge of this work is to explore the concept and nature of data monetization and discover internal data monetization opportunities for a Finnish industrial company. It is worth to note that an industrial company is a company which is not born digital nor has fully undergone a digital transformation but might be in the process of digitalization. When a company leads and monopolizes a market, it has to be fully aware of the assets it owns. Knowing them is just as important as maintaining them: by exploring ideas, developing innovative projects that allow to hold the position, but also looking for any opportunity to continue growing.

The project aims to solve the following research question: “*What kind of monetization opportunities does internal data enable for an industrial company undergoing digital transformation?*”. In order to create a basis to answer it properly, several sub questions have been drafted:

- What is internal data and what is not?
- How can companies discover and recognize their valuable data?
- What are the elements that can hinder and/or support the viability of data monetization opportunities?
- What does Data Monetization mean and involve?
- How do digital technologies affect Data Monetization?

Therefore, the objective is not only to investigate the concept of data monetization in detail, but also to identify how much value can be obtained from it (especially from internal data), how this value can be a powerful source of revenue, and of course, which are the main opportunities discovered for a company through an experimental study.

1.4 Structure of the study

The thesis is structured in six main parts. **Figure 3** shows the inputs and outputs of each of the parts of the process. Before starting this research project, only the background of the general topic was available. Chapter 1 shows how it has been possible to identify the gap and delimitations of the research from this information, as well as outline the research questions

and the objectives that will guide this study. The existing literature and previous studies have allowed an in-depth analysis of the data monetization framework. Chapters 2 and 0 include all the aspects necessary to thoroughly understand the phenomenon, i.e. what is data, what is internal data, data value creation, digital revolution and beyond, together with the benefits and impacts of commercializing data.

In chapter 4 a guide on how to approach the concept studied is provided, explaining the methodology followed to conduct the empirical study that ranges from data collection and analysis, to filtering, consolidation, and validation of business ideas. Under the aegis of the theoretical framework and the research design process carried out, it has been possible to answer the main question and derived sub-questions and find business opportunities for the case-company, always respecting professional secrecy (see chapter 5). After analyzing and interpreting these results, a personal evaluation of the research has been made, as well as recommendations for the case company, highlighted in chapter 6. Finally, once an overview of the research project was obtained, conclusions and a guideline for future research are listed in chapter 7.

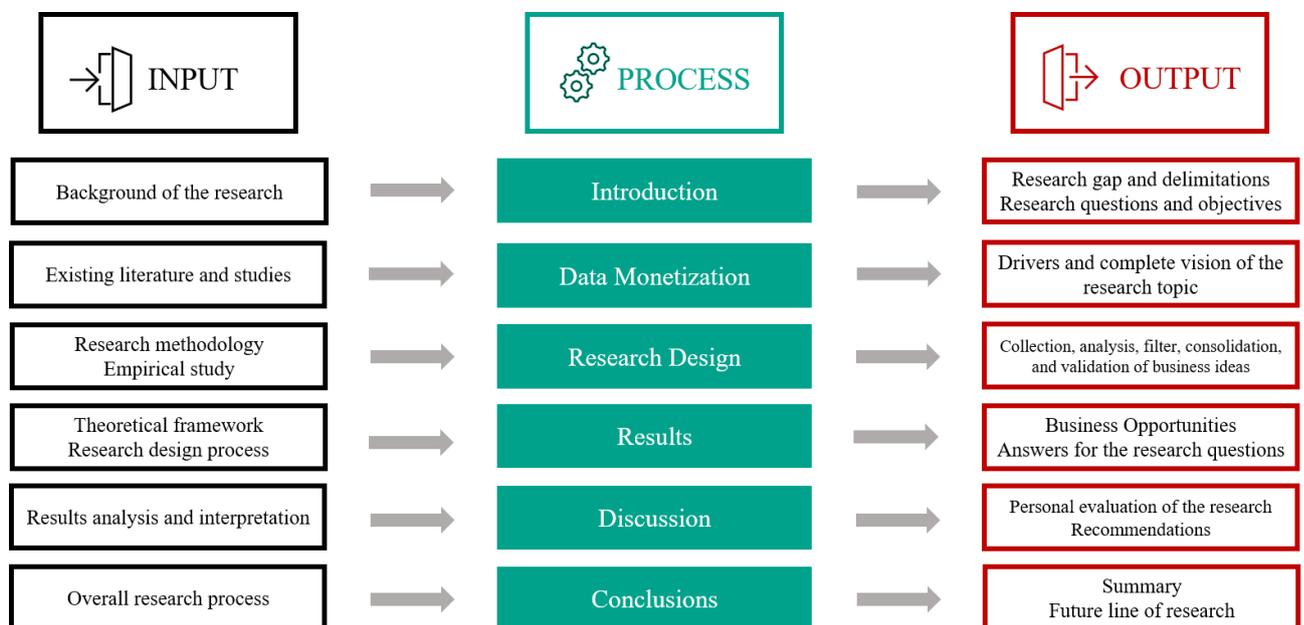


Figure 3. Structure of the study

2 DATA MONETIZATION: THE DRIVERS

The literature review in this project focuses on data monetization. For facilitating the comprehension of the topic and creating a basis for the empirical study, the theoretical framework has been divided into two main chapters: the promoters and/or drivers of data monetization, and the complete and extended vision of the data monetization concept itself. Within this chapter, the whole context that surrounds the phenomenon is going to be presented. Section 2.1 defines data, internal data, and discusses how value can be created from it. Section 2.2 introduces the digital transformation that has eclipsed the industrial world, and includes concepts such as Big Data, Industry 4.0, digital platforms, and ecosystems. The main digital technologies that have enabled data monetization are also discussed in detail.

2.1 Data as an asset

Data has become the engine of the digital age and, if properly processed, it can create a huge competitive advantage for companies. According to many researchers, data can be considered the main and most valuable resource of a company (Yousif, 2015; Ramírez, 2017; Almajano, 2018; Lampadia, 2019). In order to recognize data as an asset, it is important to understand what data means and, more specifically for this project, what internal data means and the value it can create.

2.1.1 What is data?

Data, information, and knowledge are often used interchangeably and might lead to confusion. Data has its origin in the seventeenth century and comes from the Latin word datum, which means "something given" (Milton, 2009; Diffen, n.d.). The term conceives many definitions and meanings, which vary slightly depending on the author (Alavi & Leidner, 2001; OECD, 2008; Merriam-Webster, 2021a). Data can be described as units of information, often numerical, that are collected through observation (OECD, 2008). Merriam-Webster (2021a) complements this definition by stating that is factual information used as a basis for reasoning, discussion, or calculation. However, it also collects that it is information in digital form that can be transmitted or processed, as well as information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful, which greatly supports Alavi & Leidner (2001) definition. In a more technical

sense, data is a set of qualitative (qualities) or quantitative (numerical) variables about one or more people or objects (OECD, 2008). Examples of qualitative data are names, addresses, gender, or job position, while quantitative data are dates, years or number of children, among many others.

Information is a much older term and has always referred to the “act of informing”, generally regarding education, instruction, or other communication of knowledge (Milton, 2009; Diffen, n.d.). On the other hand, knowledge is often viewed as actionable information or meaningful links between information and its applications (Laitila, 2017). Regardless of the correct definition, what can generally be assumed is that data is the raw material from which companies derive their activities, while knowledge is refinements derived from data (Yousif, 2015; Laitila, 2017). According to Alavi & Leidner (2001), data is facts, raw numbers, while information is processed and interpreted as data, and knowledge is personalized information. Diffen (n.d.) also believes that data is simply facts, opinions, and statistics that have been collected and recorded for reference or analysis - bits of information, but not information itself. Therefore, when data is processed, interpreted, organized, structured or presented to be meaningful or useful, it is called information, which provides context for the data.

From an organizational perspective, data can come from very different sources that can generally be classified between internal and external. Companies store internal data on their own IT servers that concerns either individuals (for example CRM data, service user data) or business operations (e.g. ERP data, sensor data). In contrast, data from external sources can be divided into purchased and open data, from outside their boundaries. The main examples include data from social networks and data that public actors make available. (Parvinen et al., 2020; Zemsania, n.d.) Both are useful and necessary for the well-functioning of the company, and it is important to have a clear vision about them.

Nevertheless, according to a survey conducted by González (2020) of various business analysts, approximately 65% of respondents rate internal data as more important than data collected outside the company. Furthermore, while internal data can benefit companies that want to improve efficiency and productivity as well as companies that fail to generate profits, external data is outside of an organization's control, for example economic trends and government regulations within an industry. This project will focus on studying this part of the data that belongs to the company and it is under its domain, i.e. internal information sources.

2.1.2 What is internal data?

As stated in previous section, organizations capture data in many ways from countless sources. One source that is not typically assumed to provide business benefits is internal data. Barron's (2021) defines internal data as "information, facts, and data available from within a company's information systems". Another definition is "information, statistics and trends that organizations discover through their operations. It includes facts and figures that companies obtain from internal databases, software, customers, and reports" (Business Dictionary - Internal data definition, cited in González, 2020). Typically, this data is not available or accessible from outside the organization, unless express permission is granted (Lumen, n.d.).

Internal data uses information from inside a company necessary to determine whether the strategies currently in use and decision-making processes for operations are successful or if changes should be made instead. There are four fundamental areas that a company can collect internal data from: sales, finance, marketing, and human resources. The finance department provides cash flow reports, production reports, and budget variance analysis. Internal marketing data can be collected from website traffic statistics, phone reports, promo codes, etc. Human Resources (HR) must report internal data on retention rates, delays, and absenteeism to determine whether the company should be concerned about turnover. Each area provides a unique perspective, but departments stay connected thanks to the data. (González, 2020; Lumen, n.d.)

2.1.3 Data value creation

For a long time, the data generated by the operations of the companies was considered as a by-product or waste that generated storage costs to comply with legal obligations. Companies have been improving their processes based on data in all their areas (commercial, logistics, operational or support, such as human resources) but always from a "repository" approach. (Mateos, 2020) Nowadays, the growth in the field of technology, especially in smartphones, has led to the inclusion of text, video and audio, as well as logs of web activity in the data. As a result, many authors have started to consider data as the raw material necessary for companies to create value (Yousif, 2015; Ramírez, 2017; Almajano, 2018). In order to understand how value can be created from data, it is essential to define what value is. Nevertheless, since value is not a tangible asset, it has multiple definitions that can be used in several dimensions.

Generally speaking, and following the perception line of this study, value relates to the usefulness, quality, importance, utility, monetary worth of something (Fred, 2017; Merriam-Webster, 2021c).

Because of the term ambiguity, identifying valuable data is not always easy. Data must be interpreted and analyzed properly for it to acquire meaning and value. Due to the limited (but increasingly growing) specialization in data analytics and data science sector, it is highly probable that it is interpreted incorrectly. When this leads to wrong conclusions, the data is said to be misleading. The causes are varied, but this often occurs when the data or context is incomplete. For example, an investment in a mutual fund increases by 8% and may be concluded that the fund managers are doing their job well. However, if all the major stock market indices suddenly rise by 16%, the conclusion could be misleading as the fund would have underperformed well the market. (Diffen, n.d.) Moreover, it is worth highlighting the common problem with respect to the expansion in the volume of data, in which "data overload" can become confusing to an organization and, therefore, disrupt the discovery and identification of valuable data (Freud, 2017).

The value of data varies according to context, situation, time, and individual perception (Fred, 2017; Parvinen et al., 2020; Merriam-Webster, 2021c). The collection of the data can involve a high initial cost, contrary to its copying and dissemination. As discussed initially by Thierauf (2001) and later by many other authors, value and value created are recognized only when experienced or used, and therefore data may not be inherently valuable given the implicit degree of uncertainty associated with it. This makes sense since the perceived value depends on the use of the data and therefore the assumed value may not resemble the realized value. In addition, the value varies depending on how the data is used, the combinations that are made, and whether it is accessible at the right time and place. (Parvinen et al., 2020)

2.2 Digital revolution and beyond

The literature of digitalization is vast and heterogeneous, it appears in a variety of sources – encyclopedias, dictionaries, technical literature, and studies related to economic and technological practice. As a result, there are numerous interpretations, and many definitions can be conceived. However, it is commonly accepted that digitalization goes beyond the simple adoption of various random digital technologies. It is essential to understand the difference

between digitization and digitalization. The first one refers to the process of changing from analog to digital form, i.e., something that has no paper use anymore. On the other hand, Gartner (n.d.) defined digitalization (or digital transformation) as the use of digital technologies to disrupt a business model and provide new revenue and value-producing opportunities, i.e., the process of moving to a digital business.

Fourth Industrial Revolution or Industry 4.0, where technologies intertwine and interact physical, digital, and biological fields (Kurt, 2019), is transforming and furthering our society and is clearly driven by digitalization of business models, value chains, and products and services (Parida et al., 2019). Digitalization involves changes at several levels, starting from processes and practices to roles and value chains in ecosystems and society structures (Parviainen et al., 2017). According to Parida et al. (2019), it will require companies to innovate in many ways, including demand increase for new technologies, skills, and processes thus originating many organizational and business challenges. Therefore, the firm's mentality and culture that enhances the transformation and searches for opportunities will need to be well established if they want to overcome their competitors. Companies that are able to implement digital technologies and innovate their core activities accordingly will master their efficiency and revenues. In other words, organizations which adept dynamic capabilities and use the created ecosystem will outperform the future. In order to understand the relationship between data monetization and digital revolution, it is essential to have an accurate picture of Industry 4.0, Big Data, the Internet of Things, digital platforms and ecosystems.

2.2.1 Industry 4.0

Since the end of the nineteenth century, the world has been progressively transformed due to four industrial revolutions. Today, society is subjected to what is known as Industry 4.0 (i4.0). It focuses on the end-to-end digitization of all physical assets and integration into digital ecosystems with value chain partners. It is driven by digitalization and integration of vertical and horizontal value chains, digitization of product and service offerings, and digital business models and customer access (Abloy OY, 2020). It leads to a paradigm shift in industrial production, such as the role of humans in the production system geared towards intelligent manufacturing, which enables individualized mass production. (Chiabert et al., 2018; Frank et al., 2019; Strandhagen et al., 2017; Thoben et al., 2017) In Industry 4.0, all working activities of the value chain are grounded in information and communication technologies (ICTs),

including IoT, cyber-physical system (CPS), cloud services, Big Data and analytics (Frank et al., 2019).

Industry 4.0 is rooted in smart manufacturing, which is a factory system where the other components of i4.0 are combined and placed in the context of autonomous and sustainable production to collect, exchange, and use real-time information transparently. The smart factory is seen as a manufacturing solution generating flexible and adaptive production processes. Solutions are based on digital technologies or collaboration between different industrial and nonindustrial partners. (Strandhagen et al., 2017; Chiabert et al., 2018). It consists of vertically and horizontally integrated production systems. Firstly, vertical integration focuses on advanced ICT systems that integrate all hierarchical levels of the company, from shop floor to top-management level. It generates more transparency and control of the production process while helping to improve the decision-making process on the shop floor, less dependent on human intervention. (Frank et al., 2019) Secondly, horizontal integration through value networks facilitates collaboration that allows material flow among these corporations. This integration represents an added value in a company as an enabling factor for introducing collaborative manufacturing as well as development environments (Strandhagen et al., 2017). Consequently, companies can utilize networks where a more value-added joint effort is required in order to develop products and services (Frank et al., 2019).

2.2.2 Big Data

Digitalization has fueled the emergence of new trends. Likewise, the appearance of social networks, online purchases, or even the sale of transport tickets, have inevitably increased the amount of data generated (Davenport et al., 2012; Hartmann et al., 2016; Laitila, 2017; Hanafizadeh & Harati Nik, 2019; Faroukhi et al., 2020). In the context of data monetization, Big Data could be defined as its *raison d'être*. Big Data is one of those new incipient trends of the digital revolution and, although everyone mentions the term due to its greater or lesser impact on organizations, at the moment a clear and systematic definition is not conceived. The evolutionary term Big Data refers to the set of data, both structured and unstructured, whose size (volume), complexity (variability) and growth rate (velocity) make it difficult to capture, manage, process, or analyze using conventional technologies and tools (PowerData, n.d.; Rouse, 2016; SAS Institute, n.d.). However Big Data goes far beyond the generation of

‘massive data’. What matters is not the amount of data that is generated, but what organizations do with it, i.e. the ability to exploit them to extract valuable information and knowledge.

Although the concept of Big Data gained notoriety in recent years, particularly from media coverage of the US elections (Ramírez, 2017), it has been used since the early 2000s, when industry analyst Doug Laney articulated the current definition of Big Data as the 3Vs: Volume, Variety, and Velocity. This is the result of the difficulty in evaluating how large the data must be to be considered "Big". However, there is no single approach, and what is considered huge today, may be insignificant in a few years. The experience acquired and the value given to data by the pioneering companies in this adventure, such as the four tech giants (GAFA: Google, Amazon, Facebook and Apple) has made the original definition to be expanded, adding new characteristics such as Veracity and data Value (5Vs, see **Figure 4**). (Chen et al., 2012; Opresnik & Taisch, 2015; Fred, 2017).

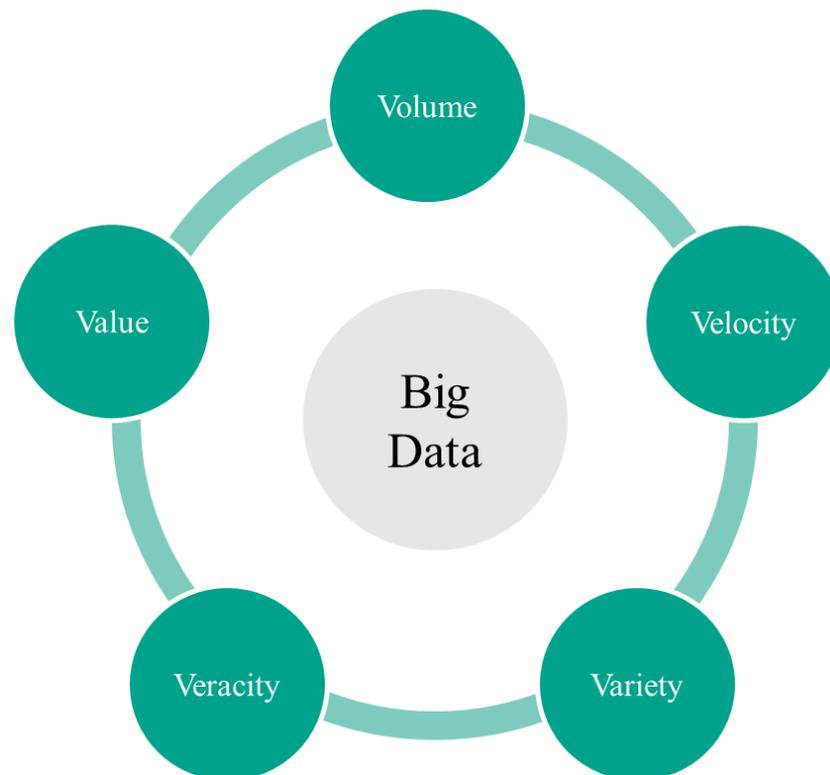


Figure 4. 5Vs of Big Data

If Big Data was a pyramid, the **volume** would be at the base. It refers to the amount and size of data collected from all sources. As already mentioned, the size used to determine whether a dataset is considered Big Data is not firmly defined and keeps changing over time. **Velocity**

refers to the speed at which the data is generated, collected, and analyzed. This data should be captured as close to real time as possible, making it available at the right time for making the necessary business decisions. Time directly impacts business results; it is preferable to have little amount of real-time data rather than a large volume of low-speed data. Processing diverse data types collected from varied data sources is known as **variety**. Big data can be classified as structured, e.g. numerical data, or unstructured, e.g. emails, videos, audios, etc. The **veracity** or validity of big data is the assurance of quality or credibility of the collected data. Finally, the fact of collecting data does not imply that this is useful. It is important to differentiate between business insights that add **value** and those which do not. Information has to provide several benefits for third parties thus creating in some way an ecosystem between producer and consumer. (Sheriff, 2019)

This is transforming not only many industries but also society and is generating new business models. According to an IDC study, the worldwide revenue for big data and business analytics solutions is expected to reach US \$260 billion by 2022 (Aleksandrova, 2019). Nowadays, banking is one of the business domains that make the highest investment in Big Data and Business Analytics technologies. Big data-based business models have evolved and treat data as an asset itself. Moreover, there are many benefits of Big Data, such as reduced costs, improved efficiency, enhanced sales, etc. Big Data can be analyzed to obtain information that leads to better decisions and strategic business movements. It makes possible to create adapted and personalized products and services in real time for each customer. Its presence is growing across several industries, where the market is increasingly driven by a customer focus. Those companies that do not develop internal capabilities (data collection and processing) will tend to disappear.

2.2.3 Internet of Things

The core idea of Industry 4.0 is to use the Internet of Things (IoT). It refers to the grouping and interconnection of devices and everyday objects through a network (generally the Internet), where all of them can be visible and interact without the need for human intervention. The objective is therefore a machine-to-machine interaction (M2M). It includes a wide variety of “smart” devices, from industrial machines that transmit data about the production process to sensors that track information about the human body. Some real IoT examples range from a smart home, which automatically adjusts heating and lights, to a smart factory, which monitors

industrial machines for problems and then makes automatic adjustments to avoid failures. In short, IoT can be defined as a gradual revolution that will make all the objects around us connect to the Internet in some way. (Chiabert et al., 2018; Kinnunen, 2020)

This term is related to Big Data as it helps various industrial sectors to have a broader vision of the future. These IoT technologies and applications help companies integrate their business by making their operations more robust, efficient, and sustainable (green) with supreme quality. Nowadays, IoT is tackling the problem of data collection. It has seen quite a stir in recent years even though implementation and use in enterprises remains not fully implemented (McKinsey, 2018). The number of connected devices in 2019 reached 26.7 billion, and by 2020, 80% of industrial manufacturing companies were predicted to be adopting IoT technology (Maayan, 2020). Based on these findings, infrastructure and technology for data-driven management are progressing, but business utilization across the industry is hampered. As companies begin to take advantage of the IoT, research from the McKinsey Global Institute states that the global economic impact of IoT applications would be around \$11.1 trillion. Among all industries, factories are experiencing the most benefits, about \$3.7 trillion annually. (McKinsey, 2018) The reason behind this is increased efficiency in labor and productivity. Many industries use IoT to understand consumer needs in real time, be more responsive, instantly improve the quality of machines and systems, optimize operations, and discover innovative ways to operate as part of their digital transformation efforts. Taking this into account, IoT will certainly disrupt and change many industries globally.

2.2.4 Digital Platforms and Ecosystems

As alleged, digital transformation brings immense opportunities for business and society, and one of its most vital catalysts are digital platforms. Platforms are defined as technology enabled business models that create value through exchanges and interactions. Therefore, digital platforms are IT systems where different actors create value for each other (positive network effect). Its purpose is to bring together users/consumers and facilitate the exchange of products, services, or social currency, thus creating value. This value is created with resources that does not own thus growing much faster than traditional businesses. (Tiwana, 2014) A platform ecosystem is a set of open-source systems (platform core, complementary apps) that interoperate each other through interfaces. To successfully build platform ecosystems, the focus of the platform owner must shift from developing applications to providing resources that

support third-party developers in their development work. In short, software systems that can cooperate well with other systems and take advantage of such relationships (Yu et al., 2007).

Platforms bring together app developers and end-users. According to Tiwana (2014, P. 33-34), a fundamental property of platforms are the network effects, i.e. externalities. They refer to the extent to which every additional user of a platform or app makes it more valuable for every other existing user. The value of adding a new user to a platform increases almost exponentially its potential value to others. Although those network effects create high barriers to enter platform's markets, once they are in place, its position is hard to assail. Network effects are classified across two properties: direction and sidedness. Direction can be both positive (every additional user of a system makes it more valuable to other users) and negative (adding a new user makes it less valuable for the rest). The second property (see **Figure 5**) refers to whether they are same-side (adding an additional participant to one side of the platform changes its appeal to all other participants on the same side) or cross-side (adding an additional participant to one side of the platform increases or decreases its appeal to all other participants on the other side). Sidedness can also be positive or negative. (Tiwana, 2014, P. 35-36)

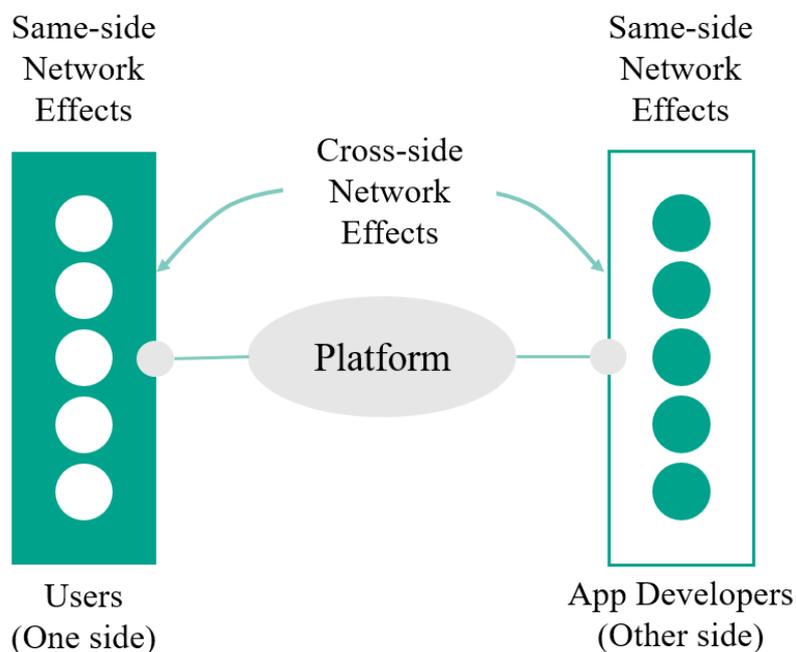


Figure 5. Same-side vs. Cross-side network effects (Tiwana, 2014, P. 35)

3 DATA MONETIZATION: THE COMPLETE VISION

In this chapter, a complete and detailed overview of the concept of data monetization will be presented. Many researchers summarize the term as the act of using data as a source of money flow. However, there is not a single definition, so it is necessary to have a broader understanding of what this phenomenon means and implies, especially to develop the present study. For this, an adapted definition will be provided as well as different opportunities and issues that affect practices around data. The way in which organizations treat data for business purposes, cybersecurity, data protection or a culture based on data, are some of the topics that will be addressed.

3.1 Data monetization

The concept of data is not new, and neither is the use of data for commercial purposes. However, the changes that have occurred in the business environment, such as digital transformation or the adoption of new emerging technologies like Big Data or IoT, have made the phenomenon evolve towards a strategy to be taken into account by many organizations. As with most derivatives of the "datum" family, the term Data Monetization is also quite ambiguous and encompasses multiple dimensions. This is due to the scarcity of studies carried out (so far it only appears in the form of articles, comments, or case studies) and research in general on the subject, so that a universal definition of the term cannot be accepted. This increases its complexity and makes its terminology vary in relation to the different points of view from which it is studied. (Fred, 2017; Laitila, 2017; Najjar & Kettinger, 2013; Thomas & Leiponen, 2016)

Before defining the concept and scope of data monetization in this study, it is vitally important to understand what monetization means. "Monetize", in general terms, refers to the process of converting something of value, in this case information or data, into money. However, its range of uses and definitions is increasing. It is important to differentiate "profit", which means making something worthwhile, productive, or rewarding, from "monetizing", which circumscribes that benefit to the purely monetary. (Fred, 2017; Merriam-Webster, 2021b) Monetizing data has given way to new business models on a global level. This concept is completely changing the market, increasing the efficiency of companies and, above all, helping to improve their economic-financial profitability. Although there are currently a multitude of

tools to do so, it is a complicated process that must bring together huge amounts of information from different sources. Given the main research question of the project, it is also considered necessary to briefly explain the difference between data monetization and data sharing. As Najjar & Kettinger (2013) point out, the main discrepancy lies in the main target of the exchange. While in data monetization the main purpose is financial, in data sharing the data is free, i.e. no price is set for your exchange. This is directly related to another purpose of monetizing data, which is to use the information to block negative money flows. However, both share the addition of value and the pursuit of competitive advantages for business.

To date two ways in which an organization can generate revenue with data and its derivatives have been identified. Direct data monetization means that data is sold and therefore monetary value is produced in this simple transaction. The form of the data can be raw, or data already transformed into analysis and information. On the other hand, with indirect revenue generation, data is used and refined to produce new information, services, or products to be sold. This is where this study lays its foundations. The goal is data-driven optimization. Data can be used to identify how to reach customers and understand their behavior, underline where and how to save costs, avoid risk, or even optimize operations. So indirectly, the key is to leverage the data and generate monetary value by refining the information to something else that is valuable. (Gartner, 2015; Sisense, n.d.)

This research conceives data monetization in a similar perspective to that of authors such as Wixom (2014), Woerner and Wixom (2015), Gartner (2015) or Freud (2017). For them, data monetization involves all actions aimed at generating income with or out of information-based products and services. This means that, given the difficulty of separating the terms data and information, the offers can vary from raw data to improved data, analytics' result, process design or even process execution (Woerner & Wixom, 2015). However, in their conception, it is not indicated that data monetization requires money in exchange of the offering, but something of comparable value. In this study, the monetization of the data will be assumed from a slightly narrow point of view, since the scope is only focused on the exchange of internal data for monetary purposes, so it should be defined as a generation of revenue from the data offered. However, it should be noted that viewing data monetization in a broad and unconstrained approach greatly increases the variety of emerging business models around data.

3.2 Opportunities

There are many benefits that come with data monetization practices: optimization of the use of data, reduction of operating costs, improvement of customer experience, strengthen competitive advantage, and many more (Sisense, n.d.; Zemsania, n.d.; Lampadia, 2019). This leads to a multitude of opportunities to create and capture value. As stated by Wixom & Ross (2017), with monetization, companies can pursue two purposes of use: improve existing processes and products (internal use of data) and create new offerings (external use). In order to recognize the offerings derived from data monetization, it is important to understand the concept of Business Model (BM). A business model describes the rationale of how an organization creates, delivers, and captures value. It can be considered as a holistic representation of the company's business, since it serves as a communication link between various activities, allows comparison between different strategies (such as positioning and differentiation, foundation of competitive advantage) and is capable of adapting to new situations (e.g. reacting to environmental changes or seeking new opportunities). It also serves the customer in a more complete way and contains key elements that competitors are unable to (profitably) imitate. (Osterwalder & Pigneur, 2010; Zott et al., 2011)

In recent decades, business models have undergone an “academic renaissance” and extensive research has been conducted in the field. Nowadays, BM represents a new unit of analysis that focuses on the creation and capture of value, which is closely related to data monetization as a concept (Najjar & Kettinger, 2013; Thomas & Leiponen, 2016; Zott et al., 2011). Nevertheless, there are still no studies on the most efficient models based on data and, much less, on internal data. This has its logical basis in that not all business models pursue the same objective and, while some seek the sale of raw data, others seek to market with analysis or sale of data-based services (Parvinen et al., 2020; Laitila, 2017). The reason for this is the selected data strategy and whether the purchasing company will obtain ownership of the original data or not. Depending on its scope, two types of strategies could be conceived: internal and external (Logicalis, 2016). The internal one seeks to satisfy the company that collects the information by improving its customer experience and increasing corporate performance. On the other hand, the external strategy focuses on generating new sources of income with third-party companies, selling the data or the analysis obtained through them.

The first opportunity is the sale of data as a service (Sisense, n.d.). Data is sold directly to clients or intermediaries in raw, aggregated, or anonymous form, and buyers are responsible for extracting the necessary information. In this case, there are not direct benefits from the data for third parties since they have to obtain it by themselves. Another option is to combine internal and external data sources and analytics applications to provide information. The idea here is to provide information that provides up-to-date data. The problem is that the statistics are limited to specific data sets purchased by the buyer. Data-based services is a more flexible type of data monetization and also provides more value to customers. It consists of installing an analytics platform to provide clients with scalable and highly versatile data analytics in real time. It is available both on-premises and in the cloud, and has the widest variety of data formats, so you can use data from any source and format. This requires configuration and specialized support. The last one refers to integrated analysis, which adds functions normally associated with software. (Laitila, 2017; Parvinen et al., 2020; Sisense, n.d.). In this study, the format in which the data is sold will depend on the management of the customer segments, especially since what is going to be commercialized is internal data, a much broader range than customer data or raw data without any value intrinsic. It is also important to bear in mind that the owner in this case always has to be the selling company itself and not third parties.

Another of the biggest opportunities generated with the monetization of data is the way to manage it. Considering data-driven management as a concept, it refers to the data itself. Consequently, trends supporting data-driven management are related to the way organizations collect, structure, analyze, and use data to drive business operations. In addition to IoT (see section 2.2.3) another factor that enables data-driven management are developments in the way data is analyzed and processed. The power of data computing has seen massive exponential growth in recent years. From 1959 to 2012, computing power used to double every two years. After that doubling time the computing power has been 3.4 months, which is about 7 times faster than in all of history. (Hao, 2019) To give this perspective, the iPhone 6 today has ten times the computing power of the first supercomputer to beat the world chess champion in 1997 (McKinsey, 2018). This can be considered rapid growth. Above the computing power, data is also produced at high speed. The research exposes that 90% of the total data in 2018 did not exist two years earlier in 2016 (Marr, 2018; McKinsey, 2018). This suggests that there is a huge amount of data available that could be used in business. Also, the technology for these

applications is available, but must be changed as operational excellence. The key problem here is transforming the data into useful information.

As the number of players in the industry grows, it is more difficult to determine who owns each part of the value chain and what the customer owns. Due to volume and value-added services, revenues are also increasing. This means that there are more opportunities to attract newcomers to the industry, but there is also competition from different starting points (McKinsey, 2018). There are the tech giants on one side and startups on the other. This can be noticed from anywhere, as digital companies are expanding into a broader range of industries hoping to grow. Companies like Amazon, Google, and Alibaba are continually innovating. For example, Amazon has expanded into grocery stores, but also last-mile solutions for consumers, although it is known for its online channels and cloud business. (Bryce & Dyer, 2007) However, they are not targeting the entire market value chain, but rather a part with less competition. (McKinsey, 2018) Since niche players compete in areas that are not the strength of the starting player, current players find it irrelevant or difficult to react against them (Bryce & Dyer, 2007).

3.3 Limitations

Despite the immense opportunities around data for the business world, there are several limitations that restrict and affect the successful development of monetization practices. Many issues are conceived in the literature: organizational, industrial, privacy or security, and this work will highlight those that really affect, to a greater or lesser extent, internal data. The first one is related to business culture and organization. The culture is an important concept that describes how people interact and influence each other as well as how they tend to behave (Burns, 2013, P. 135). Culture is about the customary and traditional way of thinking and doing things (shared values, beliefs and agreed norms which shape behavior), which is shared to a greater or lesser degree by all the members of an organization and can hinder or support entrepreneurship (Bengtsson et al., 2009, p. 139). For an organization to work, it is fundamental to build an appropriate corporate culture and develop correct activities in communities (how actions are kept together and made coherent and meaningful to the people involved).

In the last two decades, the most successful companies have been those that have oriented their culture towards data. As mentioned in previous sections, if the data is restricted, stored, disorganized, inaccessible, etc. high-value potential is automatically being wasted. On the other

hand, if they are exploited correctly, they will positively impact the rest of the components of the organization, e.g. strategy, people, operations, leadership. A data-driven culture implies a change in mentality that, based on data, improves decision-making and the choice of which alternative is the most optimal. Organizations that use data as a key element in decision making are more efficient and productive. In addition, by having the most visible and transparent data, the data is democratized and accessible to many individuals within the organization. But the true success of this culture depends on the people, since they are the ones who control the data within the organization and therefore have the knowledge and the ability to decide. (Sarganas, 2017) According to Satya Nadella, "a data culture is not just about deploying the technology alone, but changing the culture so that every organization, every team, and every individual is empowered to do great things because of the data at their fingertips." For data monetization opportunities to become a real business, feasibility is necessary, not only technical-legal but also cultural and organizational. According to Sarganas (2017), building a data culture is not easy. Data has to be democratized and all the people in the organization can access the valuable information.

The second and very important limitation of this study is data privacy and security. Since data held by the company may contain personal or customer information (therefore, it would not be dealing with internal data), it must be adequately protected. This is not only due to ethical reasons but, in several countries, legislation strengthens the privacy and confidentiality of data (Fred, 2017). Laws and regulations on data privacy impose limits on what companies can collect and exploit, but they also clarify the rules for all players (Laitila, 2017; Parvinen et al., 2020). In regard to the monetization of data, it is necessary to consider that there is sensitive data that may be illegal to sell or share, in addition to being indicated in the current legislation (that vary depending on the country). This type of sensitive data could be, for example, personal data containing the name, address, and social security number. Moreover, if this data is stored in the databases of the organization that wishes to carry out the monetization, they are obliged to protect it and guarantee its privacy and security. (Fred, 2017; Gerlach et al., 2015) If the clients in question authorize the transaction, the data exchange process and what it entails must also be secured. Data security relates to confidentiality and the ability to protect data from theft, errors, and accidental destruction (Parvinen et al., 2020). This means that confidential business information needs to be protected against access by third parties. Issues related to trust and ownership can generate conflicts between sellers and buyers in data monetization cases

(Thomas & Leiponen, 2016). This results in restrictions for the new business models created for the monetization processes.

Given the complexity of defining and limiting the scope of the word data and its derivatives, it is also difficult to establish a single law that regulates data ownership and copyright. Currently, it appears that most of the world's legislation accepts the analysis of already published data or the creative use of a subset of data, which means that a separate permission is not required (van Belle & Ruiter, 2014). However, legislative changes such as the General Data Protection Regulation (GDPR) directly affect the use of data. The GDPR was approved in 2016 and implemented in 2018 with the aim of increasing citizens' control over their data. It establishes the rules of action for any private company and public entity that manages, stores, or processes personal data of citizens of the European Union (European Commission, 2018). This Regulation grants citizens (data subjects) the right to be forgotten, to request organizations to erase their personal data, and to recover their own personal data and share it with another service provider. In addition, it also provides companies with clearer and more consistent rules and imposes more severe penalties on organizations that do not obey the laws and neglect data privacy. This means that the organization, processes, and technologies with which they manage personal data, and therefore some business models, must be constantly reviewed. In fact, sanctions for companies that do not comply with the regulations can reach up to four percent of their annual income or 20 million euros (European Commission, 2018). Social networks such as Facebook, Twitter or Pinterest have stimulated people's appetite for more complete information. Other companies like Amazon and eBay are influencing the customer experience and therefore their expectations. Google is entering the financial market, demonstrating how non-traditional competitors can break into sectors thanks to the advantages generated from data. (Alonso, 2018)

On a final note, the term data monetization is ambiguous, and its definition varies according to the researcher's interpretations and perspectives. Improved data management, new business models or commercializing the data are some of the opportunities generated from implicit benefits of monetization. However, its correct development is also hampered by policy, security, or culture, amongst others.

4 RESEARCH DESIGN

This thesis explores in detail the phenomenon of internal data monetization in a Finnish industrial company, provider of the topic and for which this thesis is performed. The incipient need for organizations to find new ways to use data and get the most of it led the foundation to do this study. The main objective is to discover the existing commercialization opportunities from internal data, i.e. information that belongs to the company and is owned by them, which will provide the answer to the central question that encompasses the entire study: **What kind of monetization opportunities does internal data enable for an industrial company undergoing digital transformation?** It must be always clarified that it has been a research-oriented process, in which a multitude of ideas have been analyzed and filtered, but no development or implementation work has been conducted, since it was outside the scope of the project. In addition, professional secrecy has been respected at all times.

4.1 Research setting, process, and methodology

Data can be provided through primary and secondary sources. Primary sources are direct or first-hand evidence where data is collected by an individual or group of individuals, e.g. experiments, interviews, questionnaires, conversations, statistical data, etc. while secondary sources refer to existing data or collected by someone else, e.g. publications, databases (Saunders et al., 2016). The empirical part has been supported mostly by primary information collected through online interviews, given the current pandemic situation, and a few face-to-face meetings. The interviews have been mostly unstructured, documented by taking personal notes during them due to the lack of authorization to be recorded and sensitivity of the topic, where open questions and discussion were encouraged. However, company material such as internal reports or products and services catalogues have been also used to facilitate the learning process. Alternative secondary data sources utilized to develop the report were search engines, databases such as Scopus, Web of Science and Elsevier, previous master's theses in the field of data monetization and companies related information, as well as textbooks and course materials.

The research process followed to meet the objectives set out by the company can be seen in **Figure 6**. It began with an extensive review of the literature on the concept of data monetization and its surroundings, which can be read in sections 2 and 0, which facilitated the development of the study that will be described below. First and foremost, brainstorming was done to

understand what internal data sources the organization had. For this, the employees were interviewed through videoconferences. It should be noted that this was an iterative step throughout the entire process. Second, these ideas were analyzed and filtered, and new ideas were included in the study setting. The next action taken was to specify which of the leaked ideas could represent a business opportunity, for which a personalized business model and feasibility study were developed. Finally, the monetization opportunities were outlined, whose methodology was based on live interviews with stakeholders.

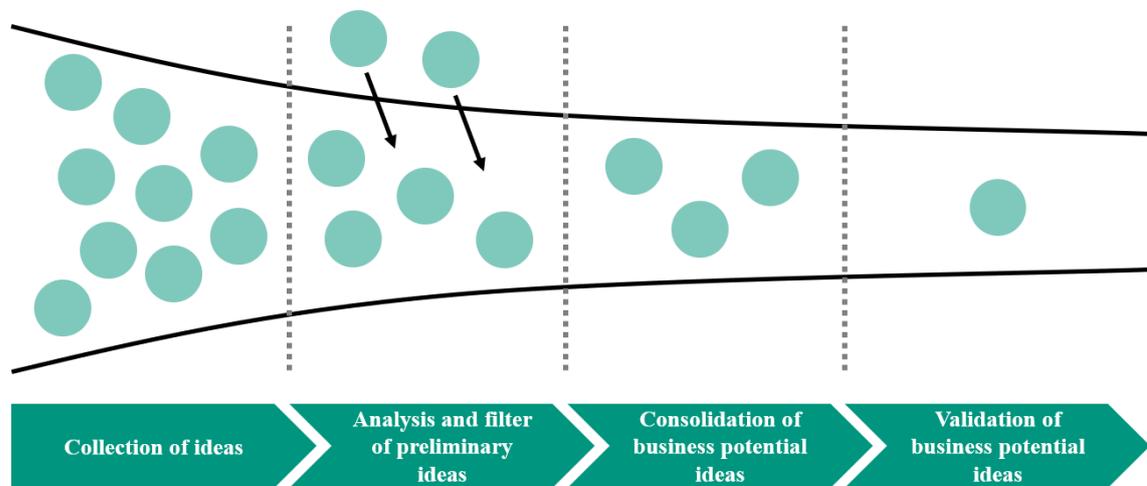


Figure 6. Research process from practical perspectives

The monetization of data as a practice is not a new concept (e.g. data brokers), but so it is as a commercial strategy in today's business environment. Added to this is the scarce and unrepresentative research on data monetization and data-driven business models. (Fred, 2017; Laitila, 2017; Najjar & Kettinger, 2013; Thomas & Leiponen, 2016) The principle has appeared so far in the form of articles and conceptual commentaries, single-case studies (Najjar & Kettinger, 2013), bibliometric and review studies (Parvinen et al., 2020), but no empirical analyzes have been performed on its evolution and impact in the real business world.

According to Saunders et al. (2016), a research problem can be handled in an exploratory, exploratory-descriptive, or descriptive way. In this case, the approach has been largely exploratory, as there has been no prior in-house investigation of internal data for monetary purposes; but also slightly descriptive since the concept of data monetization has been detailed. Nevertheless, although theory has been used to guide the research and analysis, the approach selected has been clearly inductive. Inductive reasoning is an appropriate approach for exploratory research and can be used when there is no unambiguously defined theoretical

framework to which reflect on (Saunders et al., 2016; Laitila, 2017), as is the case in academic and business literature of data monetization. It begins with data collection and then explores the results to uncover the problems or issues that may arise (Saunders et al., 2016). Therefore, the evidence is used as the genesis of a conclusion (Ritchie and Lewis, 2014).

Given the novelty of the phenomenon, its insufficient understanding, the lack of comprehensive empirical studies especially in the modern business environment, and with the simple aim of shedding light to improve its general understanding and facilitate future research, this study has adopted a qualitative research method (Saunders et al., 2016; Birkinshaw et al., 2011). In addition, a case study is an adequate method to induce theory in qualitative research (Laitila, 2017), which goes hand in hand with the methodology developed for this thesis.

4.2 Collection of ideas

Before explaining the idea's gathering process, the guidelines and objectives set by the case study company should be emphasized. As mentioned above, the main target was to discover opportunities that could be a source of revenue from the firm's internal data. For each monetization opportunity found, a business model was required, as well as a feasibility analysis or data governance scheme, which included the practical as well as the legal possibilities (GDPR) for collecting and using the data. As general comments, it was emphasized that the task consisted exclusively of extracting the maximum possible potential from the internal information, but that no development or implementation work was necessary. Additionally, the company did not have a common database that contained all internal data; hence, it was unnecessary to dive into raw data or technical databases. To approach this, three key questions were established, which would later be used as the basis for interviews with company personnel:

1. Where is the data?
2. Is it conveniently available?
3. Is there / will there be business demand for it?

In order to identify the internal data and locate it, but also to get to know the interviewees and recognize what was required from them, a detailed analysis and study of the company's organizational structure were carried out. Together with my company's supervisor, we prepared a list of potential contact persons whose expertise areas initially aimed to have internal data to work with. The classification criteria followed were PRIO1 and PRIO2. Priorities 1 were based

on existing and marketed products or systems, and 2 were based on products or systems still under development or about to be launched on the market.

Almost all the departments were included in the analysis, with special emphasis in Product Management, IT and Law areas, since they were at the heart of the feasibility analysis and were assumed to contain most internal data generated. In contrast to what was written in literature, the departments that "theoretically" encompass a greater volume of internal data, such as HR and Marketing departments, were decided to not be investigated since they store sensitive and customer data that does not belong to the company and, therefore, are outside the scope of this thesis. Firstly, an online department introductory session was carried out in order to present the thesis topic and for them to brainstorm internally and, straightaway, individual meetings were held. The main objective in these first-round interviews was to collect the maximum possible amount of information from the available sources, i.e. company's personnel. In the department meetings, the seminar guide was as follows:

1. **Presentation of the student.** With the aim of providing a context that would allow establishing a bond of trust with the company's employees and fostering further discussion on the subject, a brief introduction about the researcher.
2. **Presentation of the topic.** After the personal presentation, the most important thing was to clarify the purpose of the meeting. The following diagram was drawn up (see **Figure 7**) in which the topic was explained, what it consisted of, the phases into which it was going to be divided, and how they could help me develop each one.

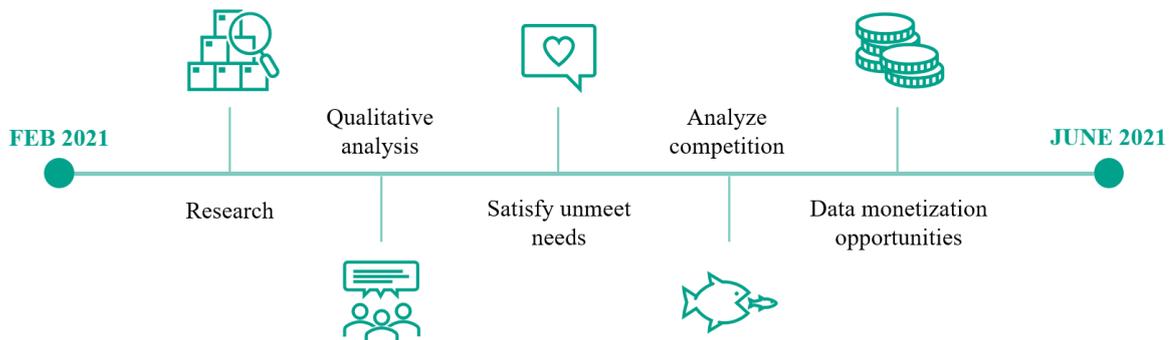


Figure 7. Thesis topic plan

3. **Employee's presentation.** The company's personnel then introduced themselves and provided context from their respective department in the company, which served as the basis for preparing the questions for the upcoming individual interviews.
4. **Additional information.** Finally, an understanding of the research project to be developed and their possible collaboration and necessary input was requested. Room for suggestions and open questions was given.

After getting to know all the departments, the first round of individual interviews started. Interviews are commonly used in qualitative research and provide a possibility to explore and describe phenomenon (Ritchie & Lewis, 2014; Saunders et al., 2016). The list of people to contact also included preliminary ideas about possible areas that contained internal data. In total, 35 individuals were interviewed (see **Table 1**).

Table 1. Total people interviewed in the first round

Department	People interviewed
International Sales	3
Domestic Sales	3
Finance and Law	3
IT	4
Operations	2
Product Management	19
R&D	1
Total	35

As mentioned above, the type of information needed was mainly based on identifying the type of data, its location (for example, a software, a database, etc.), its availability (is it possible to sell it? are there legal restrictions? are there any GDPR problems?) and whether there is or will be any stakeholder interested in buying the data. Although the interviews did not follow any type of structure or scheme, the formulated questions were aimed at filling these four "base queries" as well as obtaining additional information still unknown. All the interviews were conducted in English and formed by just interviewer and interviewee, except one, where a Finnish-English translator was needed. These questions were adapted to the role of each person and the discussion and exchange of ideas was inspired at all times. Some of the asked questions were:

- Sales oriented people
 - What are the data that customers would need?
 - What type of product groups are ordered and within what timeframe?
 - What is the relevance of the historical data?
 - What are the selling channels you currently use?
 - Does CRM contain information that can be sold?
 - Do you think someone would be willing to pay for the creation of a service X?
 - Does this information belong to the company or to the clients?
- Legal people
 - What should be considered to verify the feasibility of using the data (as an overview)?
 - Does this information belong to the company or to the clients?
- IT people
 - Is there some kind of system that lists all the systems and technical databases?
 - Is there a data categorization framework?
- Product Management people. This prompted open discussions about the business potential of the data and internal processes and systems.
 - What are the data that can be used?
 - What commercial capabilities does the data generated by the products involve?
 - How do customers use a certain system?
 - How are orders received (Order to Cash (O2C))?
 - How is the delivery process?

In inductive research, the interviews and analysis are often aligned (Laitila, 2017). Therefore, the analysis started right after the first interview and the feedback obtained with all of them was the fundamental pillar for the execution and development of the second phase of the methodology process: analysis and filter of preliminary ideas.

4.3 Analysis and filter of preliminary ideas

Conducting these interviews resulted in the collection of a large amount of information, which the researcher needed to filter and process in some way to narrow down the scope. The first step was to sort out the preliminary ideas according to the classification criteria followed by the

company's experts when providing departments' information. Internal data that was already being sold was directly discarded along with the data that included sensitive, customer or confidential information as it is neither organizational data or nor may involve legal problems. Second, ideas about products or systems whose internal information available was not sufficient to become a business opportunity were also eliminated. Finally, all ideas that were not known to be of interest to a third party, that is, the lack of knowledge regarding to whom to sell, were removed.

After this first filtering, a diagram of current potential ideas was created that allowed the analysis to continue. It listed the remaining potential candidates for monetization along with their corresponding department and contact persons. To further clarify the ideas, a second-round of interviews was conducted. In this case, 15 people were interviewed (see **Table 2**), most of them from the first round and some others were new, suggested by their colleagues. For these interviews, more detailed questions were included to find out if the data was internal or not, given the difficulties in differentiating them. Thus, the real meaning and role of internal data within their company was explained and exemplified so that the employees could match and/or apply it to their preliminary ideas.

Table 2. Total people interviewed in the second round

Department	People interviewed
International Sales	2
Domestic Sales	1
Product Management	12
Total	15

Internal data is, for example, the anonymous usage of a product, information about what kind of customers the company has, or purchasing behavior. But it does not include data on, for example, that person X has entered work at 8 a.m. and left at 2 p.m., or how much company X bought from the case company. It was also stressed out that the goal was to sell data and not services. Some of the questions that were asked are:

- Does the data we are talking about legally belong to the company?
- Is this information owned by the company or the customer?
- The existing idea of monetization is based on internal information and for the company it is clearly valuable but, is it also beneficial for a third party?

- Can existing internal data have implicit monetary value or must it be combined with non-company information to imply a monetization opportunity?

These questions were decisive for the investigation and optimized the filtration of ideas to the maximum. The next section will explain in detail the process of consolidating potential business ideas.

4.4 Consolidation of business potential ideas

After the two rounds of individual interviews, it was clarified and specified which of the ideas could represent a business opportunity and therefore needed to be studied in detail. The remaining ideas were three (see **Table 3**) and for them an individual business model was performed in order to evaluate the potential for customers in the industrial segment, together with a legal and technical feasibility study.

Table 3. Total business potential ideas

Department	Business potential ideas
Domestic Sales	1
Product Management	2
Total	3

The template for the business ideas was created using the Business Model Canvas (BMC) by Osterwalder & Pigneur (2010), composed of nine building blocks whose interaction constitutes the business model (see **Figure 8**). The BMC framework helps identify the most important activities and stakeholders of a new business model. It addresses the value proposition for customers, the relationships with them, as well as key channels and sources of revenue of the business model. By addressing the most critical parts, it is easier to analyze the feasibility of value-added services for a given company.

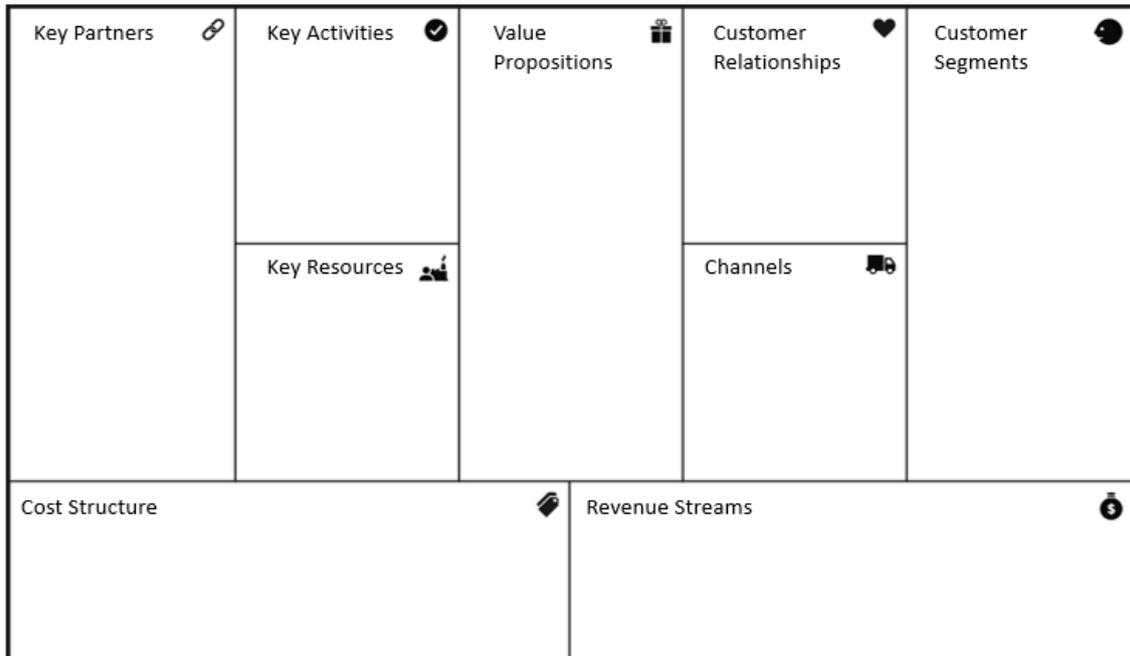


Figure 8. Business Model Canvas template (Osterwalder & Pigneur, 2010)

In order to complete these templates, it was necessary to understand what the current opportunity situation was, that is, the existing problems to be solved, the needs that could be satisfied with them, and the preliminary solution that was going to be provided. Therefore, the most relevant thing was to know for whom value was being created and the implicit benefits. **Customer segments** are comprised by all the people or organizations for which a company creates value, including users and customers who pay for the product, and satisfy their needs through goods or services (Osterwalder & Pigneur, 2010). In this case, the objective was to expand the clients' portfolio, i.e. not only attract existing customers but also new ones. In addition to customers, monetization ideas were defined which, following with the BMC blocks, corresponded to the **value proposition**, in charge of solving these customers' problems and satisfying their needs. (Osterwalder & Pigneur, 2010)

The following step was to identify the **channels**, which are the means through which the value proposition is delivered to the customer segment via communication, distribution, and sale. Since the main asset was data, the target was to find the safest way to distribute it. **Customer relationships**, which determines the type of relationship that a company establishes with its clients, attracts, retains, and expands the portfolio, were aimed at creating a long-lasting linkage. For developing this idea, it was necessary to check the willingness to pay and the desired data format, so the **revenue streams** were settled, which refer to the income generated by a company

from each customer segment, including from sales to advertising. **Key resources** describe the most important resources for the business model to create, deliver and capture value, and also serve as a representation of a company's operations, determining what physical, intellectual, human, and financial resources are required to ensure smooth operations. **Key activities** show the aspects that need to be carried out for the business model to work. They impact the creation and delivery of value proposition, the development of customer relationships, and the generation of revenue streams. Production, problem solving, and networking are the main categories of key activities. **Key partners** or key alliances describe the network of suppliers and partners that help to develop the key activities. Partnerships are built to reduce risks and acquire resources, which were not the main focus in this first stage of monetization. Finally, **cost structure** describes all the costs incurred to implement the business model. (Osterwalder & Pigneur, 2010)

Apart from this, a feasibility study was conducted in collaboration with the IT and Legal departments. When developing a business model, it is necessary to know its practical and legal possibilities. In this case, as it is internal data, it is a very sensitive issue whose decision cannot be concise nor affect the business until a final product or service is developed. For this reason, this analysis consisted of a release of premises about possible future monetization opportunities in terms of data collection and use, as well as distribution channels and GDPR issues. In order to continue developing ideas and see whether they represented a real-world monetization opportunity, it was required customer insight and validation. To do this, the segment of potential customers was contacted directly, a process that will be explained in detail in the next section.

4.5 Validation of business potential ideas

On a theoretical level, the monetization ideas were potential and had a logical and preliminary business model. However, the transition from being an idea to becoming a real opportunity can only be made after validating personal assumptions with the potential stakeholder segment. A stakeholder is someone who has a vested interest in the organization and can both affect or be affected by the business. People who work in the organization are clear stakeholders as are customers, shareholders, suppliers, and vendors. (Fernando, 2021)

Most of the ideas developed could greatly improve internal efficiency and support case company awareness, but here the real goal was to have something to sell. The next step was to

contact the preliminary customer segments. Two ideas included either partners from the case firm's clients or current company's customers. The sales department had already had contact with them, so they gave me direct information and help. However, in the remaining idea, the potential clients were totally new and unknown, so a comprehensive search was carried out on LinkedIn (the world's largest professional network on the Internet) and companies' websites. In this case, the search was primarily directed at business development management departments, as they provide the best potential fit for the purposes of the study.

In total, three interviews were conducted: two of them face-to-face and one online. The on-site interviews consisted of the interviewees, contacted by two salespeople who were also present and took the reins, agreeing on the place and time, and the researcher, who developed and executed the interview. Interviews were conducted in English, with some interventions in Finnish (clients' mother tongue) to avoid doubts with the translation of technicalities. On the other hand, the online interview was attended by two business development directors (the clients) and the researcher, and in this case the language used was only English. None of the three interviews were recorded due to the sensitivity of the subject. The main objective was to receive validation and feedback, and the interviews guide was as follows:

1. **Presentation of the student.** With the aim of providing a context that would allow establishing a bond of trust with the customers and fostering further discussion on the subject, a brief introduction about the researcher and current role in the case company, i.e. the thesis topic, were made.
2. **Presentation of the current situation.** After the personal presentation, the most important aspect was to clarify the purpose of the meeting. The existing problem was explained and how the case company's internal data could help solve it. The benefits that the suggested opportunity would bring to them and their own clients in the event of future development were also highlighted.
3. **Topics of the questions.** The interview questions were adapted to the role of each person and the discussion and exchange of ideas were always inspired. Some of the topics mentioned were related to:
 - Level of awareness about the identified problems
 - Interest in that the case company provide them with the necessary internal information to help solving the problems

- Additional optimal solutions to solve the challenges
 - End-result expected (format to transfer the data, e.g. good, service, etc., how often they would like to refresh the data)
 - Channel to interact with the case company
 - Willingness to pay for the end-result (in the form of good or service)
4. **Additional information.** Finally, an understanding of the idea in the development stage presented was requested. There was space for suggestions and open questions as well as for the presentation of other needs that a priori could be solved to a certain extent with internal data of the company in question.

Feedback received after conducting these interviews was the absolute key to hindering or supporting the execution and development of business models of current monetization opportunities with internal data. This will be explained in detail in the next chapter: the analysis of the results.

5 RESULTS

This chapter presents the results of the empirical research and answers the main research question on which the whole study revolves: **What kind of monetization opportunities does internal data enable for an industrial company undergoing digital transformation?** The results are divided according to the three areas where at least one monetization opportunity has been identified from internal data. Due to the nature of the business, the areas are related to security and locking: Master Key System (MKS), Time and Attendance solution (T&A), and Smart locks. A Business Model Canvas will be illustrated to better understand the surroundings of each opportunity. The validation given by the clients, who completed or stopped the development of the opportunities, determines the individual feasibility analysis. This means that, if the idea was positively considered, the study will be presented. Otherwise, only a few premises will be presented. The clients were selected according to salespeople recommendations and personal criteria.

5.1 Master Key System

The business opportunity detailed below encompasses internal data on the status of the Master Key System, that is, information on when the system should be renewed and replaced with a new one. The BMC was developed from the data and notes collected during the interviews carried out in the case company, and subsequently completed with the customer segment discussion. In this case, the idea was highly validated, leading to a short but concise study on the technical and legal possibilities of using this data.

5.1.1 Business Model Canvas

The business model for the MKS opportunity is explained below (see **Figure 9**). According to the existing problem and unsatisfied needs identified, the preliminary input will be a new scheme based on the old system scheme for creating the Request for Quotation (RFQ). The RFQ, also known as an Invitation for Bid (IFB), is a business process in which a company requests price quotes and offers from selected suppliers and contractors for the opportunity to fulfill certain tasks or projects. During the bidding process, information such as price, payment conditions, quality level per item or duration of the contract can be requested. (Kenton, 2020)

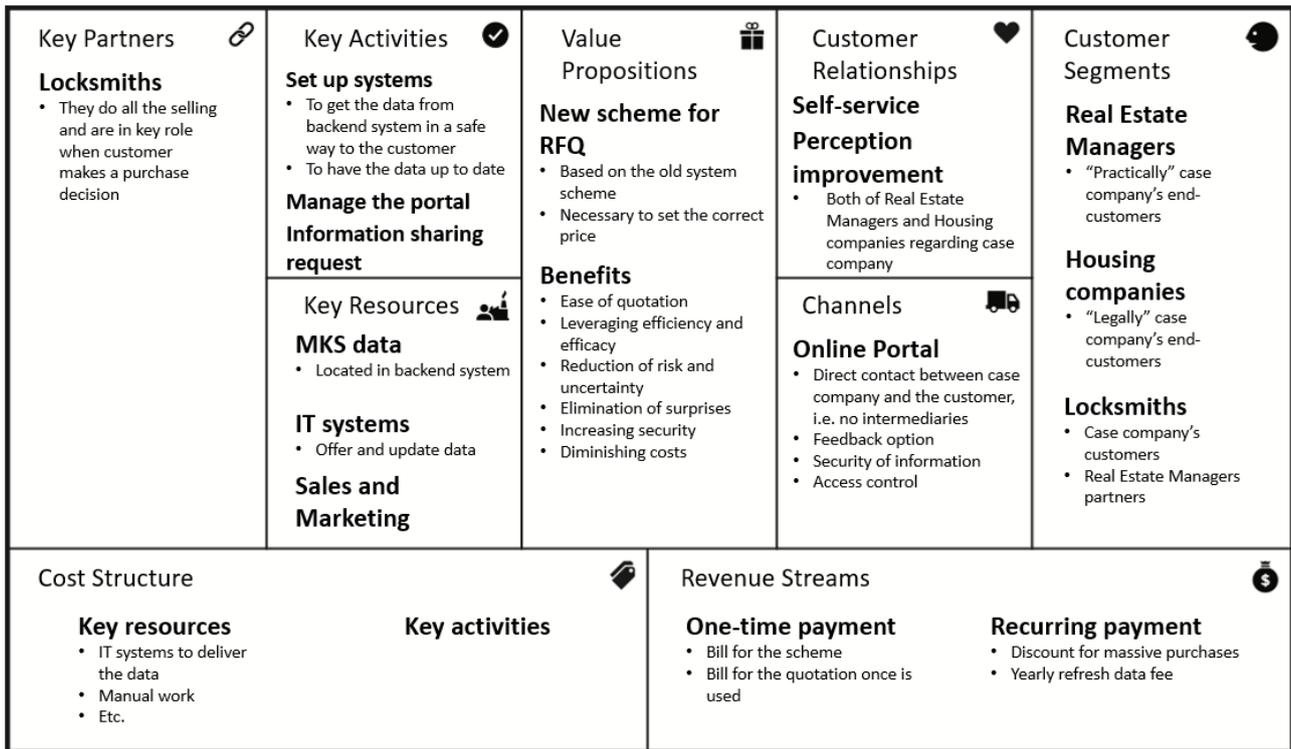


Figure 9. MKS Business Model Canvas

Customer Segments. Locksmiths are the current customers of the case company. Their main activities include changing the entire Master Key Systems as well as influencing and offering customers the case company’s products. Real Estate Managers are the customers of the locksmiths, in charge of controlling and managing operational aspects related to land and buildings, i.e. everything related to housing companies. Their duties typically include arranging leases, supervising maintenance workers, or advising on sales and property development. In practice, they are the end-customers of the firm studied, as they do the practical work and need to provide locksmiths with an accurate RFQ. However, the housing companies are the ones who pay, so they are the real end-customers. They use the services but do not have further information or see the problems involved in the keys.

Value Propositions. The preliminary format in which the data will be offered is a new scheme based on the old system scheme for creating the RFQ needed to set the correct price. This brings many benefits not only for the *Real Estate Managers* (see **Table 4**), but also for the other two parties involved.

Table 4. Real Estate Managers benefits

Benefits for Real Estate Managers	
Ease of quotation	Obtaining adjusted Request for Quotation documentation (filled with MKS data) in order to later receive more accurate offers from the locksmiths
Leverage efficiency and efficacy	It will be easier to reach locksmiths and performing the activities in general
Reduce risk and uncertainty, therefore increasing security	Being aware of the necessity of creating a completely new system allow them to anticipate challenges and solve them before they occur
Diminish costs	The RFQ will be adjusted to every MKS
Eliminate possible surprises and customer complaints	Housing companies will be aware if any locks or keys review are necessary in case they are missing or stolen

Consequently, this would directly benefit REM's customers, that is, *housing companies*. Uncertainties and surprises that may arise due to the lack of information will be eliminated and costs will be reduced, since the RFQ will be adjusted to each Master Key System. In this way, if *locksmiths* know all the building conditions, they will be able not only to offer a better service, but to know exactly which system they have to change without going through the door-to-door verification (current procedure), and also provide estimate based on case company's internal system.

Channels. The new scheme is intended to be delivered to the customer through, for example, an online portal. In this way, a direct contact is enabled between the case company and the end-customer, where there are no intermediaries and feedback can be exchanged. Furthermore, information security could be improved by giving customers the opportunity of controlling who has access to what.

Customer Relationships. Self-service and perception enhancement are the type of functionalities that will allow the company to create a long-term and lasting relationship with the customer segment. The case-company will provide information on the options for the

renovation plan with the necessary forecast of years, which will allow to recognize in advance future trends to adapt product specifications with upcoming needs and anticipate possible challenges. In this way, REM and housing companies (common people) will get an improved perception of them. Moreover, they will eliminate surprises about when or if a system change is needed, or even present the idea of renewing the system largely, e.g. upgrade to electronic.

Revenue Streams. Regarding the payments, there are two possibilities: one-time payments, for example a bill for the scheme or the quotation once is used; and recurring payments, e.g. discount for massive purchases or a yearly fee charged for refreshing the data.

Key Resources. The main activity will not be able to be completed without, of course, the MKS data, which is the internal information located in the backend system, IT systems, which are in charge of offering and updating this data, as well as the activities related to sales and marketing.

Key Activities. The tasks that will be developed will be the systems' set up, necessary to get the data from the backend system safely to the client and have the data updated for them, in addition to the verification of the end-customers system to share information. In the case that the final channel established is an electronic portal, maintaining it will also be a fundamental activity.

Key Partners. The fundamental partners are going to be the locksmiths, in charge of doing all the sale in addition to playing a key role when the client is making decisions between products. If possible, it would be a good idea to partnering with some organism that provides with information regarding who are the Real Estate Manager that manage each housing company, at the moment unknown for the case-company.

Costs Structure. This information cannot be completely accurate as ideas have been worked out rather than an established service or product. However, a priori, the highest costs would arise from the combination of Key resources and Key activities (IT systems to deliver the data, manual work etc.).

5.1.2 Customer feedback

The selected customers to conduct the interviews and provide validation and approval have been two Finnish Real Estate Managers. The interviews were aimed at solving several issues and the feedback received can be seen in **Table 5**.

Table 5. Real Estate Managers feedback

Issues	Feedback received
Level of problems' awareness	If they are aware of whether it is necessary to order a new MKS for their housing companies, is either because the locksmiths (their partners) tell them or because of the case company's salespeople. In general, the role of case company's system is unfamiliar to them.
Interest and willingness to pay for the end-result	They would be willing to pay for receiving case company's internal data to facilitate the quotation, e.g. RFQ scheme.
Channel to interact	Quotation portal. They want direct contact between case company and the end customer (feedback ensured), security of information, and control of who has access to what.
End-result expected	<ul style="list-style-type: none"> ▪ Refresh the data once or twice a year, including MKS status. ▪ The repair plans forecast is made for 5 years (and some of them will change to 10 years soon), so they need the annual update to always adjust to this X-years prediction. ▪ Information package on the options for the renovation plan with these X years ahead (recognize in advance future trends to adapt product specifications with upcoming needs and anticipate possible challenges) ▪ Obtain a margin of error as close as possible to 0, nowadays obtained by visiting the buildings one by one.

For all the above, the idea of monetization was concluded as potential in the real world, so the development of a product or service enters the case-company roadmap. The BMC can be detailed and customized for each company once the final product or service demanded is designed.

5.1.3 Feasibility analysis

Given the positive validation of the clients, a feasibility analysis or data governance scheme of the opportunity is required. It includes the practical as well as the legal possibilities (GDPR) for collecting and using the data.

Legal feasibility. As the data about the MKS status is about end customer's system, their approval for sharing the information will be likely needed.

Technical feasibility. From the technical point of view, if the potential idea ends up being a business opportunity, it is very feasible. It would be possible to set up any type of system (online portal, interface, load the data, etc.) to get the data from the backend system in a safe way to the customer. The only problem is that the database will require changes to commercialize the data. Another thing that must be taken into account are the payments. Recurring payments are quite challenging, so they have to be considered carefully.

Additionally, in the backend system there is information about the name, address, etc. of the housing companies but the Real Estate Manager that manages them is unknown. Then there are two options: advertise the service for the REMs to contact the case company; or contact the REMs manually one by one and ask whether they will be interested in the service or not through Google or public company information registered (YTJ). This decision will depend on what is offered. If the case company offers something that will lead into more business, then some manual work can be done. However, if the service provided does not generate the case company an additional revenue, then it is waste of time.

5.2 Time and Attendance

The business opportunity detailed below encompasses aggregated and anonymized data on the influx of people in time slots regarding lunch, enter and exit of their jobs, collected by customers as a side product in their case-company products. Note that this is just an idea in its development stage, and no business decision will be made without customer authorization. The BMC was developed from the data and notes collected during the interviews carried out in the case company, and subsequently completed with the customers' discussion. In this case, since the opportunity was not approved by the customer segment, the feasibility study has not been carried out in detail, and only brief explanations have been given on how feasibility would look like at a technical level. In a nutshell, since the data that was intended to be sold was aggregated data, the main work would be the "anonymization" process. It might have been necessary to set up a new type of system to collect the data from Time and Attendance system.

5.2.1 Business Model Canvas

The business model for the T&A opportunity is explained below (see **Figure 10**). According to the existing problem and unsatisfied needs identified, the preliminary input will be reports or statistics based on aggregated and anonymous data from the internal system.

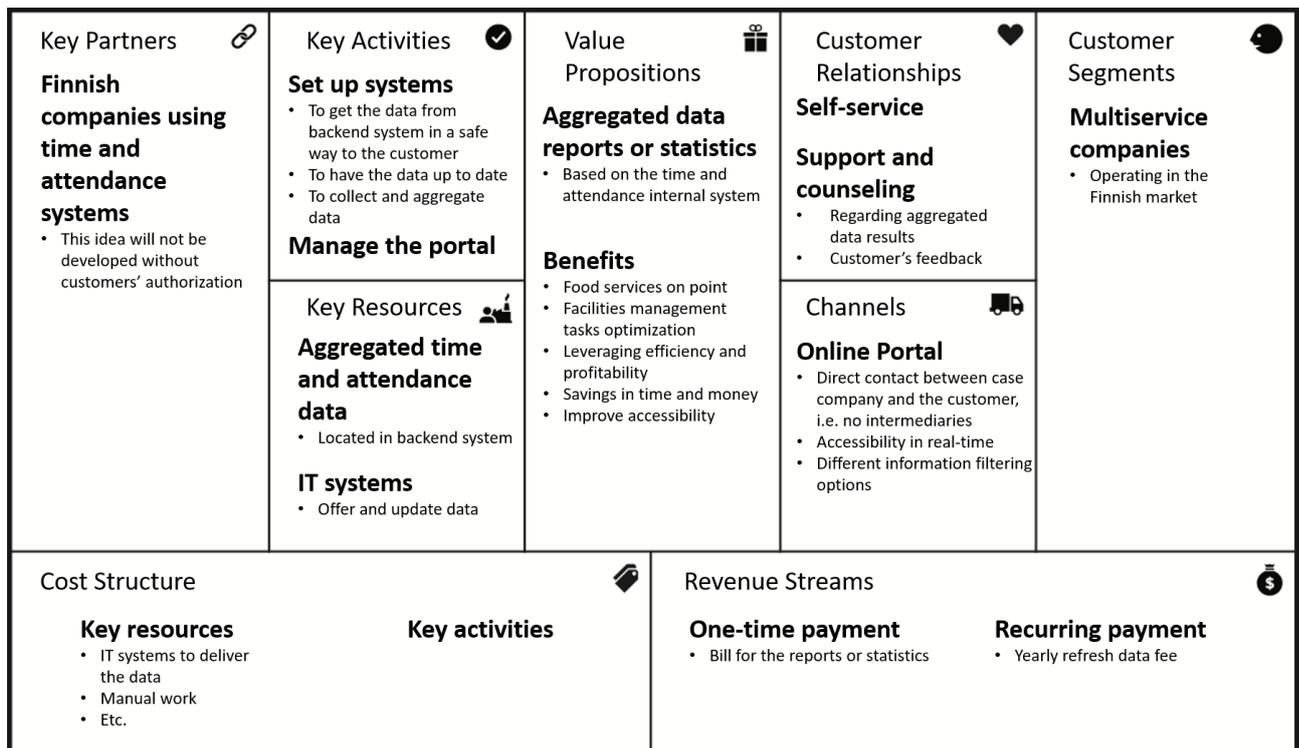


Figure 10. T&A Business Model Canvas

Customer Segments. Multiservice companies operating in the Finnish market. A multi-service company is one that does not carry out a specific activity, but rather provides a multitude of services to other companies. For example, a company that offers its security, restoration, cleaning, courier, building maintenance, gardening, transportation, etc. services to others.

Value Propositions. The preliminary format in which the data will be offered are reports or statistics based on aggregated and anonymous data from time and attendance internal system. This brings many benefits that can be summarized in **Table 6**.

Table 6. Multiservice companies benefits

Benefits for Multiservice companies	
Food services	<p>The customer is at the heart of their business, so they take a lot into account not only the healthiness, variety, and quality of food, but also the environment. By knowing the time slots in which people have lunch they can:</p> <ul style="list-style-type: none"> ▪ Adapt meals and plans of lunches to personal time preferences, i.e. on-time service delivery for customers. ▪ Adjust the amount of food production with demand, therefore preventing stock scarcity and reducing food waste. ▪ Place capacity control. Thanks to the estimation of people in each meal shift, the capacity could be controlled. This would be a measure fully in line with COVID-19, which will offer them a competitive advantage and improve the customers' experience.
Facilities Management	<p>Cleaning and laundry tasks can be optimized:</p> <ul style="list-style-type: none"> ▪ No one visited the building, no need to clean or wash the cloths ▪ Easier to know where the building is empty ▪ Adjust cleaning personnel schedules to maximum/ minimum people influx. For example, 70% people enter working in the e.g. 8 a.m. slot à more personnel is required ▪ Increase efficiency, personnel will clean more deeply if they know more people were in an office <p>Security services could be increased in peak hours Waste management could be reduced if food services are to the point</p>
General business	<ul style="list-style-type: none"> ▪ Increase efficiency and profitability ▪ Save time and money ▪ Improve accessibility

Channels. The reports and statistics are intended to be delivered to the customer through, for example, an online portal. In this way, a direct contact is enabled between the case company and the end-customer, where there are no intermediaries and feedback can be exchanged.

Furthermore, the accessibility would be in real-time and different information filtering options could be added to facilitate the search.

Customer Relationships. Self-service, support, and counseling are the type of functionalities that will allow the company to create a long-term and lasting relationship with the customer segment. The case-company will provide insight regarding the aggregated data results and enable two-way feedback for clients.

Revenue Streams. Regarding the payments, there are two possibilities: one-time payments, for example a bill for the reports or statistics; and recurring payments, e.g. a yearly fee charged for refreshing the data.

Key Resources. The main activity will not be able to be completed without, of course, the aggregated time and attendance data, which is the internal information located in the backend system, and IT systems, which are in charge of offering and updating this data.

Key Activities. The tasks that will be developed will be the systems' set up, necessary to get the data from the backend system safely to the client and have the data updated for them, in addition to collecting and aggregating data. In the case that the final channel established is an electronic portal, managing it will also be a fundamental activity.

Key Partners. The fundamental partners are going to be Finnish companies using time and attendance case company's system. Please note that this idea will not be developed without customers' authorization.

Costs Structure. This information cannot be completely accurate as ideas have been worked out rather than an established service or product. However, a priori, the highest costs would arise from the combination of Key resources and Key activities (IT systems to deliver the data, manual work etc.).

5.2.2 Customer feedback

The selected customer chosen to conduct the interviews and receive validation and approval was one of the main multiservice companies operating in Finland. The interviews were aimed at solving several issues and the feedback received can be seen in **Table 7**.

Table 7. Multiservice company feedback

Issues	Feedback received
Level of problems' awareness	They are aware of when the people go to eat (if they are on site). Security services (part of facilities management) do not need more research, they know occupancy of the meeting rooms, estimations of the number of visitors they are going to have, etc.
Interest and willingness to pay for the end-result	No, they already have some historical data in general terms, so the aggregated data from the Finnish market does not add value.
Channel to interact	Online portal. They want direct contact between case company and the end customer (feedback ensured), accessibility in real-time and different information filtering options
End-result expected	<ul style="list-style-type: none"> ▪ How many people have come to the office today? (In numbers, not %) ▪ What group of people those people belong to? ▪ They need metadata around the big mass of data (side-specific data level), i.e. specific data in real time for their operations to support their planning, personal information ▪ Examples: <ul style="list-style-type: none"> - Comparison between different days, or companies - Number of people in the building - Are they employees or external personnel? ▪ How new clients operate in their environment (offices, rooms, etc.)

For all the above, the idea of monetization was concluded as non-potential in the real world since the interest of the customer segments was not based on the internal data of the case company but on customers' data. Given this result found during the validation process, the most feasible solution would be the partnership between the case company, the customer, and the multiservice company, topic that remains outside the scope of this thesis.

5.3 Smart locks

In accordance with the research design, the scope of the project included internal data of the case company pertaining both to solutions already launched on the market and to future

scenarios. In this case, the identified opportunity is based on a new smart lock solution still under development. Internal information encompasses access and status data collected through the smart features available in the product. This information includes, for example, who opened a lock and when; when and how user access rights have been updated; battery level status; as well as if there have been failed openings, among others. The advantage of this opportunity in contrast to the other two is that the end-user licenses for the solution are not finalized yet, so it is still possible to consider that while most of the smart lock data has to be owned by the customer, perhaps the case-company could retain a permission to use some parts of the data.

As evidenced on numerous occasions, it is essential to know whether the information legally belongs to the company or not, that is why end-user license contracts with clients play a key role. There is the possibility of formulating them in such a way that some part of the value-added data remains the property of the case-company and the immediately needed transactional data remains the property of the customer. This means that the case-company could monetize the automatic aggregation of data on the condition of a building or statistical data on products, e.g. lock A has been used more than expected and needs to be repaired. However, the customer would still be the owner of the transaction itself, that is, the specific information, e.g. person X left the building. Given the duration of the project and the limitations of the working life, it has been impossible to validate the identified opportunities with the clients. This means that, unlike the other opportunities, neither a BMC nor a technical-legal feasibility study has been developed. This section includes the potential opportunities found as well as the next steps to be followed by the company once this research work is completed.

5.3.1 Preventive maintenance purposes

The first opportunity is intended to use the data for preventive maintenance purposes. Once a device has some kind of maintenance problem, the end-customer has to call the locksmiths so they can offer their services. But none of the customers know when or whether these maintenance services will be required. This means that e.g. one lock on the main door of a shopping mall is broken, so the shopping mall has to contact the locksmith, and the locksmith has to go and repair it. Therefore, the customer segment of this opportunity are locksmiths who work with maintenance companies. They currently provide installation, distribution and sales, and the main aim is to help them sell better maintenance services. This will also indirectly

benefit end users and companies using smart locks. These smart locks will generate a large amount of event data that could be used for various purposes.

Anomalies detection. This information could be used to detect failed openings, for example too many failed access attempts at night due to not having appropriate access rights or due to an error code, or to check the status of the battery level. Combined with Artificial Intelligence (AI), it could also be used to find out e.g. why people use a longer route than necessary, why they use a door that is not normally used, and also to notify the customer when there is a broken product and cannot be used.

Anticipation, pre-service. Knowing which are the most used doors and locks, building owners can request services based on that and make an agreement with maintenance companies, in which the maintenance contract is based on the actual use of the door rather than an estimated time, such as a service after 100,000 openings.

5.3.2 Status of the buildings

The second business opportunity encompasses internal data on the status of the buildings. The smart locks will collect information about how many persons have entered a building during a specific timeline. Therefore, the customer segment of this opportunity is building owners such as business parks or commercial offices. The case-company can provide end-users with aggregated and anonymous reports about buildings status for them to utilize them for several purposes.

Controlling appliances/devices. This data could be used to automatically set the heating, air conditioning or lighting systems in certain rooms, floors, or hallways to the correct level. For example, if only 50% of the capacity of an office is full, the customer can be warned not to use 100% of the lighting. Similarly, if the office is empty, they could be warned to turn off all the lights or not heat or cool a place with low estimated capacity too much. The benefits involved would be the efficient use of resources, which would directly reduce energy expenditure and costs.

Facilities management. The estimation of cleaning times could be optimized. For example, if no one visited the building, it is not necessary to clean it, or if e.g. 10,000 people used the back door and the next hallway in the morning, warn customers to ask their cleaning team to clean

the place before it is used again. Similarly, security services could be increased during peak hours.

Parking services. Depending on the number of people who drive to the offices (there is also access control at the parking doors), inform companies if they need as many parking spaces as they currently have or if it is necessary to rent more. This could be applied to numerous other services.

5.3.3 Next steps

The first thing to do with this opportunity is to interview the customer segment. At the moment, both locksmiths working with maintenance contracts and business owners have been contacted and either have not responded yet or the response has been to hold the discussion in the near future, but outside the thesis timeframe. Once the opportunities have been validated or not, it will be possible to search for additional possibilities with the same data package, depending on the needs of the clients, create the business models and, in case of positive validation, have more specific information with which to carry out a technical-legal feasibility study.

In order to analyze the opportunity environment, since there was not enough information to develop an accurate business model, a detailed study of potential competitors was carried out on their data monetization practices. Currently the level was very low, but just as the company in question has decided to carry out this study, other competing companies can do the same, so they should be vigilant. As it is a service still under development, it is very important that the contracts are made in such a way that the company keeps the necessary internal information to be able to monetize it, as explained above. This will be one of the main competitive advantages for the case-firm.

In the industry, the trend of gathering sensor data from various smart devices will allow the collection of information on, for example, temperature alerts, location, and product handling, which will generate a multitude of new opportunities. Lastly, key partners are believed to play a critical role here. For the moment they will be software companies, systems integrators, but also other ecosystem holders. This refers to the fact that, if a contract is made that promotes the monetization of internal data, it will be possible to use, for example, information on the number of people who have activated the cloud service account, which translates into the number of

users of a certain client or lock. All this must be studied in detail and always authorized by the company's clients and partners.

6 DISCUSSION

Following the line of the research question, the main mission of this study has been to find out business opportunities with corporate information. Accordingly, a detailed analysis of the case-company's internal data and technical-legal feasibility studies have been delivered. However, it was the validation and insights received from customers what determined its development. Even so this objective has been always maintained as a priority and the results are aligned, during the research, several details have emerged that have been transcendental to fully define the company's relationship with data monetization. When a challenge or topic is presented by an organization for further study, either some type of research has already been done or there is knowledge on how the idea can be executed. In this case, the situation has been a bit ambiguous and, although during the first interviews the employees seemed to understand the topic background and gave clear and concise answers to my questions, the barriers and complexity of what data monetization really involves, and its real usefulness has been shown up with the pass of the time. This chapter offers a detailed explanation of the results obtained together with managerial implications and recommendations for overcoming the existing barriers that prevent the case company from differing the monetization processes.

6.1 Results interpretation

The case company is a traditional corporation with a long trail and well-established organizational structure and business culture. They have shown to have a fundamental balance in the personnel, since they count on people who have been working for many years and know in detail the history and the value proposition, which generates great stability. But also on visionaries, who are fully aware of new trends, customer demands, and are open to change and transform the business. Adapting the business today is a basic requirement to survive and prosper in the market. This is mainly because the environment in which companies operate is constantly changing, which translates into new business possibilities. The transformation of the digital world and the adoption of new technologies has led to practices such as the monetization of internal data. Data monetization involves the transformation of systems, software, and databases, which requires a culture that promotes, facilitates, and drives data. In other words, it is necessary to make decisions based on data. It is not enough to obtain quality data and have analysts who generate conclusions based on the information, but also that the reports are

available and visible to everyone with the ability to choose the most appropriate path (Sarganas, 2017).

For companies that are going through a digital transformation, as is the case-company, it is an arduous task to undertake data monetization practices that end up being implemented and becoming a real business. This is somehow due to the business culture. As we have seen in the analysis of opportunities, at the technical level it is totally feasible since it requires e.g. creating new systems to collect data or cloud computing systems for greater accessibility and data transfer. Regarding payments, depending on the final business models that the company in question creates for monetization opportunities, they must consider the Payment Services Directive 2 (PSD2). The aim is to protect consumers who make payments online, promote open banking and make cross-border payment services more secure (European Commission, 2015). In terms of privacy, PSD2 includes a new regulation on the handling and protection of consumer financial data. At the legal level, the case company has been fully aware of the GDPR situation from the beginning, hence the desire to carry out a legal analysis for each monetization opportunity found. However, the data must be embedded in the culture, which is not that easy to construct. Thanks to the empirical study carried out, the discovered factors that may limit the monetization of internal data in industrial companies nowadays have been listed hereafter. Data monetization requires of data-based decisions and for this the available information in the firm has to be known, understandable and visible to everyone. Finally, the place they occupy within the daily activities of the company and the attitude towards their use must be known. All of this is explained in detail below.

An important aspect to consider when monetizing (internal) data is having an accurate picture of the current state of a given company's data and the added value. One of the factors discovered after carrying out this research has been the lack of a data classification framework, which hinders the global perspective that the company has on the data. The typology (internal, external, combined), category (raw data, metadata, data sets) and ownership (company, customers) of the available data is essential information to thrive in the search for monetization opportunities. Differentiating what is internal data from what is not has been proved to be a complex process. Theoretically, it is understandable that internal data refers to information generated by the company, customers, products, services, etc. that legally belong to them. What is really a challenge is to make this distinction with real data, and this is because the company

does not yet have a “tool” to differentiate them. In the second phase of interviews, there was a transition from having 10 or 12 potential ideas to 3, and the elimination of many of them from the study was related to the fact that the owner was the client. It has also been observed that while some departments are aware, or at least are open to innovation and promotion of the use of internal data, other departments put the search for opportunities aside due to the "apparent non-existence" of internal data generated by their department. Apart from Master Key System data where the entire company agreed that there could be potential, overall, there was great difficulty in finding suitable internal data for third parties. The way data is conceived and shared within the company drives this challenge.

Another main limitation derived is that the value of the data is not something tangible nor does it have a clear direct applicability, which makes difficult to be evaluated both by companies and customers. As stated in previous sections, the value of data varies depending on context, situation, time, and individual perception (Fred, 2017; Parvinen et al., 2020; Merriam-Webster, 2021c), and this can be seen reflected in the case company. Some informants stated: *“it is very difficult to sell monetization opportunities to clients based on ideas, because that does not add enough value to them”* or *“I do not think that the added value of internal data is enough for them to pay for it ”*. One of the reasons why different business models have been designed is precisely to try to discover what and to whom value can be added, with the aim that the benefit provided to third parties in the long term is even greater than the purely monetary. For example, Apple publishes its internal data for public traded companies (Lumen, n.d.). But although this data is initially directed towards them, on many occasions can be interesting and significant for other companies in any business environment. This means that even though an idea initially had Company X as a unique and irreplaceable potential customer, the data can end up adding much more value to e.g. Company Y. Throughout this research project, numerous ideas have emerged that, before being treated as a business opportunity, have varied significantly due to the customer segment and the problems to be solved, i.e. the value added. For example, in the aggregated T&A data, the first customers segment were restaurants, but ended up being replaced by multiservice companies because they performed the activities of restaurants plus many more that could make the most with the same package of data.

The prioritization of the primary activities of the company has been another important factor in limiting activities focused on monetization. Referring back to the topic background, at the

moment the data business does not constitute a major business. This means that for companies that want to start monetization practices around data, it is difficult at first to see the potential and promise. As pointed out in many of the interviews conducted, the benefits of selling data are doubtful and they do not know to what extent the costs of implementing the opportunities (such as setting up a new backend system, creating new software or payment methods) are going to be less than income. So far, the typical procedure has been based on making quick profits through conventional in-house projects, and it has worked. Then, why should a company suddenly take a chance and invest in a seemingly risky data utilization project? In general, this company has shown certain risk-averse behaviors and on many occasions the interviewees have evaluated the risks of monetizing the data as higher than the potential benefits. Specific risks included losing the trust of customers or end-user, damaging the organization's market position if data is used inappropriately, and above all, fear of sharing data with third parties.

At this point, the case study company considers that most of its income comes from the main business and to a much lesser extent from secondary projects, that is, data monetization projects. For example, in one of the sections where the greatest amount of internal information is collected, such as the backend Master Key System data, only one monetization opportunity has been found. The reason is that many of the ideas were aimed at the sale of services and not data, as well as focused on improving internal affairs and creating added value for existing clients, rather than focusing or exploring a new market. This delays experimentation with data-derived offerings and, instead of seeing this tiny market as a perfect competitive advantage and enter it, they prefer to remain in the "safe place". Therefore, data sales initiatives are not prioritized, as the potential benefits of data utilization and the effort required are more likely to earlier accrue to internal processes and projects than to monetization.

In addition to core activities, the relationship with existing customers is also prioritized. This was noted for example in the selection of clients for the MKS and smart locks opportunity. Real Estate Managers contacted were known customers aware of the utilization of case company's internal data to solve their problems. Reason is that salespeople provided this information free of charge, as an additional service item or to maintain their customers' happiness. This approach avoids creating new offerings, such as monetization solutions, for new segments, since the goal is to continue creating value for current customers and sharing the data instead of selling it. Another sign that reflects the current customer-centric approach and the aversion to diving into

new markets was to try to offer, during the first stage, the internal information of the smart locks for free. This, however, had a double intention; the value of the data is very difficult to identify, as mentioned above, so here the objective was to offer it free of cost in order to demonstrate the value of the data: *“We do as Netflix did before, we offer a free trial month for you to see that this data can be useful to your business but then you have to pay X money. Giving the information for free and suddenly saying that they have to pay is not feasible”*. In this case, the approach is different because the data ownership is not yet established, so there is a possibility to arrange an agreement with the customers in a way that some of the added-value data remains as owned by the case-company, as previously stated. On the other hand, in the Time and Attendance opportunity, the customer segment was totally new and, although they did not validate the idea, the seed for a possible future relationship is already planted.

6.2 Managerial implications

The first aspect that is seen to greatly benefit the case-firm is the creation of the missing data categorization framework so far. Huge amounts of data are generated on a daily basis and society is aware, but it is a minority the one who really stops to think and seek solutions on how to get the most out of it. The data could be collected, for example, in an online portal, accessible to all members of the company, with the option of filtering by type, category and owner. This would allow to know what data there is, its type, which directly reflects who it belongs to, see updates in real time (data that no longer serves would be eliminated, or if there is an updated product, the relevant data is saved, and the others disappear) in a clear, fast, and orderly way. Once this is done, monetization opportunities could be sought with all types of data, and the possibilities would grow exponentially. From there, it would be much easier to identify the data and add additional information, such as potential stakeholders, creating business models, or identifying the possibilities at a legal and technical level. This would also be an advantage when deciding the format in which the data is sold, since it would imply a lower cost. In short, the task performed so far could be optimized, with information accessible in a safe, categorized, and transparent way for everyone. Some of the benefits that it would imply would be to better understand the situation of the company and its departments, facilitate the understanding of the data, the utilization purposes and value, transparency in operations, enable innovation and creativity but above all, take the entire company in one direction: succeed in a promising market.

After establishing contact with several clients, it has been observed that the general demand for monetization offers is not high, which does not exactly facilitate the opportunity potential. This is mainly due to two reasons: the data market is not a mass market, and, in many cases, customers do not see the potential of this type of solution. This is partly because some case-company employees do not share the view that monetization opportunities outweigh the development process involved in making these changes. This, coupled with the fact that core business and existing products are prioritized over data commercialization projects, directly impacts the view of customer segments on monetization, who also cannot appreciate the business possibilities with the data. This could be reduced if detailed studies were carried out and the credibility and real value of the solutions for clients were demonstrated on a regular basis, as has been done for this thesis. Increasing the offerings would strongly favor the demand, resulting in many business opportunities.

Some qualitative studies about data monetization in several industries (Laitila, 2017; Parvinen et al., 2020) show that, in addition to the fact that the data generates value for customers, the customers themselves must be prepared for the proposed solutions. Solutions are usually made with the objective of satisfying a common need or problem. In the interviews with clients, it was observable how, despite understanding the situation and being aware that the proposal could solve more than one problem, some of them did not fully understand the real value that this data could have. However, the multiservice company for example, whose maturity with respect to the use of data was quite advanced, despite rejecting the idea of aggregated data, repeatedly demanded the search for a solution based on specific data, which indicates that they understand the value of the data and share the potential. Lack of knowledge of the value of data and lack of customer demands slows the start of data monetization projects but does not make it impossible.

It is important to carry out more market analysis studies and complete the organizational structure with professional profiles dedicated solely and exclusively to data analysis. The efficiency and proper functioning of their IT department is assured, but to monetize the data, profiles are needed that are dedicated to having data with the required quality, accessible to those who need it and placing the data at the center of all strategic decisions. For example, in the financial sector, the regulatory framework has significantly influenced this transformation process and various projects are already being executed around the data and creating adjusted

profiles (Almajano, 2018). Some of these roles correspond to the Chief Data Officer (CDO), responsible of creating and executing data analysis and strategies to drive business value; or the Chief Analyst Officer (CAO), in charge of creating real business value through data analytics and promoting the company's data culture. It is a profile that must be focused on innovation and exploitation of emerging technologies to solve the challenges of the data environment (such as Big Data or IoT). In addition to these two, this company would also need a profile dedicated to providing useful information, measuring, analyzing and optimizing the business intelligence data of all digital initiatives through multiple channels.

Much more could be gained from operations and services, such as data monetization, if more innovative and disruptive approaches were incorporated into the case-company processes. One of the most important aspects of be innovative is to accept change, which permits to create a company's culture in which innovation is integrated in the same way as structure or leadership. One of the main challenges is the visibility and exchange of the available data and, to increase them, it is essential that the departments know and understand the real internal data generated by the organization not only in their own departments but also in others. From my point of view, this keeps a strong relationship with the interdependence of departments explained by García & Rocha e Oliveira (2012). Today, many companies seek the best way to be innovative, but still face many barriers that prevent them from achieving it. It is important to adopt an open market mind-set, i.e. open innovation, as the current global economy is characterized by open systems and problems. In the same way that open innovation is needed, the collaborative employee management is fundamental. Workers have to be creative, and able to improvise and think "outside the box". Working with several people (inside and outside the company) makes this task easier because a single person does not have the capacity or sufficient resources to do it. The information has to be shared by all the members and the collaboration and interaction must be among and within the departments (García & Rocha, 2012). It should be noted that, for this to work, the explanations in this case must be done mostly from top to bottom, which requires vision from the leaders to see in which direction the decisions are going.

7 CONCLUSIONS

After the in-depth analysis developed on the topic “Internal Data Monetization opportunities for an industrial company undergoing digital transformation”, it is possible to sustain that the research question and sub-questions raised in the first section have been essential to understand the relationship between the case-company and data monetization. Given the novelty of the phenomenon, its insufficient understanding, the lack of comprehensive empirical studies, especially in the modern business environment, and with the simple aim of shedding light to improve its general understanding and facilitate future research, this study has adopted a qualitative research methodology for its empirical part. It has been constantly promoted and supported by inductive reasoning and a largely exploratory approach.

Everything developed previously has allowed to respond the main research question, whose objective was to identify the monetization opportunities that internal data allows in the studied company. The sub-questions were defined to outline the main objectives. Understanding internal data and differentiating it from others, the ways to discover and recognize valuable data, the elements that can hinder and/or support the viability of data monetization opportunities, as well as the impact of different technologies, have been the main elements to consider when conducting the study. All these points have as their epicenter data monetization, which has also been explained in detail. The theoretical part has guided the research and analysis, since it explains how these concepts are believed to affect companies. However, it was after the completion of the research, mostly empirical, when it was possible to observe the applications of the theory in the business world.

Throughout the project, several factors have been resolved and concluded. Three opportunities have been found in relation to monetizing internal data. The first deals with the data of the Master Key System, whose objective is to know when it is necessary to renew the system and replace it with a new one. This idea was constructively validated by the clients, leaving only as a pending task the format in which the data would be delivered to the customers segment. The second is the in-between data from the Time & Attendance solution. It includes aggregated and anonymized data on the influx of people in time slots with respect to lunch, entry and exit from their jobs, collected by customers as a secondary product in their case-company products. This idea was not positively validated by customers, since they already had knowledge of the information offered. However, it opened the door to a possible collaboration together with the

case firm and their clients, with the objective of producing a win-win situation. Finally, the access and status data collected through the smart functions available in the new product of the company were presented. This solution is not yet launched on the market, so only possible opportunities were identified. As a next step, it is recommended to carry out interviews with clients and formulate contracts so that certain internal information remains in the possession of the company and, therefore, the relevant monetization projects can be developed.

As in any study, several limitations must be addressed. On a large scale, the results show that what started out as potential brainstorming can be turned into market opportunities if polished. For this, it has been essential to explain during the interviews carried out (main research method used) that the internal data is information that legally belongs to the company and is fully owned by them. This, together with the value delivered to the data, have been the main limitations presented. Their comprehension has been facilitated by carrying out analyzes of the environment visualized through BMCs, and technical and legal feasibility studies. In the external sphere, that is, in the interviews with stakeholders, the fundamental point was to know the value and benefits obtained through this data, a basic requirement to validate and determine the direction of the opportunities. However, if the company ultimately decides to further develop these ideas and transform them into something tangible, it will be necessary to conduct more research and tailor each business model to the appropriate customer segment.

Although the research interviews reflect the opinions and points of view of the interviewees, who are prone to error and subject bias, in this case the sample used has been very representative for the topic given. At least thirty people from different departments have been interviewed. However, many companies do not want to publicly discuss data monetization since society tends to see it as a dubious act, and this has been reflected in the case company so far. Therefore, the results of this study cannot be extrapolated with other companies, given the nature of the business, their position in the market, and their current relationship with digital transformation. Most of the restrictions of not monetizing data in this company are related to the business culture and the way of conceiving data. As explained in the results and the discussion, at a technical level it has been shown that, incurring a higher or lower cost, all the ideas discovered were feasible. At a customer level, their development has also been supported to some extent. However, there are doubts generated in the use of this potential in the short term. More accurate and experienced information is needed on how to sell data, rather than trying to sell hypotheses

and speculations validated with a small sample of the market. In addition, so far, most of the validations have been oriented towards existing customers, limiting the opening to new markets. On a final note, until the company conceives that creating additional value for customers through data is at least as important as doing it through new products and services, it will not be possible to implement data monetization practices. But this needs to be done at an all-inclusive level rather than from each department individually, and it is advisable to have a basic training in the subject, even when not working specifically in the collection and analysis of data.

Throughout this master's degree, it has been possible to understand the growing need for innovation in the digitalization of society. The choice of this theme has been a starting point in many ways. For the company, this work could be defined as the first contact between its deepest part, its internal data, with the outside world. This thesis project can be seen as a planted seed that lays the foundation for a future around data, but the limitations coupled with the findings clearly indicate the need to further investigate this topic. It is a rare practice (especially that of internal data monetization), which can bring many benefits although it is not fully accepted and internalized in society. On the other hand, this has been the starting point of my professional career. Having had the opportunity to collaborate with such a large company in Finland has been totally enriching. As has been proven throughout the project, directly or indirectly, each traditional theme needs to incorporate new changes. This work is clearly focused on practice since it has been possible to contrast opinions between people whose culture and data approaches are totally different.

Needless to say, it is almost impossible to define who will win this data battle (traditional companies, a specific sector, technology giants or new competitors), but the only thing for sure is that, due to the digital revolution, in future years the data sector will be radically different from the current one.

REFERENCES

- Abloy OY (2020). Digital Platforms. Guest Lecture given in LUT University for Intelligent Product Services Systems course
- Alavi, M. & Leidner, D.E. (2001). Knowledge Management and Knowledge Management Systems: Conceptual Foundation and Research Issues. *MIS Quarterly: Management Information Systems*, Vol. 25(1), pp. 107-136.
- Aleksandrova, M. (2019). Big Data in the Banking Industry: The Main Challenges and Use Cases. Eastern Peak. [Web Article] Available via: <https://easternpeak.com/blog/big-data-in-the-banking-industry-the-main-challenges-and-use-cases/>. [Accessed 26 Apr. 2021]
- Alfaro, E., Bressan, M., Girardin, F., Murillo, J., Someh, I. & Wixom, B.H. (2019). BBVA's data monetization journey. *MIS Quarterly Executive*, 18(2), pp. 111–128. doi: 10.17705/2msqe.00011.
- Almajano, C. (2018). El dato, el activo más estratégico de las organizaciones. [Online article]. Available via: <https://www.computerworld.es/negocio/el-dato-el-activo-mas-estrategico-de-las-organizaciones>. [Accessed 3 May 2021]
- Alonso, O. (2018). Monetización de los datos: la importancia de los datos para las empresas. *La Vanguardia*. [Online article]. Available via: <https://www.lavanguardia.com/economia/20180104/434058696189/monetizacion-datos-empresas-the-valley.html>. [Accessed 16 Mar. 2021]
- Barron's (2021). Internal data. Barron's Educational Series Dictionary. [Online dictionary]. Copyright in AllBusiness. Available via: https://www.allbusiness.com/barrons_dictionary/dictionary-internal-data-4953646-1.html. [Accessed 31 May 2021]
- Bengtsson, M., Müllern, T., Söderholm, A. & Wählin, N. (2009) *A Grammar of Organizing*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
- Birkinshaw, J., Brannen, M. Y., & Tung, R. L. (2011). From a distance and generalizable to up close and grounded: Reclaiming a place for qualitative methods in international business research. *Journal of International Business Studies*, 42(5): 573-581.

- Bryce, D., & Dyer, J. (2007). Strategies to Crack Well-Guarded Markets. *Harvard Business Review*. [Online Article] Available via: <https://hbr.org/2007/05/strategies-to-crack-well-guarded-markets>. [Accessed 26 Apr. 2021]
- Chen, H., Chiang, R., & Storey, V. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Quarterly*, 36(4):1165–1188. doi:10.2307/41703503
- Chiabert, P., Bouras, A., Noël, F., & Ríos, J. (Eds.). (2018). *Product Lifecycle Management to Support Industry 4.0. IFIP Advances in Information and Communication Technology*. doi:10.1007/978-3-030-01614-2
- Daley, J. B. (2015). *Where Data Is Wealth: Profiting from data storage in a digital society*. Play Technologies, pp. 1-158
- Davenport, T.H., Barth, P. & Bean, R. (2012). How Big Data is Different? *MIT Sloan Management Review*, Vol. 54 (1), pp. 43-46.
- Diffen (n.d.). Data vs. Information. [Website]. Available via: https://www.diffen.com/difference/Data_vs_Information. [Accessed 26 Apr. 2021]
- European Commission (2018). Communication from the commission to the European Parliament and the Council. Available via: <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1517578296944&uri=CELEX%3A52018DC0043>. [Accessed 28 Apr. 2021]
- European Commission. (2015). European Parliament adopts European Commission proposal to create safer and more innovative European payments. Available via: http://europa.eu/rapid/press-release_IP-15-5792_en.htm?locale=en. [Accessed 28 Apr. 2021]
- Faroukhi, A. Z., El Alaoui, I., Gahi, Y., & Amine, A. (2020). Big data monetization throughout Big Data Value Chain: a comprehensive review. *Journal of Big Data*, 7(1). doi:10.1186/s40537-019-0281-5
- Fernando, J. (2021). Stakeholder. Investopedia. [Website]. Available via: <https://www.investopedia.com/terms/s/stakeholder.asp>. [Accessed 4 Jun. 2021]

- Frank, A. G., Dalenogare, L. S. and Ayala, N. F. (2019) 'Industry 4.0 technologies: Implementation patterns in manufacturing companies', *International Journal of Production Economics*, 210(September 2018), pp. 15–26. doi: 10.1016/j.ijpe.2019.01.004.
- Fred, J. (2017). *Data Monetization – How an organization can generate revenue with data?* Master's thesis. Tampere University of Technology, pp. 1-61
- García, C. & Rocha e Oliveira, P. (2012). *Adopting a Market Mindset: Overcoming Hidden Barriers to Innovation*. IESE Insight. doi: 10.15581/002.ART-2149
- Gartner (2015) *How to Monetize Your Customer Data*. [Online Article]. Available via: <http://www.gartner.com/smarterwithgartner/how-to-monetize-your-customer-data/>. [Accessed 28 May 2021]
- Gartner (n.d.). *Gartner Information Technology Glossary - Digitalization*. [Website]. Available via: <https://www.gartner.com/en/information-technology/glossary/digitalization>. [Accessed 16 Apr. 2021]
- Gerlach, J., Widjaja, T. & Buxmann, P. (2015). *Handle with Care: How Online Social Network Providers' Privacy Policies Impact Users' Information Sharing Behaviour*. *Journal of Strategic Information Systems*, Vol. 24 (1), pp. 33-43.
- González, Y. (2020). *Datos internos en la empresa. ¿Qué son y para qué se usan?*. Atico 34. [Online Blog]. Available via: https://protecciondatos-lopd.com/empresas/datos-internos/#Que_son_los_datos_internos_de_una_empresa. [Accessed 3 May 2021]
- Hanafizadeh, P., & Harati Nik, M. R. (2019). *Configuration of Data Monetization: A Review of Literature with Thematic Analysis*. *Global Journal of Flexible Systems Management*, 21(1), pp. 17-34. doi:10.1007/s40171-019-00228-3
- Hao, K. (2019). *The computing power needed to train AI is now rising seven times faster than ever before*. *MIT Technology Review*. [Online Article] Available via: <https://www.technologyreview.com/s/614700/the-computing-power-needed-to-train-ai-is-now-rising-seven-times-faster-than-ever-before/>. [Accessed 15 Apr. 2021]
- Hartmann, P. M., Zaki, M., Feldmann, N., & Neely, A. (2016). *Capturing value from big data – a taxonomy of data-driven business models used by start-up firms*. *International Journal*

of Operations & Production Management, 36(10), 1382–1406. doi:10.1108/ijopm-02-2014-0098

Hernández, M. (2015). Analítica de cliente 360° y Big Data Analytics. SAS Forum España 2015. [YouTube video]. Available via:
https://www.youtube.com/watch?v=bCOBFxnYBKg&ab_channel=AnalyticsBusinessUnit%3ALogicalisSpain. [Accessed 16 Mar. 2021]

Kenton, W. (2020) Request for Quote (RFQ). Investopedia. [Website]. Available via:
<https://www.investopedia.com/terms/r/request-for-quote.asp>. [Accessed 17 Jun. 2021]

Kinnunen, S.-K. (2020) MODELLING THE VALUE OF FLEET DATA IN THE ECOSYSTEMS OF ASSET MANAGEMENT. Dissertation for the degree of Doctor of Science (Technology). Lappeenranta-Lahti University of Technology, pp. 1-63

Kurt, R. (2019). Industry 4.0 in Terms of Industrial Relations and Its Impacts on Labour Life. 3rd World Conference on Technology, Innovation and Entrepreneurship (WOCTINE), pp. 590-601, doi: 10.1016/j.procs.2019.09.093

Laitila, M. (2017). Data monetization: Utilizing data as an asset to generate new revenues for firms. Master's thesis. Aalto University, pp. 1-100

Lampadia (2019). Los datos: uno de los activos más valiosos de la empresa. [Online article]. Available via: <https://www.lampadia.com/analisis/tecnologia/los-datos-uno-de-los-activos-mas-valiosos-de-la-empresa>. [Accessed 3 May 2021]

Logicalis (2016). Monetización de datos: la estrategia más rentable de analytics. Logicalis: Architects of change. [Online blog]. Available via:
<https://blog.es.logicalis.com/analytics/monetizacion-de-datos-la-estrategia-mas-rentable-de-analytics>. [Accessed 16 Mar. 2021]

Lumen (n.d.) Internal Data. Business Communication Skills for Managers. [Online course]. Available via: <https://courses.lumenlearning.com/wmopen-businesscommunicationmgrs/chapter/internal-data/#footnote-1208-1>. [Accessed 3 May 2021]

- Maayan, K.D. (2020). The IoT Rundown For 2020: Stats, Risks, and Solutions. [Online Article]. Available via: <https://securitytoday.com/Articles/2020/01/13/The-IoT-Rundown-for-2020.aspx?Page=2>. [Accessed 16 May 2021]
- Marr, B. (2018). How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read. Forbes. [Online Article] Available via: <https://www.forbes.com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/#435203660ba9>. [Accessed 16 May 2021]
- Mateos, M. (2020). Empresa Data-Driven: el dato como activo estratégico. Enzyme advising group. [Online blog]. Available via: <https://blog.enzymeadvisinggroup.com/empresas-data-driven>. [Accessed 21 Apr. 2021]
- McKinsey (2018). Disruptive forces in the industrial sectors. Global executive survey. [Online report] Available via: https://www.mckinsey.com/~/_media/mckinsey/industries/automotive%20and%20assembly/our%20insights/how%20industrial%20companies%20can%20respond%20to%20disruptive%20forces/disruptive-forces-in-the-industrial-sectors.ashx. [Accessed 16 May 2021]
- Merriam-Webster (2021a). Data - Definition of data. Merriam-Webster Dictionary. [Online dictionary]. Available via: <https://www.merriam-webster.com/dictionary/data>. [Accessed 31 May 2021]
- Merriam-Webster (2021b). Monetize - Definition of monetize. Merriam-Webster Dictionary. [Online dictionary]. Available via: <https://www.merriam-webster.com/dictionary/monetize>. [Accessed 28 May 2021]
- Merriam-Webster (2021c). Value - Definition of value. Merriam-Webster Dictionary. [Online dictionary]. Available via: <https://www.merriam-webster.com/dictionary/value>. [Accessed 28 May 2021]
- Milton, N. (2009). Data information and knowledge. Knoco. [YouTube video]. Available via: https://www.youtube.com/watch?v=sdzUfHwNCVQ&t=3s&ab_channel=NickMilton [Accessed 28 Apr. 2021]
- Najjar, M.S. & Kettinger, W.J. (2013). Data Monetization: Lessons from a Retailer's Journey. MIS Quarterly Executive, 12(4), pp. 213-225

- OECD (2008). Glossary of Statistical Terms. OECD. p. 119. ISBN 978-92-64-025561
- Opresnik, D., & Taisch, M. (2015). The value of big data in servitization. *International Journal of Production Economics*, 165:174–184. doi:10.1016/j.ijpe.2014.12.036
- Osterwalder, A. & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley
- Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises, *Sustainability*, MDPI, Open Access Journal, vol. 11(2), pages 1-18, January.
- Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the Digitalisation Challenge: How to Benefit from Digitalisation in Practice. *International Journal of Information Systems and Project Management*, 5(1), 63-77.
<https://doi.org/10.12821/ijispm050104>
- Parvinen, P., Pöyry, E., Gustafsson, R., Laitila, M., & Rossi, M. (2020). Advancing Data Monetization and the Creation of Data-based Business Models. *Communications of the Association for Information Systems*, 47, pp-pp. <https://doi.org/10.17705/1CAIS.04702>
- PowerData (n.d.). Big Data: ¿En qué consiste? Su importancia, desafíos y gobernalidad. [Online Blog]. Available via: <https://www.powerdata.es/big-data>. [Accessed 16 Apr. 2021]
- Ramírez, M. (2017). Los datos son el activo principal de una empresa. “Big Data: la revolución analítica” event. Available via:
<https://facs.ort.edu.uy/60627/36/%E2%80%9Clos-datos-son-el-activo-principal-de-una-empresa%E2%80%9D.html>. [Accessed 3 May 2021]
- Rouse, M. (2016). Big Data. SearchDataManagement. [Website]. Available via:
<https://searchdatamanagement.techtarget.com/definition/big-data>. [Accessed 15 Apr. 2021]
- Sarganas, R. (2017). ¿Es tu empresa una organización Data Driven o tradicional?. Enzyme advising group. [Online blog]. Available via:
<https://blog.enzymeadvisinggroup.com/organizacion-data-driven>. [Accessed 21 Apr. 2021]
- SAS Institute (n.d.). Big Data: Qué es y por qué es importante. [Global Forum]. Available via:
https://www.sas.com/es_mx/insights/big-data/what-is-big-data.html#history. [Accessed 20 Jun. 2021]

- Saunders, M. (2016). *Research methods for business students* (Seventh edition.). Harlow, Essex: Pearson Education.
- Sheriff, S. (2019). Understanding The 5Vs Of Big Data. Acuvate. [Online Article]. Available via: <https://acuvate.com/blog/understanding-the-5vs-of-big-data/>. [Accessed 6 Feb. 2021]
- Sisense (n.d.). Your Easy Guide to Data Monetization. [Official company website]. Available via: <https://www.sisense.com/data-monetization/>. [Accessed 21 Apr. 2021]
- Strandhagen, J. W., Alfnes, E., Strandhagen, J. O., & Vallandingham, L. R. (2017). The fit of Industry 4.0 applications in manufacturing logistics: a multiple case study. *Advances in Manufacturing*, 5(4), 344–358. doi:10.1007/s40436-017-0200-y
- Thierauf, R. J. (2001). *Effective Business Intelligence Systems*. 1st edition, Greenwood Press, p. 371
- Thoben, K. D., Wiesner, S. A. and Wuest, T. (2017) “‘Industrie 4.0’ and smart manufacturing-a review of research issues and application examples’, *International Journal of Automation Technology*, 11(1), pp. 4–16. doi: 10.20965/ijat.2017.p0004.
- Thomas, L. D. & Leiponen, A. (2016). Big Data commercialization. *IEEE Engineering Management Review*, 44(2): 74-90
- Tiwana, A. (2014). *Platform Ecosystems. Aligning Architecture, Governance, and Strategy* [online book]. Waltham: Elsevier, Morgan Kaufmann. 281 pages. Available at: <https://static1.squarespace.com/static/5ba7b499755be22c410b1cae/t/5d619cf14aa7270001322054/1566678272862/Figure 6.9>
- van Belle, G. & Rüter, L. (2014). Data and the law: Beyond the sweat of the brow: Who owns published data? And what is data? *Significance*, Vol. 11(2), pp. 28-31.
- Wixom, B. H., & Ross, J. W. (2017). How to monetize your data. *MIT Sloan Management Review*, 58(3), 10-13.
- Wixom, B.H. (2014). *Cashing In on Your Data*. Center for IS Research Briefing, Vol. 14 (8).
- Woerner, S.L. & Wixom, B.H. (2015). Big Data: Extending the Business Strategy Toolbox. *Journal of Information Technology*, Vol. 30 (1), pp. 60-62
- Yousif, M. (2015). The Rise of Data Capital. *IEEE Cloud Computing*, 2(2):4-4.

Zemsania (n.d.) Monetizar los datos, una oportunidad en la transformación digital. [Online blog]. Available via: <https://zemsaniaglobalgroup.com/monetizar-los-datos/>. [Accessed 16 Mar. 2021]

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, 37(4), 1019-1042.
doi:10.1177/0149206311406265