Aalto University
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# ORGANIZATIONAL AND CULTURAL CLOUD ADOPTION CHALLENGES

**A Case Study of the Data Engineering Team at Sievo**

Master's Thesis
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**Abstract**

In today's digital world, cloud computing has become a key force changing the operational dynamics of software-as-a-service (SaaS) businesses. This master's thesis explores the complex journey of cloud adoption based on a case study of the data engineering team at Sievo, the SaaS procurement analytics company, which is currently undergoing the cloud transformation via building and adopting the cloud integration platform to replace on-premises legacy systems.

Although platforms built on cloud computing promise increased scalability, flexibility and operational efficiency, its implementation poses both technical and cultural challenges. Drawing on academic and practical insights, this study highlights the holistic transformation required in the organizations with the focus on the cultural challenges during the cloud adoption. A key finding of the study is the human-centric challenges associated with cloud adoption, which highlight the need for comprehensive organizational engagement and cultural change. By focusing on the Sievo transition, this thesis offers a unique mapping of theoretical insights and practical set of recommendations on efficient cloud adoption.

The primary motivation is twofold: firstly, to deepen academic knowledge about the cultural and organizational challenges SaaS organizations face when adopting cloud technology, and secondly, to present a detailed analysis of the current challenges encountered by their data engineering team at the case company during the cloud transformation, accompanied by a strategic framework and set of actionable recommendations that will help to overcome these challenges. The study's findings could benefit not only the case company and academy, but also other SaaS organizations embarking on a similar cloud transformation journey.

**Keywords** cloud adoption, infrastructure transformation, digital transformation, cloud center of excellence, data engineering platform, change management

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Alena Pasynkova

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# List of Abbreviations

| | |
|---|---|
| ADF | Azure Data Factory |
| API | Application Programming Interface |
| AWS | Amazon Web Services |
| CAF | Cloud Adoption Framework |
| CCoE | Cloud Center of Excellence |
| CDF | Cloud Development Framework |
| CI/CD | Continuous Integration and Continuous Delivery |
| CISO | Chief information security officer |
| COP | Community of Practice |
| CSP | Cloud Service Provider |
| DA | Data Architect |
| DE | Data Engineer |
| ETL | Extraction, Transformation and Loading |
| GCP | Google Cloud Platform |
| MS | SQL Microsoft Structured Query Language |
| MVP | Minimum Viable Product |
| P2P | Procure-To-Pay |
| PaaS | Platform-as-a-Service |
| PDM | Procurement Data Manager |
| PDS | Procurement Data Schema |
| SaaS | Software-as-a-Service |
| SDE | Sievo Data Extractor |
| SME | Small and Medium-sized Enterprises |
| SFTP | Secured File Transfer Protocol |
| SSIS | SQL Server Integration Services |
| SVN | Version Control System |

# 1 Introduction

In an era of rapid digital transformation, cloud computing has become an indispensable technology that is fundamentally changing the way Software as a Service (SaaS) organizations manage data and deliver services. The benefits of the cloud are significant, promising scalability, flexibility, and a paradigm shift in operational efficiency. However, as with any transformation process, the journey associated with cloud adoption is filled with benefits and challenges. By focusing on the case of Sievo, the SaaS procurement analytics company navigating the digital transformation with cloud adoption, this master's thesis gets to the heart of that journey.

The literature, as highlighted by Hassan *et al.* (2017b), underscores the need for a strategic pivot for companies to grab a technology that allows them to transform internal processes. However, cloud adoption is not only about technological transformation, but also about a holistic transformation in business processes and operating paradigms. Challenges that SaaS organizations face during the cloud adoption process can be addressed by utilizing the best practices researched and developed by the industry and academy. Thus, as more SaaS organizations move to cloud solutions for their operational needs, the need for transparent and efficient cloud adoption frameworks is clear.

As the focus of this research is related to the organizational and cultural challenges, it is important to highlight that the human factor in cloud adoption is often the most challenging during the digital transformation in organizations. People tend to demonstrate resistance to the changes introduced in the organization (Vial, 2019). Therefore, it is critical to ensure that the entire organization is involved, from senior management to operational teams, and that they have practical guidance on how to address the cultural transformation challenges. Ogunlolu and Rajanen (2019) states that while there is an extensive literature on cloud computing and its benefits, there is a noticeable gap when it comes to the practical challenges of cloud adoption, as well as practices and solutions on how to address these challenges, particularly in relation to cultural change. The development of theoretical frameworks and models often requires the study of practical, real-life examples to be truly effective. Therefore, this thesis, which focuses on Sievo's journey in cloud adoption, provides the academic community with a unique case study that bridges the gap between theoretical postulates and reality. It provides an opportunity to understand the nuances, challenges and practicalities associated with cloud adoption in the SaaS industry and offers guidance for organizations undertaking similar technological journeys.

## 1.1 Motivation

As part of Sievo's ongoing cloud transformation process, the motivation for the master's thesis is to examine the transformational challenges that a data engineering team face when moving their data integration platform from on-premises to the cloud, rearchitecting and redesigning the integration platform used for the daily work, and to create a set of actionable recommendations to address these challenges. Understanding and addressing these hurdles is essential to ensure a smooth and successful transition to cloud technology both for Sievo and for the companies running the technological businesses.

Data engineering teams play an essential part in the Sievo business processes. Their role includes designing and maintaining Sievo's data integration activities from a large amount of data integration pipelines from external data sources that has been maintained and utilized using on-premises integration tools. Currently, Sievo changes its integration tools from on-prime to the platform build on the cloud to improve data integration capabilities, as integrations build on the cloud platform offer a wider range of functionalities than Sievo’s current tech stack, such as a wide range of API (Application Programming Interface) integrations, data manipulation and quality control to support the faster and effective transition.

The case company considered for the reseach has ample IT resources and highly skilled employees. According to research by Hassan *et al.* (2017b), organizations with higher levels of IT resources are more likely to adopt cloud computing, emphasizing the importance of keeping up with dynamic IT trends. Furthermore, the article highlights that competition within the industry has been perceived to positively influence innovation adoption, particularly when it is strategically necessary to adopt the innovative technology to compete within the industry. This emphasizes the urgency for the engineering teams in tech-based companies to adapt to modern technologies promptly if the cloud adoption process was undertaken slowly than anticipated at the planning stage as in the case of the case company.

This study is driven by two goals. First, to expand the existing academic base by exploring the challenges encountered during cloud adoption in SaaS organizations. While infrastructure transformation to the cloud has become more prevalent over time, limited research exists regarding its unique considerations specific to SaaS businesses - this research will offer vital insights into this transition process for the case company while offering practical recommendations to other SaaS organizations undergoing similar transitions.

Second, the motivation lies in improving the cloud adoption journey at the case company and aligning the strategy with the actual adoption process. By identifying challenges encountered during transformation and mapping them against best practices discussed in the academy, this research seeks to create a set of actionable recommendations that will assist Sievo in overcoming transformation hurdles, optimizing cloud adoption framework, and making a smooth transition to the cloud. By focusing on data engineering teams, this research expands on current cloud adoption knowledge and addresses their specific needs and challenges within an organization. Furthermore, findings and recommendations from this study will serve both Sievo's data engineering team as well as provide useful resources for other companies undertaking cloud transformation.

## 1.2 Research questions

The central focus of this thesis revolves around the following research questions:

1. **What kind of cultural and organizational challenges does the engineering team encounter during its transition from on-premises to integration platform built on the cloud?**

The objective of this question is to determine the obstacles and concerns that the data engineering team at the case company encounters while transitioning from an on-prime to a cloud-based system. Recognizing these challenges is essential in developing successful approaches to address them.

2. **How can existing academic findings, industry frameworks and case studies in the technological industry be leveraged to address the digital transformation challenges and improve cloud adoption process in SaaS organizations?**

The aim of this question is to formulate the set of actionable recommendations by leveraging the best practices gained from the academic research, frameworks, and case studies to address existing cloud adoption challenges and to improve a cloud adoption operational process both in the SaaS industry and case company.

## 1.3 Thesis structure

The structure of the thesis is designed to provide a comprehensive understanding of the research topic, drawing on both academic literature and empirical research. The thesis is enriched with tables and figures that provide visual representations of key concepts and data.

Additionally, a list of abbreviations is provided for clarity. The breakdown of the structure of the study is presented below.

**Chapter 1: Introduction**

This chapter sets the stage for the research by introducing the relevance of the study for the case company and the academy. It outlines the introduction to the study, the motivation, and the questions guiding the research.

**Chapter 2: Literature review**

Serving as the theoretical foundation for the thesis, this chapter examines the existing academic literature on cloud adoption, particularly within SaaS organizations. It covers the benefits, challenges, and strategies and frameworks associated with cloud transformation, drawing on insights from global case studies and established frameworks.

**Chapter 3: Case Company**

This chapter provides an overview of Sievo, the case company of the research. It describes the company's operations, the role of the data engineering and the cloud development framework teams.

**Chapter 4: Research Methodology**

This chapter details the methods used in empirical research. This includes interview preparation, data collection techniques, and the reasoning behind the chosen methodologies.

**Chapter 5: Empirical Study**

This section presents the findings of the empirical research conducted at the case company. It covers various aspects of the cloud adoption process, from skills assessment and pace of transformation to challenges faced and leadership support.

**Chapter 6: Research Discussion and Recommendations**

Based on the findings from the literature review and empirical study, this chapter offers a set of recommendations for Sievo and other technological organizations undergoing the cloud adoption process.

**Chapter 7: Conclusion and Research Implications**

The thesis concludes with a summary of the research findings, their theoretical and practical implications, discussed limitations and provides suggestions for future research.

# 2 Literature review

The literature review chapter examines the transformative power of cloud computing, particularly within Software as a Service (SaaS) organizations. The review examines the shift from traditional on-premises infrastructures to cloud-based platforms, highlighting the benefits and obstacles faced by SaaS companies during the transition to the cloud technologies, with the focus on the organizational and cultural challenges. Drawing from various academic sources, a review of case studies that have published their experience of the cloud adoption process, and best practice from existing adoption frameworks, the chapter examines the wider implications of the benefits, challenges, and areas of change within the organization as a result of cloud adoption. As stated in the research objective, the focus of the academical and empirical studies will be relying on the challenges and strategies related to the cultural transformation in the organization during the cloud adoption processes, while benefits of the cloud solution are discussed to highlight the emerging need in the industry for the cloud transformation taking into account its vast about of benefits versus traditional on-premises technological infrastructure setup. As Ogunlolu and Rajanen (2019) emphasizes that human factors associated with cloud adoption have the least coverage in the literature, the chapter not only sets the stage for empirical research of the study, but also enhances existing academic studies.

## 2.1 IT Infrastructure transformation to the cloud in SaaS organizations

In the era of digital transformation, Software as a Service (SaaS) has become a key business model in the technology industry where timely market innovation is paramount to growth and success. Cloud computing, which has emerged from the convergence of technological advances, provides companies with the opportunity to utilize outsourced computing with shared resources (Venters and Whitley, 2012).

The extensive and constantly evolving data layer is foundational to every SaaS organization, fueling innovation, shaping customer experiences, and guiding strategic decisions. Efficiently managing, storing, and analyzing this burgeoning data is vital in today's dynamic digital landscape. On-premises data warehouses and integration platforms quite often struggle to keep pace with the exponential growth of data, leading to operational bottlenecks and heightened costs. Facing challenges with the volume and complexity of data, SaaS enterprises often find traditional systems too expensive and inflexible for the modern data landscape. Cloud computing, thus, has become a cornerstone, aligning seamlessly with their objectives. The advantages offered by cloud platforms, such as flexibility, affordability, and operational agility, as well as readily available and flexible resources without the need for provisioning, management, or maintenance of IT resources (Vial, 2019), are causing businesses to reconsider their technological architecture. (Hassan *et al.*, 2017a)

Cloud computing stands as a cornerstone for modern SaaS enterprises, aligning seamlessly with their business objectives. One significant advantage is scalability, as cloud platforms provide on-demand resource provisioning. This enables companies to dynamically scale their data storage and processing capabilities. Moreover, companies can be more sustainable as there are recent improvements in network connectivity that has enabled cloud companies to locate their large data centers in locations where power and cooling are cheaper and potentially more environmentally friendly (Venters and Whitley, 2012). Therefore, this elasticity enables SaaS organizations to manage fluctuating workloads efficiently, environmentally-friendly, and cost-effectively.

But all changes are accompanied by challenges. Ogunlolu and Rajanen (2019) discusses the external and internal factors influencing the cloud adoption in the organization where organizational factors such as organization readiness, structure and culture are highlighted as the internal factors in line with the technological factors. Therefore, as the importance of the organizational and human factors influencing the success of cloud adoption is clear, emphasis of the literature review will be placed on change management, decision making and cultural aspects of the cloud transformation process.

### 2.1.1 Cloud computing models

A pivotal decision for SaaS organizations lies in selecting an appropriate cloud model to transition from their on-prime IT infrastructure. According to Gopalakrishnan and Maheswari (2019), there are four cloud computing deployment models: private cloud, public cloud, community cloud, and hybrid cloud, each of which has its own advantages and limitations.

**Private cloud** is considered a more advanced version of traditional corporate data centers, specifically designed to meet the specific needs of a single entity or organization. One of the four cloud computing models is the private cloud, which appeals to organizations that see the sharing of free storage and resources in the cloud as potentially risky (Gopalakrishnan and Maheswari, 2019). As a result, there is a growing trend towards organizations preferring an exclusive cloud environment customized for their operations.

Private clouds give companies and their IT departments complete control over resources and security. This increased level of control, while beneficial, can be more expensive and may limit some advantages that come with a public cloud structure.

**Public cloud** is a large digital space managed by third-party organizations and available to anyone who needs cloud services. Unlike private clouds, the public cloud provides broad access and immediate availability of resources, eliminating the need for upfront investment to scale. As explained in the research on enterprise public and private cloud service (Gopalakrishnan and Maheswari, 2019), public cloud is particularly beneficial for organizations using vendor-supported SaaS applications because it allows for cost-effective scaling. In this model, the service provider is responsible for providing fixed assets such as hardware, software, and network bandwidth, which means that users are billed based on their actual usage. While public cloud provides cost efficiency and scalability, it cannot provide the same level of customization and control as private configurations. Examples of companies operating on public cloud infrastructure include technology giants such as Google, Microsoft, and Amazon Web Services.

**Community cloud** is designed for specific groups of organizations with similar needs. When these like-minded organizations want to build a network within their constraints, a community cloud is the best option. This arrangement allows sharing of resources, which helps companies control their spend by sharing the cost of cloud infrastructure between the participating companies. (Gopalakrishnan and Maheswari, 2019)

**Hybrid cloud** is considered the most versatile type of cloud infrastructure as it combines the benefits of both public and private clouds to meet the needs of organizations. This approach combines on-premises resources, dedicated private clouds and multiple public clouds for applications and data. It provides exceptional flexibility, allowing companies to easily move workloads between different cloud solutions based on changing requirements and costs. Hybrid cloud provides scalability like public cloud models while ensuring data security comparable to private clouds. However, it is important to note that this model introduces additional complexities - the technology used to connect and transfer data between different clouds must be perfect. Typically, a private cloud on the organization's premise is used to protect sensitive information, while public clouds are used to access commercial hardware and software services under SaaS and PaaS models (Gopalakrishnan and Maheswari, 2019).

Understanding the different cloud models and their advantages is important when looking at how SaaS businesses adopt cloud technology. Although private, public, community, and hybrid models have unique features and considerations, they share the same goal of helping companies use the cloud to improve their operations. However, it is important to understand that the practicality of cloud technology adoption is different in regard to the technological changes in the organizations but associated with the same change management processes to change the cultural and organizational practices.

### 2.1.2 Cloud adoption benefits

To ensure a comprehensive understanding of the cloud adoption landscape among SaaS enterprises, the meta-analysis method is used to ascertain the overall benefits of cloud technology for technological organizations. This method combines the statistical data collected from several independent surveys, conducted by industry consulting companies. By analyzing publicly available statistical results, a weighted mean of measurements across studies is provided, which helps to mitigate bias. This approach is grounded in a systematic review of numerous reports from large companies, resulting in more generalized and robust conclusions. The benefits to be analyzed include profitability, growth rate, operational efficiency, security, resilience, flexibility, and environmental impact. This approach provides a holistic view of the advantages that come with cloud computing and the implications for SaaS companies, again highlighting the need for in-depth investigation on the different factors that might influence the cloud adoption inside the organization which could potentially slow down companies on their way to achieving the benefits listed below.

*Table 1 Cloud adoption statistical measurements and benefits*

| ***Source of the Survey*** | ***Statistical Measurement*** | ***Objective / Benefits*** |
|---|---|---|
| ***IBM (2017)*** | 65% respondents reported faster time to market | ***Reduced time*** to market through cloud computing |
| ***OpsRamp (2017)*** | 94% respondents reported reduced upfront costs | ***Lower*** startup ***costs*** due to cloud computing |
| ***OpsRamp (2017)*** | TCO savings of 30-40% | ***Cost savings*** and shift from CapEx to OpEx |
| ***Oracle (2018)*** | 60% C-suite executives listed improved security as top benefit | ***Enhanced security*** through cloud computing |
| ***Accenture (2023)*** | Carbon emissions reduction by 84% | ***Eco-friendly*** operations through cloud migration |

| | | |
|---|---|---|
| ***Deloitte (2014)*** | 21% more profit, 26% faster growth | ***Higher profitability and faster growth*** for SMEs using cloud computing |
| ***Corelynx (Anderson, 2022)*** | Disaster recovery issues resolved in 2.1 hours vs 8 hours | ***Improved*** business ***resilience*** through cloud-based solutions |

The data gathered from various industry surveys indicate that the adoption of cloud computing by SaaS companies leads to numerous advantages in different operational areas. These results highlight the importance of cloud computing for SaaS companies and its vital role in shaping their future development.

However, to fully realize these benefits, companies must understand the broader implications of cloud adoption. Cloud transformation represents more than a mere technological shift. As discussed by Vial (2019), digital transformation entails a fundamental transformation in how SaaS companies operate, requiring substantial changes in organizational culture and structure. Conclusively, the cloud transformation offers SaaS companies a chance to reassess their organizational frameworks, workflows, and cultures. Approached and executed correctly, this shift can not only enhance operational efficiencies but also promote an innovative and agile culture that is fundamental for consistent and stable growth of SaaS organizations.

## 2.2 Cloud adoption challenges in SaaS organizations

As discussed earlier, the transition to cloud computing, although offering numerous benefits, presents both technological and organizational challenges that SaaS companies must overcome during the IT infrastructure transformation process. This chapter will investigate further the challenges influencing cloud adoption.

To shortly cover the technical challenges, a research paper by Avram (2014) has been studied, as it provides a comprehensive analysis of the benefits and technical challenges associated with cloud computing. The study states that uncertainty about achieving security at all levels and the data protection of individual's information in the cloud model, as well as concerns about whether cloud computing can address privacy and governmental regulations are faced by IT enterprises during the cloud transformation process. Other technical challenges discussed in the article are related to connectivity and free access, as the full potential of cloud computing depends on the availability of high-speed access to the infrastructure. Reliability, availability, innovation characteristics, and trialability are other most common technical factors associated with cloud adoption in SaaS organizations (Ogunlolu and Rajanen, 2019).

Based on the main objective of the study, cloud adoption has implications beyond just technical aspects, as it also affects the organizational and cultural aspects of SaaS companies. The common thread in these instances is not a lack of recognition of the potential benefits of digital technologies by top management; rather, it is the deeply ingrained structural components, both tangible (e.g., means of production) and intangible (e.g., organizational culture), that stifle the innovative and disruptive potential of digital technologies. As discussed by Vial (2019), inertia poses a significant obstacle to digital transformation. This challenge has been identified in various studies and practitioner accounts. For example, Töytäri *et al.* (2017) emphasize the role of organizational culture, identity, and legitimacy as strong institutional barriers hindering the digitalization. The core of the cultural aspect of the change in any organization are human factors (Ogunlolu and Rajanen, 2019). People tend to resist change, and transformation to the cloud brings a lot of change and disruption, as discussed by Palos-Sanchez *et al.* (2017).

Moving to the cloud requires IT teams to adapt and change their working processes and adjust their roles and responsibilities to fit the new environment. Vial (2019) highlights the importance of cross-functional collaboration as a key element of the digital transformation strategy to overcome the need for organizational transformation. Such collaboration can bridge the existing gap between organizational and IT strategies, ensuring they are coordinated and moving the company toward achieving its goals. Moreover, to successfully implement cloud technologies, there is a significant need for a cultural shift. Traditional differences between IT and business functions can be deeply rooted in an organization's values, making them difficult to overcome. Therefore, for companies to truly harness the power of digital platforms, they must cultivate values that promote innovation, a common language, and embrace a cloud-centric mindset. This involves fostering a culture of innovation and agility to encourage continuous learning and adaptation while changing an organization's culture. (Vial, 2019)

To enable digital transformation specialized skills and new roles in the organization are required. Tyc (2023) offers an insightful view on this matter, highlighting the skills gap as one of the most imposing challenges facing organizations in their journey towards cloud platform. It presents a two-sided challenge. On one hand, there is an urgent need to bridge the technical skills gap, and on the other, there is a pressing requirement to cultivate soft skills required in modern workplaces, because soft skills are equally important as technical skills. Organizations that prioritize the development of both types of skills demonstrate more confidence in their future growth. In the case of cloud adoption, soft skills such as communication, problem-solving, and adaptability are crucial for employees to successfully overcome complex challenges that arise during the transformation process. Also, changes to the structure and culture of an organization lead employees to assume roles traditionally outside of their functions (Vial, 2019). Thus, a comprehensive approach to skills development is necessary to overcome transformation challenges.

The challenges associated with the cloud adoption process are not insurmountable. SaaS companies can successfully navigate these challenges and make use of the rewards of cloud technology by taking the right approach to the transformation process. However, it is crucial for SaaS companies to understand that cloud adoption is a holistic transformation that impacts every aspect of their organization. Additionally, as cloud technologies are rapidly evolving with time, new challenges may emerge, and existing challenges may change or become obsolete over time. Lack of preparation before and during the adoption process as mentioned by Vajhala and Townsend (2023) will certainly lead to the lack of digital transformation efficiently. Therefore, SaaS companies must prepare and adopt a flexible, adaptive, and comprehensive strategy to the cloud adoption by addressing not only the technical but also organizational and cultural changes and by continually monitoring the transformation process and adjusting their strategies as needed.

Further research to explore the real case studies is essential to identify and find other strategies or tools to develop the guidance to support the organizations during cloud adoption. Nevertheless, it is already now clear based on current findings that overcoming these challenges depends on the collaboration between organizational leaders and employees, as every individual's contribution is crucial for successful integration of recent technology into existing organizational frameworks.

## 2.3 Strategies in cloud transformation: Case studies from SaaS organizations

Moving from on-prime data infrastructure to cloud-based solutions is a complex process with various obstacles. However, many organizations have managed this transition smoothly by adopting strategic measures to tackle these challenges. This chapter discusses best practices and remedies that have been assessed within the cloud transformation projects, drawing from multiple case studies of SaaS organizations. The study of official materials published by SaaS companies is important for this study, since final reports in transformation processes can show different challenges that were not discussed in the theoretical study earlier, setting the wider ground to consider different aspects for the empirical part of the study.

### 2.3.1 Netflix

**Background**: Netflix, established in 1997, a global streaming entertainment service, has transformed the way people consume media.

**Transformation Objective**: Netflix's journey to the cloud began in August 2008 after experiencing significant database corruption, leading to a three-day recovery period (Netflix, 2016). This incident highlighted the need to shift from traditional single-point failure systems, like relational databases in their data center, to more dependable, horizontally scalable, distributed systems in the cloud. Netflix opted for Amazon Web Services (AWS) because it had an extensive range of services and features and was highly scalable.

**Transformation Strategy and Results:** Several strategic meetings were initiated by Netflix to plan the transformation, with a focus on resilience against problems such as database corruption and connection-related issues. Adopting a cloud-native approach, Netflix moved from a monolithic application structure to multiple microservices. This approach allowed for greater agility and innovation. As shared by Stokel-Walker (2017), to further ensure the robustness of their cloud infrastructure, Netflix created 'Chaos Monkey,' a tool intended to intentionally disrupt their cloud system and evaluate its resilience. As a result of these efforts, Netflix could manage its significant growth more efficiently. By the end of the migration process, Netflix had gained eight times more subscribers and achieved substantial cost savings (Netflix, 2016). The scalability of the cloud allowed them to fulfill growing demand without traditional server rack limitations. On top of everything discussed, Netflix's decision to migrate to the cloud was a pioneering move at the time. They were among the early adopters of cloud technology, setting a precedent for other companies to follow.

**Key Takeaways:**

1. *Strategic Vision:* Netflix (Stokel-Walker, 2017) envisioned a complete transformation of the company's infrastructure. Instead of simply 'lifting and shifting' their existing system to the cloud, they opted for a more comprehensive approach. Furthermore, as opposed to a direct 'forklift' migration, Netflix (2016) used a cloud-native strategy.
2. *Learning and Adapting:* Netflix (2016) encountered difficulties during the migration process, such as outages, despite their careful planning and

preparation. Nonetheless, these obstacles were faced as learning opportunities, allowing the company to enhance its approach and improve its systems.

3. *Collaborative Effort:* As discussed by Stokel-Walker (2017), the migration process was a collective cooperation from the entire organization, involving not just the engineering teams, but every individual in the company. This teamwork was crucial for the successful cloud adoption project.

The Netflix experience shows the power of strategic vision, the value of constant learning and adopting, as well as the critical role of a united organizational front in embracing change, all seen as cultural and organizational actions to improve the cloud adoption process. These key takeaways will be further addressed and utilized in the next part of the research focused on the development of a set of recommendations to address transformational challenges.

### 2.3.2 Spotify

**Background:** Spotify, established in 2006, is a media services provider primarily known for its audio-streaming platform, offering users the ability to search, listen, and share music and podcasts.

**Transformation Objective:** In 2015, Spotify realized the limitations of managing and maintaining their own data centers. The company's vision was to be the 'best music service in the world,' and they believed that the cloud could help them achieve this goal. Their objective was to allow their engineers to concentrate on innovative ideas rather than infrastructure maintenance. The decision was made to transition to the Google Cloud Platform (GCP) to leverage its capabilities and reduce costs (Filatov, 2019).

**Transformation Strategy and Results:** Spotify's transformation to the GCP took two years and was divided into two key components: services and data. The services migration involved moving services to the cloud in two-week sprints that involved shifting services to the cloud, during which time product development was paused. The transformation allowed Spotify to move away from on-premises infrastructure, innovate faster, and enhance the efficiency of its services.

**Key Takeaways:**

1. *Stakeholder Buy-In:* Consulting its engineers about the future vision, Spotify gained enthusiastic support from them when they were able to envision their roles (Filatov, 2019).

2. *Preparation is Key:* The transformation team spent considerable time examining different cloud approaches and constructing a case that displayed the advantages of cloud computing for the company. They meticulously charted out all interdependencies and collaborated with the Google team to determine and execute appropriate cloud strategies and solutions (Filatov, 2019).
3. *Focus and Dedication:* The migration was facilitated by Spotify's specialized team, who ensured that all parties were informed about past experiences and lessons. The engineering teams' full focus on the migration allowed them to finish it more efficiently, which minimized the impact on product development (Filatov, 2019).
4. *Collaborative Approach:* The small team of Spotify engineers who managed the transformation project collaborated with a team from Google as shared by the Spotify Engineering team in 2019. They developed a program for standardized migration sprints, created teaching materials for common migration cases and cloud infrastructure, and built a real-time visualization tool for monitoring the state of the migration. The partnership between the two teams allowed them to overcome challenges and improve the platform to meet Spotify's needs.

Spotify's case again highlights the urging need for the collaborative approach as in the case study of Netflix's transformation. Additionally, leadership engagement and collaboration with external partners significantly influences the adoption process in Spotify, enhancing the findings from the academic publications discussed earlier.

### 2.3.3 Etsy

**Background:** Established in 2005, Etsy has gained worldwide recognition as an e-commerce platform that offers one-of-a-kind items. It enables vendors to create digital storefronts dedicated to crafting supplies, vintage products, and handmade goods.

**Transformation Objective:** Etsy had been managing its own infrastructure since the beginning (Filatov, 2019), but in 2018, they realized the importance of reviewing their technological foundation to align with their future goals. The transformation plan served several purposes, including improving site performance, streamlining engineering processes, and elevating user experience. Furthermore, Etsy's long-term scalability and sustainability were considered. Their main objective was to shift from maintaining infrastructure to executing strategic initiatives that would drive the company's growth.

**Transformation Strategy and Results:** Etsy carefully and strategically migrated to the cloud. They went through a strategic selection process to choose the GCP as their best option. As shared by Tim Cochran, a Technical Director for the US East Market at Thoughtworks, and Keyur Govande, Chief Architect and VP of Infrastructure Engineering at Etsy (2022), Etsy followed principles such as Minimum Viable Product (MVP) and local decision-making to execute their transformation strategy. They also collaborated with external partners to accelerate their cloud transformation and adopt innovative technologies. By the end of their transformation journey, Etsy managed a significant increase in traffic during the pandemic, which rose from one billion to six billion events.

**Key Takeaways:**

1. *Strategic Planning:* Etsy's detailed analysis, including requirements definition, RACI matrices, and architectural reviews, ensured that their move to the cloud would fulfill all their goals (Filatov, 2019).
2. *Collaborative Efforts:* Collaboration between Etsy and external partners and the creation of architecture advisory groups involving multiple teams, helped with sharing knowledge and identifying patterns throughout the company. This resulted in a more seamless migration process. *(*Cochran and Govande, 2022)
3. *Sustainability Focus:* Cochran and Govande, (2022) noted that the focus on environmental responsibility at Etsy prompted the creation of tools like Cloud Jewels, which can estimate energy consumption in the cloud and supports the company's sustainability efforts.

Again, planning, collaboration, and engagement efforts are discovered as the solutions to overcome organizational and cultural challenges, as emphasized by Netflix, Spotify, and Etsy case studies. These findings will be analyzed and clustered further in the next chapter, but already at this stage they form the solid ground for the empirical part of the study to formulate the set of actionable recommendations for digital organizations.

### 2.3.4 Cloud adoption key factors from global case studies

Moving to cloud-based solutions can be a challenging yet rewarding endeavor as demonstrated by successful case studies such as Netflix, Spotify, and Etsy. Each of these companies pursued different objectives and approaches during their transition to the cloud, but there are shared patterns that can provide guidance for other businesses planning a similar shift.

The table 2 below serves as a summary of the complex strategies employed by all three case companies during their cloud adoption journeys. The interplay between these significant factors is noteworthy, as it reveals a pattern that could serve as a guidance for other organizations considering a similar transition.

*Table 2 Key factors influencing the success of cloud adoption.*

| ***Key factors*** | ***Netflix*** | ***Spotify*** | ***Etsy*** |
|---|---|---|---|
| **Strategic vision** | Scalability and reliability | Innovation and cost-efficiency | Improve site performance and sustainability. |
| **Detailed planning & preparation** | Assessed cloud solutions, mapped dependencies | Specialized teams, collaboration with Google | Strategic selection process, A/B testing, collaboration with partners. |
| **Collaboration & stakeholder engagement** | Organization-wide involvement | Collaboration with Google | Partnership to form the architecture advisory groups. |
| **Adaptability & learning** | ‘Chaos Monkey’ for resilience testing | Used sprints to adapt and iterate | MVP and local decision-making principles. |
| **Focus on sustainability & long-term goals** | Implicit focus through scalability and reliability | Implicit through innovation and cost-efficiency | Explicit focus, creation of tools to estimate energy consumption in the cloud. |

After analyzing case studies, it is explicit that while a strategic vision is important to overcome both technological and cultural challenges to streamline the cloud adoption process, it is the detailed planning and preparation that transform the vision into a roadmap. During the planning phase, it may become undoubted that specialized skills or external partnerships are necessary, leading to collaborative efforts both internally and externally. These collaborations are especially crucial when transformation encounters obstacles, requiring adaptability and openness to learn and adapt. Additionally, the emphasis on long-term sustainability and overall business objectives is not a stand-alone phase but is integrated into each of the other factors. It affects the strategic vision, guides the planning process, and often determines which collaborators to choose.

Additionally, the analysis presented in the Table 2 illustrates that achieving a successful cloud transformation is not a linear process but a multi-dimensional task that involves a balanced focus on various interconnected factors. The table also implies that although every transformation may have its own unique challenges, there are general principles — strategic vision, detailed planning, collaboration, adaptability, and focus on long-term goals. These principles can offer an invaluable understanding for future academic research and practical applications.

As we transition to the next chapter, which focuses on Microsoft's Cloud Adoption Framework, these key takeaways provide a rich context. The framework offers a structured approach to cloud transformation, and the insights gained from these case studies will serve as practical examples against which the framework's recommendations can be analyzed and discussed.

## 2.4 Microsoft cloud adoption framework

As cloud computing is the new normal in the modern technological world, companies need the working adoption models. To leverage the benefits of these emerging technologies, Microsoft has created the Cloud Adoption Framework (CAF) as a comprehensive guide that provides documentation, implementation guidance, best practices, and tools to assist organizations in their cloud adoption journey. The theory, recommendations and guidance in this thesis are drawn from the framework to address cultural cloud adoption challenges. In-depth analysis of the framework is essential for the study, as it can additionally enrich the findings to form the recommendations for the SaaS organizations facing the cultural and organizational challenges. This framework has been developed based on the extensive experiences and a significant amount of executed real-world best practices in cloud adoption of Microsoft's partners and customers who have already ventured into the world of cloud computing. (Microsoft, 2023a)

The Azure Cloud Adoption Framework outlines key functions that should be executed by the business, such as defining business goals, ensuring consistency with changing business priorities, validating business decisions, understanding the impact of tangible business risks, and approving the business impact of proposed architecture changes. Additionally, it specifies typical duties and obligations that play a substantial role in implementing transformation plans, such as coordinating existing inventory with fundamental presumptions grounded on intended business outcomes, determining the order of workload migration priority, and endorsing architecture proposals (Microsoft, 2023a).

The CAF comprises three main and two supportive stages: Plan, Ready, Adopt, plus Govern, Manage. Each stage requires careful consideration of several factors to ensure a smooth transition process. However, as the case company has already initiated and undergone its cloud transformation process for more than two years, this literature review will concentrate primarily on the 'Adopt' stage of the framework. The 'Adopt' stage is most pertinent aspect relevant to the empirical part of the research to gain insights into how Sievo can effectively adopt cloud technology while minimizing risks and maximizing benefits.

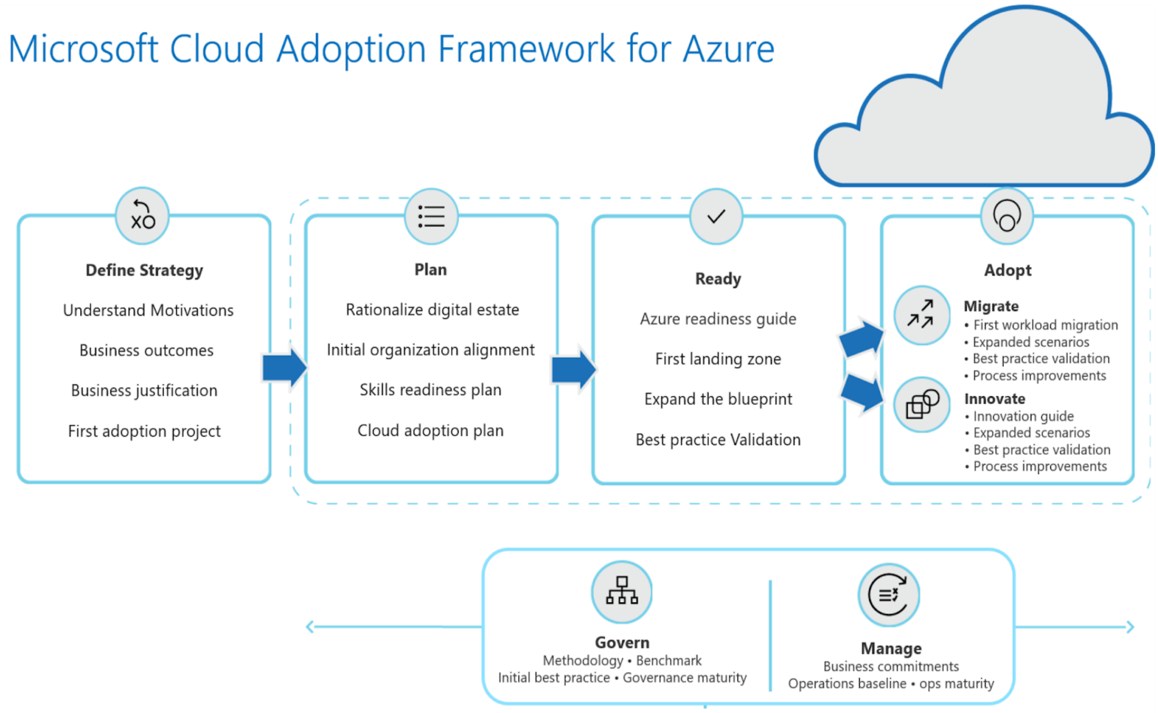


*Figure 1 Microsoft Cloud Adoption Framework*

This Microsoft CAF (2023c) emphasizes that during the adoption stage, it is vital to align roles and responsibilities of each team member involved to drive clarity and a smooth progression throughout every stage of the transformation process. It helps to manage the cultural challenges that might arise during the process. The framework outlines specific roles and responsibilities for different processes, ensuring there is a single accountable party assigned for each activity, with other responsible parties who support those activities. Such a clear definition of roles and responsibilities promotes accountability across all levels when everyone knows what they need to do and what is expected of them during the migration.

## 2.5 Cultural shift in the cloud adoption strategy

As organizations begin the process of adopting cloud, they often focus on technical aspects - choosing the right cloud service provider, transferring data, building new platforms, and optimizing performance. However, as earlier discussed, it is important to consider that a successful transition to the cloud is not just about technology, but it also involves cultural and organizational changes (Vial, 2019). The Microsoft CAF (2023a) recommends that understanding and adopting to a cloud-centric culture is pivotal for a seamless adoption process. This chapter will explore even more the cultural and organizational challenges that organizations encounter when adopting the cloud as the focus area of the study. It will examine how a shift in mindset, aligning roles with responsibilities, and transforming the organization can have a significant impact on the success of cloud transformation projects.

### 2.5.1 Organizational transformation

The adoption of cloud technology involves transforming the entire organization (Vial, 2019). This transformation is based on how an organization views and uses cloud technologies. The process of implementing cloud technology within an organization involves multiple aspects and is influenced by two main factors: the alleviation of burdens by Cloud Service Providers (CSPs) and the newfound flexibility enabled by software-defined infrastructure (Meyer and Richards, 2022). However, as discussed by Avram (2014), the speed of change is critical in the transformation journey, as it will impact the adoption of cloud technologies and the ability to decompose solutions to deliver real value from cloud technology.

Additionally, the order in which an organization approaches its transformation journey can have a significant effect on the result. Meyer and Richards (2022) suggest that the preferred sequence of transformation is Organization, Operations, and Technologies (O-O-T), rather than Technologies, Organization, Operations (T-O-O). This approach emphasizes the crucial role of establishing a strong organizational framework that aligns with the company's strategic objectives and culture. Once this framework is established, operational procedures can be adjusted to fit within this organizational context, guaranteeing that processes are optimized for efficiency, scalability, and adaptability. By placing technology last in the sequence, it becomes easier to ensure that technological solutions are completely aligned with organizational strategies and operational efficiencies, resulting in maximum benefits from the transformation process.

### 2.5.2 Cloud-centric mindset

The organizational transformation comes closely with the mindset changes of the employees in the organization. This change is crucial for unlocking the full potential of cloud technology. It is not just about transferring existing systems to the cloud; it requires a more profound organizational transformation that involves reevaluating development, architecture, and security processes.

> *Organizations should avoid viewing the cloud as another data center but as a platform offering broader capabilities, including enhanced security and software-defined infrastructure flexibility. (Meyer and Richards, 2022)*

Considering human factors in the strategy for adopting cloud technology increases the likelihood of successful deployments, allowing companies to fully utilize the speed, capacity, efficiency, and agility of cloud technology. However, as pointed out by Vial (2019), employees can demonstrate resistance to the disruptive technologies introduced in the organization. The issue of resistance raises important questions with regards to the ways and the pace at which technologies are introduced into an organization. Therefore, a change in mindset is certainly the time consuming and challenging task for any organization undergoing the digital transformation and can lead to the rapid growth of costs and a temporary decline in employee productivity during the initial period of transformation.

### 2.5.3 Communication

Along with the organizational and mindset change, the key to a successful transition to the cloud is effective communication. When employees recognize how the cloud can improve their working processes, their motivation grows. It is important to take an employee-focused approach when adopting the cloud. Vajhala and Townsend (2023) states that the employees, stakeholders, and other business partners must be informed of the transitions at every stage of the transformation process. Supported by Palos-Sanchez *et al.* (2017), when a latest information system is introduced, employees should be informed in advance of the scope, objectives, tasks, and updates of the implementation of the new technological system. This inclusivity guarantees that the move to the cloud is seen as a shared journey rather than something forced upon them.

A highly coordinated communication strategy is crucial. As suggested by James (2020), this strategy should:

1. Capture the unique culture and voice of the organization.
2. Highlight the collaborative aspect of the transition, highlighting how team members contribute to its success.
3. Clearly outline the practical effects of implementing cloud technology on daily operations and procedures.

4. Illustrate the wider advantages of utilizing the cloud, such as improved customer service, enhanced business performance, and gaining a competitive edge.

By attending to these cultural subtleties and effectively communicating the benefits of the cloud, organizations can facilitate a successful transition and develop an engaged workforce.

### 2.5.4 Role alignment and transparency

As pointed out by Meyer and Richards (2022), after transforming the organizational structure, the next step is role alignment and the transformation of operations. This involves aligning with the overall organization and the newly defined processes. Operationalizing continuous integration and continuous delivery (CI/CD), building best practices, and then addressing the technological gap by introducing new tools and training teams on their optimal use are essential components of this transformation.

Additionally, the Microsoft CAF (2023b) also highlights the importance of aligning roles and responsibilities to guarantee transparency and effectiveness throughout the adoption process. The structured approach below offered by the framework ensures that each team understands its role in the cloud adoption process, promoting accountability and transparency.

*Table 3 Steps for organizational alignment by Microsoft CAF*

| | |
|---|---|
| ***1. Structure Type***<br>It is important to determine the organizational structure that aligns with the cloud operating model, promoting efficient communication and collaboration. | ***2. Cloud Functions***<br>Identifying specific cloud functionalities and the teams responsible for them is critical for successful adoption. |
| ***3. Mature Team Structures***<br>Establishing clear teams with defined roles ensures the proficient handling of cloud tasks. | ***4. RACI Matrix***<br>This tool maps roles to teams, delineating accountability, responsibility, consultation, and information dissemination, fostering clarity in the cloud adoption process. |

A study conducted by Lee James (2020) demonstrates that radical alterations in business processes can have a failure rate as high as 70%. One major factor contributing to this high failure rate is the ignorance of employees' traditional workflows. It is crucial to remember that employees and associated human factors are the foundation of any organization. Their needs, concerns, and workflows should be prioritized when devising any transformation strategy. Meeting these needs, aligning roles, and enabling employees are essential to the success of the cloud adoption process so that the move to the cloud is seen as a positive change rather than a threat.

### 2.5.5 Training and skill development

Furthermore, any technological transformation requires a comprehensive approach to training and skill development to ensure that employees are equipped to navigate the new cloud environment.

To enable the smooth digital transformation in the organization, training of employees is critical, ensuring they acquire the requisite skills to operate within the new infrastructure. As teams adapt to the cloud environment, their roles may change. However, these new responsibilities, although different, are still critical to the organization and can often be more interesting and fulfilling.

Vajhala and Townsend (2023) further stress that the engineering departments must take the lead in educating employees about these updates. This proactive approach ensures that the workforce remains updated and can navigate the cloud environment securely and efficiently. As emphasized by Avram (2014) that any technological shift in the organization is associated with acquiring the new skill sets to deploy the technology in the context of solving a business problem. Thus, providing employees with expert support can boost their self-confidence during this transition period. Using a mentor to guide this process can be an invaluable strategy in this regard.

As organizations begin their journey to the clouds, it is important to prioritize training and skill development. Organizations should invest in training programs for employees in quality and quantity (Palos-Sanchez *et al*., 2016). This investment in employees ensures that the shift is technically competent and promotes unity, cloud-centric mindset, and success within the organization.

### 2.5.6 Leadership and governance

The journey to cloud adoption is deeply intertwined with organizational leadership and governance. Top management support is the most studied internal organizational factor influencing cloud adoption, and among the most relevant ones (Ogunlolu and Rajanen, 2019). These studies include leadership and top management support among the variables that significantly affect technology acceptance in a company (Palos-Sanchez *et al.*, 2017). The research conducted by Hassan *et al.* (2017a) supports the importance of the top management in the adoption of cloud computing. This support is not limited to decision-making but involves allocating sufficient financial investment, human resources, and technological competencies (Hassan *et al.*, 2017b). In this context, the role of organizational leadership becomes even more pronounced.

Leaders not only drive transformational change but also align it with the broader organizational goals. Organizational leaders must work to ensure that their organizations develop a digital mindset while responding to disruptions associated with digital technologies. They should act as boundary spanners who can help translate the digital business strategy into a set of concrete actions that influence organizational and cultural change. (Vial, 2019)

Leadership also includes motivation and governance. As suggested by Vial (2019), the creation of the new leading position inside the organization can signal the strategic nature of transformation for the entire organization who can ensure that digital technologies are properly leveraged and aligned with the objectives of the organization. The responsibility of a leader also includes keeping teams motivated by recognizing milestones and achievements. Research conducted by Lee James (2020) has shown that immediate and frequent rewards for completing tasks can increase job interest and satisfaction. Additionally, these rewards can improve motivation, leading to consistently high performance even without external incentives. To optimize the effectiveness of these rewards:

- **Frequency is key:** Set multiple short-term goals to provide frequent opportunities for recognition and reward.
- **Reward innovation:** Encourage and recognize suggestions that improve task completion or increase efficiency.
- **Celebrate employee-focused milestones:** Highlight milestones that resonate with employees, such as improved productivity, increased efficiency, improved customer service, or achievement of specific business goals.

To manage the full potential of cloud capabilities and the technology benefits that come with them, it is important to integrate an organization's unique culture into its cloud adoption process. This includes communicating effectively, promoting teamwork, streamlining work processes, and creating a reward system that recognizes and celebrates achievements.

To summarize, the cultural shift in cloud adoption is a multi-faceted transformation that intertwines technology, people, and processes. Each stage plays a critical role in shaping this cultural evolution, ensuring that organizations not only leverage the technological benefits of the cloud, but also develop a culture that is agile, collaborative, and forward-thinking.

## 2.6 Cloud Center of Excellence (CCoE)

The Microsoft CAF emphasizes the importance of organizations following a maturity model that can be applied across the board (Microsoft, 2023c). This model is critical to successful cloud adoption and to creating sustainable long-term operating models. As demands for cloud adoption grow, it is necessary to maintain a sense of balance and structure within organizations. To meet these growing needs, many corporations are undergoing a systematic process of organizational development. The lack of research in the literature on the impact of individuals on cloud computing adoption within organizations was identified by Ogunlolu and Rajanen (2019), such as the role of decision makers is not systematically addressed. Therefore, further research on the CCoE in SaaS organization can not only set the fundament as the potential solution to the organizational and cultural challenges associated with the cloud adoption, but also bridge this academic gap as there is a limited amount of academic research yet related to the establishment of the CCoE in SaaS organizations. Therefore, further research of the topic is based mainly on the official consulting reports.

The following graphic outlines an overview of common team structures at various stages of the organizational maturity process during the digital transformation. Microsoft suggests using this model to find the organizational structure that best aligns with the current operational needs during cloud adoption. In the specific case of the case company, the Cloud Center of Excellence (CCoE) represents the highest level of this organizational development process and is an important milestone that has not yet been achieved. Next, the literature review discusses the CCoE in more detail.

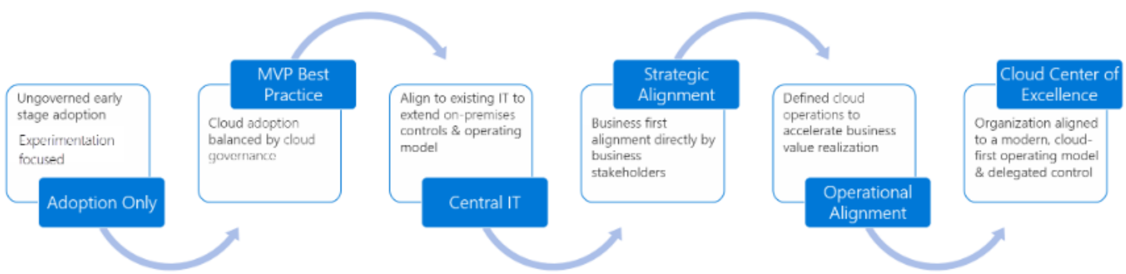


*Figure 2 Mature team structures by Microsoft CAF (Microsoft, 2023c)*

For initiatives linked to the cloud adoption processes to succeed, it is critical that organizations have the necessary skills and organizational structures in place. The recommended approach to achieve this goal is to create a centralized CCoE as stated by the Microsoft CAF (2023d). As the centralized governance entity within an organization, CCoE provides valuable support to central IT departments, business units, and various cloud service stakeholders within a company. It plays a critical role in facilitating the transformation of cloud infrastructure to address organizational and cultural challenges.

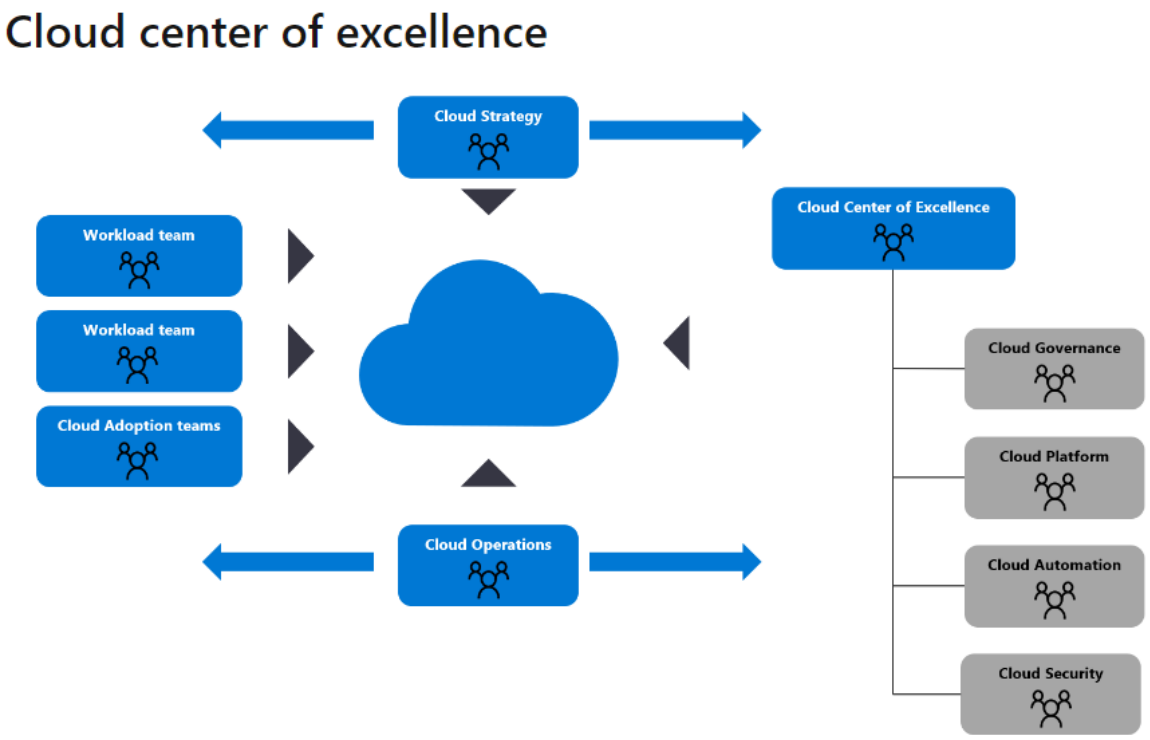


*Figure 3 Cloud center of excellence (CCoE) structure (Microsoft, 2023c)*

The process of moving to the cloud is complex and requires careful planning and effective change management throughout the organization. CCoE is not just a functional unit, but a critical part of the enterprise architecture with a wide range of responsibilities. These include security, governance, compliance, economics, and resource allocation - all needed to lead the cloud computing adoption within an organization. (Microsoft, 2023c)

The main goals of CCoE are to improve outcomes and reduce risks associated with cloud computing practices. In such, Trivedi *et al.* (2023) states that a wide range of skills from cloud experts to business specialists are required to build the effective CCoE. The shared key responsibilities of the CCoE team members includes:

1. **Accelerating Cloud Adoption**

   The CCoE plays a key role in promoting the quick acceptance of cloud services, using flexible approaches to effectively understand and execute business needs. This helps create a modern IT department. The team is accountable for creating reusable deployment packages that adhere closely to the organization's security, compliance, and management guidelines. It ensures that the cloud platform functions in line with operational processes, while also assessing and authorizing the use of cloud-native tools. (Microsoft, 2023d)

2. **Cloud Governance**

   The CCoE functions as a centralized unit within the organization that is essential to maintaining effective cloud governance while maintaining business agility (Costello, 2020). It offers knowledge about various solutions from cloud providers, sets architectural standards, defines an organization's cloud strategy, and decides on cloud provider adoption procedures. The team plays a vital role in ensuring cloud adoption is future-ready by setting policies, managing risks associated with cloud use, and controlling costs associated with cloud services.

3. **Community Engagement and Cultural transformation**

   The CCoE goal is to create and develop a cloud community of practice (COP) that acts as a forum to bring stakeholders together and facilitate collaboration on cloud projects. The COP assists in increasing the organization's understanding of cloud technology and collecting best practices through a knowledge base, repository for source code, training, communication with all departments within the organization, and many more (Costello, 2020). Also, it plays a critical role in helping the organization adapt to cloud technologies by encouraging interaction among COP members and facilitating learning and development of cloud-related skills. As suggested by Trivedi *et al.* (2023), training organized by the CCoE might be both formal and informal learning through communities of best practice.

4. **Relevance and Continuous Improvement**

   CCoE needs to ensure that its long-term goals are aligned with current business needs. This will create a solid foundation for future strategies and help minimize risks and rework (Trivedi *et al.*, 2023). On top of that, Microsoft CAF (2023d) suggests that the CCoE should aim to standardize and automate commonly needed platform components and solutions over time. Thus, to efficiently use resources, the CCoE must involve stakeholders and business representatives in all its activities.

The CCoE is a powerful mechanism for organizations navigating the complex cloud adoption journey. The CCoE differs from traditional IT models by its unique structure, which emphasizes self-service and democratization (Microsoft, 2023c). This approach requires collaboration between business and IT leaders and is essential to creating an environment that promotes innovation while minimizing operating costs. Still, implementing this model requires careful planning and leadership support to ensure a smooth transition. The empirical part of the study will explore these CCoE principles in detail, as well as examine its relevance of its concept to address the challenges related to cloud adoption based on the analyses of the data collected from the case company. Thus, the literature review has set the solid foundation to continue the research and to apply the research findings.

# 3 Case company

The case company is introduced in this chapter with a focus on its market value proposition. Additionally, the internal data engineering function is discussed, emphasizing its role and importance in achieving the research objective. This discussion connects the theoretical framework from the previous literature review to the empirical analysis that will be explored in subsequent sections.

## 3.1 Case company overview

The goal of this research is to address the challenges involved in the process of adopting cloud technology with the case study of the data engineering team at Sievo. Sievo Oy, the SaaS company from Finland, provides data-driven Procurement Analytics solutions for global organizations. These solutions are crucial for multinational companies to make informed decisions in the procurement and supply chain industries.


*Figure 4 Source-to-screen process at Sievo*

Sievo facilitates a comprehensive source-to-screen process as shown in Figure 4, encompassing procurement data extraction and extension, data enrichment, and analytics. In today's context, procurement goes beyond just savings. It requires a comprehensive approach that combines several types of data and systems. This is necessary to generate comprehensive reports that bring together information on suppliers, risk factors, sustainability scores, diversity, contracts, news updates, forecasts, and benchmarks. This enables decision-makers to make well-informed choices.

To be the global leader in the procurement analysis industry, Sievo has built the Procurement Information Hub. This hub includes the extraction of the raw data from a variety of corporate information systems including +100 different Enterprise Resource Planning systems (ERP). By partnering with top data providers, Sievo continually enhances the value of their offering by carefully merging different streams of data to create curated datasets that can be analyzed from multiple perspectives.

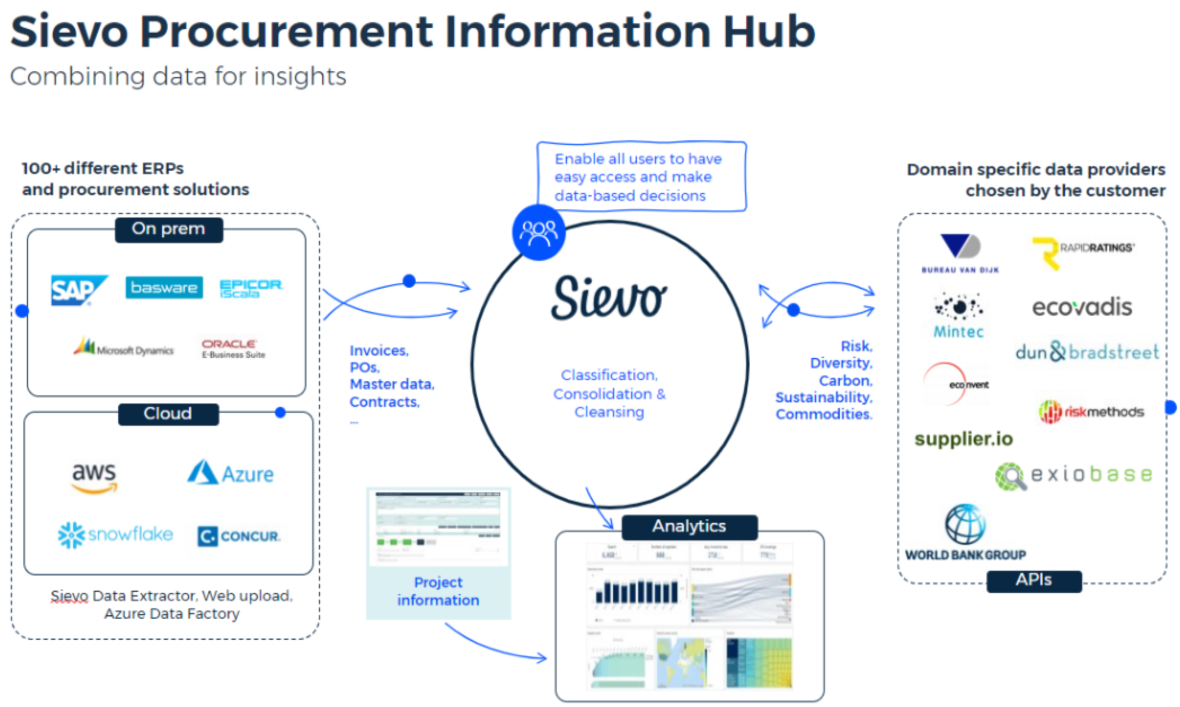


*Figure 5 Sievo Procurement Information Hub*

It is crucial but difficult to navigate the vast amount of data that Sievo manages. To extract meaning from this data requires a deep fundamental understanding, as well as the ability to connect and reconcile it with various external data sets. This complex procedure requires a lot of data searching, integration, matching and maintenance that urges the need to utilize the most innovative technologies for data management.

Sievo has developed a comprehensive procurement analytics ecosystem, carefully designed to address various needs in the procurement domain. This analytic system includes Spend Analysis, which consists of specialized products focused on CO2 emissions and Environmental, Social and Governance (ESG) factors. In addition, the ecosystem offers Savings Lifecycle and Material Forecasting solutions, providing a comprehensive set of tools for organizations. These various components of the Sievo system work seamlessly together to create a robust platform for informed analysis and strategic purchasing decisions.

## 3.2 Data engineering team

The first step in the source-to-mapping process is where Sievo's data engineering team performs an important function. Their primary responsibility is to seamlessly integrate customer data into one platform through the Extract, Transform and Load (ETL) process. This ETL process is necessary to consolidate data from various sources into a centralized data warehouse that serves as a centralized data repository.

Sievo's data engineering team is responsible for planning, creating, monitoring, and managing various data integrations, migrations, and procedures to ensure smooth and efficient data processing. Their responsibilities span both technical aspects and strategic considerations as they ensure the secure and accurate integration of data for subsequent steps in the source-to-screen process.

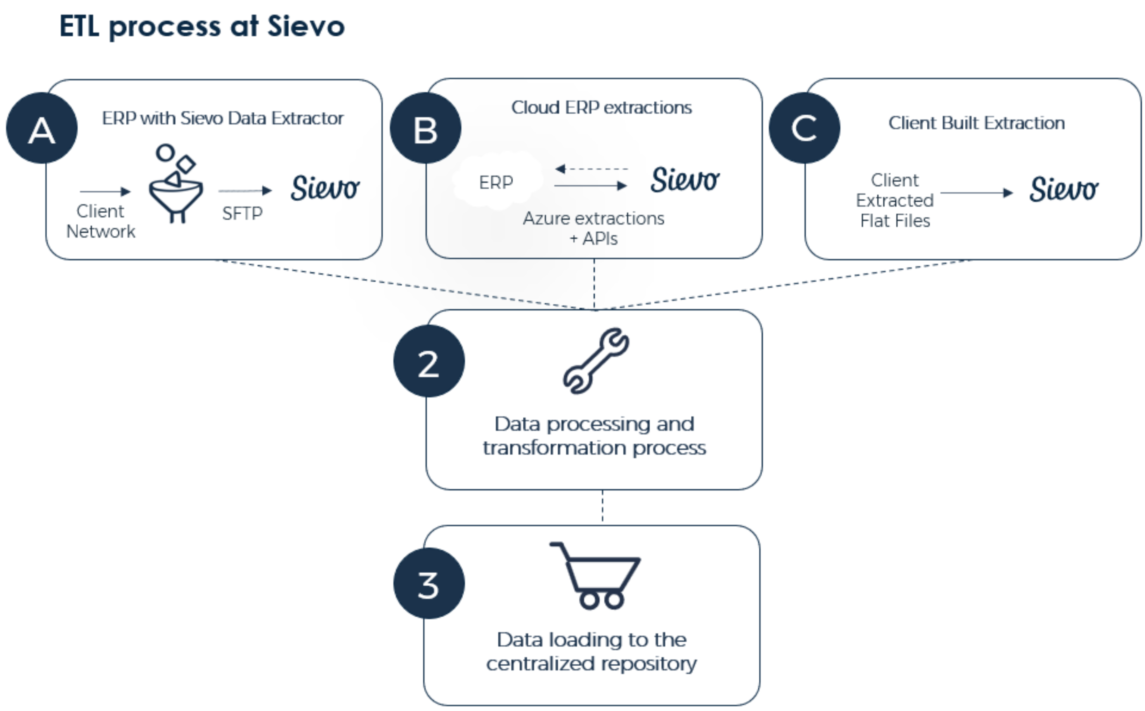


*Figure 6 Extraction, transformation, and loading (ETL) process at Sievo*

The data engineering team at Sievo is divided into different sub-teams based in three countries as shown in Figure 7. In the USA, Chicago and Romania, Bucharest offices, all data engineers report to their individual managers, regardless of their specific responsibilities. However, the operational structure in the Helsinki office is different. There, data engineers report to managers based on their teams' responsibilities, which are categorized as either project or process.

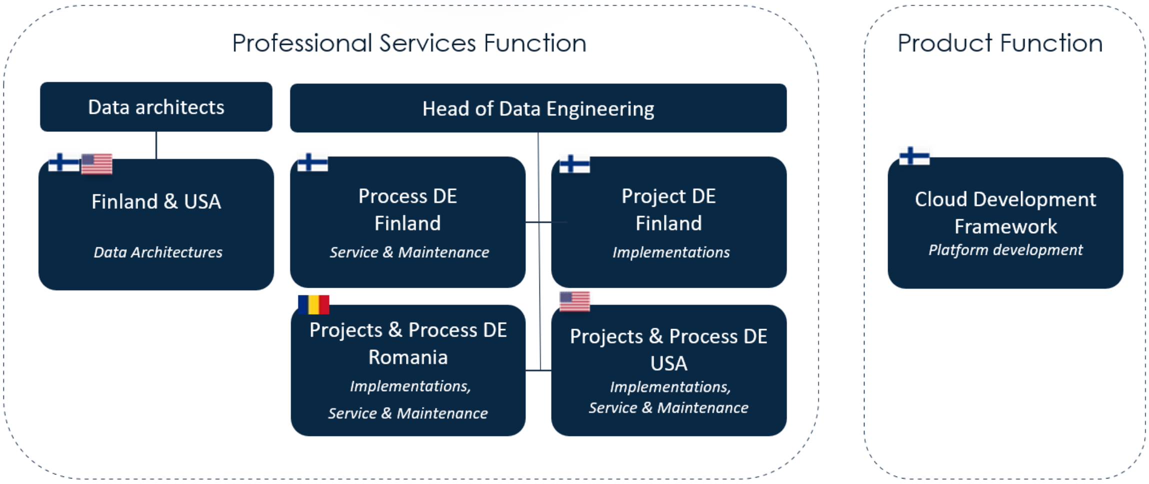


*Figure 7 Data engineering organizational structure at Sievo*

Project Data Engineers (Project DEs) play a critical role in Sievo's source-to-value process. Their main task is to integrate data from various source systems at the project implementation stage, either by using pre-existing templates or by creating custom integration pipelines. They have extensive communication with both the technical and business aspects of the customer base to determine and develop the necessary integration processes. Project DEs utilizes both on-premises and cloud platforms to build integration pipelines that meet the needs of new customers.

Process Data Engineers (Process DEs) are responsible for the upkeep and enhancement of existing clients and their integration pipelines. They provide continuous support to Sievo's customers, both internally and externally, regarding technical matters. Additionally, they play a crucial role in improving the continuous integration procedures to guarantee efficiency and dependability in the workflow for integrating and managing data.

Moreover, there is a team from Data Architects (DA) within the company that has a vital function. They oversee the integration design for challenging projects, collaborating closely with data engineers and customers. Their duties also involve creating best practices and business data logic for different source systems. Additionally, they improve the technologies and templates used by various teams and help different stakeholders regarding advanced data-related inquiries. These inquiries are typically related to sales, pre-sales, up-sales, customer support, and other technically advanced topics.

All of these data engineering teams are part of the Professional Service function at Sievo. This organizational structure ensures a smooth and effective workflow, with every team and member playing an essential role in the company's data engineering processes. Each team in all locations has specific responsibilities, and their collaborative efforts contribute to Sievo's ability to deliver high-quality Procurement Analytics solutions to clients worldwide.

In 2021, Sievo decided to transition its software and data engineering to Microsoft Azure cloud platform to remain competitive in the SaaS market over the long term. Concurrently, Sievo undertook the rearchitecting of its solution to enhance connectivity to cloud sources. This shift was recognized as a significant transformation for the entire organization, particularly impacting the data engineering team, which plays a pivotal role in the organization's data flow processes. Five principal drivers were communicated to the organization by the management, influencing the decision to migrate to the cloud: Autonomy, Tooling, Scalability, Customer Presence in the Cloud, and Employee Branding. However, the cloud adoption process was met with considerable resistance from all sub-teams within the data engineering team. The data engineering team members are tech-savvy professionals who initially approached the transformation with a high level of enthusiasm. Nevertheless, cultural, and organizational challenges emerged during the development and adaptation of the new platform, leading to significant delays in the transformation's pace and efficiency. For instance, the timeline for the transformation and adoption was consistently extended by several months many times, underscoring planning deficiencies and unrealistic expectations. Yet, these challenges and their potential solutions have not been thoroughly investigated and studied by the case company. Therefore, this research provides a unique context for examining the cultural and organizational challenges, focusing on the largest team of engineers within a SaaS organization that is experiencing profound technological shifts due to the adoption of a new cloud-based platform.

## 3.3 Cloud development framework at Sievo

A key team that plays a critical role in cloud transformation in the case company, working hand in hand with data engineers, is the Cloud Development Framework (CDF) team. The CDF team, organized within the product function, consists of Azure development engineers, a product manager, and an engineering manager. All members of the CDF team are technically focused and possess expertise in Azure development.

The CDF platform is a distinctive product of Sievo developed on the Microsoft Azure Cloud. The primary objective of the CDF team is to develop a cloud-based platform that standardizes and streamlines the ETL data process, transforming it into an efficient method for data integration. This framework establishes the ETL integration pipelines and includes rethinking of the integration methods and resources. By effectively adopting the new data integration approach, Sievo can achieve a smooth and efficient data integration process that is vital to its operations.

Sievo adopts a ‘Refactoring (re-architect)’ strategy as it transitions integration platform from on-premises to the cloud. The analysis and descriptions of different tools utilized by the CDF team is important for this research to correctly code and interpret the data collected from the interviews in the later parts of the study, as data engineering team members are referring to different tools and features during the discussion using the specific technical or organizational terms. For example, there is the internal abbreviation of the on-premises platform at Sievo called ‘Tarmo’ that might be used by the interview respondents instead of the generic term such as ‘on-premises tool.’ Thus, to elaborate, the CDF team utilizes several Azure services to orchestrate and execute the ETL process.

- **Azure Data Factory (ADF):** ADF is used for data orchestration. It plays a crucial role in determining the execution time of the ETL process, ensuring that data integration is extracted, transformed, and transferred correctly and timely.
- **Azure Databricks:** This is a service employed to execute data transformations. It provides the essential computational power and environment needed to process and convert data into the standard format.
- **Data Lake:** Serving as the data storage component, the Data Lakehouse stores the raw, staged, and curated data, as well as the data history, providing a centralized repository that can be accessed directly by the integration platform.

The Procurement Data Schema (PDS) is another critical component developed by the CDF team and the data architects at Sievo. A PDS is a critical component designed to store customer purchasing information in a format that closely resembles the structure of business documents used in the Procure to Pay (P2P) process. This approach ensures that the data stored is not only accurate but also easily understandable and accessible for analysis and reporting purposes.

The vision of Sievo's CDF platform is to create a comprehensive and established cloud data framework by 2025. This objective involves completely transforming the integration landscape, introducing innovative approaches to integration, automation, transformation, upgrading, expansion, and innovation. The CDF platform goes beyond a simple technical upgrade and instead represents a complete rewrite of Sievo's integration history, signifying a major change in how data integration processes are developed and executed.

The CDF platform's main stakeholders are the data engineers, with Project Data Engineers being more involved in the adoption and testing as they actively utilize and test the platform during project implementation phases. Their participation is critical to the development and improvement of the platform as they provide valuable information and feedback on their experiences working on data integration projects. Process Data Engineers, on the other hand, interact with the CDF platform during the continuous monitoring processes. All data engineering sub-teams play a vital role in the CDF platform development process as the main stakeholders being on the other side of the utilization and feedback loop.

Conversations with colleagues and my own experiences have revealed a shared concern about the current state of the cloud adoption process. Even though the team was recently instructed to start all new data integration projects on the CDF platform with all needed support from the experienced data engineers and the CDF team, there is a palpable sense of frustration and lack of confidence among team members regarding the efficiency and effectiveness of the adoption process.

This empirical research aims to identify and understand these challenges in depth, providing valuable insights that will improve the CDF team's product development roadmap and provide the set of strategic recommendations to improve the cloud adoption plan. By doing so, a smoother and more efficient adoption process can be achieved for everyone involved.

# 4 Research methodology

This chapter outlines the methodology selected to explore the challenges of cloud adoption at Sievo. Firstly, there will be a discussion of the choice of qualitative research approach and then the case study methodology. Subsequently, it will be explained how the data was gathered and, lastly, how it was analyzed. The summary of the research method is given towards the end of the chapter.

The interview-based case study is a common qualitative approach in management research that seeks to reveal the importance and comprehension of a phenomenon instead of concentrating on variables. By interviewing team members, the study seeks to uncover the nuances of the challenges faced, such as communication issues, lack of training and support, resistance to change, delays in implementing the adoption plan, and common frustration among team members.

According to Priya (2020), the case study approach of qualitative research facilitates an in-depth exploration of a program, event, activity, or process, with the case being bound by time. Using this method, the study will explore the complex issues involved in cloud adoption by focusing on the experiences, perceptions, and reactions of individuals within the team members. The case study approach is appropriate for a few reasons:

- **Exploration of specific challenges**: The approach enables the exploration of specific issues associated with the adoption of cloud technology at Sievo, providing detailed insights into the challenges of the process.
- **Understanding dynamics and interactions:** The cloud adoption process provides insights into the collaborative and sometimes contentious nature of the transition as it helps us understand the dynamics and interactions within the DE and CDF teams.
- **Analysis of influencing factors:** The case study approach allows for the analysis of several factors—organizational, cultural, and human—that influence the cloud adoption process. This approach will provide a holistic view of the challenges faced.
- **Generation of insights and recommendations:** The thorough examination carried out by case study at Sievo results in the generation of valuable observations and suggestions, aiming to improve cloud adoption strategy both for the DE and CDF teams.

Case study research methods can be used in multiple approaches: Descriptive, Explanatory, Exploratory (Priya, 2020). The article discusses that the exploratory case study method is used for ‘exploring’ or identifying fresh research questions which can be used in subsequent research studies. Therefore, this approach will be used to formulate interview questions to explore the difficulties and challenges of cloud technology adoption in Sievo.

Then, the interview data will be analyzed using the thematic analysis method. Thematic analysis is useful to identify consistent themes and patterns associated with barriers to cloud adoption in Sievo. By carefully and systematically analyzing the interview responses, the thematic analysis will reveal key higher-level themes and patterns associated with the research area of this case study via generating code from the collected dataset for as many topics as possible and applying the code to a contextual segment. (Mihas, 2023)

*Table 4 Summary of the research methodology*

| ***Activity*** | ***Description*** |
|---|---|
| **Aim of the study** | To explore and understand the organizational and cultural challenges faced during the cloud adoption process in SaaS organizations with the focus on the case company, and to propose recommendations for improvement based on the CAF and other best practices in the industry. |
| **Studied phenomenon** | Transformation challenges and dynamics involved in the cloud adoption process within a technical team in a SaaS company. |
| **Unit of analysis** | Existing academic studies and industry best practices from the theoretical part of the study. The data engineering team at Sievo is analyzed in the practical research, with a focus on individual team members’ experiences and perceptions. |
| **Researchers' role** | The researcher is an active member of the project data engineering team at the case company, participating observer, and interviewer, with an insider perspective on the challenges faced by the team. |
| **Data sources** | ✓ Literature review and internal documents<br>✓ Semi-structured interviews with data engineering teams<br>✓ Researcher’s personal experience and observations. |
| **Research design** | Qualitative research design with the exploratory case study methodology. |
| **Research strategy** | ✓ Semi-structured interviews<br>✓ Researcher observation |
| **Research method** | Semi-structured interviews and participant observation |
| **Analysis strategy** | Thematic analysis to identify, analyze, and report patterns within the data, with the findings used to develop recommendations aligned with the CAF. |

| | |
|---|---|
| **Time horizon** | Cross-sectional, as the study is conducted at one point in time to explore the current challenges of cloud adoption within the team. |
| **Limitations** | ✓ Social desirability bias of the team<br>✓ Insider bias of the researcher<br>✓ Time-bound focus<br>✓ Restricted applicability |

The use of the exploratory case study method, as well as thematic data analysis as summarized in Table 4, provides a strong basis for conducting this study. This combination of methodologies increases the reliability and completeness of the findings and allows for the discovery and mapping of identified challenges against best practices discussed in the literature review part of the study.

## 4.1 Interview preparation

Understanding the complexities of selecting a research topic is crucial. The selection of the research topic has been impacted by my extensive professional background. Through actively engaging with the cloud adoption process, the researcher has identified several areas that require improvement. This engagement has highlighted the need to improve certain processes within the transition process, thereby aligning with the research topic selected for this thesis.

The required interview data for the empirical part of the research includes both short and extended responses from the discussions, carefully segmented into different topics to achieve a comprehensive understanding of the objectives. Given that the thesis' main aim is to trace the cultural transformation required to build a cloud-centric mindset in a team of data engineers, it is essential that the responses are semi-structured. This format is thoughtful and provides wide opportunities for participants to express their thoughts, feelings, and experiences fully and unrestrictedly.

Various sources of data were used to develop the interview questions. The researcher's personal experience in the field and the knowledge gained from a comprehensive review of the relevant literature played a significant role. In addition, invaluable discussions with the CDF product manager, who not only oversees change management but has also previously conducted similar internal research, provided a vast amount of knowledge to answer the questions.

Exploratory case study requires defining the sample size of the data for the study. Interviewees are the data engineers - primary users and stakeholders of the platform built on the cloud, who can provide invaluable insights into the day-to-day operation of the platform and its functionality in general. The team of data engineers at Sievo is divided into several subgroups with the same amount of people. It was decided to interview representatives of each subgroup, deliberately excluding managers to encourage openness. Separate interviews were conducted with the DE management team. The geographical and role diversity of the respondents were met ensuring that the insights captured are holistic. Also, the interviewees had varied years of experience, from fresh to long-term employees. This diversity in tenure ensured that the feedback captured ranged from fresh perspectives to insights steeped in historical context.

When conducting qualitative research, the researcher had direct connection with all interviewees. Prior to scheduling interviews, the discussion was undertaken, and approval was obtained from the Vice President of the case company to ensure transparency and approval at the organizational level. The objectives of the study were communicated to team leaders in advance, allowing them to inform their teams. This proactive approach to communication facilitated the scheduling and conduct of interviews, invitations to which were sent to all teams separately. To encourage preparation and engagement, participants were provided with interview questions in advance.

To prevent any bias caused by the researcher's position at Sievo deliberate measures were taken. These measures included peer debriefing with the thesis supervisor, plus careful crafting and agreeing on interview questions, as well as obtaining feedback from managers and experienced data engineers to share process details and get peer feedback on the initial findings. Transparency of the researcher's role at the case company was consistently maintained throughout the study to maintain ethical standards and ensure integrity.

After preliminary preparation, the interview questions were constructed based on the literature review, interviewer's own perspective and support from the manager of the CDF team. This procedure resulted in four specific groups of questions, each addressing a different aspect of the transformation challenges identified during the literature review phase.

The introduction of the '**Skills and Perspectives**' section was a direct reflection to Tyc's (2023) discussion about the serious skills shortage faced by organizations when adopting the cloud. This category included questions assessing participants' confidence in their current Azure cloud skills and knowledge and their views on the speed of the transformation process.

- *How confident do you feel about your current skills and knowledge to work effectively on the CDF platform?*
- *How do you feel about the current pace of the transformation process? Is it too fast, too slow, or 'just' right?*

To offer participants the opportunity to express their own obstacles and difficulties by identifying the '**Challenges and Difficulties**' section. This section consisted of questions that addressed the main difficulties encountered by participants, situations where the transformation process was more difficult than anticipated, and specific aspects or capabilities of on-premises tools that are missing when using the CDF platform.

- *What are the main challenges you have faced during the cloud transformation process?*
- *Can you share any specific features or functionalities that you miss from the on-premises tools while working on the CDF platform?*

Considering the findings of the literature review, it was recognized that training and skills development play a critical role in the process. To reflect this, the category '**Training and Support**' was adopted. The purpose of this category was to gather participants' views on what kind of training or support is needed for a smooth transition to the cloud from their perspective. In addition, their opinion on the communication and support provided by the CDF team was also evaluated.

- *What kind of training or support do you think would have made the transition to Azure cloud easier for you?*
- *How do you feel about the communication and support from the CDF team during this transformation process?*

Since the focus of the research is based on the cultural changes required for cloud adoption, a new category of '**Cultural Transformation**' was applied. Questions were formulated to explore how the transition to Azure cloud technology has impacted teamwork and collaboration, discover the impact of the transition to the CDF platform on job satisfaction and motivation of participants, understand the leadership influence on the process, and assess the extent to which team members agree on the need for the transition.

- *How has the transformation to cloud affected team dynamics and collaboration?*
- *Do you feel the company and leadership support this kind of technological change? If not, what aspects of the culture do you think need to change?*
- *How has the shift to the CDF platform affected your job satisfaction and motivation?*

The interview style was both semi-structured and adaptive, thus, additional questions were asked to better understand participants' initial responses. If certain topics raised deeper concerns, the focus would shift slightly to explore these issues within limited interview time, sometimes sacrificing other planned questions. This approach allowed for the identification of different perspectives on prominent issues. Answers were often paraphrased for clarity and references were made to previous answers to maintain consistency and depth of data collection. The importance of certain questions varied between teams, especially those related to the pace of transformation, which resonated more with those who have been at the company longer, therefore, had gone through various stages of the transformation process at Sievo.

Ethical considerations were strictly followed throughout the research process. Maintaining the confidentiality and anonymity of participants was a top priority. Informed consent was obtained from each participant before conducting the interviews. The study's purpose and procedures were clearly explained, and participants could withdraw from it at any time without facing any negative consequences. These ethical measures were necessary to maintain research ethics and create a trusting environment in which participants felt comfortable sharing their thoughts and experiences openly. Table 5 summarizes the interview preparation process.

*Table 5 Interview preparation stages*

| ***Activity*** | ***Description*** |
|---|---|
| **Question Formulation** | ✓ Researcher's experience<br>✓ Literature review<br>✓ Discussions with the CDF product manager |
| **Sample Selection** | DE teams and DE managers, eight interviews with follow up discussions |
| **Access Negotiation** | Approval from departmental vice president |
| **Question Development** | Four categories reflecting different transformation challenges identified in literature and follow-up questions |

| | |
|---|---|
| **Reflexivity Measures** | Peer debriefing and transparency |
| **Ethical Considerations** | ✓ Confidentiality<br>✓ Informed consent<br>✓ Voluntary participation |

## 4.2 Data collection

Data collection was done according to the chosen exploratory case study research methodology. This phase lasted six weeks and was carefully organized with the participation of respondents from different subgroups of the DE team at Sievo. The interviewees who participated in the discussion had varied years of experience, from fresh entrants to long-term employees. This diversity in tenure ensured that the feedback captured ranged from fresh perspectives to insights steeped in historical context. Since project DEs are more involved in the cloud transformation process as initial stakeholders utilizing the CDF pipelines, their interviews were divided into two sessions to encourage broad and active participation. Process and Project Data Engineers based in the US were interviewed in one session and clustered into one group, as they are reporting to one manager regardless of the role. Interviews with Helsinki-based Project Data Engineers and Managers were divided into two sessions. In total there were eight interviews, but they are grouped into six clusters by locations and positions. Additional underlying reason for more interviews than clusters is the scheduling challenges due to the holiday season. Below is the table containing the interviewee Cluster IDs assigned to each group, the number of participants per interview session, their roles inside the organization and location. Interviewee cluster ID will be used to label the quotes in the data analysis later in the research.

*Table 6 Interview clusters*

| ***Interviewee Cluster ID*** | ***Amount of Participants*** | ***Role Description*** | ***Location*** |
|---|---|---|---|
| **1** | 14 | Project Data Engineer | Finland |
| **2** | 7 | Process Data Engineer | Finland |
| **3** | 7 | Process Data Engineer | Romania |
| **4** | 6 | Data Architect | Finland, US |
| **5** | 8 | Project DE and Process Data DE | US |

| | | | |
|---|---|---|---|
| **6** | 6 | Manager | Finland, Romania, US |

The sessions were carefully planned to accommodate the availability of all team members. Attempts were made to reschedule the sessions to include those on long vacation or sick leave. One to two interviews were conducted each week to accommodate the research process and participants' schedules.

The quality and reliability of the collected data were of high priority, with direct access to legitimate data provided by the main stakeholders of the research objective that is ensuring trustworthiness. Although the interviews were not recorded, comprehensive notes of the responses and reflections during the sessions were documented and later anonymized for ethical considerations. Securely stored semi-structured data will be deleted after the study to maintain participants’ confidentiality. Establishing the context of the research is critical at each data collection process. Though extensive introductions were unnecessary as participants were already familiar with Sievo's organizational structure and ongoing cloud adoption initiatives, all participants were provided with a concise overview of the study's purpose and objectives.

After the introduction, all questions by sections were addressed to the participants. In the ‘Skills and Perspectives’ section, respondents could choose their answers from the distinct options provided. For the self-assessment of the cloud expertise, the participants rated themselves on a scale ranging from 0 to 10, thereby facilitating future analysis of distribution. Additionally, they shared their perspectives on the speed of the transformation process, categorized as too slow, right, or too fast, which was a good starting point for the subsequent discussion. The next three sections of the interview presented more open discussion, enabling participants to express themselves freely and furnishing depth to the collected data. All participants were encouraged to engage actively in the process, with some offering additional insights on the covered topics.

The last stage of collecting data was to follow up with specific participants who had additional insights to share or who needed to elaborate on points made during the main interview. One participant, heavily involved in the cloud adoption and change management processes, was reinterviewed in the unstructured form to provide more insight and feedback on the initial findings.

The engagement level observed during these sessions was high. Respondents highlighted an interest in the subject, reflecting the transition's importance and their commitment to the case company's success. These measures and active participation have established a broad understanding of the challenges and dynamics of cloud adoption at the case company, providing a solid foundation for the analysis and recommendations in the following chapters.

## 4.3 Data analysis

This chapter describes the thematic analysis approach used to analyze the qualitative data obtained from the semi-structured interviews. The analysis was based on the methodological framework proposed by Brown and Clarke (2006), which is characterized by its flexibility and applicability to different research paradigms. Although the approach is focused on thematic analysis in psychology, the reference is relevant to the study due to the nature of the focus area of the research, as the challenges of cloud adoption are considered from a cultural perspective, which is inherently close to the field of psychology.

**Data Preparation:** Initially, all interviews were transcribed in full during the in-person interviews to facilitate a thorough examination of the data. This transcription process was crucial as it allowed for immersion in the data and a full understanding of the content and context of participants' responses.

**Coding Process:** The initial coding process was based on a set of predetermined codes derived from the interview question groped by themes. These codes were manually developed according to the key themes and concepts identified in chapter 4.1. No external coding software was used. Coding was applied systematically across the data set to ensure consistency and alignment with the theoretical framework.

**Theme Development:** Once the initial codes had been generated, they were combined into themes. This involved an iterative process of combining and refining codes into broader categories that encapsulated key ideas or concepts. The themes were developed with a focus on how they related to the research questions, ensuring relevance and consistency.

**Reviewing Themes:** Each potential theme was carefully examined to ensure that it was supported by the data set. This involved reviewing the coded data extracts and assessing whether the themes accurately reflected the themes in the interview questions and responses. Themes were then identified and refined, with some discarded, combined or separated to accurately represent the data.

**Defining and Naming Themes:**

The themes were then clearly defined and named to reflect their content and the theoretical constructs they represented. The naming process was guided by the research questions and the theoretical focus of the study.

**Data Analysis:** The analysis resulted in the selection of key data to illustrate each theme. These extracts were chosen to illustrate the main narrative and to provide evidence for deductive analysis, thereby grounding the conclusions in the data.

**Ensuring rigor:** Throughout the deductive analysis, measures were taken to ensure methodological rigor. This included maintaining close manual control over the coding process and theme development and documenting the decision-making process throughout the analysis.

**Summary of Themes:** Deductive thematic analysis revealed several themes and qualitative insights directly influenced by the semi-structured interview questions. These themes provided a structured view of the participants' cloud skills, observed organizational and cultural challenges, missing functionalities, learning curves, support needs and cloud adoption improvement suggestions, in line with the original aims of the study.

# 5 Empirical study

The journey from legacy systems to advanced cloud-based platforms is complex, involving not only the technical intricacies, but also the dynamics of human interaction, learning, and adaptation. This chapter explores and analyzes the data collected from semi-structured interviews with members of Sievo's data engineering team during their transition to the integration platform built on the cloud. Through deductive thematic analysis, the empirical study highlights the numerous ways in which cloud transformation has influenced skill sets, pace perceptions, cultural and organizational challenges faced, and the resulting changes in roles and responsibilities. During the interviews, more experienced members that can be considered as experts expressed their insights on how to improve the cloud adoption process that will be additionally analyzed in the 'Qualitative Insights' parts of the following chapters to be used during the development of recommendations to meet the second objective of the study.

## 5.1 Skills assessment

The focus of this part of the thematic analysis is the confidence levels of different team members at Sievo in their skills and knowledge about the CDF flatform. Evaluating confidence is important because it gives an understanding of how prepared and comfortable the team is with cloud technologies, which can guide future training and development efforts.

The confidence levels, ranging from 0 to 10, were extracted from 48 interviewees. A range of confidence levels from 0 to 8 was observed among the data engineers and managers, where managers have done both self and team assessments. Participants' self-assessment of their CDF skills and knowledge revealed a widespread variation, with a notable number expressing low to low or moderate confidence. The histogram represented in Figure 8 shows the distribution of self-reported confidence levels among respondents on their ability to work effectively with the cloud technology.

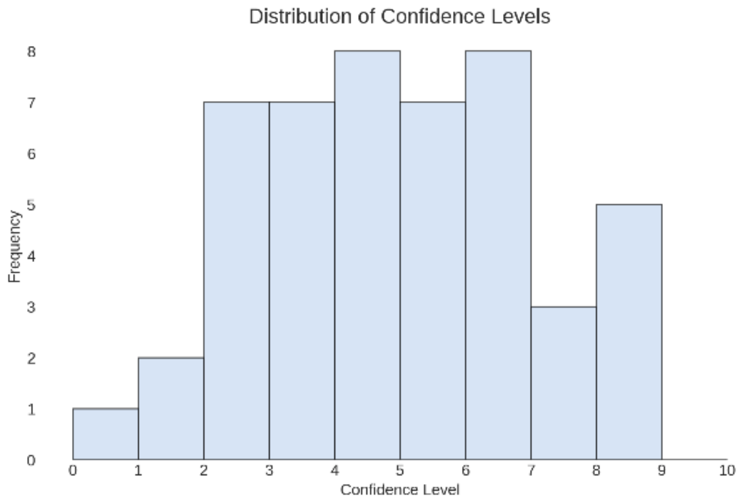


*Figure 8 Confidence level in using the CDF platform - self-assessment.*

The pie chart below in Figure 9 shows the visual insight into the varying degrees of confidence among the respondents, facilitating an understanding of the overall sentiment and self-assessment of skills and knowledge in the CDF platform.

- **Low Confidence:** This segment includes respondents with confidence levels ranging from 0 to 3.
- **Moderate Confidence:** Respondents with confidence levels ranging from 4 to 6 fall into this segment.
- **High Confidence**: This segment comprises respondents with high confidence levels ranging from 7 to 10.

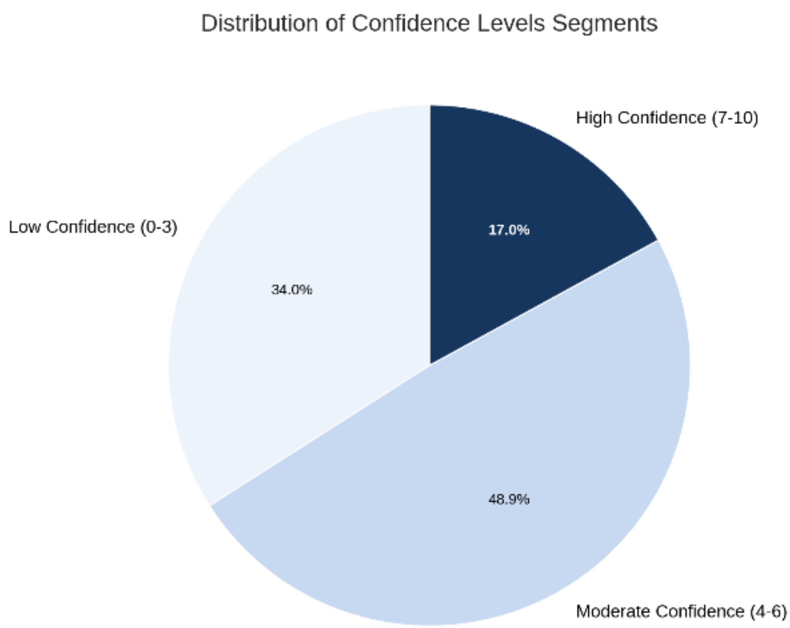


*Figure 9 Distribution of confidence level segments*

The thematic analysis of the self-assessed confidence levels within the DE subgroups revealed significant differences. For example, some members of the Helsinki Project DE team were moderately confident (rating themselves at 8), while others had lower confidence levels (with ratings as low as 2). Participants who rated themselves higher showed confidence in using specific tools such as Databricks and ADF, while those with lower ratings expressed difficulties in understanding and navigating these tools effectively. Most of the managers have assessed themselves and their teams in the same segment range, where DA, Project DE and US DE are in the moderate segment, and Process DE, Romania DE and overall DE organization are in the low segment. This discrepancy within subgroups indicates that team members working in similar roles may have differing degrees of familiarity and comfort with the CDF tools and processes.

**Qualitative Insights:** Many participants in the study *expressed a lack of confidence in their skills to use the CDF platform*. They attributed this lack of confidence to limited exposure and hands-on experience with cloud technologies. The uneven allocation of the cloud-based projects among team members has led to differences in the amount of experience and learning opportunities. Quotes labeled by the Interview cluster IDs (Table 6) such as '*only confident to do the standard things (Cluster 1)', 'struggle with new errors (Cluster 3)',* and '*intimidating as it is new (Cluster 4)*' captured the overall feeling of uncertainty and lack of confidence among team members.

## 5.2 Transformation pace

In this section of thematic analysis, the participants' perspectives on the pace of the technological transformation process at the case company is examined. Analyzing the stakeholder's perception towards the transformation pace inside the organization is essential to understand how even the change management activities are applied across the stakeholders undergoing the transformational change, as well as to adapt and adjust the transformation timeline.

The text segments reveal a variety of perceptions, with individuals expressing views that the pace is either too slow, too fast, or just right. Most interviewees (62% of all respondents) feel that the process is slow, while others feel (36%) it is at the right pace. Only one respondent (2%) has expressed that the transformation is too fast.

The Helsinki Project DE sub-group expressed mixed feelings, with some members finding the pace just right, but wanting more robust solutions and better documentation. In contrast, the Romanian Process DE all agreed that the transformation process is slow. Expressions such as

> *'We should speed up the transformation and be ready for the pain (Cluster 5)'*
>
> *'Don't see the realistic way to accelerate it much (Cluster 4)'*
>
> *'It is the same as moving the Qlik view to Qlik sense, it took four years, and this timeline is more realistic (Cluster 4)'*
>
> *'We have right now almost everything, but our solution is not too robust (Cluster 2)'*
>
> *'We should evenly distribute clients both in project and process DE teams (Cluster 3)'*

illustrate the diversification in views and understanding of the ongoing transformation. Although the transformation pace of cloud adoption seems right inside the organization, the thematic analysis revealed additional insights that are important to meet the goals of the research.

**Qualitative Insights:**

- ***Lack of clarity in the communication*** about the transformation process affects the understanding and assessment of the pace and progress of the transformation. This ambiguity leads to a call for clearer guidelines, expectations, and enhanced support structures to guide team members through the transformation journey.
- ***The critical need of the even distribution of projects*** was highlighted again. This reallocation would ensure that all team members receive fair exposure and learning opportunities, thereby fostering a supportive environment in which both project and process DE teams can equally thrive and grow during the transformation process.
- Moreover, although there was a shared desire to accelerate change, it was tempered by a recognition of existing limitations. These limitations include not only unrealistic expectations, but also a noticeable ***shortage of cloud-experienced team members.*** Participants express a need for acceleration, but also stress the importance of setting realistic expectations and plans that consider the current limitations and technical challenges faced by the teams.

## 5.3 Challenges of the transformation

After the evaluation phase drawing on the reflections of various team members, the next part identifies the key challenges faced by the data engineering team members during the transformation process summarized in Table 7. As the main objective of this research is to identify the cultural and organizational challenges that the data engineering team encountered during its transition from on-premises to integration platform build on the cloud, the focus of the discussion did not cover any technical challenges, ensuring the consistency in the research focus.

*Table 7 Challenges of the cloud transformation process at Sievo*

| ***Identified challenges*** | ***Ellaboration*** |
|---|---|
| **Skillset and Hiring** | **Skills shortages:** Balancing between different skill sets in the recruitment is overly complex. It was also pointed out that the company is more inclined to offer internal transitions to new roles rather than hiring externally qualified individuals. It was discussed that *'we give an opportunity internally to move to new roles who do not know anything. We are not recruiting external people with many skills (Cluster 6)'* emphasizing the challenge identified. |
| **Time Management and Prioritization** | **Client Prioritization over Learning:** Catering to existing clients while also focusing on learning modern technologies is the big challenge highlighted by the quote *'The challenge when you have an organization who dealing with existing clients is their priority, you don't have a luxury to say that I am gone to learn new things (Cluster 6)'*. This suggests a potential conflict between client service and upskilling.<br>**Overbooking**: The ever-present problem of time with an overbooked work schedule is the barrier to adopt new ways of working. The statement '*We are trying to implement the new way of working, but we are already overbooked for work, we did not have enough time allocated'* was discussed during the interviews with the managers (Cluster 6). |
| **Communication and Collaboration** | The Project DE and DA highlighted the '*disconnect between data engineers and the platform development team (Cluster 1 and 4).'* This disconnects manifests in **unclear vision of the product development roadmap** and upcoming features. |
| **Expectation Management and Skill Utilization** | **Unclear Expectations:** While there is an underlying assumption that team members should have extensive knowledge, there is at the same time a '*lack of clarity about the specifics of their work (Cluster 1 and 5).'* This lack of clarity can lead to underutilization of individual strengths and overload in areas outside of core competencies. |
| **Business focus of the cloud platform** | **Business Knowledge Involvement:** The statement '*the CDF team was built by people who do not understand the business (Cluster 6)'* highlights a sentiment that the engineering team that develops the integration platform in the cloud needs to involve people with a deep understanding of the business into the tool development. |

Feedback from participants highlighted the main challenges faced during the cloud transformation process. A recurring issue was the lack of communication. Additionally, concerns were also frequently raised about the organization's recruitment strategy and the perceived skills imbalance. Lack of time, as noted in the responses of the managers, pointed to potential resource management issues. Finally, feedback called for clearer role expectations, emphasizing the need for roles and tasks to be more clearly defined during the change. All challenges are now identified at this stage, with the need to get more insights to capture the holistic view to create the set of actionable to overcome these challenges.

## 5.4 Missing features and functionalities

Building on an understanding of the challenges faced during the transition, this chapter aims to further the investigation by shedding light on the specific features and functionalities that data engineers are missing in the new cloud platform. This part is important, as the feedback will help to improve and optimize the integration platform product development roadmap, facilitating the transformation. This is the only part of the study with the focus on more technical than organizational or cultural inputs from the interviews.

This analysis, based on feedback from team members across distinct roles and geographies, aims to provide a thematic overview of the missing functionalities. By categorizing these themes based on popularity and importance, the research provides a comprehensive understanding of the areas where the CDF may require enhancements or adjustments to address user expectations more holistically. Thus, it will improve the usability of the new tool and make the transition more effective, as the parties in change will not miss substantial capabilities of the new platforms to build the integration pipelines on the new platform. The result of this analysis summarized in the Table 8 is to bridge the gap between the end-user experience and the potential evolution of the CDF platform, ensuring that as the cloud transformation journey continues, the tool not only addresses the broader challenges, but also closely aligns with the detailed functional needs of the organization. Quotes in the 'Additional clarification' column are linked to the Interview Cluster IDs assigned in Table 6 to link the statements expressed by the interviewees.

*Table 8 Features and functioinalities missing in the CDF platform*

| *Area* | *Missing feature* | *Additional clarification* |
|---|---|---|
| **Data Quality & Validation** | **Validation Framework** | A notable absence of *a comprehensive data validation system* in the CDF. There is an expressed need for validation prior to data transfer to production (Clusters 1 and 2). |
| | **Data Handling & Quality** | '*On-premises tools, especially PDM, offer error descriptions and data handling capabilities (Clusters 3 and 5)'*. Plus, there are synchronization challenges between PDM and CFD such as delta update/delta insert data import types (Cluster 1). |
| **Monitoring, Logging & History** | **Monitoring Tools** | Robust *monitoring tools and history logs were* mentioned several times by Clusters 2, 4 and 5, indicating the importance of tracking data changes, and ensuring consistent data quality. |
| | **Centralized Log Repository** | A '*centralized database of all logs (Clusters 5 and 6)'* is seen as useful to allow DE to monitor data loading processes. |
| **Documentation** | **Guidance & Instructions** | *Existing* documentation in the CDF is found to be *overwhelming and technical in-depth programming* as mentioned in each interview session. On-premises tools offered clearer to-do lists and common issue trackers. |
| **Integration & Compatibility platform** | **Azure Changes** | The ask for a notification from the CDF team on *tool changes or updates* as discussed by participants in the interview Clusters 1, 2 and 5, such as the transition from Pandas to Spark in the Databricks. |
| | **Connection between Systems** | Concerns about the '*absence of connections between CDF and on-premises tools (Cluster 4)'* block the possibility to query directly. |
| **Quality Assurance & Testing** | **Review Process** | In CDF, individual data engineers often work alone on projects, increasing the risk of errors as quoted '*we should avoid putting ourselves as the reviews in the pull requests. we need to make sure that data engineers are doing the things they are supposed to do (Cluster 5)' – peer reviews should never be self-evaluated.* |
| | **ETL Process restart** | In PDM, users could *'retry specific steps, but CDF requires restarting the entire process'* as highlighted in the interview Cluster 6. This inefficiency increases the timeline and frustrates users. |

| | | |
|---|---|---|
| **Data Accessibility** | **Data management** | New cloud platform requires users to *indicate specific times* for file transfers, which contrasts the continuous access in on-premises systems (Cluster 1). Additionally, in Azure, identifying *missing files* is a challenge. |

## 5.5 Training and support

Moving from understanding the challenges and missing functionalities of the new platform to analyzing potential solutions, this chapter will explore the perspectives of different team members on the type of training or support that could have facilitated a smoother transition to the cloud. Through an exploration method of thematic analysis, the research highlights the gaps, needs and recommendations that can pave the way for a more effective cloud transformation process. The responses have been dissected and grouped into common thematic areas:

1. **Hands-On Training and Exercises**

The overwhelming need for hands-on exercises, as opposed to the use of pre-defined templates, was expressed repeatedly by all the sub teams. Expressions such as '*we should have hands-on exercises, when DE are really creating something by their own, not only using the templates. People can learn something from it (Cluster 1)'* highlights the need for hands-on training, where they create and troubleshoot for themselves, leading to real learning and problem-solving skills.

2. **Clarity and Systematic Training**

A notable gap in the training program is the lack of a systematic onboarding program specific to the CDF platform and Azure. There is a desire for systematic training expressed by the participants in the interview Clusters 1 and 3 with a clear checklist of what individuals should understand about the new cloud platform.

There is a strong view about the applicability of the training. Managers (Cluster 6) mentioned that *'while the rotation of the data engineers to the CDF team gives them exposure to Azure, it does not necessarily prepare them for day-to-day work at Sievo with the CDF'.* Managers are concerned about measuring the tangible impact of these rotations on actual work as stated, '*talking about the rotations of individuals to the CDF team, we cannot measure that percentage of the rotation can be applied to the real work.'* While data engineers point out the need to expand the scope of training beyond the new cloud platform

(Clusters 1, 2 and 5), since all DE are faced with custom processes in their daily work beyond the functionalities of the CDF platform.

3. **Continuous Documentation**

There is a strong wish for consistent and up-to-date documentation, particularly around data models and error handling. Feedback pointed to the need to be cautious about standardization, especially if it makes tasks more difficult. Participants mentioned the variety of courses and resources available externally about Azure but felt disconnected or overwhelmed in bridging the gap between self-learning and organizational practice.

4. **Direct Support and Communication**

While some team members were satisfied with the support they received, there is a clear call for more direct communication and hands-on help from knowledgeable individuals or teams. Walkthroughs of completed integrations or projects were cited as a potentially beneficial training approach. There is a clear need for the *'support initiative team inside Professional Service function to create the supporting network to have it more structured'* as highlighted multiple times during the the Cluster 5 interview. It will help to have dedicated, experienced DE or CDF team members to support projects during implementation and during monthly processes to assist DE who might encounter more intricate troubleshooting tasks.

5. **Continuous Learning**

There is a pressing need for continuous learning opportunities and regular training. Participants want to keep up with change and feel that the current pace of organizational support does not keep pace with self-directed learning as emphasized by the statement *'I can find myself Azure training in Google, but with the CDF platform I cannot keep up with changes (Cluster 1)'.* Development of the continuous support system, complemented by resources, guidance, and practical assistance, is seen as a potential means of accelerating the cloud transformation process.

## 5.6 Communication management

Effective communication and dedicated support systems are crucial for smooth transformations, as emphasized in the literature review section of the research. When teams start using cloud-based platforms or other innovative technical solutions, it becomes essential to have a deep understanding, timely responses, and collaboration with the development team. The thematic analysis examines the various aspects of communication and support provided by the CDF team based on feedback from DE teams and managers.

The data revealed four main themes that highlighted areas of praise and opportunities for improvement.

1. **Response Time and Priority Alignment**

While the CDF team's intentions to help are well recognized by the team as clearly stated *'if you ask the CDF team for the help, they will do their best to help you. But the first question is how much it takes and when it should be implemented. Not always product team can meet those deadlines, as they have roadmaps that they need to follow (Cluster 1)'*, thus, there is a discernible disconnect between their timelines and the project team's deadlines, resulting in perceived discrepancies in priorities.

2. **Collaborative Product Development**

The historical lack of DE influence in product development highlights the need for greater collaboration and transparency as discussed by Managers (Cluster 6): *'Before CDF product managers joined, we did not have much influence on the product development, there-fore it was complicated to work with the CDF team'*. Respondents suggest a more active involvement of the DE team in the development process.

3. **Training and Reinforcement**

Participants highlighted the need for regular updates on the CDF changes and features by the quote *'The CDF pipeline / features in the environment are changing often, not standardized yet as the case with our on-premises integration pipelines. Therefore, the CDF team needs not just release documentation but to do workshops or real project demos at least once every two weeks repeatedly until we are so familiar with the CDF pipeline and its features (Cluster 1)'*. Monthly demonstrations of the new releases as well as the highlights from the previous sessions are proposed, underlining the need for continual reinforcement of the latest information.

4. **Perceived Realism**

The promises and objectives set by the CDF team were sometimes viewed as unrealistic as indicated in all interviews. Therefore, it is more difficult for people to adapt to new ways of working with a discrepancy between the communicated vision of recent technology and reality.

## 5.7 Team dynamics and collaboration

As discussed throughout the study, successful transformation to the cloud depends not only on technical skills, but also on an organization's ability to adapt culturally to solve the challenge regarding the cultural resistance to the change. By examining how mindset realignment, role and responsibility synchronization, motivation levels and management support can transform an organization, the following chapters aim to highlight the significant impact of teams' perceptions of human factors influencing the cloud adoption process.

Firstly, the team dynamics and collaboration during the cloud adoption process has been discussed during the interviews and summarized via the thematic analysis presented below.

**Enhanced Collaboration and Unity**

- While some members felt that there had been minimal change in team collaboration following the change, most team members felt that the change had led to an *increased collaboration between teams.*
- The transformation has united *the team*. When challenges arise, team members now find it easier to seek and offer solutions within their own ranks.
- *Collective problem-solving* has been mentioned as the aspect of cloud adoption that strengthens team spirit as proved by the quote *‘Cloud adoption journey has certainly improved our collaboration. If two or three people are exposed to one error, you remember this call for months. It also affects your motivation - it is a steep learning curve (Cluster 3).’*

**Increased Enthusiasm and Positive Reception**

- There is clearly *a tangible enthusiasm* for the move to Azure as assessed by the managers: ‘*We should face it as the positive thing, it brings us together to face the common challenge, we should take benefits of it (Cluster 6)’*. Interest and eagerness to adapt to the new environment is evidenced by the high attendance at Azure-related training sessions.

## 5.8 Leadership support

Next, the perception on the leadership support has been analyzed based on the interview responses. As per Hassan *et al.* (2017a), successful cloud integration requires dedicated support from top management, which includes resource allocation and decision making. Cloud adoption involves a symbiotic relationship between technology, culture, and operations, all crucial in shaping the transformation. Table 9 explores the interview answers to reveal findings on these areas.

*Table 9 Thematic themes of the leadership support analysis*

| *Theme* | *Discussion* |
|---|---|
| **Perceived Lack of Support & Communication** | *Lack of support*: There is a shared perception among team members that the company has not provided sufficient support for the technological changes mentioned by interviewees from Clusters 1 - 5. They believed they were left to navigate the difficulties of the transition alone. |
| | *Unrealistic timelines:* A point of contention revolves around project timelines. Some feel that these are not strictly adhered to, and when delays occur due to the new platform utilization, timelines are not properly adjusted. |
| **Expectations & Promises** | *Overpromised expectations:* The initial communication promised a '*beautiful, easy, and smooth (Cluster 6)'* transition to the new tool. However, as challenges emerged, these promises were questioned, leading to a divergence of opinions within the team. |
| | *Unclear goals:* Some found the purpose behind the adoption unclear (Cluster 2), resulting in confusion and uncertainty. The lack of clarity has had domino effects, leading to questions from other departments. |

The results highlight the importance of effective management support and clear communication during significant technology transitions such as cloud adoption. This emphasizes the need for realistic project management, transparent and consistent support structures, and clarity of both the goals and expected outcomes of such a transformation. Without this, organizations risk internal resistance, confusion and a lack of cohesion that can hinder the successful implementation of new technologies.

## 5.9 Team motivation towards the adoption

The team's motivation towards the digital transformation has been addressed at the end of the data collection processes to capture the current stage of the team's resistance to the change, as motivation is at the heart of this human factor and plays a critical role in how individuals adapt and thrive in new technological environments. By analyzing interview responses, the research aims to understand how the transition to the cloud platform has affected individual job satisfaction and motivation.

1. **Career and personal development**

For many respondents, the shift represented an opportunity for personal and career development. They saw value in gaining skills and experience with the new platform, looking at the bigger picture beyond immediate challenges.

> *'In my case, it is motivation, at least for me personally. It will be useful for my future and career (Cluster 1)'.*
> *'It is one of the reasons why I want to work for Sievo because I want to learn new technologies (Cluster 5)'.*

2. **Push out of the comfort zone**

Several respondents (Clusters 2 and 5) felt that the new platform '*pushed them out of their comfort zones'*. While some interpreted this as a positive step towards growth and embracing modernization, others felt a distinct discomfort, underpinned by anxiety and stress (Clusters 3 and 5). From a managerial perspective, while recognizing the potential of the transformation, the entire journey to the new platform is seen as an added responsibility, which can sometimes feel overwhelming.

3. **Expectations management**

For many respondents, the transition to the new integration platform was met with initial excitement. However, as time passed and challenges were faced, the initial enthusiasm waned, replaced by a sense of disillusionment, or perceiving the platform as just another tool.

> *'At first, I had an excitement when starting to work with the CDF project (Cluster 5).'*
> *'At the beginning I was very enthusiastic, but because I have had to learn too many things my motivation decreased. (Cluster 2)'.*

Through thematic analysis of the interview data, several critical issues and insights were highlighted in the research. The feedback from these interviews emphasized the cultural, communicative, motivational, and organizational aspects of cloud adoption. The diverse perspectives captured in this chapter provide a comprehensive understanding of the cloud adoption journey at the case company and set the stage for the discussions and recommendations in the next chapter.

# 6 Research discussion and recommendations

## 6.1 Set of recommendations

One of the two main objectives of this study was to investigate the organizational and cultural challenges encountered in the cloud adoption process. The research focused on Sievo's data engineering team, with an emphasis on the individual experiences and opinions of team members, as well as their strategies for adopting the new platform built on the cloud. By combining the best practices discovered in the literature review part and integrating the findings from the empirical research, the developed cloud adoption guidance aims to significantly enhance the process of adopting CDF platform. The findings from the thematic analysis have been used to develop the set of recommendations discovered both in the research papers and data collection part of the study, where people undergoing the cloud transformation process had a room to share their expert insights. By implementing these suggestions, the case and other digital companies in the industry can better address the challenges of cloud technology adoption. This will involve addressing and improving both the technical and cultural aspects of the transformation.

*Table 10 Cloud adoption guidance for Sievo*

| *Challenge Identified* | *Recommen-dation* | *Rationale (Based on Literature Review & Interviews)* |
|---|---|---|
| **Lack of confidence** | ***Promote a Cloud-centric mindset*** | Cloud adoption requires a change in organizational mindset, encompassing rethinking development, architecture, and security. As discovered in the literature part of the research, an organizational mindset shift in terms of innovative capacity, trust, competency, and resources is essential for true cloud adoption success as stated by Ogunlolu and Rajanen, (2019). Still, Vial (2019) points that employees might demonstrate resistance as seen in the case company. |
| **Gaps in training and knowledge** | ***Hands-On Training and Exercises*** | Quantitative insights from the data collection part of the study uncovered that a structured, hands-on training approach that focuses on real-world scenarios ensures employees can effectively adapt to their new roles in the cloud environment. Role-specific hands-on training developed by the engineering department as suggested by Vajhala and Townsend (2023) provides both theoretical understanding and practical expertise. |

| | | |
|---|---|---|
| | ***Onboarding Training Modules*** | Interview data analysis shows that for new team members, a dedicated onboarding training focused on the cloud platform will ensure a smooth integration into the company's cloud processes. New team members will not only assimilate into the cloud-centric culture of the organization but also understand their specific roles within the adopted structure, thus, the organization will express its strategic vision to the new team members by investing into the training programs (Palos-Sanchez *et al.*, 2016) |
| | ***Dynamic Training Modules*** | Both interview insights and research papers state that the embracement of an adaptive training strategy by setting multiple short-term goals will help to fill the gap in the knowledge. Regularly updating training content, coupled with feedback mechanisms and one-to-one discussions of the learning milestones, ensures that employees remain motivated, rewarded, and equipped as suggested by Vial (2019). |
| **Discrepancies in communication and support expectations** | ***Improve Coordination between Teams*** | As emphasized by Vajhala and Townsend (2023), efficient communication is crucial as organizations move to new platforms. As discovered in the interviews, delays due to communication gaps can disrupt workflows. Therefore, it is important for teams to synchronize schedules and align priorities to foster a cohesive working environment. |
| | ***Transparent Communication*** | It is crucial to have transparent communication about the company's direction and how to manage existing operations simultaneously with the adoption, as discussed by Vajhala and Townsend (2023). A clearer product development roadmap and transparency about the challenges have been recommended by interviewees to ensure seamless operations. |
| | ***Feeback Mechanism*** | As stated by Palos-Sanchez *et al.* (2017), when a latest information system is introduced, employees should be informed in advance of the scope, objectives, tasks, and updates that the implementation of the new technological system. Designing and implementing a feedback mechanism post-project completion, emphasizing openness, transparency, and constructive criticism is suggested by the academical findings and interviewees to improve the connection between different stakeholders. |

| | | |
|---|---|---|
| | ***Collaborative Product Development*** | As recommended by the interviewed experts, organization of monthly workshops will encourage team's active participation in the product development process. These sessions can be utilized for brainstorming, reviewing proposed features, and gathering direct feedback on the current tool functionalities. As discussed by Vial (2019), companies need to effectively navigate the expectations of various stakeholders and align with the distinct perspectives. Therefore, the organizing of the collaborative working sessions will encourage product development that will balance the demand of multiple value co-creators. |
| | ***Engage Leadership for Aligned Vision*** | Engage executive leadership to improve communication clarity and offer visible support to teams as stated by Hassan *et al.* (2017a): conduct a workshop to align perceptions, set expectations, and address concerns related to the transformation's pace and support structures. |
| **Skills shortage both in the technical and business perspective** | ***Refined Recruitment Profiles*** | Given the skills shortage, adapting hiring profiles to seek out specific expertise can be key as suggested by the management team from the case company. By aligning recruitment practices with precise skill needs, organizations can more effectively fill knowledge. |
| | ***CDF Team Expansion*** | Lee James (2020) highlights the high failure rate of drastic changes to business processes due to a lack of understanding of employees' traditional workflows. By expanding the development team with members who understand the business, especially in areas such as spend analysis, the organization ensures that they do not overlook critical business workflows. |
| **Decentralized Documentation** | ***Develop & enhance document-tations*** | Initiate a project to create or update internal documentation, engaging experienced team members in knowledge-sharing initiatives as clearly stated in the data analysis of the study. |
| **Uneven or lack of the resource allocation** | ***Strategic project allocation*** | Allocate projects and resources wisely to all team members. As highlighted by Hassan *et al.* (2017a), top management support in resource allocation plays a crucial role in successful cloud adoption. Redesigning the project allocation system will ensure that the organization’s vast resources are used effectively as recommended by the case company. |

| | | |
|---|---|---|
| | ***Strategic time allocation*** | Several interviewees emphasized that prioritizing training hours and certifications not only equips teams with the necessary skills, but also increases motivation levels. By allocating training hours, encouraging certification options, recognizing, and celebrating achievements, teams will have improved skills and motivation to effectively navigate the cloud platform. |

The inherent challenges faced by Sievo's data engineering team, as revealed by the empirical study, are consistent with the broader themes found in the literature, suggesting that adopting the cloud, while full of benefits, also comes with challenges. Qualitative insights discovered in the data analysis have been extensively applied to improve the challenging areas in regard to the organizational and cultural transformations during the cloud adoption. Although there are some areas of support and positive feedback regarding the cloud adoption process, the study highlights a strong need for improved communication, targeted recruitment and training, and effective leadership support and resource allocation.

To highlight the most insightful research results that have influenced the cloud adoption process in the case company and can be utilized by digital organizations undergoing the same transformation, it is important to determine the metric. During the data collection period, some insights were captured from industry experts during the interviews. These insights were preliminarily analyzed immediately after the interviews. The management of the data engineering team in the case company was actively involved in the research, with the need to promptly obtain results from the ongoing process to apply the findings into actions. The three findings listed below have been immediately applied to optimize cloud adoption within the ongoing development initiative in the organization, and they have proven their relevance and adaptability straight away.

**1. Hands-on dynamic trainings**

The case company has started developing hands-on training and exercises to make training not abstract but similar to real business cases inside the organization. Thus, the main users of the new integration platform built on the cloud can quickly fill the gap in training and knowledge, as discovered in the identified challenges. Additionally, dynamic trainings are now developed in the organization to identify the key milestones and metrics during the learning process. Those key milestones will be reflected with the managers on an ongoing basis.

**2. Feedback mechanisms**

Feedback mechanisms in the form of project retrospective meetings have been organized inside the organization. By implementing such post-project completion feedback mechanisms, stakeholders can express openness, transparency, and constructive criticism towards the process of testing and using the new tool.

3. **Documentation development**

The project to create and update internal documentation has been initiated, and the researcher has been participating as the consultant in such projects on a continuous basis. This process can prevent any gaps in knowledge sharing due to decentralized documentations, as discovered as one of the main challenges.

The recommendations in this guidance provide a comprehensive cloud adoption framework based on solid research and tailored to their unique context. They aim to achieve a balanced approach that addresses both technical and cultural elements. Recommended actions have either already been initiated, as presented earlier, or will be carefully planned and applied in the near future by the case company. But it is already clear that the results of this study have significantly improved the cloud adoption framework at the case company based on feedback from the stakeholders. Findings demonstrate how technological companies can not only overcome the challenges of cloud adoption but also emerge stronger, more adaptable, and better prepared for the future.

## 6.2 Key academical findings

In addition to the company-specific findings detailed in the preceding chapter, this research has unveiled two key insights related to organizational factors influencing cloud adoption processes within digital companies. These findings not only contribute to but also augment the existing academic discourse discussed in the study.

1. **Strategic resource allocation for all digital transformation activities**

All organizational stakeholders, ranging from technical specialists to business professionals and those involved in the human resourcing activities, play a crucial role in the digital transformation, and must allocate their time to contribute to the related processes. For instance, to secure support from management, individuals need to acquire or be initially equipped with the strategic skills essential for the digital transformation process. Conducting training sessions requires the development of these programs by the engineering department (Vajhala and Townsend, 2023). Plus, the identification or invitation of specialists capable of delivering them, and the flexibility to adapt the allocated time for training based on evolving processes – a responsibility that falls on management teams. The implementation of all recommendations outlined in the previous chapter demands a significant investment of time from both direct participants in the process and indirect contributors, necessitating substantial organizational resources.

The examination of 41 empirical studies conducted in the research by Ogunlolu and Rajanen (2019) specifies 217 unique factors related to the cloud adoption are categorized into technological, organizational, and external factors where organizational readiness is listed as the top organizational factor influencing the cloud computing adoption. Organizational readiness includes organization process innovation, design capacity, organization trust in cloud, competency, satisfaction with current system and slack resources. Across 217 unique factors identified in the reference study, slack resources factor is the only one that can be related to the time allocation of the cloud adoption process. Therefore, it leads to the discussion that such factors as the availability of organizational resources, more specifically – time resources, has not been sufficiently addressed in existing academic studies. At the same time, the empirical results obtained in this study emphasizes the need for sufficient time allocation for all activities related to the cloud adoption in the case company. Thus, it can be concluded that even if a company has all the necessary established processes for a successful cloud adoption, if individuals do not have enough time to navigate through this path, the transformation will fail. It is crucial to note that time resources are not only direct primary stakeholders of the cloud technologies. Instead, it encompasses various departments within the organization, as any digital transformation invariably impacts all organizational processes.

**2. Strategic time allocation for trainings**

Among the need for the strategic time allocation for all cloud adoption activities, there is a special challenge identified in the empirical research such as the urging need of time allocation specifically for trainings. The research shows dynamic collaboration among team members during the cloud adaptation process, reflecting a strong eagerness to learning new technologies. Despite this motivation, participants expressed constraints in terms of inadequate or insufficient time allocation for essential training.

At the same time, such correlation was not addressed or identified in the academical studies discussed in the research. For example, the existing study by Vajhala and Townsend (2023) emphasizes the importance of considering employee preferences and interests in addition to challenges before committing to the cloud adoption plans. The study addresses that the enterprise should take the responsibility of investing in training on cloud management to their employees in different domains. However, the time allocation as one of the main resource investments for cloud adoption process, is overlooked in the study. Another research by Hassan et al. (2017b) primarily focuses on IT resources needed for the cloud adoption, neglecting time, or other not technical resources. Similarly, Ogunlolu and Rajanen (2019) underscore the importance of technical expertise and training in cloud computing, production timeliness or deployment time as technological factors in the adaptation process but tend to overlook resourcing allocation as the organizational factor. Another study (Vial, 2019) that neglects the influence of the strategic time allocation discusses that human factors such as inertia and its rooted product resistance cannot be addressed by simply altering the behavior of employees. It suggests that workshops discussing organizational factors can help prevent resistance and improve cross-functional collaboration. However, it does not mention that each workshop requires the allocation of resources, particularly time, of people affected by the digital transformation as revealed in this research.

For Saas organizations, time is a valuable resource, and resource allocation is a cost. Effective leaders' support as highlighted by Hassan *et al.* (2017a) is crucial for the proper allocation and adaptation of time. Therefore, the correlation between the strategic time allocation and top management support is clear and has been grouped into one category in the set of recommendations developed in this study (Table 10). As discussed earlier, significant cost reduction is one of the main benefits of the cloud technology for digital companies, still, substantial resources investment during the transformation process, particularly employee time, will significantly increase costs for the organization during the cloud adoption period. Thus, it can be challenging to many organizations to invest resources and time at the adoption stages of the cloud technology. Additionally, some SaaS organizations such as Sievo prioritize immediate client requests, creating an inverse correlation between the pressing need for training and the available time for employees involved in digital transformation. Thus, existing operations and resourcing allocations should also be continuously readjusted. Therefore, further academic research is needed to find solutions on the strategic time and resourcing allocation during any digital transformation processes, more particularly during the cloud adoption.

## 6.3 Development initiative

As technological companies face the challenges of cloud adoption, there is a perceived need for a structured approach that not only solves current challenges, but also sets the stage for its future operating model. One approach to solve the challenges associated with cloud adoption is the establishment of a separate unit that operates with a degree of autonomy from the rest of the organization, as highlighted by Vial (2019). To achieve this, establishing the CCoE is the proposed step to enhance the change management of cloud adoption. The establishment of the CCoE team is aimed at implementing the proposed recommendation to address the previously mentioned challenges of the transition to a new platform built on the cloud.

As suggested by the Microsoft Cloud Adoption Framework (Microsoft, 2023d), when organized and given authority, the CCoE team has the potential to be a catalyst for change within an organization. Its role is more than just overseeing operations; it becomes the driving force behind organization's efforts to speed up innovation and transition smoothly to the cloud. This initiative can simplify the process, reducing time to market and improving various quality indicators such as reliability, safety, efficiency, and maintainability. Additionally, as the impact of cloud technologies becomes increasingly intertwined with business differentiation, CCoE effectiveness goes beyond operational efficiency.

The CCoE is intended to be designed as a collaborative team or a community of professionals from different departments at the case company. The basic principle is not to create an isolated team, but to encourage initiative where members, although dedicated to their core functions at Sievo, dedicate part of their time to the CCoE efforts. This structure ensures a harmonious interaction of viewpoints that considers both the technical and business aspects of cloud adoption. The attached organizational chart in Figure 10 describes the proposed structure of the CCoE group at Sievo. On the one hand the proposed CCoE responsibilities are presented. In parallel, the composition of the team is visualized with two core components: the Data Engineering team, including at least one member of the Data Architect, Process DE, Project DE and CDF teams from each geographical location, and other CDF platform stakeholders from Sievo organization, e.g., Pre-Sales Consultant(s), Solution Consultant(s) and Dev Engineer(s), ensuring the different perspectives and expertise are taken into the process of driving the cloud adoption.

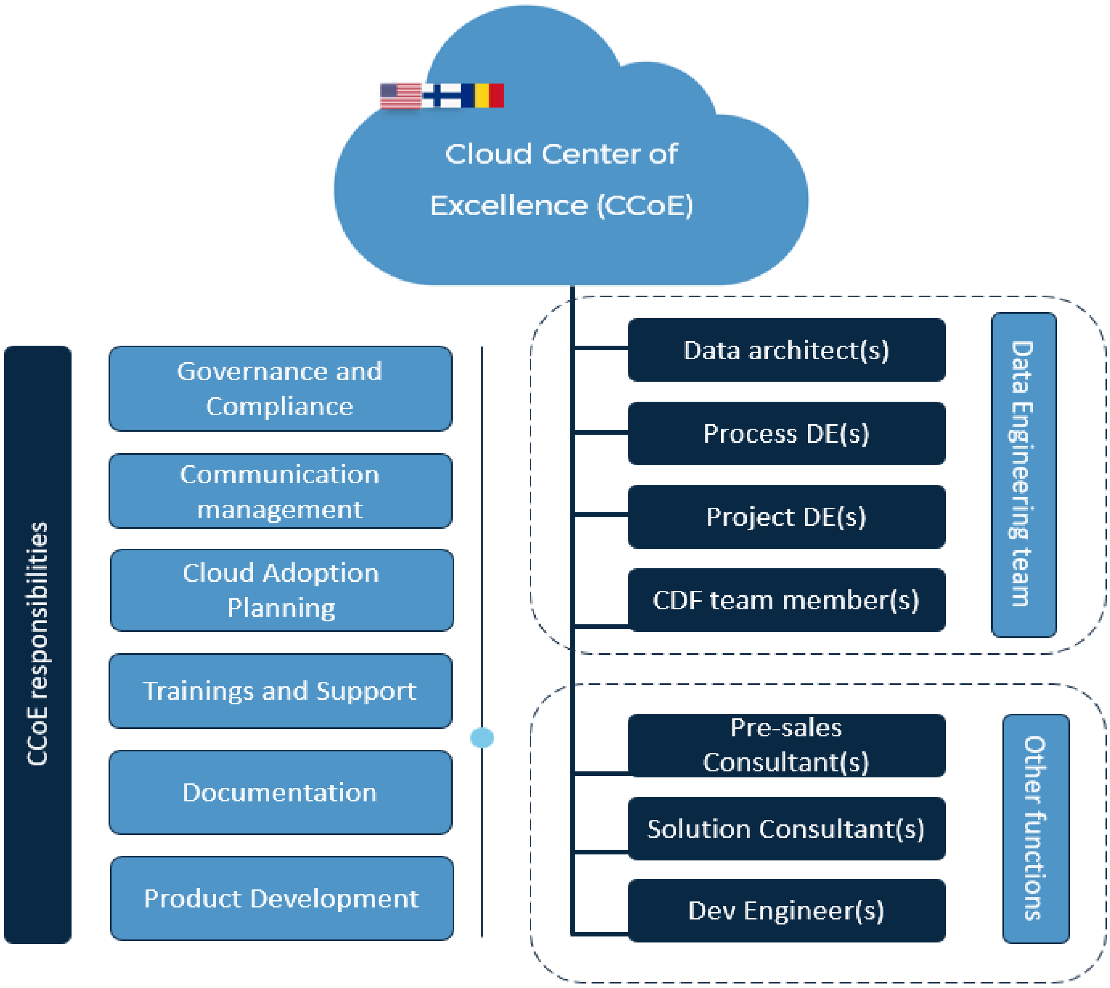


*Figure 10 Cloud Center of Excellence at Sievo*

With the support of the RACI matrix pointed in the Table 3 of the literature review, as well as the need to for a clear definition of roles and responsibilities that promotes accountability across all levels as suggested by the Microsoft CAF (2023c) discussed in the Chapter 2.4 of the study, the proposed areas of the CCoE team accountability are presented:

- **Governance and compliance**: The CCoE ensures alignment with governance requirements and compliance directives. By establishing a robust governance model, the team ensures that cloud adoption evolves with the business needs.
- **Communication Management:** The CCoE is the primary communication point for matters relating to the CDF platform ensuring transparency and clarity across the organization. The team might be responsible for ensuring that all stakeholders are kept abreast of the latest platform changes, developments, and initiatives.
- **Cloud Adoption Planning:** In line with the Microsoft Cloud Adoption Framework, the CCoE is not just a governance body. Instead, it is actively involved in planning

and managing the cloud adoption process. The team leads development projects, defines roles, and actively promotes the cloud-centric mindset within organization.

- **Training and Support**: In line with the literature review and the empirical findings of the study, the CCoE undertakes the essential task of fostering cloud expertise within organizations. By developing training programs and facilitating both formal and informal learning through communities of best practice, the CCoE ensures that the direct stakeholders and other teams are equipped to utilize the new platform.
- **Continuous Improvement:** As stated by Trivedi *et al.* (2023), the CCoE is critical in identifying opportunities to improve cloud adoption. By ensuring a process of continuous review and improvement, e.g., establishing and documenting best practices, the CCoE can mitigate risk and improve the delivery of service.
- **Accelerate product development:** According to Microsoft CAF (2023d), the CCoE should be responsible for promoting the rapid adoption of cloud services as being in the ideal position to suggest optimization tips and to help adoption teams better tune assets. This might include the creation of reusable deployment packages and contribution to the product development roadmap that aligns with the organization's compliance and security policies.

As the organization continues its transformation journey, it is important to understand that while CCoE teams can demonstrate quick returns in some areas, the higher-level goals, like business agility and time to market, can take much longer (Microsoft, 2017d). Like many complex organizational initiatives, this type of change requires patience, experimentation, and ongoing engagement. There will be many challenges, obstacles, and setbacks on the road to full implementation of the new cloud platform. However, with a constant commitment to adaptability, openness to experimentation and persistence, the prospects for achieving greater flexibility, speed and reliability are remarkably high as proven by organizations undergoing a similar transition.

# 7 Conclusion and research implications

This research, grounded in the real-world experiences of a SaaS company, has provided a comprehensive understanding of the challenges, intricacies, and opportunities presented by the shift from on-premises solutions to the platform built on the cloud. During the research, it became clear that the adoption of cloud technology is not just a change in technology, but rather a comprehensive transformation that affects various aspects of an organization. The difficulties faced by the team at the case company responsible for managing data, ranging from technical obstacles to issues with implementing change, emphasizing the intricacy of this shift. However, these difficulties also highlight the rich opportunities for knowledge discovery that arise from undertaking such a transformative process.

Throughout the study, the need for subject restructure was minimal. The research objectives were properly linked from the literature review to the broader organizational context of the case study that have provided insightful results. The use of sequential individual interviews with real-time digital recording of responses facilitated a comprehensive dataset for the insightful analysis of the cloud adoption process in SaaS companies. Despite the time constraints of these interviews, participants successfully articulated definitions, clarified issues, identified challenges, and outlined potential actions, painting a complete picture of the new platform built on the cloud for data integration and the expected outcomes of its deployment. Through thematic analysis, different perspectives on pre-identified topics were synthesized into multiple themes. Through linking them to the industry best practices, this resulted in a robust set of recommendations aimed at improving the cloud adoption process of the case company.

One of the key takeaways from this research is the importance of the regular reassessment of the cloud adoption approach. Using frameworks such as Microsoft's Cloud Adoption Framework and insights from global case studies, organizations can more effectively transform the cloud adoption framework. Best practices from the industry serve as a roadmap, guiding companies through the decisions and actions required for successful change management. Although some organizational functions, such as external consultants or those developing the new platform built on the cloud, were not directly interviewed, key stakeholders involved in the deployment of the new cloud platform were actively involved in the discussions. With this in mind, I am confident that the first objective of the study - to identify the organizational and cultural challenges faced by the engineering team when adopting a new platform built on the cloud - was successfully achieved.

A comprehensive literature review provided a solid foundation for the study's second objective: to formulate recommendations for the case company. This knowledge provides business decision makers with the tools to refine their cloud platform implementation strategy, define strategic priorities, and gain a clearer understanding of the factors the team considers critical during the change management process. It is important to note that these perspectives reflect the true stakeholder voices and, in many ways, offer greater organizational applicability than common academic definitions.

This study combines both academic research and practical case study methods, bridging theoretical ideas and practical application. The combination of academic and consultancy research perspectives adds multi-dimensional value to the research, benefiting both academia and industry. This combination provides a robust set of recommendations and new findings for the existing research linked to the cultural and human factors affecting the digital transformation, supported by a rich set of academic and empirical results, leading to the successful implementation of the second research objective.

In addition, this research has had a profound impact on my personal and professional development. Being embedded in the team undergoing the transformation provided a unique viewpoint, allowing to witness first-hand the challenges and achievements of cloud adoption. This experience not only supported my studies, but also provided me with practical insights that I have been able to apply in real time at the case company. The opportunity to bridge the gap between academic research and real-world application has been invaluable, enhancing my contributions to the data engineering team and allowing me to play a role in shaping the cloud adoption journey.

## 7.1 Theoretical implications

Cloud computing technology is one of the most important IT developments and represents an essential step forward for information systems (Palos-Sanchez *et al.,* 2017). However, for organizations especially, the adoption process is neither easy nor quick and involves many challenges discussed in the academy. The journey of the data engineering team at the case company in adopting cloud computing and organizational and cultural challenges associated with it provides a rich set of insights that contribute to the academic literature on cloud adoption, particularly within SaaS organizations.

Identified challenges align with the broader academic discussions about the non-technical challenges related to cloud adoption in digital organizations. These challenges can lead to resistance and inertia to the adoption process and initiatives related to it, highlighting the need for a comprehensive understanding of both technical and organizational solutions to these challenges. While existing academic research dives into specific technical barriers and potential solutions, there is a noticeable gap between technical recommendations and those that address challenges related to the organizational and cultural change, as well as human factors influencing the change management during the cloud adoption processes (Ogunlolu and Rajanen, 2019). While technical issues are often addressed at an advanced level, cultural issues are typically presented at a more basic level. The present study bridges this gap by offering a comprehensive mapping of challenges and solutions, providing a robust theoretical framework that complements the existing academic literature. The insights gained from research, combined with broader theoretical discussions, provide a multifaceted perspective on the challenges of cloud adoption and their potential solutions for technical and leadership teams in the organizations.

Additionally, the study adds another factor to the analysis of 217 unique factors related to the cloud adoption conducted by Ogunlolu and Rajanen (2019) that has omited resourcing allocation, particularly time allocation and associated organizational costs, as the key element to drive the change management related to the digital transformation in any organization. The direct linkage between hands-on trainings and efficient time resource allocation has been identified in the study, contributing to the existing research that have studied the cloud adoption challenges and processes related to the cultural and human factors.

Moreover, the exploration of the CCoE in this research reinforces the suggestion of Vial (2019) to overcome the organization structure and cultural challenges by enabling the cross-functional collaboration in organization during the transformation. This study underscores the significance of such collaboration as a strategic lever to facilitate organizational transformation, further enhancing the theoretical depth of the discourse on cloud adoption and validating the existing theories.

## 7.2 Practical implications

The journey to cloud adoption for SaaS companies is a complex interplay of technological, organizational, and cultural dimensions. This research highlights the profound implications of this transition, both from a practical and managerial perspective. As SaaS managers plan the transition to a cloud-based technology platform, the focus needs to go beyond purely technological considerations. The findings suggest that a predominant focus should be on the cultural aspects of transformation. This is not a sequential process, but rather a concurrent endeavor in which these restructuring and cultural shifts are initiated along with the technological transition.

The research highlights the importance of applying more focus to certain aspects of the change management indicated in the set of recommendations. As SaaS organizations navigate the challenges of cloud adoption, a robust change management strategy emerges as the central hub, ensuring not only a seamless transition, but also the support and commitment of operational staff. This is critical, as these individuals are at the forefront of using the new technologies, and their support can significantly enhance the organization's ability to realize the full potential of cloud computing.

Furthermore, the choice of adoption framework is not a common decision. Managers need to be analytical and choose frameworks that fit the organization's structure and strategic imperatives. This tailored approach ensures that the cloud adoption process is aligned with the needs and nuances, optimizing the chances of a successful transition.

From the perspective of the case company, the research has already demonstrated its practical relevance. The management team has been informed of the findings throughout the research process, resulting in immediate action and implementation based on the insights provided. This proactive approach has resulted in tangible benefits for the company, including increased efficiency in the adoption journey. The empirical applications of the research underline its actionable value.

The research provides a practical guidance of the cultural challenges associated with cloud adoption and practical solutions based on academic research, ensuring that digital companies are well equipped to navigate the challenges and opportunities of cloud adoption.

## 7.3 Limitations and future research

While this research provides valuable insights into the complexities that data engineering teams face when migrating to the cloud, it is important to acknowledge its limitations. Hassan *et al.* (2017a) highlights the limitations inherent in the empirical literature on cloud computing adoption, particularly when examining integration teams transitioning from on-premises infrastructure to cloud-based systems. Despite the growing interest in cloud computing, empirical studies examining the factors that influence its adoption remain limited. Moreover, much of the existing research operationalizes cloud computing adoption in a binary manner, focusing primarily on the intention to adopt or not to adopt. Such an approach is not entirely appropriate for organizations such as Sievo, which are in the adoption phase of cloud transformation. Furthermore, each company and industry have unique characteristics, and a data engineering team in a company may face different challenges than those highlighted in this research.

During the preliminary stages of an innovation's diffusion, community expertise is limited, and technology is often defined more in terms of its expectations than its actual implementation (Venters and Whitley, 2012). Thus, the generalized approach may not capture the intricate nuances and specifics of the actual adoption process. Such low maturity level of existing academic discussions could lead to a potentially distorted understanding of the challenges faced by other organizations during their transformation process, thereby compromising the applicability of solutions developed.

Additionally, the chosen study's methodology in the empirical part of the research has some limitations. Firstly, the qualitative approach relies on the subjective experiences and perceptions of the data engineering team members, providing useful but potentially biased insights. During the interview, their responses may be influenced by social desirability bias, leading to underreporting issues or omitting sensitive issues related to the cloud adoption process. As an insider researcher offering deep insights, the researcher might be biased because my interpretation of the data may be driven by my own experience and position in the team. This perspective may narrow the scope of the analysis overlooking aspects visible to outside observers. In addition, the study is limited to the cloud adoption challenges encountered at a particular point in time and may not reflect the evolution of these obstacles as the team progresses through the adoption journey. Finally, the use of a case study method, while increasing comprehensiveness, limits the transferability of the findings to other enterprises or contexts due to the likelihood of a single occurrence of constraints and relationships determined by the tactics of cloud adoption.

This study emphasizes the importance of considering and allocating sufficient resources in the preparation process before committing or planning different actions for employees, and such a correlation often overlooked in many existing studies reviewed for this research. Empirical results of this study highlight the need for academic research to study the strategic time allocation as significant technological and organizational factors in scope of the cloud adoption process.

Suggestions for future studies are to explore the unique difficulties experienced by technical teams in various industries and organizational settings, considering the aforementioned limitations. To gain a more comprehensive understanding of these challenges, it would be beneficial to conduct empirical research that focuses on the actual process of adopting cloud technology rather than just intentions. In addition, as the research has identified the direct link between time allocation and training required for the cloud adoption process, industry and academia will benefit from studies and tools that could provide solutions on how to calculate the slack resources required for cloud adoption for different types of SaaS organizations. This topic is massive and will require the collaboration of many parties, but the invention of the strategic mechanism or algorithms will benefit SaaS companies and save a lot of resources in the future. In addition, further research into the direct correlation between resource allocation and adoption policies will improve existing frameworks.

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