UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS

EFFECTIVE INFORMATION AND KNOWLEDGE MANAGEMENT AMONG INTERDISCIPLINARY TEAMS IN DIGITALIZATION PROJECTS

Ljubljana, July 2025 EDI OBLAK

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ABSTRACT

This thesis investigates information and knowledge management practices to support more effective digitalization project execution. The research was conducted in collaboration with Hilti AG branch office Thüringen and focuses on the company environment and analyzes ongoing project for tool data visualization. Digital transformation initiatives in manufacturing companies are often facing many challenges. They were identified through semi-structured interviews. Additionally, this thesis proposes best practices to improve information and knowledge management of digitalization projects. The findings show the need for structured documentation, delegated accountability, integrated digital platforms, and collaboration.

KEY WORDS: digital transformation, information management, knowledge management, digitalization projects, project handover

SUSTAINABLE DEVELOPMENT GOALS

POVZETEK

Magistrsko delo raziskuje prakse upravljanja informacij in znanja za učinkovitejšo izvedbo projektov digitalizacije. Raziskava, izvedena v sodelovanju s podružnico podjetja Hilti AG v Thüringenu, se osredotoča na okoliščine podjetja in analizira aktualni projekt vizualizacije podatkov o orodjih. Digitalna transformacija se v proizvodnih podjetjih pogosto sooča z mnogimi izzivi. Ti so bili v raziskavi identificirani s pomočjo pol strukturiranih intervjujev, poleg tega pa delo predlaga uporabo praks za izboljšanje upravljanja informacij in znanja v projektih digitalizacije. Ugotovitve kažejo na potrebo po strukturirani dokumentaciji, jasnem delegiranju odgovornosti, integraciji digitalnih platform in okrepljenem sodelovanju.

KLJUČNE BESEDE: digitalna transformacije, upravljanje informacij, upravljanje znanja, projekti digitalizacije, predaja projekta

CILJI TRAJNOSTNEGA RAZVOJA

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sl. – Slovene

AG – (sl. Delniška družba); Aktiengesellschaft

AI – (sl. Umetna inteligenca); Artificial Intelligence

BI – (sl. Poslovna inteligenca); Business Intelligence

CAM – (sl. Računalniško podprta proizvodnja); Computer-Aided Manufacturing

CNC – (sl. Računalniško numerično krmiljenje); Computer Numerical Control

DIKW – (sl. Model podatkov, informacij, znanja in modrosti); Data, Information, Knowledge, and Wisdom Model

DT – (sl. Digitalna transformacija); Digital Transformation

IIOT – (sl. Industrijski internet stvari); Industrial Internet of Things

IOT – (sl. Internet stvari); Internet of Things

IT – (sl. Informacijska tehnologija); Information Technology

OE – (sl. Operativna odličnost); Operational Excellence

RQ – (sl. Raziskovalno vprašanje); Research Question

TDV – (sl. Vizualizacija podatkov orodij); Tool Data Visualization

1 INTRODUCTION

Digital transformation (DT) has become a fundamental concept in the development of organizations. According to Liu et al. (2011), it is an organizational transformation that integrates digital technologies and business processes in a digital economy. DT can be defined as the integration of digital technology into all aspects and operations of an organization, which leads to infrastructural changes in how the organization is operated (McGrath & Maiye, 2010). Indeed, in recent times, numerous research studies have demonstrated how the success of manufacturing firms is closely linked to their ability to embrace advanced digital technologies and implement knowledge management processes capable of identifying the necessary knowledge and disseminating it within the organization (Leoni et al., 2022). Asrar-ul-Haq & Anwar (2016) states that the ability to integrate knowledge into the organization is one of the essential factors that facilitate the successful DT of organizations.

In today's rapidly evolving knowledge-based economy, the effective management of information and knowledge has become crucial for organizational success. Therefore, managing knowledge is as important for an organization as managing other assets (Asrar-ul-Haq & Anwar, 2016). Knowledge management is the process of sharing, transmitting, distributing, and documenting knowledge (Abualoush et al., 2018). It serves as a novel method for locating and arranging specialized knowledge to ensure efficient retrieval and reuse. By managing knowledge both internally and externally, with diverse stakeholders, the intention behind knowledge management is to provide value to companies (Taherdoost & Madanchian, 2023). The knowledge-based economy is experiencing rapid development, and knowledge is viewed as a vital factor in achieving success (Abubakar et al., 2019).

As companies navigate the complexities of DT, the ability to collaborate across interdisciplinary teams and manage diverse data sources plays a pivotal role in maintaining competitiveness and achieving sustainable growth. With an emerging interdisciplinarity, there is a growing requirement for multiple collaborators on projects, which are needed to supply relevant expertise in each of the involved disciplines (Macrae & Matuszewski, 2024). Collaboration is recognized as an important factor in the successful delivery of projects within the field of project management. Recent empirical studies have demonstrated a positive relationship between the level of collaboration and the success of the project (Urton & Murray, 2021). Effective collaboration in interdisciplinary teams not only promotes problem solving skills but also encourages the sharing and integration of diverse knowledge that is essential for complex digitalization projects.

With the growing complexity of DT efforts, managing knowledge and information has become increasingly demanding. The rise of interdisciplinary project teams, composed of both technical and domain-specific experts, makes it even more difficult to create, update, and share information in a way that is clear and understandable for all involved stakeholders.

Efficient information management is more important than ever. Modern digital technologies allow manufacturing companies to collect and process data from daily operations at a scale that was not possible in the past. It is highly beneficial for companies to use this data to make informed, data-driven decisions. Integrating emerging technologies into established processes is possible through digitalization projects, and many companies are recognizing the improvement potential in information and knowledge management, as well as in the interdisciplinary collaboration of ongoing digitalization projects. This has also been recognized at Hilti AG branch office Thüringen. Researching the topic in collaboration with the company, this master's thesis focuses on knowledge and information management in digitalization projects, with an emphasis on addressing the challenges faced by interdisciplinary teams.

According to Ramesh & Delen (2021) up to 90 percent of DT projects fail to meet their initial goals. The purpose of this thesis is to improve information and knowledge management in digitalization projects at Hilti AG branch office Thüringen by identifying critical improvement areas and researching best practices to support successful DT. Improving how information and knowledge are managed is important because issues such as inefficient data flows, unclear documentation, or inefficient handovers lead to delays in digitalization project delivery. Without addressing these problems, it becomes harder to manage and extract real value from digitalization projects over time. By improving these areas, the company can ensure more stable project progress and improve the success of its DT efforts.

The first objective of this thesis is to showcase good practices for information and knowledge management in digitalization projects, based on theoretical research and practical observations. The second one aims to identify and present challenges faced during digitalization projects within collaborating company. The focus is on developing recommendations for improving knowledge and information management in interdisciplinary project teams. Another objective is to improve the quality and accessibility of project documentation to ensure long-term usability. Finally, the thesis aims to improve information and knowledge management processes, enabling project managers and team members to concentrate more on project work. Special attention is given to improving the handover process for involved stakeholders, as digitalization project handovers are frequent within collaborating company.

This master's thesis addresses the following research questions (RQ):

RQ1: Which information and knowledge management practices enable an effective and efficient digitalization project handover process from interdisciplinary project teams to operational end users?

RQ2: How can these practices ensure smooth integration of emerging technologies?

RQ3: How can companies better adapt to a dynamic digitalization project environment using effective information and knowledge management practices?

Satisfying the objectives and answering the RQs is based on both theoretical and empirical research. The thesis begins with a review of relevant literature, including books and articles on the topics of DT, knowledge management, information management, project management, and collaboration in interdisciplinary teams. The theoretical chapter describes the main concepts and provides definitions of relevant expressions. It is mostly based on foreign literature and provides an adequate overview of the focus areas. The empirical part of this thesis is based on primary and secondary data. As the research is conducted in collaboration with a company, access to internal company data was possible to identify past challenges in information and knowledge management of digitalization projects. Additionally, primary data was collected through semi-structured interviews with company experts in digitalization project management. This research approach allows us to develop recommendations for improving information and knowledge management practices in digitalization projects, tailored specifically to the collaborating company.

2 DEFINING DIGITAL TRANSFORMATION

The industrial world is evolving into a digital one. DT has gone from being a technological opportunity to a necessity for managing the needs and expectations of the world's growing population. These developments have led to considerable changes in many organizations, with DT introducing new processes and mechanisms that can affect the key structures of how a company operates (Kraus et al., 2022). Organizations nowadays must deal with increasing amounts of data and act in complex and growing networks. They are supported by innovative technologies, tools, and methods that offer increasing flexibility and performance at decreasing prices. This environment of continuing technological change may require a transformation of organizational structures, processes and strategies (Heilig et al., 2017).

This chapter explains the core concepts of digitization, digitalization, and DT. It describes key technologies used in DT initiatives and their practical application in the manufacturing industry, forming the basis for understanding the technical environment of digitalization projects.

2.1 Digitization, digitalization and digital transformation

Terms digitization, digitalization and DT have different meanings. For clarity reasons distinction between them is highlighted in this paragraph. Digitization is the process of representing information as binary values, which computers are using to store, process and transmit as information. Digitization defines the process of converting information from analogue to digital form, which can result in changes in the existing business model to provide value to all process stakeholders (Heilig et al., 2017). It refers to the process of transforming analogue technology into a digital format, whereas digitalization defines the impact of digital technology on the existing process. It defines the way in which digital technology transforms the existing business process (Verhoef et al., 2021). Digitalization refers to the integration of digital technologies, platforms, and services leading to new ways of utilizing modern technology (Čiković & Lozić, 2024). DT is the most pervasive phase and describes a company-wide change that leads to the development of new business models. It affects the whole company and its ways of doing business and goes beyond digitalization (Verhoef et al., 2021). It is inherently linked to strategic changes in the business model as a result of the implementation of digital technologies (Sebastian et al., 2017).

Currently, there is no commonly accepted definition for the term DT (Schallmo & Williams, 2018). According to Liu et al. (2011), DT is an organizational transformation that integrates digital technologies and business processes in a digital economy. McGrath & Maiye (2010) argue that DT can be defined as the integration of digital technology into all aspects and operations of an organization, which leads to infrastructural changes in how the organization is operated. One way to define DT is as a business process, but it is also a term used for the activities of organizations related to information technology (IT) sector (Čiković & Lozić, 2024). DT is concisely defined by Vial (2019) as a process in which companies face changes in their business and economic environment by adopting technologies to improve their performance. Regardless of previous definitions, DT is the process of increasing productivity, value creation and social wellbeing by adopting disruptive technologies. It changes organizations by digitizing business processes using information systems (Imran et al., 2021). Erjavec et al. (2018) summarized various definitions of DT as changing the core elements of a business, including the business model, strategy, business processes, organizational structures and organizational culture by harnessing the capabilities of modern digital technologies.

2.2 Technologies driving digital transformation

According to Verhoef et al. (2021) the need for DT is driven by three major external factors: the rapid development and adoption of emerging digital technologies, reshaped competition, and changing consumer behavior. As emerging digital technologies artificial intelligence (AI), blockchain, the Internet of Things (IOT), robotics, and big data were mentioned. Other authors mentioned additional digital technologies as DT drivers (Folgado et al., 2024), often specific to the particular industries.

The following subchapters will describe emerging digital technologies used in DT projects at Hilti AG branch office Thüringen, as the company is also a part of the research context. These technologies are:

- cloud computing,

- Industrial Internet of Things (IIOT),
- big data, and
- AI.

In the context of a manufacturing plant, the focus is on DT technologies aimed at optimizing production processes. The convergence of cloud computing, IIOT, big data, and AI is reshaping business operations by enhancing efficiency, optimizing supply chains and reducing costs through automation (Verhoef et al., 2021).

2.2.1 Cloud computing

Computing technologies must be able to process and store the on-demand business data consistently and effectively. Since traditional distributed computing architecture lacks in delivering flexibility, scalability, elasticity and faster processing speed, companies are diverging into cloud technologies for huge data storage and load balancing availability (Ahmad et al., 2017). Cloud computing is significantly used in business innovation and because of its agility and adaptability, it enables new ways of working, operating, and running a business. The service enables users to access files and applications stored in the cloud from anywhere, removing the requirement for users to be always physically close to actual hardware. Cloud computing makes the connection available from anywhere because services are kept on a network of hosted computers that carry data over the internet. It also eliminates the need for businesses to plan for provisioning and allows organizations to start small and scale up only when service demand increases (Islam et al., 2023). The cloud also facilitates automation, which aids driving innovation. It works in tandem with technologies like low-code and no-code applications to enable a wider range of individuals to create a wider range of new digital services. Cloud computing enables businesses to rapidly scale and adapt, accelerating innovation, increasing agility, streaming operations, and cutting costs (Islam et al., 2023).

According to different business needs, cloud architecture can be categorized into four basic types of deployment models and three types of service models. Each service has distinctive fundamental characteristics, with its own benefits and weaknesses. The deployment models are private cloud, public cloud, virtual private cloud and hybrid cloud. Ahmad et al. (2017) described also service models named as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Each of them has its own capabilities and correspond to serve as an organizational scope and depict a level of abstraction over the computational level (Omotunde et al., 2013).

2.2.2 Industrial Internet of Things

According to Munirathinam (2020) the IIOT refers to the extension and use of the IOT in industrial sectors and application. Khan et al. (2020) defined the IIOT as a network of intelligent and highly connected industrial components that are deployed to achieve high production rate with reduced operational costs through real-time monitoring, efficient management and controlling of industrial processes, assets, and operational time.

With a strong focus on machine-to-machine communication, big data, and machine learning, the IIOT enables industries and enterprises to have better efficiency and reliability in their operations. The IIOT is revolutionizing manufacturing by enabling the acquisition and accessibility of far greater amounts of data, at far greater speeds, and far more efficiently than before. Several companies have started to implement the IIOT by leveraging intelligent, connected devices in their factories. The IIOT is driving strong demand for more data acquisition, communication, real-time analytics and data-driven decisions across a wide range of industrial verticals (Munirathinam, 2020).

IIOT has a strong connection with cloud computing, as it improves the quality and experience of using the IOT. Data can be saved in the cloud using cloud computing and IOT for later reference, in-depth analysis, and increased performance (Islam et al., 2023).

2.2.3 Big data

Big data refers to a large amount of data that increases fast and is difficult or even impossible to handle by traditional methods (Oliveira & Bollen, 2023). Authors Yaseen & Obaid (2020) gathered multiple definitions of big data, one of them simply stating that it is complex, unstructured, or large amount of data. A more precise definition was proposed by Chen et al. (2012) who described big data as datasets and analytical techniques in applications that are so large and complex that they require advanced and unique data storage, management, analysis, and visualization technologies.

The most widely accepted definition of big data is based on the 4V's framework: volume, velocity, variety and veracity. Volume refers to the amount, size and scale of data. The amount of data reaches such a level that it cannot be managed without dedicated analytic tools. Velocity refers to the speed by which the data is generated and how fast the data should be processed. Variety is the heterogeneity of data. Big data often comes from different sources, which can be diverse in type, format, semantics, and volume. Veracity refers to the quality of the collected data. It is related to the biases, noise and abnormality of data (Oliveira & Bollen, 2023). Big data represents the information assets characterized by such a high volume, velocity and variety to require specific technology and analytical methods for its transformation into value (De Mauro et al., 2016).

The manufacturing sector has always relied on data, and it has always been using it to transform itself and its ways of working to achieve better quality of work and effectiveness. It is among the largest data-gathering industries. The reason behind the quick expansion of big data is the extensive degree at which it is created, shared and utilized in recent times (De Mauro et al., 2016). A major factor in producing massive amounts of data has been digitization. With the introduction of IIOT manufacturers get real-time data which can be used to optimize costs and maximize output (Yaseen & Obaid, 2020).

2.2.4 Artificial Intelligence

To include all the applications currently recognized as AI, Sheikh et al. (2023) described it as systems that display intelligent behavior by analyzing their environment and taking actions, with some level of autonomy, to achieve specific goals. AI today can predict patterns from huge amounts of information. It is capable of augment human intelligence, making autonomous decisions, delivering insights and improving productivity. It uses algorithms to construct analytical models and uses trial and error to find out how to perform tasks (Saleh, 2019). Rai et al. (2019) defined AI as the ability of machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision making, and even demonstrating creativity.

In recent years, AI has become increasingly important in manufacturing due to advancements in machine learning, natural language processing, and computer vision. With the proliferation of IIOT, manufacturers have more data than ever before, which can be analyzed and processed by AI algorithms to improve decision-making, optimize processes, and create new business models (Wijaya et al., 2024).

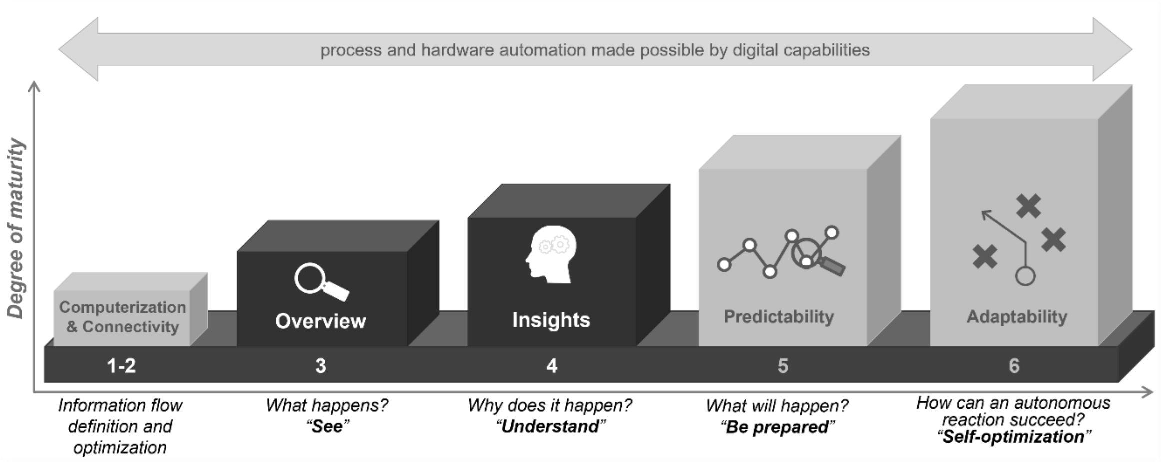
The above sections provided an overview of some of the emerging digital technologies used in manufacturing. AI helps make significant advancements by simplifying the introduction of these technologies in the manufacturing sector. Low code development platforms are an example of technology backed up by generative AI. These platforms are IT artifacts that support the development of software, applications, and workflows using minimal source code and a graphical interface instead of complex programming languages. In the future, it is expected that generative AI will produce a large part of the code with little human input. This will not only improve existing code, produce a lot of code in a short period of time, but also provide use-case specific content and reduce the error-proneness due to human errors.

2.3 Implementation of digital technologies in manufacturing

The approach to implementing digital technologies can vary across industry sectors. The following paragraph outlines the theoretical background for the implementation approach, based on the process established by the collaborating company.

Introducing digital technologies in manufacturing requires significant upgrades of the production environment, competencies and capabilities, and significant changes across the whole organization (Schuh et al., 2017). The implementation process, used by collaborating company and by other manufacturing companies is summarized by Schuh et al. (2017) and involves six main steps. The first step is computerization, where information technologies are employed in isolated applications within the company. The second stage is connectivity where the company transitions from isolated technology applications to interconnected ones. At this stage, the integration of IT is partial. The combination of first and second step lays the foundation for digitalization. Step three is visibility, and it involves the integration of sensors in the processes to capture data, allowing for the awareness of the activities on the shop floor. Stage four is transparency and involves analyzing the collected data, enabling the company to understand why certain events occurred. The fifth stage is predictability. At this stage, the company is able to simulate various future scenarios and identify the most likely ones. The final stage is adaptability, where self-optimizing systems are introduced. This enables certain decisions to be delegated to IT systems ensuring rapid adaptation. The closer the companies get to stage six, the higher the value they can capture from implementing digital technologies in their organization (Boffa & Maffei, 2024). Hilti AG branch office Thüringen visualized the six-step process as shown in the Figure 1. It is used on the global level as a DT strategy to further develop all Hilti production plants.

Figure 1: Implementation of digital technologies in manufacturing



Source: Hilti AG (2025).

DT uses new technologies, systems, and ways of providing value across organizations. However, the successful implementation of these changes relies not only on technological capabilities but also on the ability to manage information effectively and retain critical knowledge of digitalization initiatives over time. As digitalization projects grow in complexity, so does the need to structure, maintain, and transfer project-related knowledge efficiently. The next chapter explores how organizations can manage information and knowledge to successfully support DT initiatives.

3 INFORMATION AND KNOWLEDGE MANAGEMENT IN DIGITALIZATION PROJECTS

Businesses may profit from DT in a variety of ways. Digital technology may automate repetitive operations, eliminate mistakes, and increase productivity. It can help businesses to distinguish themselves from competition by supporting new goods and services development. Digital technologies allow firms to gather and analyze vast volumes of data, resulting in insights that might guide decision-making and drive development (Abu-Alsondos et al., 2024). According to Forliano et al. (2023) DT projects can better deliver the desired benefits. They have urged organizations to remain proactive for their digitization while accelerating capital spending in innovative technologies and new business processes (Khilji et al., 2024). However, the success of digitalization projects depends not only on the adoption of new technologies but also on how effectively information and knowledge are managed within organization.

This chapter defines information and knowledge management, the difference between them, and presents key concepts. It explains why both are important for running digitalization projects successfully and how they can help companies use their resources better. The chapter also looks at how organizations manage data and knowledge and presents best practices that can support digitalization projects from an information and knowledge management perspective.

3.1 Defining information and knowledge management

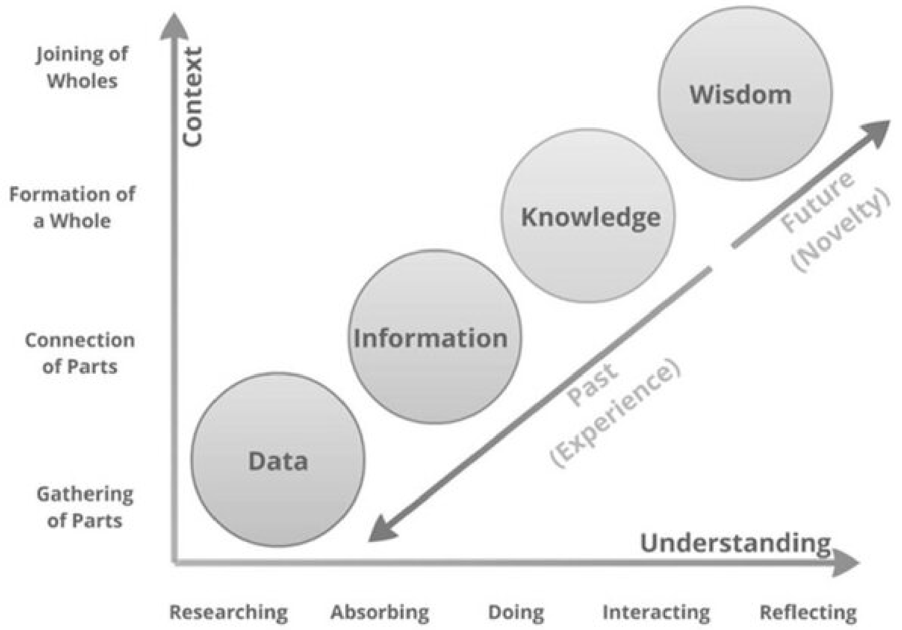
In the following subchapters a clear distinction between information management and knowledge management is defined. These two terms are sometimes used interchangeably, but they refer to different aspects of handling and utilizing data within organizations. Information management primarily focuses on systematic collection, storage, processing, and distribution of data. It enables employees and systems to retrieve necessary data. In contrast, knowledge management goes beyond the handling of raw data. It involves capturing, sharing, and applying information in a way that creates value by integrating context, experience and interpretation. Knowledge management ensures that expertise within an organization is retained and transferred.

3.1.1 Information versus knowledge

The distinction between information and knowledge can be better understood through the Data, Information, Knowledge, and Wisdom (DIKW) model. It explains that data leads to information, information to knowledge, and knowledge to wisdom (Targowski, 2005). To better understand this concept Baškarada & Koronios (2013) provided definitions for all four key pillars of DIKW model. Additionally, it is shown in Figure 2.

Data consists of discrete, objective facts or observations, which are unorganized and unprocessed, and do not convey any specific meaning. Data are physical signs that have no inherent meaning because they reside outside of a human mind. Information emerges through the cognitive processing of data. It is data that have been shaped into a form that is meaningful and useful to the human mind. Knowledge builds on information that is extracted from data. It involves data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity. Wisdom is accumulated knowledge, which allows one to understand how to apply concepts from one domain to new situations or problems (Baškarada & Koronios, 2013).

Figure 2: The DIKW model



Source: Williams (2014).

3.1.2 Information management

Information management is the management of the processes and systems that create, acquire, organize, store, distribute, and use information. The goal of information management is to help people and organizations access, process and use information efficiently and effectively. Doing so helps organizations operate more competitively and strategically, and helps people better accomplish their tasks and become better informed (Detlor, 2010). Information management can also be defined as the unity of processes that enable organizations to obtain information from potential sources, transform and produce it, and transfer information to relevant stakeholders in order to achieve their goals (Altındağ & Öngel, 2021).

Information management systems integrate people, processes, and technology to achieve sustainable results. In these systems, effectively utilizing collected and generated information and putting it into practice is essential. Information management practices should include the development and implementation of a policy and strategy that provides a framework and guidelines for data creation, data storage, data processing, distribution, and use of information (Opoku & Enu-Kwesi, 2017).

3.1.3 Knowledge management

Knowledge management is the process of using systematic steps to acquire, design, manage and share knowledge within an organization to achieve better performance such as reduced costly rework, faster work and use of best practices. It involves several elements like human resources practices, technology, culture and organizational structures (Abubakar et al., 2019).

Knowledge management seeks to improve performance by leveraging and maintaining both current and future knowledge assets. Creation, updating, availability, quality and use of knowledge have been recognized as an essential component of a proactively managed organization. The key concepts include converting data, organizational insight, experience and expertise into reusable and useful knowledge that is distributed and shared with the people who need it. If an organization manages knowledge successfully it will be able to use information and consult experience that will be very useful in doing a job better than it has been done in the past (Terzieva, 2014).

3.2 Information and knowledge management in digital transformation

Findings of a recent study conducted by Abu-Alsondos et al. (2024) have highlighted the relevance of DT in today's businesses. The authors have recommended businesses to embrace digitalization in order to obtain a competitive edge in digitalization sphere. Conclusions of the study lead to the following four recommendations: Businesses nowadays should formulate a plan for DT, foster a supportive culture, invest in digital skills and adopt a customer centric approach. The advantages of undergoing DT include an improvement in productivity, an increase in customer satisfaction, an advantage over the competition, the establishment of new income streams, and the growth of current revenue streams (Abu-Alsondos et al., 2024).

However, successful DT requires more than just adopting new technologies. It depends on how well organizations manage both information and knowledge. Without effective information management, digitalization efforts may lead to high expenses, without real value added. Similarly, poor knowledge management can result in the loss of expertise, undermining the long-term benefits of digitalization. Digitalization efforts are often implemented within projects and transform specific business operations (Verhoef et al., 2021). These projects are defined as punctuated efforts of interrelated tasks undertaken to achieve predefined objectives within a specific timeframe (Baier et al., 2022). In general, a digitalization project is a project that pursues the goal to digitally transform a specific area of the company. This can involve not only redesigning parts of the working environment but also networking systems or production facilities through machines (Leyh et al., 2021).

An organization's success depends on how well it manages information. Information management is critical throughout a project's life cycle, serving as a key factor contributing to a project's success (Bwalya & Saul, 2014). Rather than being a supportive function, information management is a proactive and strategic endeavor that helps organizations to thrive amid uncertainties. Organizations that possess a capacity for continuous learning through information management are more likely to adapt to changing circumstances. Information management, in this view, becomes a dynamic process that fuels organizational agility and resilience (Lansonia et al., 2024). Altındağ & Öngel (2021) point out that information management is an essential factor that adds efficiency and speed to every business. An organization's performance depends on its ability to manage and utilize information resources effectively.

Similarly, knowledge management greatly affects organizational success. A review of multiple studies by Abualoush et al. (2018) indicates a direct positive impact of knowledge management processes on the performance of organizations. Knowledge management helps organizations to create knowledge and to share, acquire, and benefit from it by applying it. Organizational knowledge is an important asset for competitive advantage and an effective contributor to the success and survival of organizations within a complex and competitive environment. In an organization that depends more on their products, services, and knowledge, the creation, generation and exchange of new knowledge becomes a vital source of competitive advantage. Accordingly, knowledge management enables organizations to perform better than their competitors.

The success of DT depends on how effectively organizations manage their information and knowledge. Digitalization projects often fail due to poor information management and a lack of structured knowledge sharing systems. By integrating effective information and knowledge management practices, businesses can gain more benefits from DT.

4 COLLABORATION IN INTERDISCIPLINARY TEAMS

This chapter focuses on collaboration in interdisciplinary teams, which has become a necessity in digitalization projects. It presents both theoretical perspectives and empirical findings on the benefits, challenges, and best practices for effective teamwork among individuals with different technical or domain specific backgrounds.

4.1 Defining collaboration

Collaboration refers to the active and ongoing coordination of tasks, knowledge, and responsibilities among individuals or teams to achieve shared goals. Interdisciplinary teams are composed of members from various professional backgrounds who contribute different expertise to solve complex problems (Brown et al., 2023; Nguyen & Mougenot, 2022). Such teams are particularly relevant in projects that require both technical and domain knowledge, as is often the case in industrial environments where IT specialists, engineers, and other employees must work together to deliver digitalization solutions.

Interdisciplinary collaboration promotes innovation by combining diverse perspectives, enabling teams to solve complex problems more effectively than single-discipline teams (Brown et al., 2023). In digitalization projects, this integration of expertise is key success factor where people with diverse backgrounds must align to achieve project goals. Nguyen & Mougenot (2022) found that interdisciplinary teams working on digital projects were more likely to achieve technical goals when supported by clearly defined roles and regular alignment on objectives. However, differences in terminology, professional logic, and communication styles often lead to delays and misunderstandings, especially in fast-paced project environments (Sthapit, 2023). Urton & Murray (2021) also highlight the tension between individual autonomy and team coherence, where conflicting expectations across people with different backgrounds can slow progress unless structured coordination mechanisms are in place. These findings point to the dual nature of interdisciplinary teamwork. It offers clear value in terms of project outcomes while requiring additional effort to manage interdisciplinary collaboration effectively.

4.2 Benefits and challenges of interdisciplinary collaboration

Interdisciplinary collaboration enables knowledge exchange across diverse team members and improves the integration of diverse competencies. This allows teams to approach problems from multiple perspectives and to develop more robust, user-oriented solutions. Brown et al. (2023) highlighted that such diversity supports innovation by promoting deeper problem analysis and expanding the range of potential solutions. In projects involving technical system development, domain expertise must often be translated into technical requirements. In interdisciplinary teams, this translation occurs more effectively through close cooperation between stakeholders with different but complementary backgrounds (Nguyen & Mougenot, 2022).

Success of interdisciplinary collaboration depends largely on the structure and clarity of team roles, shared objectives, and communication processes. Nguyen & Mougenot (2022) found that well-functioning interdisciplinary teams in digital health projects shared a clear understanding of goals and had frequent alignment meetings, which helped reduce miscommunication and confusion. These findings apply equally to industrial digitalization projects, where alignment between technical and domain experts is crucial for project success. Brown et al. (2023) found that teams working in the same location made decisions faster because they could give each other quicker feedback. Team members being close to each other helped reduce misunderstandings and made it easier to work.

Despite the advantages, interdisciplinary collaboration also brings challenges that must be managed. Sthapit (2023) points out that team members often have different work habits, terminologies, and expectations shaped by their disciplinary backgrounds. These differences can result in misalignment, especially in early project phases when goals and responsibilities are being clarified. Such differences can lead to technical misunderstandings, which result in delayed decision making. In time-constrained projects, the need to resolve misunderstandings could become a limiting factor. It also must be considered that collaboration is influenced by interpersonal dynamics and organizational culture.

Urton & Murray (2021) describe how interdisciplinary teams struggle to balance individual autonomy with collective accountability. In some cases, participants remain focused on their own priorities and resist team ownership of project outcomes. This is especially problematic when team members are not equally invested in project success. A lack of recognition for each discipline's contribution can reduce trust and limit open knowledge exchange. Furthermore, Nwulu et al. (2023) emphasize that beyond technical integration, the success of interdisciplinary teams depends strongly on interpersonal competencies. Their study shows that collaboration across roles is more productive when team members have and apply soft skills like communication, feedback, and conflict resolution. These skills help prevent delays that often occur when members interpret problems only through their point of view. According to the authors, many technically oriented professionals are not formally trained in these areas, which creates a gap between the collaboration required and the team's actual capacity to manage it. Progress is hindered when interpersonal tensions are unresolved, even when the technical side is strong.

4.3 Impact of interdisciplinary collaboration on project success

Effective collaboration in interdisciplinary teams is not only a theoretical field but also a practical requirement for project success. Empirical studies provide concrete evidence that collaboration influences project outcomes in dynamic and complex environments where knowledge must be shared between interdisciplinary team members.

Nguyen & Mougenot (2022) showed that in digital health projects, frequent communication directly contributed to reduced misalignment and faster problem solving. These results are relevant for industrial digitalization projects, where the complexity of systems requires coordination between domain experts and technical developers. Brown et al. (2023) investigated collaboration practices in industrial projects involving diverse teams and found that project outcomes improved when teams maintained high levels of communication, regularly aligned on goals, and clarified individual roles early on. In cases where these elements were missing, teams encountered delays and rework. Nguyen & Mougenot (2022) reported similar findings from interdisciplinary digital healthcare projects. Their research showed that frequent communication between domain experts and technical teams helped prevent misunderstandings of domain specific requirements. Additionally, teams that built relational trust and had mechanisms for continuous feedback showed higher performance and shorter development cycles.

Radhakrishnan et al. (2022) found that collaborative project environments, with active involvement, mutual responsiveness, and cross-functional knowledge sharing, were more likely to deliver positive results. They also highlighted that collaboration did not automatically lead to success. Structured implementation of collaborative processes, such as regular check-ins and decision-making transparency, had a measurable impact. Teams that only adopted surface level collaboration practices without deeper integration experienced frustration and misalignment. Urton & Murray (2021) further highlighted that collaborative success in interdisciplinary teams depends on the interpersonal skills of team members. Their study emphasized that while technical competence remains essential, projects often stagnate when team members lack the soft skills required for constructive dialogue, conflict resolution, and active listening. Teams that invested time into building communication routines and feedback culture were more resilient under time pressure.

Empirical research supports the view that collaboration can improve project outcomes through better alignment, faster decision-making, and smoother integration of diverse knowledge. The project's success depends on the team's ability to work together effectively. Regular communication, shared understanding, and soft skill competence are critical success factors for effective collaboration.

4.4 Best practices for effective interdisciplinary teamwork

The effectiveness of interdisciplinary teams in digitalization projects is highly dependent on how collaboration is structured and supported. Beyond conducting a group of competent individuals, the success of such teams relies on the ability to coordinate diverse skill sets, maintain clarity in roles, and maintain an open environment for knowledge exchange. Empirical research provides several best practices that enable interdisciplinary teams to function effectively, especially under time pressure and in technically complex projects.

One recurring topic is the importance of shared goals and clearly defined roles. Adegbola et al. (2024) emphasize that role clarity and mutual accountability are critical in avoiding duplication of work and ensuring that decisions are made efficiently. Their study on cross-functional software development teams showed that ambiguity in responsibilities often led to overlapping efforts or task gaps. Establishing transparent role descriptions early in the project and establishing them through routine alignment meetings increased overall task ownership and improved project delivery times.

Another best practice is integrated communication routines. While it is common in fast-paced environments that updates are done when needed, they are insufficient for sustained interdisciplinary collaboration. Structured communication routines such as weekly stand-ups, decision logs, and issue-tracking systems were identified by Balasubramaniam et al. (2024) as enablers of both synchronous coordination and asynchronous transparency. These tools are particularly useful in hybrid or distributed teams, where misunderstandings can easily occur without proactive communication. A practical case from their study describes a cross-functional IT team in a multinational corporation that implemented a structured communication protocol combining daily 15-minute syncs with a digital backlog tool. This approach helped reduce task ambiguity and improved coordination between software developers and operations engineers. Based on data collected from their internal issue tracking system over a six-month period, the team recorded a 22 percent reduction in average task resolution time. The reason was largely due to faster clarification of blockers and clearer task ownership (Balasubramaniam et al., 2024). According to their study, teams should adopt a fixed meeting rhythm supported by digital collaboration tools that allow progress and decisions tracking in real-time.

Psychological safety also plays a key role in promoting open communication, especially when team members have different disciplinary backgrounds. Daspit et al. (2013) found that high-performing cross-functional teams consistently reported higher levels of trust and respect among members. Their findings highlight the importance of having an environment where questions, concerns, and even disagreements are expected and accepted. This reduces the tendency for team members to withhold information due to perceived hierarchy or fear of being misunderstood.

Interpersonal skill development is another best practice found in literature for strengthening interdisciplinary collaboration. Adegbola et al. (2024) point out that technical knowledge alone is not sufficient. Soft skills such as feedback techniques, conflict resolution, and active listening significantly contribute to effective teamwork. Teams engaged in soft skill development reported higher levels of resilience under project stress and showed better alignment during technical problem solving. Especially investing time into building a feedback culture was shown to reduce interpersonal tension and prevent coordination difficulties.

These practices demonstrate that effective interdisciplinary teamwork does not emerge by default but is the result of deliberate structures and routines. Teams benefit when roles are clearly distributed, communication is formally supported, and interpersonal dynamics are actively managed. Interdisciplinary collaboration offers benefits in terms of innovation, knowledge integration, and problem-solving capacity, all of which are critical for digitalization projects implementation. At the same time, it introduces communication, coordination, and relational challenges that must be managed through clear role definition, regular alignments, and a supportive organizational environment. These factors determine whether interdisciplinary collaboration improves the execution of digitalization projects.

5 PROJECT MANAGEMENT AND HANDOVER

Project management is important for organizations as it helps them to become more efficient in areas such as planning, allocation of resources and time management. Since project outcomes are strongly related to organizational objectives, companies are increasingly focused on executing projects with the highest possible efficiency. Organizations are constantly constrained in terms of time, budget or other resources. Project management enables them to take a structured approach to overcome these challenges (Varga & Csiszárik-Kocsir, 2024).

5.1 Best practices for effective project management

Research on project management and firm performance has shown that effective project management practices can have a significant positive impact on firm performance (Almulhim, 2023). Best practices in this context refer to optimal ways of performing work to achieve high performance (Bogan & English, 1994). They can also be defined as activities or actions performed to a higher standard compared to the standard achieved by other companies in similar circumstances. Best practices need to combine two key elements. Firstly, they must build explicit knowledge into a knowledge base which connects people with information. Secondly, they must provide methods for sharing tacit knowledge such as communities of practice that can connect people with people. These two approaches are both essential and complement each other (Dani et al., 2006).

In the following paragraphs the focus is on describing essential factors of aligning projects with the goals of the business and developing a strategy to ensure that projects continue to go in the direction of success. Strategic alignment and careful preparation are the two most important factors that decide whether a project will be successfully executed. To increase the probability of project success Suresh (2024) emphasized the importance of:

- aligning with organizational objectives,
- defining clear project goals and objectives,
- needs assessment and mitigation,
- resource allocation,
- project scheduling and milestones,
- contingency planning,
- stakeholder involvement,
- communication and documentation, and
- monitoring.

The organization's broad strategic goals must match the projects that are being undertaken. By ensuring that resources are spent on activities that directly contribute to the success of the business, this alignment enables successful resource allocation. Goals and objectives that are specific, measurable, attainable, relevant, and time-bound (SMART) give the project team a clear roadmap to stay focused and accountable (Suresh, 2024).

It is necessary to carry out comprehensive needs assessments and feasibility studies to determine whether the project is both necessary and viable. This step reduces the risk of spending resources on initiatives that have a low probability of success. Before starting the planning process, potential risks and problems should be identified, and comprehensive risk mitigation measures established to increase the likelihood of project success. Furthermore, resources such as manpower, budget, and supplies must be distributed effectively to fulfil the needs of the project while simultaneously improving resource use. Creating a detailed scheduling plan with clearly defined milestones helps keep the project on track and allows the team to make alterations in a timely manner if they are required. Preparing ahead for potential obstacles and developing backup strategies is important for handling unforeseen problems (Suresh, 2024).

Involving key stakeholders in the planning process is essential to obtain their support, insights, and commitment. Effective stakeholder participation contributes to the success of the project and reduces internal opposition. Throughout the project's lifetime, it is crucial to ensure that all stakeholders have access to necessary information. This can be achieved by establishing efficient communication channels and maintaining complete documentation. Additionally, systems should be put in place to monitor and assess the project's progress against the defined goals and objectives. Regular assessments make it possible to make timely modifications and improvements (Suresh, 2024).

Strategic alignment and planning are essential for achieving project objectives. When projects are well planned and aligned with the company's strategy, they are in a better position to deliver on their objectives, avoid risks and contribute to the overall success of the business. On the other hand, we also must consider understanding of the flaws in project conditions. Effective project management requires the implementation of competent feedback mechanisms. Feedback and reviews can initiate preventive corrective actions which are important for the success of the project, but more importantly they are the first step towards unacceptable risk identification. Risk is an uncertain event or condition that can create a positive or negative effect on project objectives. Risk management is one of best practices for project management and many companies follow risk management tools, and procedures effectively. It includes identification, assessment, control, avoidance, and mitigation or the elimination of unacceptable risks. To manage project effectively, organizations must define an appropriate risk management plan during the start of the project (Menon, 2024).

The above best practices can only be implemented if the project manager is able to adapt to changing situations, displaying creativity and courageousness when dealing with project conditions. In addition to technical skills, project managers must also exhibit business skills, personal characteristics, and attitudes while managing projects. Effective use of project management skills, understanding organizational stakeholders, availability of strong technical and people competencies, and project feedback and review mechanisms are crucial for managing projects successfully (Menon, 2024).

5.2 Handing over digitalization projects

Project handover occurs when a project, or a phase within it, transitions from one team or phase to another, ensuring continuity, efficiency, and the successful realization of objectives. This process is essential in adapting to changing business environments, leveraging new expertise, or addressing changes in a strategic direction. Transitioning ongoing digitalization project successfully requires meticulous planning, clear communication, and seamless transfer of knowledge, ensuring that the incoming team is equipped to continue without losing momentum or direction (Deshmukh, 2023). Effectively managed handovers according to Deshmukh (2023) ensure the continuity of project activities, facilitate the alignment of the project with evolving organizational strategies and external environments, and introduce fresh perspective and expertise. Such transitions lead to improved performance, reduced risks, and higher stakeholder satisfaction by keeping projects on track, within budget, and aligned with the overarching strategic objectives of the organization.

Stettina & Kroon (2013) emphasized the importance of knowledge sharing and creation routines during project handovers. Knowledge creation is tightly linked to human action, and to truly understand this process, it is necessary to consider patterns of human interaction in which new knowledge emerges. Nonaka & Takeuchi (1995) identified these patterns as socialization (e.g. standup meetings), externalization (e.g. writing, creating a product backlog), combination (e.g. creating design from requirements), and internalization (e.g. reading). Agile methods mostly rely on direct communication and socialization of knowledge. For team members to contribute effectively to this environment, they must share a common understanding.

The project handover process involves a systematic transition of project deliverables, knowledge, and responsibilities, ensuring continuity and operational efficiency. This process includes detailed documentation, training sessions, and the transfer of relevant information and resources. Effective communication and planning are critical throughout the project handover, ensuring that all parties are informed and prepared for the transition.

Deshmukh (2023) described the handover process in five steps. It begins with a self-assessment phase, where the incoming project manager gathers all available information, both formal and informal, about the project to build a high-level understanding. This includes reviewing documentation, speaking with stakeholders, and preparing for deeper conversations. In the second phase, the formal transition starts with structured discussions between the outgoing and incoming project managers. The goal is to ensure a comprehensive handover of documents, reports, risks, and plans while also initiating relationship building with cooperating teams. The third step is used to understand where the project stands and involves a detailed analysis of project metrics and constraints to evaluate the current status and identify any gaps or issues. The fourth step is about achieving consensus on the findings by presenting a handover document for joint review and approval. This lays the foundation for future tracking and planning. Finally, once the transition is formally concluded, the new project manager continues with project delivery. This is especially critical in complex and high-impact projects where the handover itself can function as a standalone effort. Having explored the steps involved in the handover process, it is crucial to recognize the common challenges that can obstruct a smooth transition, especially in the context of digitalization projects.

In order to achieve successful project handovers, it is essential to examine the factors that commonly hinder the process and may even result in failure. Laine (2012) identifies flexibility and motivation of the project team members as key factors. Poor motivation among team members often comes from unclear responsibilities, lack of documentation, and a lack of communication between management, the project team, and end users. A second factor is related to external stakeholders. While external suppliers may have a good knowledge base about the project, they often fail to provide additional insights, once their obligations have been met. Documentation is the third critical factor. The lack of proper documentation significantly increases the likelihood of operational tasks and handover failures. It must be taken into account with a lot of consideration. Documenting without clear purpose, or just for the sake of it, not only wastes monetary resources but also negatively impacts team morale (Stettina & Kroon, 2013). Additionally, the availability of resources is crucial for the success of handovers. A lack of people with the right skillsets and knowledge to manage the project can decrease the likelihood of a successful project handover. Besides the main success factors, project size, time pressure, complexity, and the interdisciplinary nature of the team also play significant roles in determining handover success (Laine, 2012; Stettina & Kroon, 2013). In digitalization projects, where complex environments and challenging internal circumstances are usually present, these factors influence the handover process. To increase the probability for successful digitalization project handover, critical success factors should be evaluated, and deliberate action should be taken to mitigate their impact.

A key consideration that remains is how the success of a digitalization project handover can be measured. One way is to evaluate how effectively the handover was executed. The transition should neither disrupt the ongoing project execution nor negatively affect the project objectives. Another indicator is the final outcome of the project after implementation, which reflects how well the transition was managed. In the case of project failure, the post-implementation phase should not raise any doubt on the effectiveness of the handover itself (Deshmukh, 2023).

6 METHODOLOGY

This chapter describes the research design and methods used in the thesis. It explains how data was collected through literature review, interviews, and company documentation, and the approach used to analyze the collected information.

6.1 Research design

This thesis follows a qualitative research design, combining theoretical analysis with practical insights gathered from people with digitalization project experience. The objective is to identify challenges in information and knowledge management in digitalization projects and to develop improvement recommendations based on best practices from theory and practice. The research is divided into two main parts. The first part consists of a review of existing literature related to DT, knowledge management, project management, and interdisciplinary collaboration. The second part is based on empirical research, involving semi-structured interviews with project managers and digitalization experts at Hilti AG branch office Thüringen. This approach provides insights into best practices for effective information and knowledge management in digitalization projects highlighted by researchers and experts from the industry. Additionally, it allows identification of practices used inside the collaborating company and enables the collection of additional views and expert recommendations.

6.2 Data collection and analysis

The empirical part of this thesis is based on primary and secondary data sources. The primary data was collected through semi-structured interviews with experts involved in digitalization projects, while secondary data was gathered from documentation available within the collaborating company.

6.2.1 Semi-structured interviews

Semi-structured interviews were chosen as the primary data collection method to gain broader participant insights while making sure that key research areas were consistently covered. The interview questions were developed based on the findings from the literature review, with the focus on real-world experience of participants.

Interviews were conducted with five participants who have direct experience in project management, digitalization, and interdisciplinary teamwork within the context of industrial digitalization projects. The selection of participants was based on their professional background, years of experience, and involvement in digitalization initiatives at the Hilti AG branch office Thüringen. All participants had at least three years of experience in leading digitalization projects. Some of them gained this experience in collaboration with Hilti AG, others provided valuable insights also from their time spent in other companies. Three of the participants were project managers of digitalization projects during the time of the interviews. The other two worked as project managers in the past and are currently taking a role as head of department, where they continue to encourage digitalization initiatives. All participants are highly educated individuals, each with a different domain of expertise. More detailed information about interview sample characteristics can be found in Table 1.

Table 1: Interview sample characteristics

Code	Position	Level of education	Expertise domain	Years of experience	Department
Participant 1	Project manager	Doctoral degree	Conceptualization	3	External
Participant 2	Project manager	Master's degree	Production management	3	Assembly & Engineering
Participant 3	Head of department	Doctoral degree	Robotics and sustainability	8	Sustainability
Participant 4	Project manager	Master's degree	IT project management	5	Logistics
Participant 5	Head of department	Doctoral degree	Technology management	7	Quality

Source: Own work.

Before conducting the semi-structured interviews, the interview guideline and questions were prepared. The questions were divided into five main sections. The introduction began with a brief explanation of the thesis research and two warm-up questions. In that section, interviewees also shared characteristics shown in Table 1. The following section focused on knowledge and information management challenges, where participants were asked about issues in information flow, handling complexity in data structures, and onboarding of new team members. The next section addressed best practices and tools for effective knowledge transfer, utilization of knowledge and information management tools, and approaches for adapting to dynamic environments. The fourth section asked participants about opportunities for improvement. This included a direct question about gaps in currently used practices, followed by questions about ideal solutions and the future of knowledge management. The semi-structured interviews concluded with an open-ended question. The detailed guidelines and questions can be found in Appendix 1.

The interview data was analyzed using a manual thematic analysis approach. After all interviews were conducted and transcribed, the transcripts were systematically reviewed to identify recurring codes and themes relevant to the research focus. Initial attention was placed on statements related to the main research areas: information management, knowledge management, digitalization projects, interdisciplinary collaboration, and project handover. Codes were grouped under broader themes that aligned with the RQs and theoretical concepts identified in the literature review. The themes included challenges in documentation practices, collaboration routines, system complexity, accessibility of knowledge, and practical improvement suggestions.

The results were then cross-checked for consistency across participants, highlighting both challenges and individual improvement ideas. This qualitative approach ensures that the findings reflect real-world complexities and practical needs identified by professionals with experience in digitalization projects.

6.2.2 Company documentation

Internal processes and documentation from Hilti AG were reviewed to understand current information and knowledge management practices established in the company. These included materials related to the internal project management of digitalization projects, mostly focused on documenting practices. The internal documentation provides an overview of how digitalization projects are initiated, managed, and monitored within the company. Project managers must comply with both global and local requirements. Conducting research in collaboration with the company provided the opportunity to review documentation and related processes for specific digitalization projects, as well as the company's broader approach to managing a large number of digitalization projects both locally and globally.

A paper from 2019 was also reviewed to gain background on information and knowledge management practices and challenges within the organization. While the focus of that thesis differs from the current work, some of the findings provided valuable insights and served as a foundation for understanding information and knowledge management challenges at Hilti branch office Thüringen.

7 COMPANY AND CASE DESCRIPTION

This chapter introduces the case study conducted in collaboration with Hilti AG branch office Thüringen. It describes the Tool Data Visualization (TDV) project, including its purpose, technical setup, and relevance for ongoing digitalization initiatives. The chapter outlines specific challenges observed during the project related to information and knowledge management. These challenges form the foundation for identifying improvement areas and developing recommendations later in the thesis.

7.1 About Hilti Thüringen AG

The Hilti Corporation was founded in 1941 in Schaan, Lichtenstein. With more than 34,000 team members in over 120 countries the company stands for direct customer relationships, quality and innovation. Hilti Group generated sales of more than CHF 6.4 billion in 2024. The company's purpose is "Making Construction Better", which was reflected in 2024 by investing seven percent of sales in research and development. Hilti Group is providing vast selection of tools and system solutions for construction professionals including measuring systems, drilling and demolition, diamond coring and cutting, cutting and sanding, screw fastening systems, cordless technology, direct fastening, anchoring systems, firestop systems, foam systems, installation systems and software. It also offers services which provide technical support for customers' projects and tool park management needs. Those include engineering, fleet management, tool service, repair service, delivery service, training and consulting (Hilti AG, 2025).

With the strategy directed towards market resilience and mission to provide its customers with high quality products, Hilti Group has expanded its production network globally. Within this global framework, manufacturing of components and final assembling for four business units is carried out in Hilti AG branch office Thüringen, located in western Austria. More specifically drilling and demolition, diamond drilling, cutting and grinding, direct fastening, and measuring tools are produced at this location, alongside some new business products such as Jaibot and Exoscelleton. Hilti AG branch office Thüringen, also called Plant 4, was founded in 1970, has since then extended over more than 40,000 m2, currently employs 575 people (of which approximately 80 people are apprentices), and produced more than 400,000 final products in 2024. With its operations, Plant 4 has received multiple awards including Factory of the year 2017 – outstanding large-scale production, Factory of the year 2022 – overall winner, Best apprenticeship "fit for future" 2022 – top three placement, Hungry Lion Award 2022 in category "Digital Innovation", and others. Awards reflect dedication towards performance promise to be best partner for industrialization and production in Thüringen and in the global production network (Hilti Thüringen AG, 2024).

Strategic fields of action in Plant 4 are directed towards operational excellence (OE) and industrialization. The main pillars supporting this strategic direction are technology innovation and digitalization, outperforming and inclusive teams, and sustainability. By clearly defining future direction the company is trying to improve efficiency with increased:

- productivity through a higher level of software/hardware applications that reduces downtime and enables improved asset utilization and inventory management,
- quality of products via sensors and actuators that monitor the current production in real-time and intervene in case of errors immediately,
- manufacturing flexibility through machine tools which execute production steps for a high variety of products, and
- speed from the first prototype to serial production through consistent data approaches.

Moving towards its strategic objectives Hilti AG branch office Thüringen is enabling an innovative culture and deepening understanding of digital technologies to implement smart solutions for efficient and adaptive processes in global manufacturing operations (Hilti Thüringen AG, 2024).

Hilti AG branch office Thüringen, as a modern manufacturing company, which provides not only highly developed production, but also dynamic environment where DT and interdisciplinary collaboration are strongly emphasized. The combination of complex manufacturing processes, ongoing digitalization projects, and a strong focus on interdisciplinarity makes the plant a relevant environment for conducting research on knowledge and information management during digitalization project handovers.

7.2 Tool Data Visualization project

Hilti AG branch office Thüringen specializes in two core production activities: the machining of metal parts for Hilti power tools, and the final assembly of these tools. Hilti power tools are complex products composed of various mechanical components, electronic elements, and housing parts. Within the Hilti Group, production is categorized according to the type of operations.

The project described in the following section focuses on the digitalization of specific machining related processes. It was initiated as a part of the company's strategy to gain data-based insights into its production system. This project provides a practical case for studying information and knowledge management within interdisciplinary teams. The TDV project is particularly suitable for such research, as it is an ongoing, long-term, and complex digitalization project. It involves integration of modern digitalization technologies and the collaboration of multiple departments across several implementation phases.

7.2.1 Background of the project

The idea behind the TDV project dates back to 2019, when a question regarding tool utilization in Plant 4 was raised. At that time, the production facility had the capacity of more than 100 milling and turning machines to manufacture hundreds of thousands of metal parts annually. Across these machines, approximately 4,000 different tool types were in use. What became increasingly clear was the lack of any system to monitor tool performance over time. With over 60,000 tool changes required each year, manual tracking was impossible. In 2018 alone, tool-related expenses in Plant 4 amounted to 2.2 million CHF, the number that draws attention as significant potential for cost optimization. However, there was no available system for the precise allocation of tool costs. Analysis could only provide management with a basic overview of tool-related expenses. More detailed information, necessary to optimize tool utilization and drive down costs, was not available.

Producing metal parts with precision and high quality on milling and turning machines require highly trained personnel. At the Hilti AG branch office Thüringen, the CAM (Computer-Aided Manufacturing) department is responsible for programming and optimizing milling and turning processes on CNC (Computer Numerical Control) machines. These specialists are experts in metal cutting and grinding processes, with knowledge of machine capabilities, specific operations, and related tool utilization. Processing metal with drills and other cutting tools requires precise parameter settings, among others cutting speed, feed rate, width and depth of cutting. In addition, the quality of produced parts must be ensured, and tool lifetimes must be defined for each specific milling or turning operation. Optimization of tool utilization can be achieved by identifying inefficiencies in machining processes and inconsistencies in tool performance over extended periods. Realizing this optimization potential depends on highly skilled CAM experts equipped with accurate and timely information about actual tool performance.

7.2.2 Objective and purpose of the project

Providing transparency into tool costs and real-time utilization is the primary objective of the TDV project. It is a digitization solution designed to provide visibility into tool usage and costs, thereby increasing productivity and reducing tool consumption. To achieve this level of transparency, real-time data must be captured directly from the milling and turning machines. After validation of captured data, the concept is to pair it with tool costs information and perform calculations that can provide valuable insights. The processed data is then visualized through dashboards, accessible to both CAM experts and machine operators. This setup supports CAM experts in optimizing machining operations and enables machine operators to anticipate upcoming tool changes and communicate them efficiently across shifts. The resulting transparency creates a foundation for targeted tooling optimization and cost reduction.

7.2.3 Current technical architecture

The TDV project aims to enable data-driven decision making and production optimization by visualizing tool performance. To achieve this, a complex data infrastructure is required. It must enable the integration of multiple systems and data collection from various sources to support validation and visualization. This section outlines the current technical setup of TDV solution, explaining how data is acquired from machines, validated and combined, and prepared for visualization. By understanding this data flow, we can both grasp the complexity of the current solution and identify potential for architectural improvements. These insights serve as a basis for further analysis and support the research focus of this thesis on improving information management in digitalization projects. It also showcases the complexity of the digitalization solution which proves the need for effective knowledge management.

The main data source for the TDV system is real-time messages generated by milling and turning machines. They store various process related variables on their controllers, including which part is being produced, tool identifiers and positions, target and actual parts produced by specific tool, and time stamps marking production events. Additionally, the controllers capture tool-related events, such as tool changes during a production cycle. This data is transmitted in the form of multiple machine messages per produced part, typically one per tool used in the machining process. They provide the real-time tool information needed for performance monitoring and subsequent analysis.

Before machine messages can be sent to the cloud, it must be defined which variables should be extracted from each machine controller and forwarded to the Edge Hub, which handles cloud communication. This setup process, known as mapping and publishing, is considered master data generation and is typically configured once per machine. The task requires specific knowledge of machine connectivity. In Plant 4, this is supported by multiple machine connectivity experts who manage data integration across various systems, including TDV.

Before machine messages can be used for visualization, they must be validated and combined with additional information that is not available from the machines themselves. Program master data is essential for the validation process. Prior to production, each part must be programmed using Siemens NX, a CAM software where milling and turning parameters are defined, along with the tools and their specific positions on the machine. The software enables exporting tool setup as a file, which serves as a reference for validating machine messages. These files are transferred manually into the system via GitLab. This manual transfer process depends on implicit knowledge and requires manual execution by a knowledgeable person. Maintaining accurate and up to date program data requires close collaboration between CAM experts, machine operators, and the TDV project team.

Hilti AG branch office Thüringen uses SAP for storing tool purchase information, including prices for all tools used in machining. For later visualization machine messages need to be paired with tool cost data. TDV project team updates the relevant prices every three months. Access to the SAP system is restricted and an authorized person from the purchasing department manually exports tool prices from SAP, which are then converted into the right form. Data is uploaded to the system through GitLab, the same method used for uploading program master data. Both program master data and tool cost data are stored in GitLab repository and sent to Azure SQL. The TDV project team developed a system to validate the machine messages, add the tool price information, and save the updated data in the cloud. Once checked and enriched, the data is ready to be used for visualization.

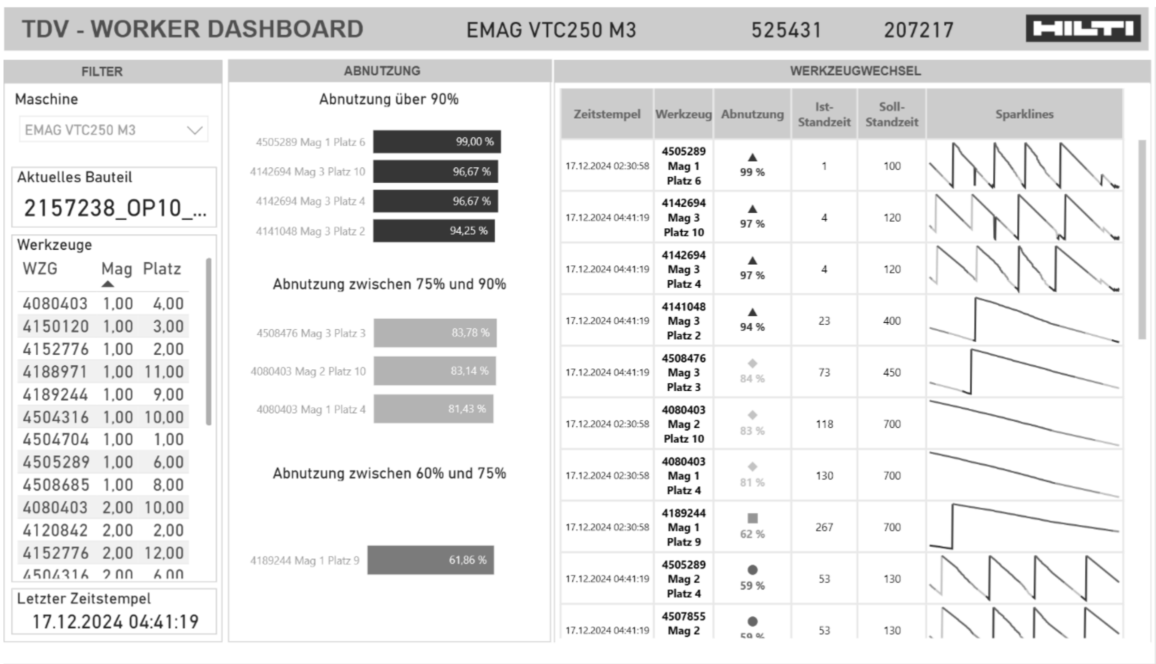
In addition to machine messages and program master data, some relevant tool information is stored in Microsoft SharePoint lists. One list contains tool identification numbers, another stores additional machine related data, and the third tracks program master data. These lists provide an overview of important information, some of which is used for visualization purposes.

7.2.4 Visualization dashboards

The data from multiple sources is visualized using Microsoft Power BI (Business Intelligence). Information is loaded into a semantic model, allowing the integration of data from various sources based on predefined rules. By matching common values across columns, data from different sources can be connected. For example, the machine message includes a machine number, and from SharePoint, additional machine-related information can be attached using this specific identifier.

Visualization serves two primary target groups, machine operators and CAM experts. Machine operators need real-time insights into tool usage across machines. The “Worker Dashboard”, shown in the Figure 3, provides a clear overview with machine selection on the left side. Once a machine is selected, the dashboard displays the tools in use, their positions, and the most recent timestamp of new data. The middle section of the dashboard shows tools approaching their set lifetime, enabling operators to plan for the next tool changes. On the right, a more detailed view of tool status is available, with “Sparklines” showing tool wear over time. The dashboard is interactive, allowing operators to click through visuals and analyze bar charts and graphs in more detail for deeper insights.

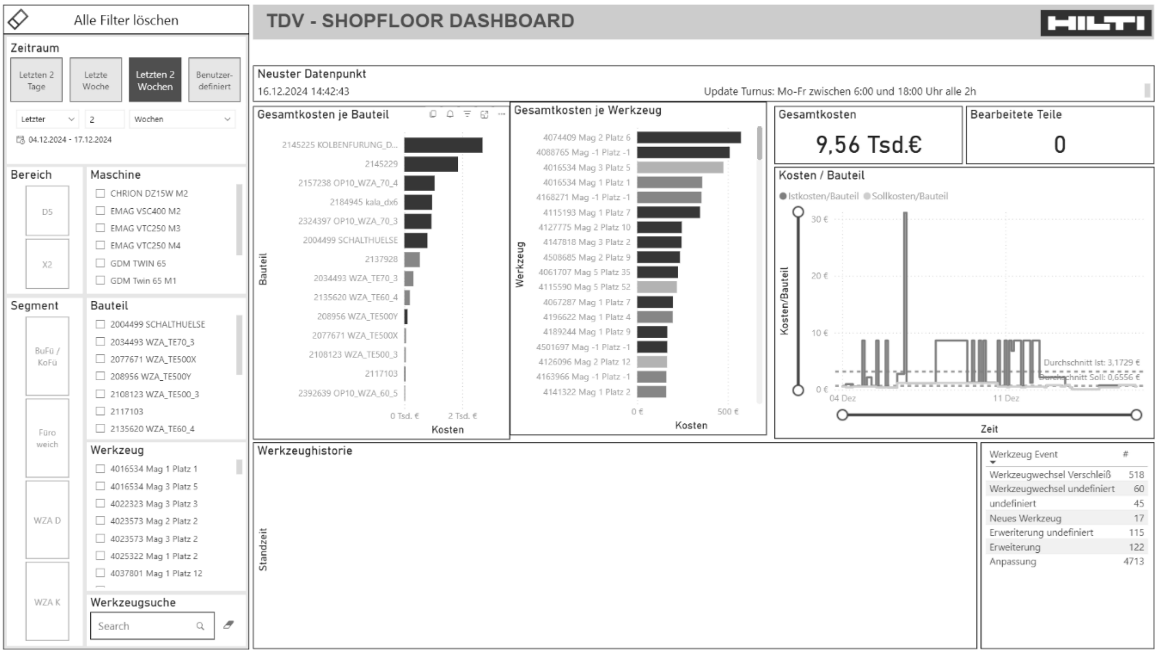
Figure 3: Worker dashboard



Source: Own work.

CAM experts and production managers focus on tool costs when optimizing machining processes. The “Shopfloor Dashboard”, shown in the Figure 4, provides overview for analyzing this data. Users can filter by machine, part, and tool, narrowing down information based on specific criteria.

Figure 4: Shopfloor dashboard

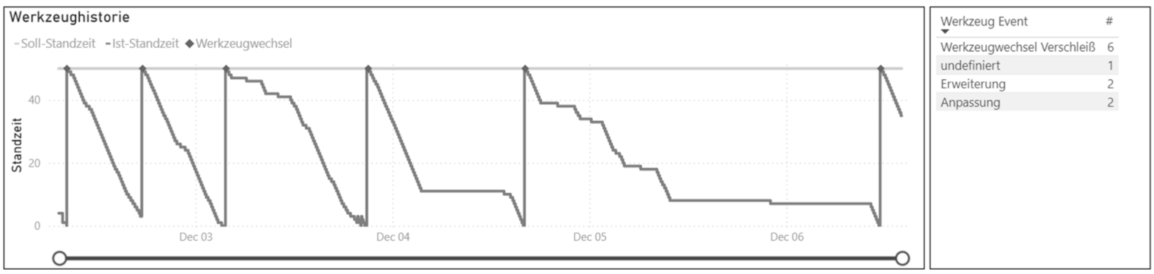


Source: Own work.

Before filters are applied, all machining processes in scope of TDV project are visible. Once a part is selected, detailed analysis of the tools used to produce it can be done. The middle section displays total tooling costs for the selected part, while the right section shows the costs per tool through time. If spikes in tool costs are detected, CAM experts can investigate the chosen time frame and take further action to reduce costs by analyzing tool performance history.

The tool performance history is shown at the bottom of the "Shopfloor Dashboard", after specific tool is chosen. An example is shown in Figure 5. By correlating tool performance with spikes in tool costs, CAM experts can identify inconsistent tool behavior. Special tool events, such as tool changes, are also displayed. Experts can analyze the consistency of tool performance in detail which supports decision-making for process optimization.

Figure 5: Tool performance history



Source: Own work.

7.2.5 Current state of the project

The TDV project aims to improve transparency in tool usage and costs. It brings together data from various sources and departments and requires coordination between roles. Manual processes like master data gathering and SAP tool cost information updates should be further developed, which requires improving information management. The project went through several backend restructurings and team member changes. Currently, a pilot is running in the production environment. End-user feedback is being collected to ensure the solution fits operational needs. Some manual processes, especially obtaining master data, need to be improved before a broader rollout. After validation, the system can be expanded to the full production area and potentially scaled to other Hilti AG plants. This project provides a relevant use case for analyzing information and knowledge management challenges in digitalization projects.

8 IDENTIFIED CHALLENGES AND PROPOSED IMPROVEMENT RECOMMENDATIONS

This chapter presents the results of the thesis, based on theory research, empirical data collected through expert interviews, and an analysis of company documentation. The first part highlights recurring challenges in information and knowledge management, particularly those affecting digitalization projects and interdisciplinary collaboration at the Hilti branch office Thüringen. The findings address the RQs outlined in the introduction and serve as the foundation for the development of improvement recommendations in the second part of this chapter.

8.1 Challenges in digitalization projects

The key findings are structured around three major topics identified during the research process. Those are challenges in information management, challenges in knowledge management, and gaps in onboarding and project handover processes. These could be improved in the future for more effective project execution and knowledge transfer in digitalization projects. The specific challenges described in the first sections are based on both the interviews and the review of company documentation.

8.1.1 Challenges in information management

Efficient information management is a key requirement for the success of the project described in the case study. The system depends on real-time, up-to-date data from multiple data sources and systems, which makes information management complex. The following sections describe current challenges related to data sources, system complexity, and manual processes.

8.1.1.1 *Multiple data sources and various systems*

The currently designed system covers requirements specified at the beginning of the project. Data comes from multiple sources (machine controllers, Siemens NX, SAP, and SharePoint). The TDV project team managed to combine the data from these sources and visualize it in Power BI. An additional system used in the process is GitLab, which enables loading data into the Azure SQL service, where computing is done via a cloud computing service. Being critical towards the current data flow setup and the need to maintain master data for machines and programs, two questions arise. Could we simplify the master data gathering process, and could we eliminate some systems by simplifying processes?

Updating machine master data is required on a monthly basis for some machines. Updating program master data is a daily job that currently demands a certain level of system understanding and collaboration between departments. There is significant potential in simplifying data gathering processes, which could lead to time savings in the operational use of the TDV solution and reduce the risk of knowledge loss, as the requirement for deep system understanding would be lower and less tacit knowledge would be tied to it.

8.1.1.2 *Manual and redundant data handling*

Gathering master data is not optimal, especially because it comes from multiple sources. The TDV system requires various types of information from different systems, which is a fixed condition rather than something that can be changed. However, the data flow should be carefully analyzed and optimized. All data must be combined at some point, and all related processes should be as efficient as possible.

Currently, updating program master data involves several manual steps. Files generated by CAM experts in Siemens NX software are first saved in a network folder, then manually copied to a SharePoint folder. From there, they are manually transferred to a GitLab repository, requiring action by an authorized GitLab user. This process is not only manual but also involves redundant storage of the same files, only to make them accessible across different platforms. Updating tool cost information is even more demanding, which is one reason why updates are infrequent. It requires collaboration between the TDV project team and the purchasing department. Tool cost data must be manually exported from the SAP system, sent to the TDV team, then cleaned, processed, and manually pushed to GitLab repository. Currently, only one person can perform this task, and it depends heavily on tacit knowledge. These examples highlight the need for further process optimization, which would significantly benefit the operational use of the TDV solution. Alongside the technical and procedural inefficiencies, the system has a strong dependency on individual tacit knowledge that requires the use of effective knowledge management practices.

8.1.2 Challenges in knowledge management

Ginter (2019) identified multiple challenges related to knowledge management within Hilti AG branch office Thüringen. The findings of that research were based on expert interviews and pointed out issues in documentation quality, accessibility, knowledge sharing culture, and structural knowledge management practices.

As part of this thesis, additional interview data was collected within collaborating company to investigate whether those challenges are still present and how they affect knowledge sharing in digitalization projects. The findings confirm that some of the earlier identified challenges remain unresolved. In the following subchapters, key knowledge management challenges are described, structured into organizational level gaps and project related challenges.

8.1.2.1 Organizational level knowledge management gaps

The earlier research showed that some parts of the company's knowledge base exist only in the heads of experienced employees. There were no established mechanisms for turning this implicit knowledge into shareable, explicit documentation. Interviewees in 2019 described that knowledge was not proactively passed on and that there was a strong reliance on informal networks and personal interactions. This pattern is still present in 2025. In recent interviews, several participants emphasized that when key individuals leave, essential system knowledge is lost, including technical project related insights. One interviewee stated: *"If someone leaves, knowledge goes away"* (Participant 4). The statement was further backed up: *"In most of the cases, the people who built up the system are gone. So, we have no one to ask about it"* (Participant 4). These comments reflect that important contextual and technical knowledge is still not sufficiently externalized, leading to long-term risks for continuity and scalability of already developed solutions.

In 2019, documentation was generally seen as a low-priority task. Employees were not incentivized to document processes or decisions, and in many cases, documentation was only created when explicitly requested. The 2025 interviews confirm this issue persists. Several participants expressed that documentation feels like extra work, especially when their main responsibility lies in project execution. One participant put it clearly: *"Documentation takes time. It's not like fancy work"* (Participant 4). The same person pointed out: *"Team members always need a bad cop, a manager, or a boss who tells them to document"* (Participant 4). These statements suggest that without active supervision, documentation often remains incomplete. It also indicates a need for better integration of knowledge management responsibilities into day-to-day workflows.

Lack of standardization in knowledge management practices was also described in 2019 study. Different departments used different formats and systems for documentation. There was no central knowledge base or standard for how to structure, store, or update project related information. This challenge continues to affect documentation consistency in 2025. Interviewees reported inconsistent use of templates and the absence of a common system for saving documentation. One noted: *“We have no standard for how to save knowledge”* (Participant 4). Another added*: “The templates are lacking structure. People are documenting in very different styles”* (Participant 3). The absence of standardized documentation templates results in poor comparability across teams and hinders the reuse of existing documentation in similar contexts.

Previous study found out that responsibilities for maintaining knowledge were not clearly assigned. Employees did not see knowledge externalization as part of their role, and documentation tasks were often informal. In recent interviews, this challenge was still found to be true. In some cases, documentation is only updated when one person actively reminds others or takes the initiative. One interviewee noted: *“If coworker would come up to me and ask to update documentation, then maybe more of it would be in the database”* (Participant 4). This illustrates how dependent knowledge maintenance still is on individual initiative rather than structured processes.

8.1.2.2 Knowledge management challenges in digitalization projects

The 2019 thesis highlighted that knowledge often disappears when people leave, especially if no proper handover was arranged. This challenge is relevant in TDV project. Some specific system tasks such as keeping GitLab repository up to date, SAP cost updates, and some other master data creating processes depend heavily on one individual. One participant described this clearly: *“If key users leave, the other users know how to do the basics, but never on that same high level”* (Participant 2). This not only introduces risk for operational continuity but also affects scalability and future development.

The previous study described how lessons learned during project work were rarely documented unless explicitly requested. Although feedback and decisions are discussed during meetings, they are not consistently documented or stored for future needs. One of our interviewees confirmed the issue is still present: *“A lot of experienced people leave the company after they’ve finished work with all the knowledge in their heads. Nothing is digitalized; nothing is stored”* (Participant 4). Another shared: *“At the end of the project I know the three most relevant learnings, but we don’t store them anywhere”* (Participant 5). These quotes indicate that team members recognize the issue of not capturing the knowledge systematically, even though it is created during the processes.

During the recent interviews, shifting direction and the loss of historical context in digitalization projects also emerged as an issue. As team composition changes, project direction can shift based on the perspectives of new members. Without documentation of the rationale behind previous decisions, teams risk losing clarity about goals and past assumptions. One interviewee described that by stating: *“The North Star of the project changed. Everyone brings their own interpretation”* (Participant 2). This statement highlights the need for structured decision documentation that can be referred to when team members change.

Differences in technical background and vocabulary were also noted in the earlier research as barriers to effective knowledge exchange. This still holds true in the recent digitalization projects. Communication between CAM experts, developers, and other stakeholders is slowed down by different working styles. One interviewee pointed out: *"CAM experts think one way, developers another. And someone has to translate between them"* (Participant 4). This clearly highlights that interdisciplinary collaboration requires active efforts to ensure that team members with different professional backgrounds can work toward a shared understanding of project goals.

8.1.3 Project handover and onboarding challenges

In 2019 interviewees conducted by Ginter (2019), inconsistent onboarding practices were identified. The 2025 interviews reveal that best practices have still not been researched or established for digitalization project handovers. Several interviewees mentioned that onboarding quality varies significantly depending on overlap time and individual effort. One participant stated: *"Time is a crucial factor for taking over. For a recent project handover, I had five weeks overlapping with the last one who did the project before. We had a very intense time working together"* (Participant 3). Findings show that time for handovers is often limited, yet when available, it can significantly improve the transition. The importance of overlap time is recognized within the company: *"It is always easy if the person who is handing over is still in the company for another two months"* (Participant 2). These observations suggest that knowledge transfer processes remain highly dependent on individual circumstances rather than structured procedures.

The frequency of project handovers was highlighted by one interviewee: *"We are a company which puts a lot of focus on developing people, which leads individuals to not staying too long in their roles"* (Participant 5). This results in frequent handovers, which are not always well-supported. One participant stated: *"We had one week for handover, and I got some grasp of it, but it wasn't really enough"* (Participant 1). Frequent handovers, combined with the lack of structured processes, underline the need to define and apply best practices to enable smoother and more reliable knowledge transfer to new project team members.

8.2 Improvement recommendations

The following paragraphs present recommendations based on the challenges and gaps identified in the previous subchapter. These improvement recommendations are grouped into four areas: information management, knowledge management, onboarding and project handovers, and interdisciplinary collaboration. Each section builds on practical insights from the TDV project and interview findings, to provide practical recommendations that can support more efficient project execution and sustainable knowledge transfer in digitalization projects at Hilti AG branch office Thüringen.

8.2.1 Improving information management

The analysis of the TDV project revealed several issues in information management. One of the present challenges is the necessity of manual data transfer. This approach is not only inefficient but also increases the risk of mistakes when team members are dealing with data. There is significant potential to optimize system maintenance effort and reduce human error by optimizing data flows. The requirement for manual data transfer originates from the system complexity, which requires the use of different platforms that are incompatible with each other. Consequently, redundant data storages are used, from which importing data into each of the platforms used is enabled.

Table 2 is pointing out the information management challenges from TDV project. The challenge with multiple data sources is rather a property of the solution than a result of poor system design. In the case of TDV, it is not possible to reduce the number of data sources, but there is a possibility to make data gathering processes more straightforward, or even automated. This could help the operational team to maintain the data with less effort and in some cases even reduce the number of people involved in data gathering processes. Simplifying information flows potentially increases the probability of sharing process knowledge among other team members. As the project team is dealing with multiple data sources from various platforms, documenting the processes can firstly reduce the risk of process knowledge loss. Secondly, it gives the currently responsible employees the opportunity to transfer knowledge to other team members faster, in a more standardized way, and with less time invested in the process.

Table 2: Overview of challenges and potential benefits in information management

Challenge	Why it is a problem	Potential benefits
Multiple data sources	Inefficient data gathering, inconsistent updates	Easier maintenance of data, less stakeholders involved
Process documentation	System reliant on individuals, risk for information loss	Faster handover, reduced risk for process knowledge loss
Manual data transfer	Inefficient, risk of outdated data, repetitive tasks	Reduced time for maintaining the system, reduced errors
Redundant data storages	Inefficient, leads to higher costs, confusion	Streamlined workflows, reduced costs, data reliability
System complexity	Hard to maintain, difficult onboarding	Increased transparency, reduced training effort
Incompatible platforms	Require additional workflows for data transfer	Decreased system complexity, no redundant data storages

Source: Own work.

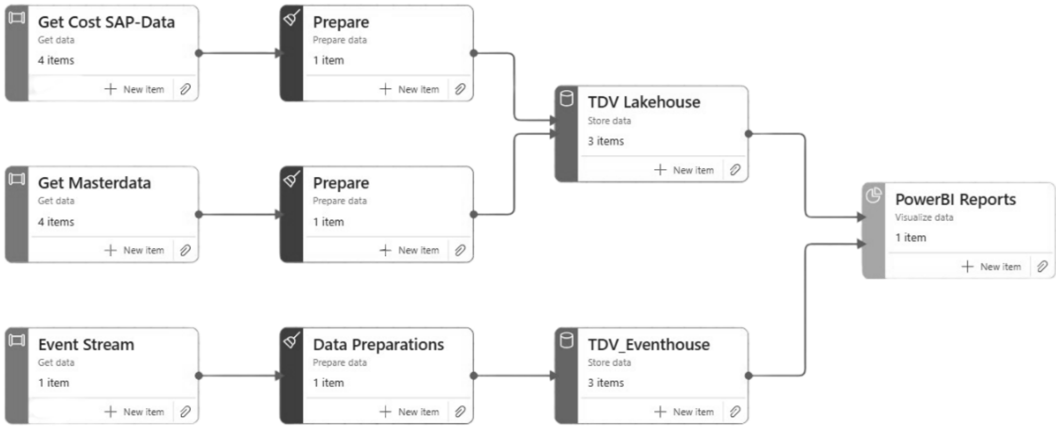
Solving the issues of manual data transfer, redundant data storages, system complexity, and incompatible platforms calls for the use of a single platform that enables data flow from multiple sources and allows all data manipulation and visualization to be done in one place. By eliminating the use of multiple platforms, the system complexity can be reduced. This solution specifically addresses current need for redundant data storages, further simplifies data flows, and eliminates the need for manual data transfer.

The platform capable of handling the complexity of TDV is Microsoft Fabric. It is a unified, cloud-based data platform that delivers data management and analytics in the form of SaaS. It provides end-to-end data services, from data ingestion to visualization, and connects seamlessly with Azure's data processing and analytics capabilities (Microsoft, 2025).

Using the Fabric platform enables significant improvement of the information flow, therefore is a viable solution proposal. Based on various global digitalization projects requirements, the responsible employees for global data handling in Hilti AG decided to enable this platform for use cases where the complexity requires advanced approaches. To create value for the company, further description of the data flow optimization, specifically for the TDV solution using Microsoft Fabric, is provided in the following paragraph. This new concept can serve as an example of how the company could approach information management architecture design in future digitalization solutions. By using Fabric as the core platform, the information flow is significantly simplified for the case of TDV, making the solution easier to understand, more robust, and scalable for future development phases.

The proposed dataflow for TDV solution is shown in Figure 6. To improve information management for TDV solution, Microsoft Fabric was used as a platform where data from multiple sources is stored. This enables data visualization reports with close to real-time refresh rates, while keeping all the data on one platform. Before using Microsoft Fabric, master data had to be copied into a shared repository, requiring manual effort and redundant data storage due to platforms incompatibility. By implementing new information flow, files can now be uploaded automatically. Once the master data file is created, a purpose-built script transfers it to the correct SharePoint location, from where it is included in the system. This proposed flow significantly reduces manual effort, storage usage, and increases system reliability. Another challenge was updating SAP cost data. As noted in the case description chapter, the update process was complex and time-consuming. The new architecture introduces a direct connection between SAP storage and Microsoft Fabric. This allows frequent updates, and once the system is set up, no additional manual steps are required. The TDV project team tested the proposed information flow architecture and confirmed that it is fully feasible. During the testing phase, many technical issues were encountered and successfully resolved. The research on information management encouraged the company to use new tools, dedicate resources to implementing new concept, and created value by simplifying TDV solution. Additionally, value was created by showcasing an innovative approach towards improving information management in digitalization projects.

Figure 6: Proposed dataflow



Source: Own work.

The TDV use case provides a comprehensive challenge and serves as a great example to showcase the possibilities for improving information management in digitalization solutions at Hilti AG. Expanding the impact of the benefits offered by advanced data handling tools, such as Microsoft Fabric, requires effective knowledge management within the company. Utilizing best practices can accelerate knowledge exchange and the implementation of new concepts in the digitalization solutions.

8.2.2 Improving knowledge management

In the current management of digitalization projects at Hilti branch office Thüringen, several knowledge management challenges were identified. Inconsistent documentation standards result in scattered and incomplete knowledge that cannot be reused efficiently. In some cases, documentation is skipped due to time constraints or low self-initiative of responsible employees, which hinders knowledge sharing and makes the onboarding process lengthier. Additionally, the responsibility for maintaining and updating documentation relies on self-initiative of individuals from the project teams. There are no clear guidelines on how to maintain documentation and who is responsible for which part of it. Documentation creation and keeping it up to date should be delegated more clearly. This would particularly benefit to externalize more knowledge from individual project participants. Another issue is that documented knowledge lacks clear structure, which makes it harder to understand and reuse it across teams or projects. One of the most critical issues is to externalize tacit knowledge, meaning that much of the insights from experienced team members remains undocumented. As a result, teams become overly dependent on specific individuals. Lastly, even when documentation exists, it is often not used extensively enough due to lack of standard structure and even accessibility constraints. This causes teams to repeat previous mistakes and miss out on knowledge generated by past projects. Overview of challenges and potential benefits in knowledge management is summarized in Table 3.

Table 3: Overview of challenges and potential benefits in knowledge management

Challenge	Why it is a problem	Potential benefits
Documentation standards	Inconsistent documentation practices	Ensure critical knowledge to be preserved in structured manner
Documentation frequency	Sometimes skipped due to lack of time	Increased consistency and quality of documentation
Responsibility delegation	Knowledge update is not delegated adequately	Clarifies accountability for knowledge sharing
Structured templates	Knowledge sharing takes too much time	Reusability and compatibility of knowledge across projects
Externalizing tacit knowledge	Know-how of team members is not shared systematically	Reduced dependency on specific individuals
Reusability of knowledge	Past documentation unavailable or unusable	Avoiding redundant mistakes by leveraging past experiences

Source: Own work.

To address identified knowledge management challenges in the digitalization projects at Hilti branch office Thüringen, relevant best practices for improving knowledge exchange are highlighted based on practical input from interviewees and theoretical research findings. Most of these practices lead toward improving documentation. The collaborating company is known for its people's orientation, which is reflected in the way where knowledge is transferred more through personal connections among employees than through structured documentation processes. While this approach tends to support knowledge exchange in a more pleasant and informal manner, it also introduces risks when rapid promotion decisions are made or when people leave the company unexpectedly. Improving documentation practices undoubtedly reduces the risk of knowledge loss and is an area that should be addressed.

One effective practice is to begin documentation early in the project and work on it continuously as the project progresses through development stages. Waiting until the end increases the risk of incomplete documentation. Clarifying the purpose of documentation at the beginning of a project helps align expectations and priorities. Whether the goal is handover, onboarding, or long-term knowledge retention, a shared understanding of the documentation's intent encourages meaningful contributions from all team members. Interview participants emphasized that starting documentation early helps distribute the workload over time and enables tracking of important decisions and their context. Capturing the reasoning behind key decisions also adds value to documentation. Instead of focusing solely on technical facts, teams should also document why specific solutions were chosen. This contextual information can be especially helpful in the case of a handover.

Another relevant practice is assigning clear responsibility for structuring and maintaining documentation. Proper documentation can be expected when a specific person, such as the project manager, lead developer, or technical expert, is made accountable for the documentation’s structure and content. For interdisciplinary teams working closely together, it is important to pay special attention to how the content is presented. People from various disciplines can struggle to understand information that falls outside their area of expertise. Visual elements such as diagrams and architecture overviews are particularly helpful for making information easier to understand across disciplines. Rather than documenting details, documentation should focus on the most essential and reusable content. Examples include system overviews, architecture descriptions, process guides, and explanations of access procedures. Avoiding overly detailed content keeps documentation concise and relevant, which also makes it easier to keep up to date.

Documentation should be integrated into the digital platforms already used by team members. As they are already familiar with these platforms, it takes less time to organize content, allowing them to focus on content creation. Switching from one platform to another is time consuming and demotivating for most people, especially those with more experience. They have developed skills in using preferred platforms, and shifting to different ones can be stressful for them. One of the interviewees highlighted that switching to different knowledge sharing platforms can be successful with the right approach, but it doesn’t necessarily deliver the expected benefits. The reason is often reluctance to change, and the effort required before people fully adopt the functionalities of it. Teams that store documentation directly on platforms such as SharePoint, Confluence, or within source code repositories encounter fewer accessibility issues and are more likely to keep documentation content up to date. Better accessibility and regular updates increase the likelihood that team members will take the time to learn from the content.

While improving documentation is essential for sustainable knowledge sharing, many challenges in digitalization projects also arise during onboarding and project handovers. Both are closely linked to effective knowledge transfer, which is why the following section provides recommendations for improving these critical transition phases.

8.2.3 Onboarding and project handover recommendations

Smooth onboarding and effective project handovers are essential for maintaining momentum in digitalization projects. They are closely tied to knowledge sharing, as new team members or successors need to quickly understand not only the project’s goals but also its context, information flow architecture, and prior decisions. While improved documentation is of great support, it is not sufficient on its own.

Table 4 highlights the most relevant challenges observed during onboarding and project handovers in collaborating company, along with the potential benefits of best knowledge sharing practices. This overview serves as a basis for the recommendations, which aims to address these challenges through practical solutions.

Table 4: Overview of challenges and potential benefits in project handover process

Challenge	**Why it is a problem**	**Potential benefits**
Standardizing process	Inconsistent practices, knowledge loss	Continuous success of project handovers
Define handover content	Unclear which knowledge should be handed over	Critical project content retained and transferred systematically
Handover time	Project members leave before proper transfer is finalized	Reduced disruption of project progress
Documentation structure	Unclear where to find information	Faster handover, less information loss
Handover checklist	Can not ensure that all topics for handover were addressed	Clarity and accountability for successful handover process

Source: Own work.

One of the observed challenges is the lack of structured onboarding processes. Different teams use different practices for transferring knowledge to new colleagues. Some rely heavily on documentation, while others prefer a more personal, informal exchange. The absence of a standardized approach can lead to inefficiencies, which are not necessarily recognized. Team members may be experts in their domain but might not know how to transfer knowledge effectively. Every new team member should receive additional explanations, but the foundation of knowledge transfer should be based on reading the project documentation. One interviewee pointed out that the onboarding process should not be too easy for the new person. While this may sound counterintuitive, it highlights an important point. The most valuable learning occurs when effort is required. By actively engaging with the documentation content and solving challenges independently, the individual gains a deeper understanding of the project.

The onboarding or handover process should follow a structured path. First, the new team member should review the available project documentation and familiarize themselves with the relevant parts of it independently. Then, additional explanations from experienced team members should be provided for better understanding. The importance of comprehensive project documentation comes into play at this point. When documentation is clearly structured and includes relevant content, it reduces the time required from individual team members for personal knowledge transfer. For successful knowledge transfer, the amount and structure of onboarding documentation should be standardized across the organization. Documenting can be seen as a burden, rather than beneficial activity. Despite that, clear guidelines would be beneficial to reduce the use of ineffective practices.

Another important factor during digitalization project handovers is timing. There should be enough time for the new team members to take over responsibilities and learn the project's specifics. While a well-structured handover process can reduce the time needed, the complexity of the project still determines the required duration. Simpler projects can be handed over more quickly, while more complex ones need extended transition periods.

During semi-structured interviews it was emphasized that it is also highly beneficial if the outgoing responsible person remains available for at least two months after the official handover. This ensures that the onboarded person can still reach out in case of urgent questions. This also highlights the strategic importance of planning handovers properly. They shouldn't be rushed, and enough overlapping time and required resources should be allocated. The progress and overall success of a project are closely linked to the effectiveness of its handover. An unsuccessful handover can be recognized when the project is not progressing with the same pace during or after the transition. In the worst case it can also lead to project failure.

For the improvement of onboarding and handover processes, incorporating a feedback loop is necessary. New team members can help identify gaps or suggest improvements for onboarding materials. As digitalization projects typically involve people from multiple expertise domains, effective onboarding is important for future successful interdisciplinary collaboration.

8.2.4 Interdisciplinary collaboration best practices

Effective interdisciplinary collaboration is a key success factor in digitalization projects. These projects typically involve professionals from diverse backgrounds such as IT, production, and business units. Various technical and domain experts are needed to contribute with their expertise. Consequently, different terminologies, expectations, and working styles can lead to misunderstandings, inefficiencies, and rework. To address these challenges, several practical methods were identified to support better collaboration based on semi-structured interviews and literature review. They are presented in Table 5 and discussed in more detail in the following paragraphs.

The early clarification of responsibilities is frequently mentioned as the best practice for effective collaboration. Interview participants described unclear responsibilities as a reason for slow progress due to avoidance of responsibility or overlapping interests of individual team members. When expectations are clear from the start, the team works more efficiently, and decisions are easier to make. Assigning clear individual contributions also supports structured collaboration. This makes sure everyone knows what they are responsible for and how their work fits into the project goals. It consequently improves motivation, as people can better focus on clearly defined goals and plan for individual contribution based on the predefined expectations which match their expertise.

A kick-off meeting at the start of the project was highlighted as best practice as it helps build a shared understanding of the goals, scope, and communication structure. It is especially important when people from different areas work together for the first time, and they are spread across different locations. Regular check-in meetings are also helpful. Interviewees pointed out that lack of regular communication results in redundant work and other project seatbacks. Short and regular meetings help detect problems early and keep everyone aligned.

Table 5: Best practices for interdisciplinary collaboration

Best practice	Why it is important	Potential benefits
Clarify roles and responsibilities early	Misaligned expectations, duplicated tasks	Increased accountability, efficiency and trust among team members
Role-specific contributions	Clear task delegation helps deliver project objectives	Improves motivation and alignment between team members
Kick-off meeting	Project starts with unclear understanding of goals	Build mutual understanding of the project from the start
Regular check-in meetings	Silence between team members leads to rework	Encourages proactive problem solving
Simple, neutral use of language in meetings	Domain specific language causes confusion	Increases inclusivity and participation
Feedback loops between team members	Critical insights must be communicated timely	Promotes agility and continuous improvement
Shared communication tools	Technical and domain specific experts' alignment	Promotes mutual understanding and better communication
Psychological safety	Team members may hesitate to express opinions	Increased risk detection

Source: Own work.

The use of simple and neutral language in meetings is another effective practice. Technical or domain-specific terms are often not understood by all team members. Using clear language avoids confusion and helps everyone follow the discussion. Another best practice for improving collaboration in interdisciplinary teams is establishing feedback loops between team members. It can significantly improve the connection between team members over time. When feedback is given regularly, smaller issues can be corrected before they become big problems. Interviewees mentioned that feedback is often missing, especially when responsibilities are not clearly defined.

Improving collaboration between interdisciplinary teams requires alignment in choice of communication tools. Technical and domain-specific experts often use different project management tools and personal task planners. It is important to choose tools and formats that are understandable for all team members, so that communication remains clear and effective.

Psychological safety was also brought up as an important factor for effective interdisciplinary collaboration. Team members need to be able to speak openly, especially when they see risks or mistakes. When this is missing, important information is not shared in time.

Improving interdisciplinary collaboration is not about adding more meetings or tools but rather about making communication and teamwork more intentional. The practices described above help teams avoid common misunderstandings and work more efficiently across technical experts and people from different domains.

9 DISCUSSION

This chapter starts with the interpretation of the results. The focus is on evaluating how the identified challenges and the proposed recommendations contribute to improving information and knowledge management, as well as interdisciplinary collaboration in Hilti's digitalization projects. At the end of the chapter the limitations of the research are presented.

9.1 Interpretation of the results

The collaboration with Hilti branch office Thüringen enabled research within a company strongly focused on digitalization. Using the case of the TDV project, we were able to identify recurring challenges in information management. Furthermore, the company setting allowed us to interview experts in digitalization project management, which led to the identification of gaps in knowledge management. The research was structured around a theoretical investigation of relevant practices to address these challenges. During the process, interdisciplinary collaboration repeatedly emerged as one of the key factors for digitalization project success. Simplifying the information architecture of newly designed digitalization solutions, managing knowledge in ongoing initiatives, reusing knowledge from past projects, and improving interdisciplinary collaboration are all factors that can support the successful development of digital solutions. This research presents recommendations on improving these crucial areas, tailored to the context of the collaborating company. The proposed improvement recommendations are expected to contribute positively to the overall success of digitalization projects and support the company's DT progress.

The company is actively promoting DT initiatives and follows the six-stage process described by Schuh et al. (2017), aiming to integrate emerging technologies into its operations. Although significant progress has been made, there are still several challenges that must be addressed to fully realize the benefits of digitalization. The Hilti branch office Thüringen is aligned with broader industry trends and is not falling behind compared to other companies which are adopting cloud computing for scalable data storage and computation load balancing (Ahmad et al., 2017).

In the area of information management, one of the main issues observed was the reliance on manual data handling and redundant storage across multiple systems. This was caused by the use of incompatible platforms and the complexity of the system architecture. Fragmented data storage made it difficult to maintain the solution efficiently. While the TDV project team had already invested significant effort into building a functional data pipeline, the underlying data flows remained dependent on time-consuming, manual processes. These problems were not the result of poor design decisions but rather platforms limitations and the distributed nature of data sources within the company. Based on this, it became clear that simplifying and automating information flows is essential for reducing operational workload, improving system transparency, and ensuring long-term reliability. The research on information management encouraged the company to use new tools, dedicate resources to implementing new concept, and created value by simplifying information flow of the TDV solution. Additionally, value was created by showcasing an innovative approach towards improving information management in digitalization projects.

With the introduction of IIOT, manufacturers gain access to real-time data that can be used to optimize processes and reduce costs (Yaseen & Obaid, 2020). The collaborating company is utilizing such technologies, which is reflected in the ongoing TDV project. According to Wijaya et al. (2024), analyzing real-time data can significantly improve decision-making and support process optimization. However, the research identified several obstacles that currently prevent the company from fully leveraging these benefits. Manual data transfer, redundant storages, platform incompatibility, and overall system complexity remain key challenges. Proof of concept using a platform capable of addressing these overarching issues was introduced in the second part of the main chapter. Microsoft (2025) highlights the benefits of its new data platform, and the implementation of the proposed solution in the TDV project showed that these advantages are indeed applicable at least in this use case. In the future, the same platform could be applied to overcome technical limitations in other digitalization solutions used within the company.

Regarding knowledge management, Nonaka & Takeuchi (1995) highlighted knowledge externalization as one of the main pillars of effective knowledge management. Furthermore, Suresh (2024) emphasized the importance of documentation for successful digitalization project implementation. The findings from semi-structured interviews revealed a lack of structured documentation processes and a general reliance on tacit knowledge shared informally between colleagues. While this reflects the company's people-oriented culture, it also introduces risks when individuals leave or change roles. Documentation efforts were inconsistent, and responsibilities for maintaining documentation were rarely assigned clearly. An interesting part of the findings is that several interview participants actively pointed out these issues. They were aware of the importance of knowledge sharing and even suggested ideas to address the challenges. What is currently missing is a formal initiative, with clear guidelines and proposed templates that team members in digitalization projects would be expected to follow. To support the company in moving towards a positive direction, practical recommendations were proposed in the second part of the main chapter. These include beginning documentation early in the project, assigning clear responsibility, using visual representations, and integrating documentation into digital platforms in a structured way. Each of these actions addresses the challenges identified in the company's current knowledge management practices. According to Abualoush et al. (2018), improving these practices should have a direct and positive impact on organizational performance.

At Hilti branch office Thüringen, digitalization project handovers occur frequently, which was the initial reason this thesis aimed to examine current information and knowledge management practices within the company. Developing less complex digitalization solutions makes it easier for new team members and operational users to take over and understand these solutions. Additionally, improving knowledge management practices enables a more seamless transfer of lessons learned from digitalization projects. According to Deshmukh (2023), effectively managed handovers ensure continuity of project activities, support alignment with evolving organizational strategies and external conditions, and introduce new perspectives and expertise. This statement links the importance of handover practices directly to the progress of DT initiatives, especially when transitions happen frequently.

Failure to ensure effective handovers can hinder the overall digitalization efforts of the company. During the semi-structured interviews, several challenges within existing project handover routines were identified. Interviewees particularly emphasized the lack of standardized processes and the importance of handover duration. The first issue is closely tied to documentation practices and highlights the need for well-established knowledge management process. Since digitalization projects in the collaborating company often involve interdisciplinary teams, special attention should be given to collaboration, as knowledge transitions are more effective when stakeholders from different backgrounds work closely together (Nguyen & Mougenot, 2022). The final section of the main chapter presents best practices for interdisciplinary collaboration, including the importance of regular meetings, the use of neutral language, and establishing feedback loops among team members. According to Brown et al. (2023), applying such collaboration practices in industrial projects with interdisciplinary teams led to better outcomes, particularly when teams clarified individual roles early in the process, maintained open communication, and regularly aligned on shared goals. Improving project implementation, handovers, and the overall success of DT initiatives is closely linked to the quality of collaboration, and companies should therefore place special emphasis on strengthening it.

This research was initiated with several objectives aimed at improving digitalization project outcomes at the Hilti branch office Thüringen. The primary objective was to identify current challenges and provide recommendations on the areas of digitalization projects extensively described in the previous chapters. More specifically, the first objective to identify challenges in information and knowledge management faced during the digitalization projects was addressed through a combination of interviews and internal company documentation review. The challenges themselves were presented in three key areas: information management, knowledge management, and onboarding and handover processes. The second objective was to showcase the best practices for managing information and knowledge in digitalization projects. This was achieved through literature research and later matched with the company relevance based on semi-structured interviews with experts in digitalization project management from the collaborating company. Another important objective was to increase the quality and accessibility of documentation created during the digitalization projects. The thesis addressed this by highlighting the importance of standardization, platform choice, and specifying the person responsible for documentation. Additionally, the thesis proposed best practices to improve onboarding and handover processes through a structured approach, clear accountability delegation, and improved use of documentation. This structured approach towards improving information management, knowledge management, and onboarding and handovers is reducing time spent on inefficient practices and enabling better use of information and knowledge to support project teams.

The defined RQs were addressed during the research. RQ1 focused on identifying information and knowledge management practices that enable effective and efficient handovers from interdisciplinary project teams to operational end users. The results indicate that practices such as early and structured documentation, clear responsibility assignment, standardized templates, and defined onboarding process contribute to better handover effectiveness and reduce the risk of knowledge loss. RQ2 addressed how these practices can support the integration of emerging technologies. The analysis of the TDV project demonstrated that simplifying data flows and using platforms like Microsoft Fabric improves data processing, reduces complexity, and supports scalability. Information management practices using emerging technologies were shown to improve data accessibility, consistency, and implementation efficiency. RQ3 focused on how companies can address dynamic digitalization project environment using effective information and knowledge management practices. Digitalization projects often involve changing team members, shifting scopes, and evolving requirements. Establishing routines that support continuous documentation, feedback loops, and clear communication across interdisciplinary teams helps to effectively adapt to changes while minimizing the risk of project failure.

The results of this thesis point to several challenges and practical recommendations for Hilti branch office Thüringen. First, improvements in information management can be achieved by utilizing cloud-based platforms such as Microsoft Fabric, which can streamline complex data flows, reduce redundancy in data storing, and improve overall data reliability. On the knowledge management side, the research emphasizes the importance of standardizing documentation practices and using structured templates. These measures would improve consistency, accessibility, and long-term usability of project knowledge. Furthermore, the findings suggest that structured onboarding and handover routines are essential for ensuring continuity and stability in digitalization projects, especially in interdisciplinary teams.

9.2 Limitations and further research

During the research, several limitations were identified in both the theoretical and empirical parts of the study. The research was conducted in collaboration with only one company. All interview participants were from Hilti branch office Thüringen. This means that the findings reflect challenges and practices specific to this organization. As a result, they cannot be broadly applied to other Hilti AG locations, other companies in the same industry sector, or to companies from different sectors. In addition, because all interviewees came from the same organization, their responses may reflect shared internal perspectives, which introduces a certain bias. Interviews were conducted in English, which is not the first language of the participants. While communication was generally clear, this may have limited the precision of some answers.

One of the challenges was the limited availability of literature linking information and knowledge management to digitalization projects. While a lot of literature is available on DT, fewer sources address its connection to knowledge management.

The research focused on Microsoft Fabric as a solution for improving data flow in the TDV project. Other tools or platforms were not considered. This limits the analysis to the implementation of this specific tool in a single digitalization project. It is possible that using different platforms could also address the identified challenges.

Future research could expand the scope by including other Hilti production sites to determine whether the same challenges are present at other locations. To generalize the findings beyond Hilti, companies from the broader manufacturing sector should also be included. This would allow for cross-company comparisons and increase the industry-wide relevance of the recommendations. Still, some of the identified challenges and proposed improvements may be applicable in other companies where inefficiencies in information and knowledge management are present.

10 CONCLUSION

The thesis aimed to improve information and knowledge management practices among interdisciplinary teams in digitalization projects at Hilti branch office Thüringen. Semi-structured interviews were conducted to identify challenges in information flow, documentation, and handover practices. Based on the findings from theoretical research and interviews, this research further proposed improvement recommendations. This master's thesis supports improved digitalization project execution, reduced knowledge loss, and more effective DT implementation in the collaborating company.

The RQs focused on identifying the specific factors that hinder effective information and knowledge management in digitalization projects. Ther research explored best practices to overcome these limitations, with an objective to support successful digitalization project handovers. RQs were directly addressed through the empirical research and supported by findings from the theory research. The results highlighted that structured documentation, simplified data architecture, standardized templates and processes, feedback loops, and interdisciplinary collaboration are key enablers of digitalization project success.

The study confirmed that Hilti branch office Thüringen is actively promoting DT through digitalization projects. While these efforts contribute to productivity, the organization has not yet fully realized the benefits of emerging technologies. Several challenges were found to harm the project's effectiveness and continuity. These included multiple data sources, manual data transfers, redundant data storages, incompatible platforms, and overall system complexity. Interview participants also highlighted problems related to documentation practices, such as inconsistency, unclear responsibility delegation, unstructured content, and difficulties in externalizing tacit knowledge.

This thesis contributes by identifying these gaps and providing applicable improvement recommendations. While the findings are based on collaboration with a single company, some of the proposed improvements may be transferable to companies facing similar information and knowledge management challenges. By addressing these challenges, organizations can establish a foundation for scalable, sustainable, and knowledge-driven DT.

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APPENDICES

Appendix 1: Interview guideline and questions

Introduction (5 minutes)

Introduce research, your role in the company, and University of Ljubljana, SEB UL.

The research focuses on improving information and knowledge management in digitalization projects, especially within interdisciplinary teams. With your expertise and insights, it aims to provide practical recommendations for improving current knowledge and information management processes.

The objective is to develop recommendations that enable smoother and more efficient knowledge transfer and project handovers, potentially saving time and effort for all team members involved.

1. Warm-up question: Briefly describe your role and experience with digitalization projects?

Write down characteristics of the participant.

2. Warm-up question: What comes to your mind, when you hear the terms "knowledge management" and "information management"?

Knowledge and information management challenges (10 - 15 minutes)

3. Challenges in information flow: In your experience, what are the main challenges in sharing and managing information across interdisciplinary teams in digitalization projects?
    a. Are these challenges related to tools, processes, team dynamics, or other factors?
    b. Could you provide specific examples?

4. Handling complexity in data structure: Digitalization projects often involve complex data and multiple input sources. How do you manage these complexities with your team?
    a. Do you use standardized templates, centralized tools, or other methods to simplify and organize information?

5. Onboarding new team members: How is knowledge transferred to new team members when they join your team or a project?
    a. What is most effective, and what are common pain points?
    b. Do you rely more on documentation, personal coaching, or other methods for onboarding?

Best practices and tools (10 minutes)

6. Effective knowledge transfer practices: What practices have you found most effective for ensuring that critical knowledge is transferred between teams and/or individuals?
    a. Which one do you find the most effective: structured documentation, regular knowledge-sharing meetings, or mentorship programs?

7. Knowledge and information management tool utilization: What tools or platforms do you use to manage project knowledge and information, and how effective are they?

8. Adapting to dynamic environments: Digitalization projects often evolve over time. How do you ensure that knowledge management processes keep up with these changes?

Opportunities for improvement (10 minutes)

9. Gaps in current practices: Where do you see the biggest gaps in how knowledge and information are currently managed in your projects?
    a. Are there specific areas where you feel more support, tools, or training could help?

10. Ideal solution: If you could design the perfect knowledge management system or process, what features would it have?

11. Future of knowledge management: How do you see the role of emerging technologies like AI improving knowledge management in the future?
    a. Are there any specific technologies or approaches that would be game changers?

Closing and open-ended questions (5 minutes)

12. Is there anything we haven't discussed that you think is important for improving knowledge and information management in digitalization projects?

13. Would you be open to reviewing and providing feedback on the recommendations based on this research?

Post-interview: Email expressing gratitude for participation in our study.