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# DATA MONETIZATION CHALLENGES IN ESTABLISHED ORGANIZATIONS: A SYSTEMATIC LITERATURE REVIEW

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# DATA MONETIZATION CHALLENGES IN ESTABLISHED ORGANIZATIONS: A SYSTEMATIC LITERATURE REVIEW

*Research Paper*

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## Abstract

*Over the last decades, researchers and practitioners have looked at data as a valuable asset for improving business processes in organizations. However, nowadays, they see data more as a tradable asset that can be monetized. Data monetization here refers to generating revenue from selling data and data-based products and services. Despite providing opportunities for generating new revenue streams, data monetization is not without challenges, especially in established organizations. Previous research shows that an organization's data monetization capability is constrained by its existing business model, infrastructure, and organizational culture. Although Information Systems (IS) research and practice have shown an increasing interest in data monetization, we lack a thorough understanding of its challenges. As a first step in addressing this gap, we set out to identify challenges that established organizations face in monetizing their data. To that end, we conducted a systematic literature review and identified 21 challenges reported in the extant literature. Based on their nature, we divided these challenges into five categories, including business model, legal & regulatory, security & privacy, organizational, and data management challenges. Our study has several implications for IS research and practice.*

*Keywords: Data monetization, Big data, Selling data, Selling analysis, Selling data-based services*

## 1 Introduction

The amount of data being generated and collected by organizations and digital societies increases exponentially. This, in turn, provides companies with many opportunities for value generation (Naimi and Westreich, 2014; Opresnik and Taisch, 2015) and data monetization (Lewis and McKone, 2016). Data monetization refers to capturing the value of data (Parvinen *et al.*, 2020, p. 27). Companies can monetize data in two general ways. In Implicit monetization, revenue is generated indirectly by reducing costs through improving internal business processes and decisions. In explicit monetization, revenue is generated directly by selling data-based products and services (Parvinen *et al.*, 2020).

Until now, the internal use of data has been the focal point in data monetization research and practice (Thomas and Leiponen, 2016; Parvinen *et al.*, 2020). This is not very surprising since internal data usage seems to be a convenient starting point for value generation (Parvinen *et al.*, 2020). Developing data-based business ventures and designing novel strategies to externally monetize data (i.e., explicit monetization) have attracted attention in different contexts such as financial and retail sectors recently (Najjar and Kettinger, 2013; Wixom and Farrell, 2019). However, firms are still trying to discover how to use data in its most potential way (Wiener, Saunders and Marabelli, 2020). While start-ups such as Airbnb and Uber take the lead in capturing data's value by designing innovative data-based offerings, established organizations 'either sit unknowingly on top of an enormous resource or lose themselves in

the morass of meaningless analytics' (Aaltonen and Tempini, 2014, p. 108). Established organizations abound with data lack an understanding of how to generate revenue from their data to its full potential. As a first step in gaining such understanding, we set out to answer the following research question: *What challenges do established organizations face in explicit data monetization?*

To answer the research question, we have reviewed the extant literature on data monetization issues in incumbent firms. Conducting an iterative qualitative analysis, we identified 21 data monetization challenges and grouped them into five distinct categories. As such, our study contributes to data monetization research by providing an overview of past research and gaps in the current literature as a starting point for future research.

The remainder of the paper is organized as follows. The presentation of previous research starts in section 2, presenting the theoretical background of data assets and data monetization approaches. This will be followed by section 3 describing the research methodology. Subsequently, section 4 includes the findings from the literature review. Finally, we discuss the implications and limitations of the paper and propose avenues for future research.

# 2 Theoretical background

## 2.1 What is data monetization?

Data monetization is a fairly new term, and currently, there is no clear definition of it (Thomas and Leiponen, 2016; Fred, 2017; Laitila, 2017). Generally speaking, data monetization refers to capturing the value of data (Parvinen *et al.*, 2020). Companies have three options to monetize their data: (1) enhancing organizational decision-making and operations through insights derived from data, (2) enriching their products and services by wrapping information around them, and (3) selling data and data-based offerings (Wixom and Ross, 2017). In this paper, we look into the third approach and consider data monetization as 'exchanging information-based products and services for legal tender or receiving something with an equivalent value' (Wixom, 2014, para. 3).

Considering the definition of data monetization provided by Wixom (2014), there are three approaches to creating and capturing value from a company's data: selling data, selling data-driven insights, and selling data-driven services. These models vary in the amount of potential opportunity they provide and the effort they require. The first and most direct approach includes selling raw or prepared data directly to a third party (Van't Spijker, 2014; Thomas and Leiponen, 2016; Parvinen *et al.*, 2020). Organizations could easily generate revenue by selling a raw dataset, especially if it is impossible or at least onerous for others to collect the same data (Buff, Wixom and Tallon, 2015). However, the major downside would be privacy issues since the buyer will get the ownership of the data (Parvinen *et al.*, 2020). In the second approach, companies offer insights driven from data analysis but restrict access to the original data, which is favorable with regard to security and privacy. However, compared to raw data, data-driven insights may have fewer potential customers since customers could use the raw data in much more different ways (Parvinen *et al.*, 2020). Finally, the third approach includes creating new services for delivering data, usually through multi-sided business models (Najjar and Kettinger, 2013; Van't Spijker, 2014). Selling advertising space is the most well-known form of this approach that enables business customers to target certain user groups based on the user data. These services could also be in the form of consulting or process outsourcing (Buff, Wixom and Tallon, 2015). In this approach, the true nature of the data is hidden, and customers do not see the original data (Parvinen *et al.*, 2020).

To stay competitive in a data-driven economy, established firms must design effective procedures and strategies to monetize their data (Lange, Drews and Höft, 2021). While start-ups benefit from 'starting from a blank page' (Hartmann *et al.*, 2016, p. 1383). Incumbent firms are hindered by their existing businesses and organizational structures (Günther *et al.*, 2017a). Thus, they still struggle to break free from the current organizational culture and structures that hinder data monetization (Wiener, Saunders and Marabelli, 2020).

## 2.2 Data as a tradable asset

With the emergence of the data economy, data has emerged as a new type of asset (Opher *et al.*, 2016). Like other intangible assets (e.g., intellectual property), data is an 'identifiable, non-monetary, non-physical, potentially valuable resource' (Ylijoki and Porras, 2019, p. 1089). However, unlike many other intangible assets, data is nonrivalrous (Romer, 1994); it can be used simultaneously by more than one person and for different purposes. Furthermore, when revealed, it is difficult to keep track of data's final usage. These characteristics make it extremely difficult to define and protect ownership rights on data which is referred to as partially exclusive good.

It is challenging to estimate the value of data for several reasons. First, whereas it is costly to collect data initially, it is quite cheap to copy and distribute it. Thus, original marginal-cost pricing could no longer be applied. Secondly, the value and quality of data could not be evaluated before consumption (Pantelis and Aija, 2013), and therefore, it is hard to convince potential buyers about data's value (Spiekermann, 2019). Finally, the value of data hinges on its quality (Pantelis and Aija, 2013), situation, context, and time (Parvinen *et al.*, 2020). These characteristics of data make it different from other assets, and consequently, trading it involves a great deal of careful consideration.

Regarding its source, data may originate from inside or outside of the organization (Negash and Gray, 2008). Internally sourced data could be further split into exhaust data (Brown, Chul and Manyika, 2011) and intentionally acquired data. Exhaust data is a by-product of business operations and transactions and is collected from different sources, including sensors or ERP systems (Brown, Chul and Manyika, 2011; Parvinen *et al.*, 2020). Alternately, companies could collect data for a specific analytical or commercial purpose through crawling internal sources, tracking sensors, or data crowdsourcing (Hartmann *et al.*, 2016). In contrast, external data is acquired from outside an organization's borders and can be divided into paid and freely available data. As its name implies, paid data is purchased from other data providers (e.g., stock market data). In contrast, free data (e.g., open data and social media data) is collected from publicly available electronic resources (Hartmann *et al.*, 2016).

# 3 Method

To answer our research question, we engaged in a systematic literature review. The review was carried out based on Webster and Watson (2002) to review relevant past literature on data monetization challenges and outline the boundaries of the research. The literature review process proceeds in three steps: literature search, selection, and analysis. These steps are discussed below.

## 3.1 Literature Search and Selection

A summary of the literature search and selection process is shown in Figure 1. We began our review by looking for papers reporting the challenges of designing and selling data or data-based offerings in established organizations. We started by searching within the AIS basket of eight IS journals[1]. Due to the newness of the research phenomenon and since there is still no consensus regarding the scope of data monetization in the literature, the search used a variety of relevant terms, including "*data monetization*", "*data-based business model*", "*data-driven business model*", "*big data business model*", "*selling data*", "*selling analysis*", and "*selling data-based*" in any part of the text. To extend the coverage, we also searched the scientific databases *AIS eLibrary*, *ScienceDirect*, *Scopus*, and *Web of Science* for relevant journal and conference papers.

Our initial search yielded a total of 1008 studies. The selection process consisted of three rounds. In the first round, the relevant papers were selected based on the title, abstract, and keywords. To be considered relevant, the article had to give a hint to answering the research question. After removing the duplicates, this primary selection resulted in 113 studies. In the second round, we scrutinized the full texts of these articles to check their relevance. In total, 22 papers were labeled as relevant since they considered the

[1]. http://aisnet.org/?SeniorScholarBasket, accessed 30-12-2021

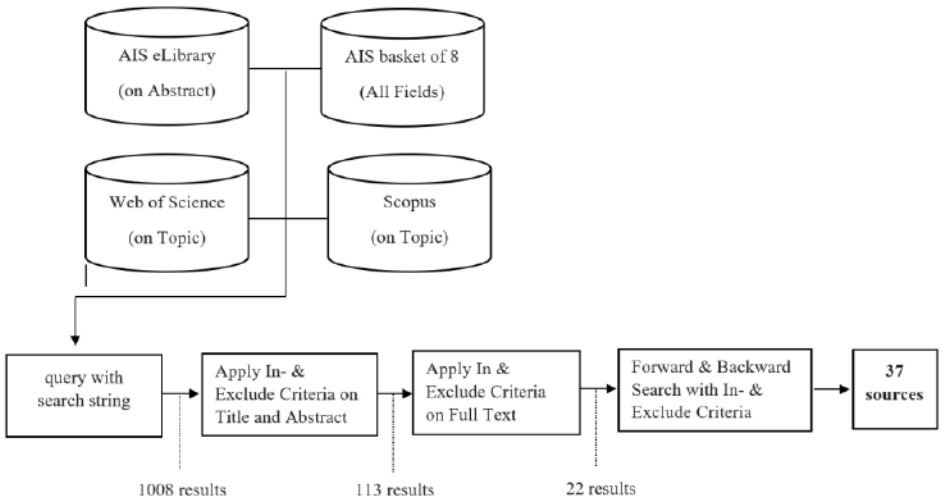


*Figure 1: search and selection process*

challenges of data monetization in established organizations. In the third selection round, a forward and backward search was conducted to identify more relevant studies. While backward search means reviewing the list of studies cited by a paper, forward search refers to reviewing the articles that have cited the paper (Hunke *et al.*, 2017). The forward and backward search added 15 additional related articles. Regarding selection criteria, we only included English articles published between 1.1.2000–30.12.2021. However, we did not consider any criteria regarding research design (e.g. empirical or conceptual). It must be noted that due to a small number of peer-reviewed articles on data monetization, we also included articles published by MIT CISR and Harvard Business Review in the third round of selection. Ultimately, 37 articles were selected for further review and analysis[2].

### 3.2 Literature Analysis

Our analysis focused on identifying and categorizing challenges established organizations face in monetizing their data. We aimed to gain new insights that can pave the way for future research instead of merely mapping or describing past scholarly works. Thus, we decided to follow a systematic and iterative process following the open coding and axial coding techniques (Corbin and Strauss, 2014).

We started the data analysis by performing a line-by-line open coding process to search for data monetization challenges in the selected articles. During this stage, we created 104 open codes (i.e., first-order constructs). Then, we searched for similarities and relationships between open codes and aggregated them into 21 axial codes (i.e., second-order constructs). For instance, in the open coding stage, we found that advancing data monetization requires *significant initial investments* to cover different costs, *choosing the right price* for data-based offerings and *ensuring monetary return*. Thereafter, we put these first-order concepts into a second-order code and labeled it as *profitability*. In the end, we matched the extracted 21 second-order codes to the five categories of challenges shown in Table 1. Due to space limitations, the open codes (i.e., first-order constructs) are not included in the table but are available upon request from the authors.

## 4 Results

Our analysis resulted in five categories with a total of 21 challenges shown in Table 1. Next, we will discuss each category and its underlying challenges in more detail.

[2] The list of the selected articles used for data analysis is shown in Table 1

| Category | Second-order construct | Analyzed studies |
|---|---|---|
| Business model challenges | Existing business model | Chen et al., 2017; Fruhwirth, 2018; Gebauer et al., 2020; Grover et al., 2018; Günther, et al., 2017a; Najjar & Kettinger, 2017; Parvinen et al., 2020; Rashed & Drews, 2021; Wiener et al., 2020; Woerner & Wixom, 2015 |
| | Value proposition | Brownlow et al., 2015b; Buff et al., 2015; Chen et al., 2017; Davenport, 2016; Fruhwirth, 2018; Gandhi et al., 2018; Hanafizadeh & Harati Nik, 2020; Hunke et al., 2017; Muhtaroglu et al., 2013; Parvinen et al., 2020; Rantala et al., 2018; Thomas & Leiponen, 2016; Wiener et al., 2020; Wixom, 2014; Wixom & Farrell, 2019 |
| | Customer relationship | Alfaro et al., 2019; Buff et al., 2015; Fruhwirth, 2018; Gandhi et al., 2018; Günther, et al., 2017b; Hanafizadeh & Harati Nik, 2020; Lange et al., 2021; Liu & Chen, 2015; Najjar & Kettinger, 2017; Parvinen et al., 2020; Rantala et al., 2018; Wixom, 2014; Wixom & Farrell, 2019 |
| | Business partnership | Buff et al., 2015; Chen et al., 2017; Fruhwirth, 2018; Gandhi et al., 2018; Gebauer et al., 2020; Günther, et al., 2017a; Hanafizadeh & Harati Nik, 2020; Hunke et al., 2017; Lange et al., 2021; Muhtaroglu et al., 2013; Najjar & Kettinger, 2017; Wixom, 2014; Wixom & Farrell, 2019 |
| | Profitability | Al-Zahrani, 2020a; Bataineh et al., 2016; Chen et al., 2017; Fruhwirth, 2018; Gandhi et al., 2018; Grover et al., 2018; Lange & Drews, 2020; Muhtaroglu et al., 2013; Najjar & Kettinger, 2017; Parvinen et al., 2020; Wiener et al., 2020; Wixom, 2014 |
| Legal & regulatory challenges | Data usage | Buff et al., 2015; Cech et al., 2015; Günther, et al., 2017b; Hanafizadeh & Harati Nik, 2020; Parvinen et al., 2020; Thomas & Leiponen, 2016; Wixom, 2014 |
| | Ownership and legal liability | Grover et al., 2018; Günther, et al., 2017a, 2017b; Hunke et al., 2017; Thomas & Leiponen, 2016 |
| | Cross-border data trade | Mohammadzadeh et al. 2018; Najjar & Kettinger, 2017; Schroeder, 2016; Wiener et al., 2020 |
| | Standardization | Fruhwirth, 2018; Schroeder, 2016; Wiener et al., 2020 |
| Security & privacy challenges | Transparency | Günther, et al., 2017a; Hanafizadeh & Harati Nik, 2020; Morey et al., 2015; Najjar & Kettinger, 2017; Schroeder, 2016 |
| | Data confidentiality | Al-Zahrani, 2020; Günther, et al., 2017a, 2017b; Hanafizadeh & Harati Nik, 2020; Parvinen et al., 2020; Thomas & Leiponen, 2016; Wiener et al., 2020 |
| | Conflict of interest | Gandhi et al., 2018; Günther, et al., 2017a, 2017b; Parvinen et al., 2020; Thomas & Leiponen, 2016 |
| Organizational challenges | Organizational culture | Al-Zahrani, 2020a; Brownlow et al., 2015b; Buff et al., 2015; Chen et al., 2017; Fruhwirth, 2018; Gebauer et al., 2020; Lange et al., 2021; Parvinen et al., 2020; Rashed & Drews, 2021; Schroeder, 2016; Wiener et al., 2020; Wixom, 2014; Wixom & Ross, 2017b |
| | Technical capability | Buff et al., 2015; Chen et al., 2017; Fruhwirth, 2018; Gandhi et al., 2018; Hanafizadeh & Harati Nik, 2020; Lange et al., 2021; Liu & Chen, 2015; Muhtaroglu et al., 2013; Najjar & Kettinger, 2017; Rantala et al., 2018; Rashed & Drews, 2021; Wiener et al., 2020; Wixom, 2014; Wixom & Ross, 2017b |
| | Analytical capability | Alfaro et al., 2019; Brownlow et al., 2015a; Buff et al., 2015; Davenport, 2016; Elsaify & Hasan, 2021; Fruhwirth, 2018; Gandhi et al., 2018; Gebauer et al., 2020; Hanafizadeh & Harati Nik, 2020; Lange et al., 2021; Muhtaroglu et al., 2013; Najjar & Kettinger, 2017; Parvinen et al., 2020; Wixom & Farrell, 2019 |
| | Organization type | Chen et al., 2017; Elsaify & Hasan, 2021; Günther, et al., 2017a; Lange et al., 2021; Parvinen et al., 2020; Thomas & Leiponen, 2016; Van't Spijker, 2014 |
| Data management challenges | Data acquisition | Brownlow et al., 2015b; Buff et al., 2015; Chen et al., 2017; Davenport, 2016; Fruhwirth, 2018; Fruhwirth et al., 2020; Günther, et al., 2017b; Hunke et al., 2017; Lange et al., 2021; Najjar & Kettinger, 2017; Parvinen et al., 2020; Rantala et al., 2018; Schroeder, 2016; Thomas & Leiponen, 2016; Wiener et al., 2020; Wixom & Ross, 2017b |
| | Data quality | Brownlow et al., 2015b; Chen et al., 2017; Lange & Drews, 2020; Parvinen et al., 2020; Rantala et al., 2018; Van't Spijker, 2014; Wiener et al., 2020; Wixom & Rodriguez, 2021; Wixom & Ross, 2017b |
| | Data processing | Buff et al., 2015; Fruhwirth, 2018; Hanafizadeh & Harati Nik, 2020; Lange et al., 2021; Najjar & Kettinger, 2017; Rantala et al., 2018; Wiener et al., 2020; Wixom & Rodriguez, 2021; Wixom & Ross, 2017b |
| | Data visualization | Davenport, 2016; Hunke 2017; Rantala et al., 2018; Wiener et al., 2020 |
| | Data agreement | Grover et al., 2018; Lange et al., 2021; Najjar & Kettinger, 2017; Thomas & Leiponen, 2016 |

*Table 1: data monetization challenges in established organizations driven from the analyzed literature*

## 4.1 Business model challenges

To start data monetization, companies must be equipped with a new business model in which the nature of the value proposition and the structure of revenue and cost are significantly different from their existing one (Najjar and Kettinger, 2013). Failing to set up such a business model renders organizations unable to identify and exploit business opportunities and, as a result, curtails the range of data monetization (Parvinen *et al.*, 2020). Several business challenges will be discussed below.

***Existing business model:*** While start-ups benefit from 'starting from a blank page' (Hartmann *et al.*, 2016, p. 1383), incumbent firms are bounded by their existing business model (Günther *et al.*, 2017a). They must go through the challenges of either integrating data business into their existing business or developing a subsidiary business (Wiener, Saunders and Marabelli, 2020). In some cases, integration is not feasible since the new data business contradicts or even competes with the company's old business (Grover *et al.*, 2018; Parvinen *et al.*, 2020). Selling a data-based predictive maintenance service, for instance, cannibalize the existing machinery engineering service by reducing the downtime of facilities (Fruhwirth, 2018). Running dual business models, on the other hand, may reduce the firm's efficiency since the firm could not focus on one single business. The firm's inability to manage these conflicts and also unwillingness to invest in new business models impede data monetization (Gebauer *et al.*, 2020).

***Value proposition:*** Established organizations generate lots of data through their business operations. Even though sometimes they use this data for internal usage, they often lack novel ideas and use cases to generate direct revenue from it (Lange, Drews and Höft, 2021). There are plenty of meaningful insights hidden in data. However, there is no guarantee that potential customers would pay for all of them (Fruhwirth, 2018). Before engaging in any data gathering activity, the company's data strategy must be developed to determine what kinds of data should be stored. This could be challenging for established firms since it requires extensive knowledge about data and data-driven business models (Rantala, Palomäki and Valkokari, 2018). Identifying customer needs that can be solved using a firm's data (Rantala *et al.*, 2016; Hunke *et al.*, 2017), defining the right value proposition (Hunke *et al.*, 2017) that could not be easily replicated (Gandhi *et al.*, 2018), conceptualizing and commercializing data products (Davenport, 2016), assessing competitors (Hunke *et al.*, 2017), and sustaining competitive advantage (Wixom and Farrell, 2019) are among the challenges involved.

***Customer relationship:*** Due to the newness of data markets, customer relationships have become more critical. Potential customers still need time to fully realize the actual value of data-based offerings (Parvinen *et al.*, 2020). Thus, an appropriate marketing strategy is required to precipitate this process by advertising and promoting the value of data-based offerings. It is important to approach potential customers, communicate all the ways in which they can exploit the company's data (Najjar and Kettinger, 2013; Gandhi *et al.*, 2018) and engage them in value co-creation (Günther *et al.*, 2017b). Subsequently, end-user training and product support must also be an essential part of customer relationships (Buff, Wixom and Tallon, 2015). Finally, to nurture trust and establish a long-term customer relationship, the company must strive to treat all stakeholders, including existing customers whose data is used in the offerings (Liu and Chen, 2015) as well as data buyers, through transparency and fairness (Buff, Wixom and Tallon, 2015).

***Business partnership:*** Partnering helps companies acquire essential resources and capabilities for data monetization that is difficult or even impossible to develop internally (Buff, Wixom and Tallon, 2015). Examples include providing technical and analytical capabilities (Najjar and Kettinger, 2013; Buff, Wixom and Tallon, 2015; Fruhwirth, 2018), providing additional data to generate co-value (Fruhwirth, 2018; Lange and Drews, 2020), and facilitating the relationship between the company and the data buyers through myriad ways such as making contracts or offering support and training (Najjar and Kettinger, 2013). As a result, data monetization requires an investigation of which parts of the new business could be outsourced, the specification of the collaboration with partners (Hunke *et al.*, 2017), and finding the best fitting partner from potential partners (Chen *et al.*, 2017). Nevertheless, companies cannot disclose their data to just anyone. They must cautiously engage in the process of partner selection in which trust plays an essential role (Najjar and Kettinger, 2013).

***Profitability:*** A further complication for the development of data monetization is ensuring monetary returns and profitability. Establishing a data business needs significant up-front investments to cover many costs, including the technical infrastructure costs (Lange and Drews, 2020), costs for buying supplementary data, sales and marketing costs (Muhtaroglu *et al.*, 2013), and above all, human resource costs (Grover *et al.*, 2018). However, established companies have a scarce calculation of return on investment (ROI) for their data monetization efforts, which makes them doubtful about the payoff of big data investments (Wiener, Saunders and Marabelli, 2020). In practice, it is too difficult to measure ROI on data investment because there are too many factors that must be considered, and some of these variables, such as potential demand and pricing, are not clear (Parvinen *et al.*, 2020). Pricing can be complicated for data-related businesses due to the lack of reference prices in the market (Parvinen *et al.*, 2020). It is an essential and demanding task to find the proper balanced pricing of offerings in a way that maximizes profit without losing potential customers (Al-Zahrani, 2020). Proper pricing models must be designed to take into account not only the corresponding investment but also the value of data to customers (Najjar and Kettinger, 2013). Nevertheless, estimating the value of data-based offerings is difficult since, similar to other experience goods, data's real value is hidden before consumption. Additionally, calculating data's monetary value is challenging due to a lack of 'clear classification of data types and data quality levels' (Bataineh *et al.*, 2016, p. 473).

## 4.2 Legal & regulatory challenges

Monetizing data entails an array of legal and regulatory issues, and negligence in addressing them may cause severe problems such as damaging the company's reputation. The ambiguity and constant changes in legal requirements and regulations, such as the General Data Protection Regulation (GDPR), exacerbated the situation, especially in organizations dealing with personal or highly sensitive data (Günther *et al.*, 2017a; Parvinen *et al.*, 2020). The most prominent challenges regarding legislation and regulation include data usage, data ownership, liability, cross-border data flows and global trade, and standardization.

***Data usage:*** Some companies could not start data monetization simply because rules and regulations prevent them from using their data and operating in any other business venture except the one in which they are currently operating (Parvinen *et al.*, 2020). Similarly, laws are strict and constrain data exploitation in industries working with sensitive information, such as the health sector, or in organizations operating under substantial government control, such as education (Cech, Spaulding and Cazier, 2015). In other industry sectors, accessing or selling personal data could also be ethically or even legally questionable (Hanafizadeh and Harati Nik, 2020). Data providers have no control regarding the final use of sold data. This may entail future risk of illegal or unethical data usage. Therefore, data providers must take extensive measures to establish mechanisms to discover the final use of data (Tallon, Ramirez and Short, 2013). Recognizing future risks helps companies set up relevant contracts (Buff, Wixom and Tallon, 2015) and take strict governance actions (Tallon, Ramirez and Short, 2013).

***Ownership and legal liability:*** Data monetization poses significant legal liability challenges which require careful consideration. The nonrivalrous nature of data makes data ownership quite complicated and gives rise to conflicts regarding data sharing (Hart and others, 2002). When data flows through long and complicated value networks, it is difficult to recognize who owns the data (Weinberg *et al.*, 2015) and who should be liable for any negative consequences arising from faulty data and analysis (Thomas and Leiponen, 2016). Therefore, firms must address any potential liability issues, particularly when using employees' or third-party's data in their offerings (Grover *et al.*, 2018).

***Cross border data trade:*** The span of data monetization activities is not limited to just one jurisdictional boundary. Data collected in one jurisdiction could be transferred to parties in another jurisdiction (Mohammadzadeh *et al.*, 2018). This feature might raise some problems since there is not yet a comprehensive regulatory framework regarding data sharing and monetization throughout the world (Thomas and Leiponen, 2016). For instance, depending on the jurisdiction and its underlying objectives, there are different regulations regarding personal privacy. While in the EU there is a single regulatory

framework regarding data security and privacy, in the US there is not such a unified framework but different laws in different states and for different industries (Thomas and Leiponen, 2016).

***Standardization:*** Another regulatory challenge relates to the lack of general guidelines and standards for data storage, processing, and trading (Schroeder, 2016; Fruhwirth, 2018; Wiener, Saunders and Marabelli, 2020). The lack of common standards results in interoperable solutions, which hinders data exchange and integration (Bogle, 2017), and entails the risk of vendor lock-in (Wiener, Saunders and Marabelli, 2020).

## 4.3 Security and privacy challenges

Data security is about ensuring the confidentiality of data and safeguarding it from unauthorized access and changes, vandalism, and accidental destruction throughout its lifecycle. Privacy, in particular, relates to protecting personal and business-sensitive information (Talha, Abou El Kalam and Elmarzouqi, 2019). Any security and privacy plan should take into account the issues of transparency, data confidentiality, and conflict of interests.

***Transparency:*** Finding a degree of transparency to satisfy potential data buyers while preserving the privacy preferences of current customers is an extremely challenging issue in the data monetization context. Nowadays, many data buyers have no choice but to rely upon data sources without a complete understanding of them (Schroeder, 2016) which decreases their willingness to pay for data. Thereby, data suppliers must strive to offer products and services with transparency so that potential customers realize that they were created based on science and technology (Schroeder, 2016). On the other hand, they need to inform current customers regarding the use of their data, let them have control over its use, and offer them fair value in exchange (Morey, Forbath and Schoop, 2015).

***Data confidentiality:*** Confidentiality concerns anonymity and creating value without unauthorized disclosure of personal and sensitive data (Hanafizadeh and Harati Nik, 2020). While combining data from different sources increases the value of data (Parvinen *et al.*, 2020), it can reveal personal and business-sensitive information (Günther *et al.*, 2017a). This, in turn, gives rise to confidentiality issues in data sharing and monetization. Thus, as highlighted by Parvinen et al. (2020, p. 30), 'authorization, access, auditing, and encryption' become critical factors in securing personal and highly sensitive data.

***Conflict of interest:*** Privacy issues are challenging to resolve since companies must find a way to balance various 'tensions between privacy, innovation, and value creation' (Thomas and Leiponen, 2016, p. 85). Indeed, the value of data emerges in unanticipated secondary uses (Thomas and Leiponen, 2016), particularly when merged with data from other sources (Parvinen *et al.*, 2020). However, the practice of opening data for discovery and combining it with other sources may violate privacy expectations (Günther *et al.*, 2017a). Adding to the difficulty, the expectations of privacy vary among public and private sectors, government and citizens, companies and customers, and amongst users themselves. As a result, it could be extremely complex or even impossible to discern and satisfy individuals' needs and preferences for privacy (Rose, Eldridge and Chapin, 2015; Mohammadzadeh *et al.*, 2018).

## 4.4 Organizational challenges

Aside from external challenges, various organizational constraints and contingencies affect data monetization efforts, including a firm's culture, type, and technical and analytical capabilities.

***Organizational culture:*** Cultural issues in many incumbent firms hinders data monetization. The organization's culture could, for instance, prevent data monetization by discouraging experimentation and new business ventures (Parvinen *et al.*, 2020). In some organizations, company politics limits data sharing (Schroeder, 2016). If there is a departmental collaboration issue (Brownlow *et al.*, 2015) and no trust to share data, it is difficult or even impossible to monetize it (Al-Zahrani, 2020). Moreover, above all, top management support is an integral part of developing data monetization (Fruhwirth, 2018; Rashed and Drews, 2021).

***Technical capability:*** designing data-based offerings needs extreme technical requirements to collect, store, and process the data (Najjar and Kettinger, 2013). Meeting necessary technical capabilities could be extremely challenging for incumbent non-technology-driven firms (Lange and Drews, 2020). Additionally, the prevailing IT architecture could be a threat to data monetization due to legacy systems, insufficient scalability (Wiener, Saunders and Marabelli, 2020), high complexity with multiple interfaces and redundancy (Lange and Drews, 2020), and other architectural constraints (Rashed and Drews, 2021).

***Analytical capability:*** Companies with higher data science and machine learning capabilities seem to monetize their data more successfully (Elsaify and Hasan, 2021). However, since many firms are searching for data scientists, hiring and retaining such talents are becoming a key barrier (Fruhwirth, 2018; Grover *et al.*, 2018; Lange, Drews and Höft, 2021). Furthermore, analytical capabilities cannot be disseminated throughout the firm if employees are unwilling or unable to understand them (Alfaro *et al.*, 2019). Hence, organizations must educate all employees about data and data-driven business models according to the level needed for their roles (Brownlow *et al.*, 2015; Alfaro *et al.*, 2019)

***Organization type:*** The type, size, and position of a company significantly affect the probability of successful data monetization initiatives. As developing new businesses requires proper organizational alignment and transformation, legacy structures and processes in a stable organization constrain data monetization. In contrast, companies that have access to certain types of data, whether through production systems, digital offerings, customer relationships, or digital channels, are more ready to monetize it (Parvinen *et al.*, 2020). Besides, since moving along the value network is the most common form of data monetization (Van't Spijker, 2014; Thomas and Leiponen, 2016), the position of a company in the value network affects its data monetization initiatives (Parvinen *et al.*, 2020). Furthermore, SMEs will have more challenges in their monetization path since creating data-based offerings requires significant resources and data infrastructure that mainly large firms are equipped with (Günther *et al.*, 2017a; Elsaify and Hasan, 2021).

## 4.5 Data management challenges

Data management challenges are a set of challenges faced while gathering, processing, and analyzing the data and presenting the resulted information and insight (Rantala, Palomäki and Valkokari, 2018). The most prominent challenges regarding data are discussed below.

***Data acquisition:*** Companies have to continuously assess the availability, accessibility, and veracity of internal as well as external data required for data monetization activities (Hunke *et al.*, 2017). A key challenge stems from the lack of standardization in the way data has been stored (Schroeder, 2016). Consequently, incumbent firms with a complex IT landscape and multiple diverse interfaces usually do not have a clear overview of what data is available and who owns those data (Lange, Drews and Höft, 2021). Besides, the availability and acquisition of external data often become challenging (Fruhwirth, 2018). The manual work of feeding data into systems is another big challenge that has not been addressed yet (Rantala, Palomäki and Valkokari, 2018).

***Data quality:*** Ensuring the quality and reliability of data is another initial issue that most incumbent firms face (Van't Spijker, 2014), which in turn impacts their attitudes towards using data in the first place (Rantala, Palomäki and Valkokari, 2018). Inconsistent data formats, partially or completely unlabeled data, missed or incomplete data, and data from outdated systems result in quality problems and thus hamper data monetization. Integrating inconsistent data from different sources is a non-negotiable issue for traditional businesses. Data structuring is also required to contextualize the existing data, select the fitting data from datasets, prevent overhead, and ensure quality (Lange and Drews, 2020). Aside from the collection of quality data, the verification of external data is critical (Wiener, Saunders and Marabelli, 2020). Solving quality problems can be a major challenge for incumbent companies, especially when dealing with qualitative data, since it requires a considerable amount of strategic planning and data science skillsets (Lange and Drews, 2020). Whereas different customers demand different quality levels, so far, there is not such a clear classification of quality for different data types. This also poses some challenges for pricing different datasets of different quality (Bataineh *et al.*, 2016).

***Data processing:*** To leverage the potential value of raw data, data processing is needed to create new value for specific uses (Wixom and Ross, 2017). To monetize data, businesses first need to build 'liquid strategic data assets' (Wixom and Rodriguez, 2021, para. 7). Liquidity here refers to decontextualizing data from its original location and intended purpose in order to be ready for reuse and recombination (Wixom and Rodriguez, 2021). Data processing requires extensive knowledge and expertise to apply statistical methods and machine learning algorithms to datasets to discover insightful analysis (Buff, Wixom and Tallon, 2015). Data processing could be challenging for incumbent non-IT firms that lack fundamentals, knowledge, and experience for processing data (Fruhwirth, 2018).

***Data visualization:*** Data visualization relates to representing key data, information, and insight in a more comprehensive way through using visual elements such as graphs or data grids (Sivarajah *et al.*, 2017; Faroukhi *et al.*, 2020). Data visualization plays an important role in both the first and last stages of data monetization. As discussed before, incumbent firms, especially large ones, do not have a general outlook of existing data sources because data is scattered over multiple databases throughout the entire firm (Lange, Drews and Höft, 2021). Therefore, visualizations and dashboards are required to reflect the scattered data at a single position in a graspable form (Fruhwirth, 2018) and help employees and managers discover new trends in data (Faroukhi *et al.*, 2020) and make better data monetization decisions (Wixom and Farrell, 2019). Effective and innovative visualization is also needed in the last step of value creation to deliver data-based offerings to the customers (Alfaro *et al.*, 2019; Wiener, Saunders and Marabelli, 2020; Dehnert, Gleiss and Reiss, 2021). Even though interactive tools offer great business value (Steve *et al.*, 2010), large and complex datasets (Rantala, Palomäki and Valkokari, 2018), the lack of visualization technologies (Wiener, Saunders and Marabelli, 2020), and designing relevant and customized visual interfaces (Hunke *et al.*, 2017) make data visualization challenging for traditional non-IT firms.

***Data agreement:*** A final challenge concerns making clear contracts to stipulate what buyers could and could not do with the data (Najjar and Kettinger, 2013). Data agreements need to address a range of issues regarding data protection and privacy (Grover *et al.*, 2018), data ownership (Thomas and Leiponen, 2016), the use and reuse of the data, regulatory compliance, and pricing (Truong *et al.*, 2012). Besides, data agreements have to cater for data quality considerations, including reliability, veracity, completeness, consistency, and timeliness (Thomas and Leiponen, 2016). As data are heterogeneous and different contexts require different considerations and stipulations (Thomas and Leiponen, 2016), preparing and making these contracts are a matter of concern, especially for traditional firms.

# 5 Discussion

Even though selling data and data-based offerings can be a profitable practice for established firms with vast data inventories, there are still many challenges that need to be addressed to reap its potential benefits (Davenport, 2016; Al-Zahrani, 2020). In this study, we aimed to provide new insights into the challenges of data monetization in established organizations. To that end, we conducted a thorough review of the extant literature on data monetization. In the following sections, we discuss our contributions to research and practice.

## 5.1 Implications for research and future research opportunities

This study has several implications for research. First, our review is one of the first comprehensive surveys reporting data monetization challenges in established organizations. A few notable studies that discussed the issue looked into it through the narrow lens of B2B firms (Rantala, Palomäki and Valkokari, 2018), SMEs (Coleman *et al.*, 2016), Austrian enterprises (Fruhwirth, 2018), or just focused on a specific type of challenges such as management challenges (Vidgen, Shaw and Grant, 2017). As such, this study enables IS researchers to get a better understanding of the actual characteristics of each barrier established organizations face during data monetization efforts and put forward prospects for future research. Second, our study shows that the current data monetization literature is still at a nascent

stage with regard to unfolding how established organizations address these challenges in practice. Drawing on our results, we propose four main areas for future research:

- **Data monetization business models:** While issues related to business model development are key reasons preventing established organizations from monetizing their data (Aaltonen and Tempini, 2014; Gillon *et al.*, 2014), empirical IS research has barely touched upon this topic. Thus, we highlight the need for more in-depth case studies to explore the distinct phases established companies go through when introducing the new business logic, identify enablers and barriers of each phase, and investigate how established companies modify their business model components in different stages of data monetization.
- **Data protection and regulatory compliance:** Ensuring data security and privacy is an essential concern in data monetization (Thomas and Leiponen, 2016). Additionally, the dynamic regulatory environment and lack of precedents make it challenging for established companies to reflect on regulatory changes and keep their customers informed about how their data is used (Parvinen *et al.*, 2020). However, our review indicates a void of IS studies on ethical and acceptable data monetization practices for established companies. Hence, we call for more in-depth exploratory studies to investigate how different organizations across domains deal with legal and ethical issues and accommodate data security and privacy concerns.
- **Organizational context and data monetization strategy:** Our study highlights a lack of empirical studies explaining how established organizations orchestrate data monetization efforts. As there is no one size fits all data monetization strategy, future research should study the interplay between context, organizational resources, and data monetization success. For instance, future research could examine which data monetization strategies suit which contexts and how different organizational capabilities and resources affect data monetization success across domains.
- **Data management and governance:** Our review indicates that despite the importance of data as a critical asset for value creation, established organizations with insufficient knowledge and experience of data have difficulty managing their data (Lange, Drews and Höft, 2021). Therefore, future research should improve our understanding of proper data management and governance mechanisms facilitating data monetization in established organizations. In so doing, future research could examine how data governance mechanisms should be designed to integrate different data silos, address data quality issues, and facilitate intra- and inter-organizational collaboration.

## 5.2 Practical implications

Our study provides a concise and comprehensive overview of data monetization challenges in established companies. As such, it helps managers to formulate and propose tactical and strategic policies for initiating and advancing data monetization efforts and overcoming potential challenges. Based on our results, we suggest the following recommendations for established organizations, regardless of the data monetization approach they follow:

- **Develop a data-driven business model:** Since selling data is entirely different from selling tangible products or services (Lange, Drews and Höft, 2021), established companies need to design a subsidiary business model based on their data resources and market needs. To create a unique value proposition, companies need to identify problems that could be solved using their data, design data-based solutions, and continuously adjust the offerings to protect their competitive advantage. However, developing a new business, in practice, depends on the firm's willingness to reduce its investments in the current business and focus on exploring new ones.
- **Ensure data protection and regulatory compliance:** Security and privacy insurance is an integral part of trust and relationship building, without which no data monetization strategy would succeed. Hence, it is a firm's responsibility to protect data from distribution, integration, sharing, and usage

in ways that would violate privacy and consequently damage the company's image. Additionally, the unique characteristics of data necessitate making solid and explicit agreements regarding data usage and ownership according to the latest regulations. Additionally, companies must establish mechanisms to become aware of the final consumption of their data offerings. This awareness allows them to manage the risk associated with their new business and accordingly informs how contracts must be set up, particularly when dealing with sensitive data.

- **Nurture a data-driven culture:** An organization's existing culture that has evolved for another traditional business over time could hinder data monetization by discouraging data sharing and risk-taking. Thus, established organizations should strive to develop an appropriate corporate culture for data monetization. Such culture includes the nurture of new competencies, new attitudes toward change, and internal as well as external collaboration. Top management commitment is perceived as an essential part of this cultural shift.
- **Build necessary capabilities:** Different approaches to data monetization demand unique resources and technical and analytical capabilities. Therefore, we caution that established companies should start developing these resources only after they define their data monetization strategy and value proposition. For instance, a proprietary data platform may be needed if the company decides to scale up its data business.
- **Develop liquid data assets:** Access to different data sources, especially the scarce ones, is the first stimulus to data monetization for established companies. However, to make the most of these valuable resources, established organizations should implement practices, such as data integration or data and metadata management, to develop liquid data assets that facilitate further value creation.

### 5.3 Limitations and concluding remarks

In this paper, we identified challenges that established organizations encounter in their data monetization efforts. Based on their nature, we divided the challenges into five categories related to business models, legal and regulatory challenges, security and privacy issues, organizational barriers, and data management challenges. Our review highlights several gaps in the literature and calls for further research on data monetization. We suggest that overcoming the identified challenges and creating monetary value from data requires a clearly defined data strategy and management commitment combined with investment in technical and analytical capabilities. The results outline future research opportunities and present practical tools for companies entering the field.

Our study, like any other study, has its limitations. First, due to the newness of the topic and the lack of peer-reviewed articles, we also included white papers in our analysis. However, to mitigate the impact of this issue on our results, we only included white papers published at MIT CISR and Harvard Business Review that are reputable magazines among executives and commonly cited by researchers. Second, due to the keyword-based search method applied to the publications, we may have missed some relevant sources. However, we tried to mitigate this issue by selecting and testing different combinations of search terms. Additionally, we searched different digital sources and repositories to ensure sufficient coverage of IS literature. Finally, the qualitative classification applied in the analysis section is subjective and might have been influenced by personal biases. To decrease the personal bias, even though the analysis was conducted by the first author, the results of the data analysis were frequently shared with other authors and improved iteratively based on discussions among all the authors.

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