



BRNO UNIVERSITY OF TECHNOLOGY

FACULTY OF BUSINESS AND MANAGEMENT

Department of Informatics

**Modification of the Methodology for the Implementation
of Information Systems Involving Elements of
Digitalization and Remote Collaboration**

Abbreviated version of the dissertation thesis

Author:

Ing. Jan Špatenka

Supervisor:

doc. Ing. Miloš Koch, CSc.

Brno 2025

Abstract

A business information system is a part of every organization, which due to its size requires digital coverage of essential business processes and a controlled form of working with and storing data. Since the number of information systems implementations is increasing, the success of such projects is a crucial issue. Project management standards and other implementation methodologies deal with these topics. The question remains whether these standards reflect the emergence of recent phenomena in the form of the inclusion of elements of digitalization and forms of remote collaboration. In recent years, the use of these aspects has been growing. This opens a wide area for investigating the influence of specific aspects of remote collaboration and digitalization on the project life cycle, including the determination of a meaningful level of use of these tools. The aim of the dissertation is to modify the methodology of implementing corporate information systems reflecting the meaningful involvement of elements of digitalization and remote collaboration. The set result will be achieved by the combination of primary and secondary research. The secondary research reacts to research questions related to the state of art whilst primary research is used for those with high added research value. Primary research is represented by using the Design Science Research paradigm including qualitative research in the exploratory and confirmatory phases of the research. Since the work is based on extensive research of professional literature and its ambition is to modify the implementation model that respects the meaningful involvement of elements of digitalization and remote collaboration, its contribution in the scientific, managerial, and pedagogical fields is evident.

Keywords

Information system, implementation, project management, digitalization, remote collaboration, project lifecycle

Contents

1 Introduction.....	4
2 Scope and Purpose of the Thesis	5
2.1 Aim of the Dissertation Thesis.....	5
3 Theoretical Background and Definition of Key Terms	7
3.1 Projects and Project Management.....	7
3.2 Digitalization.....	8
3.3 Remote Collaboration	9
4 Analysis of the Current State of Scientific Knowledge.....	10
4.1 Bibliometric Analysis.....	11
4.2 Identifying the Research Gap.....	13
5 Methodology.....	16
5.1 Research Strategy.....	16
5.2 Conceptual Scheme of the Research.....	17
5.3 Methods Used in the Dissertation Thesis.....	18
6 Solutions and Results of the Dissertation	20
6.1 Summary of the Results of Secondary Research Conducted.....	20
6.2 Summary the Results of Empirical Research Conducted.....	23
6.3 Addressing Research Questions.....	24
7 Discussion.....	32
7.1 Confrontation of the Results with Existing Sources	32
7.2 Limits of the Research.....	34
8 Contributions of the Dissertation Thesis.....	36
8.1 Scientific Contribution	36
8.2 Field of Managerial Practice	36
8.3 Pedagogical Contribution.....	37
9 Conclusion	37
Bibliography	39

1 Introduction

In the past, the key aspects of an efficiently managed company were considered to be properly selected functional structures, adequately set processes, and last but not least, human resources. However, in the context of the digital revolution, which can be dated back to the turn of the 20th and 21st centuries when considering its impact on the corporate environment, there is one more essential aspect. This is digital technology and information systems.

When we talk about the process of implementing an enterprise information system, it is essentially a specialized project management methodology. Project management is a broad concept that enters many industries, including information and communication technologies. Even so, the field of IT project management can be considered so broad that, given the importance of information systems, it makes sense to delve deeper into the issue of selecting an appropriate project management methodology, its transformations, or even the alternative of finding the most appropriate combination of such methodologies in order to maximize the efficiency and likelihood of successful implementation completion.

The question is to what extent the widespread use of home office has accelerated the already rapid development and subsequent use of digital tools in the field of remote collaboration and remote management of project teams. There is no doubt, however, that there is a correlation between the two phenomena in general and if indeed information systems implementations are such an essential link in the development of companies that individual companies are increasingly turning to as a means of achieving an implemented ERP solution, there is much room for research in the area of the impact of digitalization and remote collaboration on ICT projects.

2 Scope and Purpose of the Thesis

2.1 Aim of the Dissertation Thesis

Based on the justification of the topic of the dissertation and the identification of a scientific gap during an extensive search of relevant literature, the main goal of the work was determined, as well as sub-goals that are a necessary part of fulfilling the main goal.

The main goal of the dissertation work is **the modification of the methodology of the implementation of corporate information systems reflecting the meaningful involvement of elements of digitalization and remote collaboration**. By evaluating the influence of the two above-mentioned phenomena, their meaningful use in individual stages of the life cycle of the implementation project will be proposed. The broad concept of digitalization will be narrowed down in this research, following Wang et al. (2022), to Digital Technology and Application, encompassing collaborative tools and tools for digitizing processes. The modified methodology will be based on existing project management methodologies describing a project life cycle of implementation of enterprise information systems.

A debatable point may be the question of what is perceived as *meaningful involvement* of researched elements. For the purposes of this dissertation, *meaningful involvement* is considered to involve elements of digitalization and remote collaboration that are perceived to be beneficial to the research in terms of the so-called *project triple constraint*. That is, it has a positive impact on the aspects of time, cost, scope and quality. These aspects are in the common interest of all project stakeholders.

Furthermore, the following sub-goals leading to the fulfillment of the main goal were identified:

- **Sub-goal no. 1:** Selection of a suitable methodology for the implementation of information systems used for the subsequent modification and involvement of the investigated phenomena in the life cycle of the project.
- **Sub-goal no. 2:** Detailed research of the current state of knowledge based on published scientific articles related to the given issue.

- **Sub-goal no. 3:** Verification of the assumption of growing interest in projects implementing corporate information systems and the growing trend of using elements of digitalization and remote collaboration.
- **Sub-goal no. 4:** Determining a meaningful level of involvement of elements of digitalization and remote collaboration within triple constraint in the corresponding phases of the implementation of corporate information systems.
- **Sub-goal no. 5:** Identification of alternative approaches to the modified methodology of the implementation of corporate information systems, taking into account the environment in which the information system is implemented.

3 Theoretical Background and Definition of Key Terms

The purpose of this chapter is to define the terms on which the dissertation relies to define the main and sub-objectives of the research. These terms can be considered as *project* and *project management*, *digitalization*, *remote collaboration* and *enterprise information systems*.

3.1 Projects and Project Management

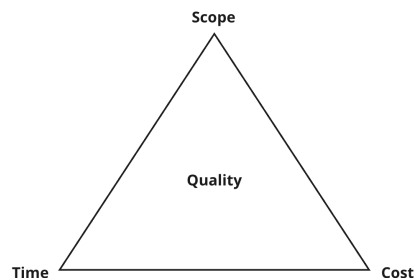
To define terms like *project* or *project management*, it is important to recognize that a project can have diverse meanings across different languages and contexts. In fields such as architecture, construction, or engineering, the term often denotes a concept or plan, which differs from its use in project management. In these disciplines, *project* refers more to a proposal rather than the structured framework understood in *project management* (Doležal, Máchal, Lacko et al., 2012).

In this main chapter, several definitions of a *project* are presented, which highlight the concept of the *triple constraint* in project management. According to Rose (2005), the *triple constraint* comprises *time*, *cost*, and *scope*, all of which are equally crucial for both project success and the project manager. A key responsibility of every project manager is to balance these three aspects to meet the project objectives and achieve optimal results. Rose (2005) also introduces a fourth element, *quality*, which is closely related to *scope* and reflects customer requirements. Some authors, such as Dobson (2004), refer to *performance criteria* as the third element instead of *scope*, as it encompasses both *scope* and *quality* considerations.

Recent studies in project management literature emphasize the importance of integrating quality into the traditional project management constraints of *scope*, *cost*, and *time*, forming what is often referred to as *the quadruple constraint*. Kerzner (2017) proposes that this expanded model, which includes quality alongside the traditional constraints, provides a more holistic approach to managing projects. By considering *quality* as a critical element, project managers can address not only the deliverables and their specifications but also the satisfaction of stakeholders and the sustainability of project outcomes. This inclusion reflects a broader understanding of project success, moving beyond just completing projects within the pre-

defined scope, budget, and schedule to ensuring that the output meets or exceeds quality expectations. Similarly, Jugdev & Thomas (2002) argue that *quality* should be managed as a core dimension to align project objectives with stakeholder needs, enhancing overall project performance and success.

Figure 1: The Triple Constraint



Source: own design inspired by Kerzner (2017).

The notion of integrating quality with the traditional project management triad is further supported by Munns & Bjeirmi (1996), who suggest that considering quality in conjunction with time, cost, and scope leads to more robust project outcomes. Turner & Müller (2005) highlight that quality management improves project performance by ensuring that the project deliverables align with stakeholder expectations and standards. This expanded framework, as noted by Atkinson (1999), facilitates better decision-making and provides a more comprehensive view of project success criteria. By including quality as a fundamental component, project managers can effectively balance competing demands and enhance both the efficiency and effectiveness of project delivery, ultimately leading to higher stakeholder satisfaction and project success.

3.2 Digitalization

For companies today, having a profound and comprehensive understanding of information technology and digital innovation is more critical than ever before. This necessity extends beyond basic IT knowledge to include a nuanced grasp of how digital advancements can be harnessed to drive growth and efficiency. The technological advancements and innovations, especially those that blend the physical world with digital realities, are ushering in significant paradigm shifts. These shifts are not confined to a single sector but are sweeping across all industries, fundamentally altering how businesses operate, compete, and interact with their environments and stakeholders (Leyh et al., 2021). As digital and physical worlds continue to

converge, companies must adapt to these changes to remain relevant and competitive in an increasingly technology-driven market.

Digitalization is a widely used term, but to understand it, it is necessary to understand the terms *digitization* and *digital transformation*. The relationship between these terms is illuminated by Gobble (2018), for example, who suggests that *digitization* is an early stage involving the conversion of analogue content into digital content. *Digitalization* is a technical process that enables data to be processed, stored, and transmitted digitally, paving the way for more advanced technological applications.

3.3 Remote Collaboration

Remote collaboration, also known as *virtual collaboration*, involves the use of digital technologies to enable teamwork and communication among individuals who are geographically dispersed. The theoretical foundation of *remote collaboration* is grounded in several key concepts and frameworks from organizational behavior, information systems, and communication studies.

One of the primary theories speaking about remote collaboration is the Media Richness Theory, proposed by Daft & Lengel (1986). This theory suggests that communication effectiveness depends on the richness of the medium used. Rich media, such as face-to-face communication, can convey more information through multiple cues, immediate feedback, and personal focus. In contrast, lean media, such as emails, lack these attributes. Remote collaboration tools like video conferencing and instant messaging are considered richer media compared to traditional emails, facilitating more effective communication in virtual teams.

4 Analysis of the Current State of Scientific Knowledge

The purpose of the review of the current state of scientific knowledge is to create a comprehensive overview of the existing literature and the results of the research carried out so far. This step is particularly important in order to clearly define how far scientific knowledge has come in the field of the dissertation topic. At the same time, this analytical and critical approach to the analysis of the current state of knowledge will help to identify the so-called *research gap*, on the basis of which the main objective, sub-objectives and research questions of the dissertation will be defined. In addition to determining the initial state of this research, the search of existing sources is also essential from the perspective of learning from the work of other authors - a significant part of the analysis focuses not only on the outputs and conclusions of research papers, but also on the chosen procedures and methods that were selected for this research topic.

To provide a comprehensive view of the current state of scientific knowledge, a structured and systematic review of the literature was conducted. While the structured review provides an idea of the broader context (e.g. the evolution of the number of publications and citations), the systematic review is represented by a more in-depth summary of the literature related to the dissertation topic. In contrast to a traditional literature review, which usually contains a significantly lower number of research evidence and is mainly created to present the individual perspective of one or a unit of authors, a systematic review attempts to provide a context for all empirical research. The structured review is represented by an analysis of publications from the two most relevant databases, Scopus and Web of Science. The results are then processed in the form of a bibliometric analysis. The systematic literature review is covered by a content analysis of a shortlist of publications that have been identified as having made the greatest contribution to establishing the state of scientific knowledge of the dissertation topic.

The search was carried out as follows:

- Selection of databases of primary scientific papers - Scopus and Web of Science.
- Keyword definitions for filtering relevant articles (*information system, implementation, project management, digitalization, remote collaboration, critical success factors, information management*).

- Keyword validation on a random sample of relevant publications.
- Import of RIS data files into the EndNote 20 software tool and subsequent homogeneity and quality control of the data (211 titles in total).
- Exclusion of selected publications due to duplication, lack of English language content or lack of essential metadata for the article (48 titles excluded).
- Selection of publications closely related to the dissertation topic according to the analysis of titles and abstracts of individual papers. Relevance of articles rated on a scale of 1 (not relevant) to 5 (most relevant). Publications with a score of 3 or higher were subjected to a detailed content analysis (116 titles were excluded).
 - Relevance 1: 81 titles
 - Relevance 2: 35 titles
 - Relevance 3: 25 titles
 - Relevance 4: 12 titles
 - Relevance 5: 10 titles
- Detailed content analysis of a shortlist of publications (47 titles in total).

On the basis of the above procedure, 47 publications were identified for which a detailed content analysis was carried out in order to identify the most accurate description of the current state of scientific knowledge and to identify a research gap.

The total number of 163 relevant sources was also analysed according to the date of publication, from which the topicality of the topic under study can be deduced. The literature review by date shows that 106 sources out of the total 163 were published between 2018 and 2024. At the same time, there is always a year-on-year increase in the number of publications in these years.

None of the titles that were subjected to detailed content analysis originated from the Czech Republic. At the same time, none of the research refers to investigations in the local environment.

4.1 Bibliometric Analysis

In order to gain a closer understanding of the state of the literature on topics related to the dissertation topic, a bibliometric analysis was performed using the software tool VOSviewer 1.6.18. This analysis was performed on the above specified set of scientific publications, for

bibliometric analysis confirm that the definition of the keywords reflected in the shortlist of publications for the content analysis was appropriately done and none of the essential terms were omitted. Furthermore, the bibliometric analysis indicates a strong link between information systems issues and project management, but the result does not show that the phenomena of digitisation and remote collaboration have been more frequently linked in the context of information systems to date.

4.2 Identifying the Research Gap

Based on the literature review and bibliometric analysis, a scientific gap has been identified, which is reflected in the description of the dissertation's objectives. In the majority of cases, the reviewed materials address the relationship between digitalization and information system implementations, where digitalization is perceived as the end product of such a project, from which the enterprise, as the end customer, derives expected benefits (Hadjikhani & Lindh, 2020; Kazakov, 2020). Content analysis reveals that the authors do not approach elements of digitalization as tools that can be utilized in enterprise information system implementation projects but rather as outcomes of such efforts.

In the realm of remote collaboration, authors like Palumbo (2020) examine the sociological and psychological impacts of the sudden increase in the use of home offices, including the effects on fatigue and work-life balance.

In selected works that focus on critical success factors, authors (Kala Kamdjoug et al., 2020; Toscana & Zappala, 2020; Leyh et al., 2021) repeatedly identify areas related to remote collaboration or digitalization. However, these studies do not aim to further develop their findings and do not address the question of which specific elements of these phenomena can be utilized in enterprise information system implementations.

From the above, it is evident that there are no studies focused on the implication of remote collaboration in project management or even in implementation projects.

4.3 Formulating Research Questions

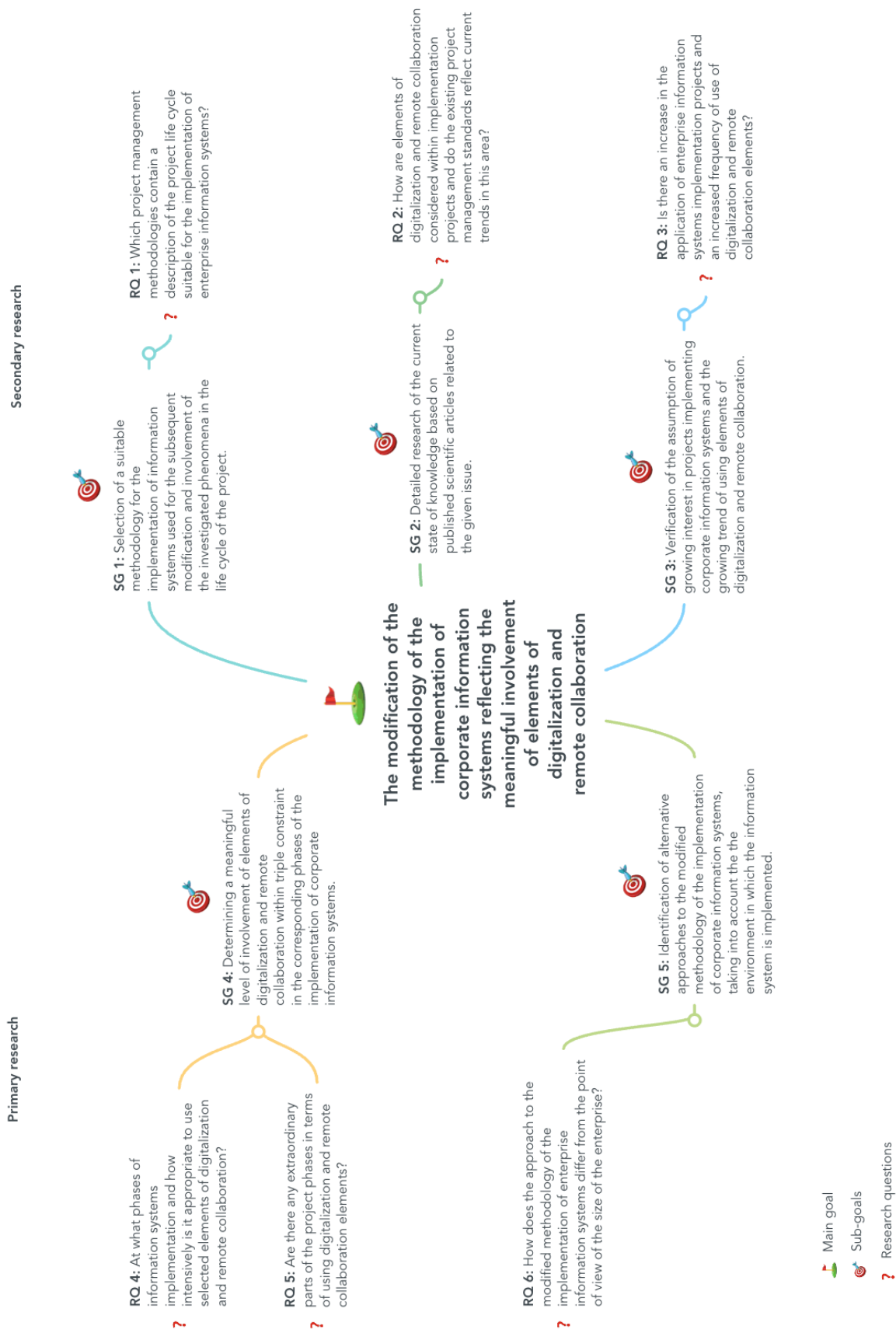
Following the established objectives of the dissertation, it is also necessary to define the research questions, which are a key element of the research design. According to Taylor & Martindale (2014), a clear research question is a fundamental and determining aspect for developing the associated objectives. Although it is possible to partially modify the research

questions during the course of the dissertation, their formulation should be based on the analysis of the academic literature.

Based on the theoretical foundations and the identified research gap, the research questions are formulated, which will be answered through secondary or empirical research:

- **Question no. 1:** Which project management methodologies contain a description of the project life cycle suitable for the implementation of enterprise information systems?
- **Question no. 2:** How are elements of digitalization and remote collaboration considered within implementation projects and do the existing project management standards reflect current trends in this area?
- **Question no. 3:** Is there an increase in the application of enterprise information systems implementation projects and an increased frequency of use of digitalization and remote collaboration elements?
- **Question no. 4:** At what phases of information systems implementation and how intensively is it appropriate to use selected elements of digitalization and remote collaboration?
- **Question no. 5:** Are there any extraordinary parts of the project phases in terms of using digitalization and remote collaboration elements?
- **Question no. 6:** How does the approach to the modified methodology of the implementation of enterprise information systems differ from the point of view of the size of the enterprise?

Figure 3: Mind Map Linking Dissertation Aims and Research Questions



Source: own elaboration in MindMeister.

5 Methodology

5.1 Research Strategy

The ambition of the whole research project is to modify the methodology of enterprise information system implementation reflecting the meaningful involvement of digitalization and remote collaboration elements in the individual stages of the project life cycle.

The two main types of participants in this type of project are the supplier and customer parties. In general, there are common goals that both parties work towards during the project – these typically stem from the so-called *project triple constraint*. This views the project from the perspective of time, cost, scope and quality (see chapter 3.1.3). However, it is natural that from a certain perspective the interests of the two parties differ. It can be expected that for the customer side, for example, maintaining the original budget and running the system in a production environment only when they are absolutely satisfied with the quality of the delivered solution will be a priority. While the supplier will prefer to cover all costs associated with the implementation, including the margin, at the usual time and place and to launch the system in the production environment on a predetermined date so that capacity problems do not arise on other projects. It is precisely the concern about the partially divergent interests of the two parties involved in the project of implementing enterprise information systems that care will be taken to ensure that representatives of both parties participate in the research. This measure will ensure an increase in so-called *external validity*. It will therefore be possible to generalize the conclusions of the investigation applicable to a wider field of cases and thus increase the contribution of the work to practice and teaching. Specifically, this fact is written into the line-up of focus group participants – representatives of the supplier and customer in different roles must not be absent.

As mentioned in previous chapters, design science research is in synergy with quantitative and qualitative methods. They are used – typically several times in the name of an iterative process – to reach the best possible form of the artifact. In this case, focus groups as representatives of qualitative methods will be applied. A substantial part of chapter 5.2.2 is devoted to the methodology of focus groups including the arguments why this tool is considered appropriate in the context of this dissertation. Based on facts stated in this chapter, this research will use focus groups at least twice, with a different composition of participants (see Figure 5).

The investigation will take care to identify the specific stages and phases of the project in which the phenomena under investigation have been applied. The research participants will consider the involvement of the elements of digitalization and remote collaboration in the context of the *project triple constraint* and its impact. MAXQDA 24 software tools for qualitative data analysis will be used to process decoding and encoding the data from the focus group sessions.

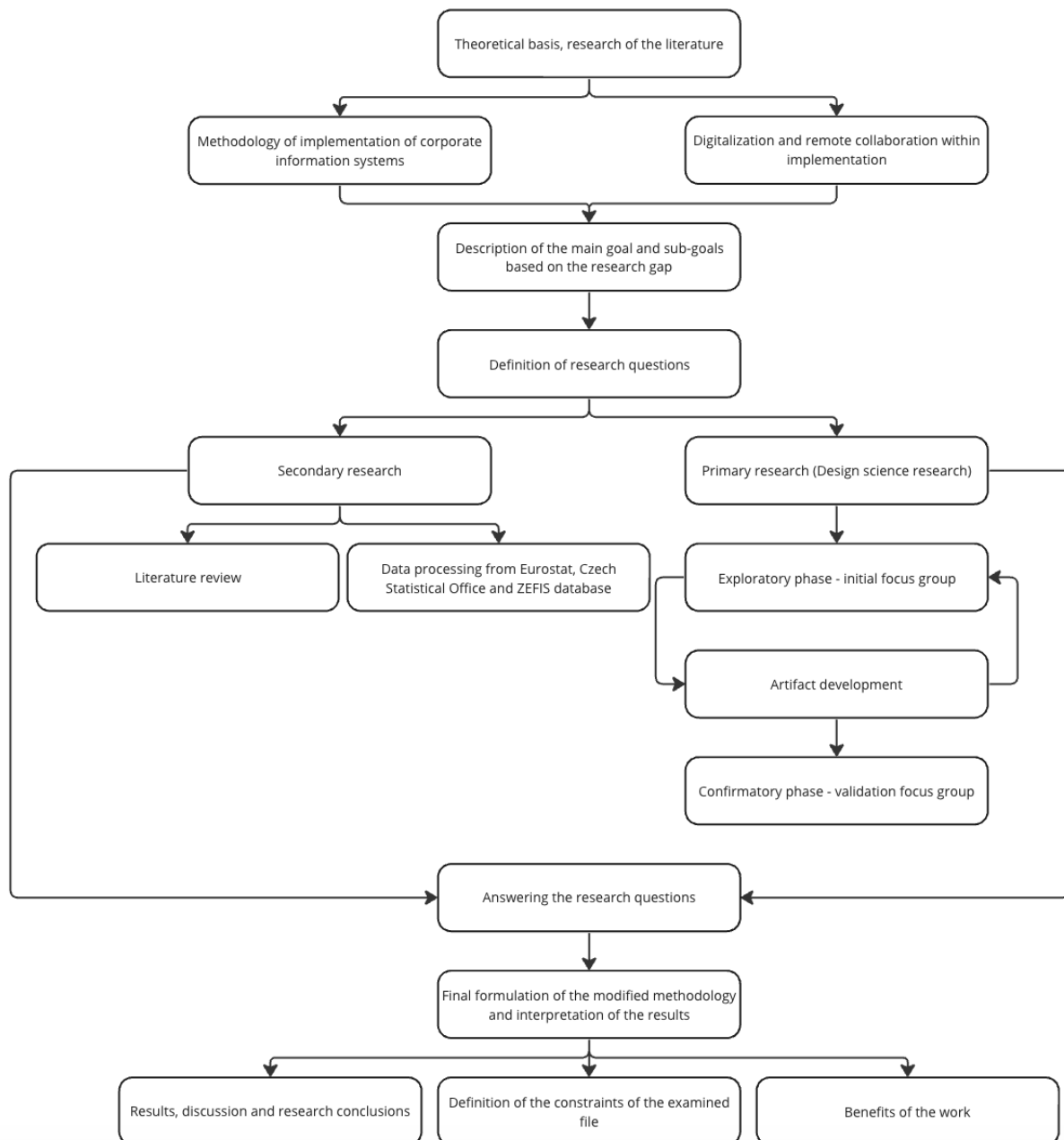
Once the artifact, i.e. the modified methodology, has been formulated, it is necessary to elaborate all related circumstances in the discussion and research conclusion. Also define the constraints of the examined file and last but not least present the results of the work including the contribution.

5.2 Conceptual Scheme of the Research

The conceptual diagram of the research graphically interprets the interrelationships between the different aspects of the research and places them in the sub-phases of the whole dissertation project. The links between the different objects allow the links and sequences of the individual steps to be highlighted. The inspiration for the conceptual diagram presented was the *work breakdown structure* technique, which aims to create a hierarchical decomposition of the project goal into sub-steps down to the lowest necessary level that defines the activities required to successfully achieve the main goal.

The conceptual scheme shows that the process of dissertation development respects generally applicable methodological principles. At the same time, the scheme reflects the author's intention to work towards the predefined goal by answering the defined research questions in the form of secondary and primary research methods. An essential fact is that primary research will be represented by the method of *design science research*. The specifics and reasons for using this method are discussed in the chapter devoted to the dissertation methodology.

Figure 4: Conceptual Research Schema



Source: own elaboration in Miro.

5.3 Methods Used in the Dissertation Thesis

The methods that will be used to achieve the aim of this dissertation are clearly presented in the table below and linked to the research questions that they will be applied to answer. In the secondary research, literature review and data from existing databases such as ZEFIS, Czech Statistical Office and Eurostat is used. When processing secondary data, correlation coefficient is counted, specifically Kendall’s tau using Gretl – specialized, statistical software. The

empirical part of the research is represented by *design science research* using *focus groups*. To achieve the best possible result, an incremental approach of shaping up the modified methodology is used – outputs of the interview with the first focus group are validated by the second confirmatory focus group. The paradigm of *design science research* is used in empirical research because it is well suited for the creation of innovative artifacts such as the creation or modification of methods. DSR is also very often used in the information technology environment. Recordings of the interviews are adjusted in DaVinci software, transcribed using cesky.ai tool and then coded. 3 different methods are used to encode the text – concept coding, magnitude coding and In Vivo coding. MAXQDA 24 software is also used for selected actions with text.

To get the whole big picture of the thesis, its main goal, sub-goals, research questions and use of primary or secondary research, the Mind map linking dissertation aims and research questions (see Figure 3).

Table 1: Research Questions and Data Collection Methods

Research Question	Research Type	Data Collection
RQ 1: Which project management methodologies contain a description of the project life cycle suitable for the implementation of enterprise information systems?	Secondary	Literature review
RQ 2: How are elements of digitalization and remote collaboration considered within implementation projects and do the existing project management standards reflect current trends in this area?	Secondary	
RQ 3: Is there an increase in the application of enterprise information systems implementation projects and an increased frequency of use of digitalization and remote collaboration elements?	Secondary	ZEFIS database, Czech Statistical Office, Eurostat
RQ 4: At what phases of information systems implementation and how intensively is it appropriate to use selected elements of digitalization and remote collaboration?	Empirical	Design science research - qualitative research via focus groups
RQ 5: Are there any extraordinary parts of the project phases in terms of using digitalization and remote collaboration elements?	Empirical	
RQ 6: How does the approach to the modified methodology of the implementation of enterprise	Empirical	

information systems differ from the point of view of the size of the enterprise?		
--	--	--

Source: own elaboration.

As stated in Table 6, this thesis is based on secondary and primary, empirical research. Within secondary research, literature review and critical evaluation of the current state of knowledge will be used, accompanied by processing secondary data from databases of Eurostat, Czech Statistical Office and ZEFIS. Primary research is represented by the design science research paradigm using the iterative process of focus groups within the exploratory and confirmatory phase of the research.

6 Solutions and Results of the Dissertation

6.1 Summary of the Results of Secondary Research Conducted

In the initial phase of the secondary research, the focus was placed on selecting a suitable methodology that incorporates a project life cycle for information system implementation which would best serve the objectives of this dissertation. The selected methodology needed to provide a clear structure, enabling the integration of digitalization and remote collaboration elements into individual phases of the project. This approach allows the study to explore how these elements function differently depending on the stage of implementation, ensuring the final proposed methodology is both relevant and practically applicable.

As a typical representative of information systems, the Enterprise Resource Planning (ERP) system was selected for the purposes of this dissertation. ERP systems are comprehensive software platforms used to manage and integrate core business processes across various departments within an organization. Among the most widely used ERP solutions globally are SAP and Microsoft Dynamics 365. Given their dominant market position and extensive practical use, the methodologies associated with these two systems – SAP Activate and Microsoft Sure Step – were evaluated in this study to determine their suitability for structuring the implementation life cycle in a way that aligns with the aims of this research. In addition to vendor-specific approaches, traditional project management frameworks like IPMA, PMI, and PRINCE2 are considered. However, these are too general for ERP implementation and lack the tailored guidance found in SAP Activate and Microsoft Sure Step, which are specifically designed for the unique demands of ERP projects.

Microsoft Sure Step offers a structured, phase-based methodology with clear stages such as Diagnostic, Analysis, Design, Development, Deployment, and Operation. Each phase includes detailed tasks and deliverables, with templates and tools to support efficient planning, risk management, and quality assurance. Its structured nature, combined with some agile features, allows for adaptability while maintaining a consistent framework, making it suitable for both small and large projects. SAP Activate, in contrast, follows a hybrid approach combining waterfall and agile principles. It includes phases such as Discover, Prepare, Explore, Realize, Deploy, and Run. The methodology incorporates Fit-to-Standard workshops, iterative development, and continuous feedback, all of which help align the system with evolving business needs. A key component of SAP Activate is its use of LeanIX, a tool for enterprise architecture management that enhances planning, tracking, and system alignment throughout the implementation.

Both methodologies support agile and waterfall strategies, but Microsoft Sure Step remains more traditionally structured, while SAP Activate leans more into agile flexibility in later phases. Despite differences, they share the common goal of guiding ERP projects toward successful implementation by organizing tasks into manageable and logical stages. Ultimately, for the purposes of this dissertation and its planned focus group research, Microsoft Sure Step is selected as the preferred methodology. The main reason lies in its clearly named and described phases, which better support participants' understanding and reduce the risk of confusion. Since focus group members will directly engage with the methodology's phases, clarity in terminology is critical to ensuring the accuracy and reliability of the research process.

As part of the secondary research, attention was given to how digitalization and remote collaboration are reflected in project implementation, and to what extent existing project management standards respond to these trends. The COVID-19 pandemic accelerated the use of digital tools and remote work, which has had a lasting impact on how projects are managed across industries. These changes raise questions about whether traditional methodologies still provide effective guidance under current conditions.

A comparative analysis of IPMA, PMI, and PRINCE2 reveals different levels of responsiveness. IPMA promotes competence-building and discusses current issues at events but has not updated its official materials since 2018. PMI, in contrast, has taken concrete steps with its 2021 PMBOK Guide, which introduces principles for managing distributed teams and

adapting to modern conditions. PRINCE2 remains largely unchanged, with its last update in 2017, and shows little engagement with post-pandemic challenges.

The last part of secondary research is dedicated to how frequently information systems, especially ERP systems, are implemented in companies and to what extent digitalization and remote collaboration are integrated into these projects. ERP implementations are demanding and carry high risks – failed projects can cause serious financial damage or even lead to bankruptcy. Nonetheless, ERP adoption across the EU has steadily grown, rising from 22.6% of businesses in 2010 to 43.3% in 2023. However, national differences are stark: Belgium reached 59.5% adoption by 2023, while the Czech Republic declined from a peak of 38% in 2019 to 29% in 2023.

Small enterprises (0 – 49 employees) dominate the EU economy, representing over 99% of all businesses, which significantly shapes ERP implementation trends. A deeper look at Czech data between 2010 and 2023 shows that fluctuations in ERP adoption often correlate with shifts in company structure and possibly market conditions, although this was not the main focus of the analysis.

Data from the ZEFIS portal, based on 203 respondents from Czech and Slovak companies, shows that 55.2% adopted new digital tools due to the pandemic, but a Kendall's tau of -0.089 and p-value of 0.2023 indicate no statistically significant link between company turnover and digital tool adoption. Similarly, over 80% of respondents reported actively trying to improve the quality of remote meetings (e.g., using cameras or whiteboards), and only 15.6% perceived a decline in service quality from software suppliers due to remote collaboration. A statistically significant moderate negative correlation (Kendall's tau = -0.26, p = 0.0003) was found between these two variables, suggesting that those who proactively improve virtual communication perceive less decline in service quality.

Taking into account the limitations of the research, the results suggest that, in response to the COVID-19 pandemic, companies increasingly adopted and utilized digital tools and remote collaboration options. The level of satisfaction with IT support provided by suppliers during this transition appears to depend on the company's ability and effort to actively mitigate the disadvantages of remote cooperation by implementing supportive measures.

6.2 Summary the Results of Empirical Research Conducted

The primary research part was carried out through two focus groups – an initial exploratory session and a later confirmatory one. The research was conducted in alignment with the design science research paradigm. Each group consisted of six participants, carefully selected to maintain a balanced representation of both customer and implementer perspectives. On the implementer side, key project roles were included, namely project managers and consultants, with consultants represented by individuals such as application architects, analysts, or testers. The customer side featured professionals from a wide range of business domains, including finance, sales, marketing, logistics, and manufacturing. Both men and women were included to ensure diversity.

A key requirement for participation was hands-on experience with at least one project involving the implementation of an information system. Participants' profiles and backgrounds were documented through a pre-session questionnaire, which also provided insight into the number of projects each person had been involved in. One significant outcome of this questionnaire was the identification of digital tools and technologies that participants considered meaningful in the context of system implementation. Based on their responses, several thematic categories were defined: customer relationship management, online communication, high-fidelity prototyping, document management and storage, project planning and task management, risk management, automation, and reporting. These categories were established based on the declared purpose or vendor classification of the mentioned tools and serve as a foundation for understanding which digital applications professionals rely on most during ERP and IS implementation projects.

The research was structured around the meaningful use of remote collaboration and elements of digitalization applications across project phases. Through three rounds of focus group interviews involving experienced professionals from both customer and implementer sides, a wide range of insights was gathered to inform the creation of a modified implementation methodology.

Participants agreed that face-to-face interaction is crucial in the diagnostic and early analysis phases, when trust and mutual understanding are built. As projects progress into design and development, remote collaboration becomes more acceptable and even preferred, particularly for structured activities such as task management or code development. The deployment phase

generated mixed views: while data migration was seen as well-suited for remote execution, go-live support required physical presence due to the need for immediate troubleshooting and reassurance for users. User training sparked the greatest disagreement – some preferred personal sessions to boost user confidence, while others supported shorter, remote formats. There is a consensus among participants that company culture plays a key role in this issue. Digital-first culture strongly supports success in remote collaboration. In the operation phase, remote collaboration was widely accepted, as the system is stable and less hands-on involvement is needed. These trends were quantified using magnitude coding, showing a growing acceptance of remote work across the project timeline, with specific exceptions.

The second subject of interest is how digital tools are integrated into project phases. Participants confirmed the essential role of communication platforms, with emphasis on video quality, interactive features, and user familiarity. Project planning, task management, and document storage tools were also widely used, valued for their ability to support consistency across all stages. High-fidelity prototyping and risk management tools were appreciated by customers but not commonly used by implementers, mostly due to concerns about time, budget, or perceived added value. Automation tools were mainly applied in the development phase, particularly for regression and unit testing. Reporting tools were commonly used internally throughout the project and externally at key milestones.

Based on these findings, the modified methodology reflects not only the technical structure of information system implementations but also the practical realities of modern collaboration and tool usage. It recognizes the value of combining remote and onsite work depending on project phase and task type and highlights the importance of selecting the right elements of digitalization, digital technology and application in other words, to give support and mitigate risks of remote collaboration.

6.3 Addressing Research Questions

When defining the aim of this dissertation as well as the description of the artifact, six research questions were established. Finding answers to these questions were the focus of the research and led specifically to the design of the artifact and the fulfillment of the research aim. These questions are as follows:

- **Question no. 1:** Which project management methodologies contain a description of the project life cycle suitable for the implementation of enterprise information systems?
- **Question no. 2:** How are elements of digitalization and remote collaboration considered within implementation projects and do the existing project management standards reflect current trends in this area?
- **Question no. 3:** Is there an increase in the application of enterprise information systems implementation projects and an increased frequency of use of digitalization and remote collaboration elements?
- **Question no. 4:** At what phases of information systems implementation and how intensively is it appropriate to use selected elements of digitalization and remote collaboration?
- **Question no. 5:** Are there any extraordinary parts of the project phases in terms of using digitalization and remote collaboration elements?
- **Question no. 6:** How does the approach to the modified methodology of the implementation of enterprise information systems differ from the point of view of the size of the enterprise?

The answers to each of them are contained in Chapter 6 – Solutions and Results of the Dissertation, however, this chapter serves to summarize all the results so that everything can be clearly found in one place.

RQ no. 1: Which project management methodologies contain a description of the project life cycle suitable for the implementation of enterprise information systems?

The research conducted in this dissertation identifies Microsoft Sure Step and SAP Activate as the most suitable methodologies for implementing enterprise information systems, particularly ERP solutions like SAP S/4HANA and Microsoft Dynamics 365. Unlike general standards such as PMI, IPMA, or PRINCE2, these two methodologies offer clearly defined project life cycles tailored specifically for ERP implementations.

Microsoft Sure Step was found to be especially appropriate due to its structured phases: Diagnostics, Analysis, Design, Development, Deployment, and Operation – which are supported by clear terminology and practical tools. This clarity proved beneficial in the empirical part of the research, particularly in focus group discussions.

SAP Activate also provides a complete life cycle through its six phases and uses a hybrid agile approach. However, its terminology and structure were found to be more complex and less intuitive for research participants.

In summary, while both methodologies meet the criteria, Microsoft Sure Step is better suited for use in research and practice due to its clearer phase definitions and better alignment with user understanding.

RQ no. 2: How are elements of digitalization and remote collaboration considered within implementation projects and do the existing project management standards reflect current trends in this area?

The research conducted within this dissertation confirms that elements of digitalization and remote collaboration have become increasingly relevant in project implementation, particularly following the global pandemic. These shifts have changed how project teams interact, how timelines are managed, and how outcomes are delivered – raising the need to evaluate whether existing project management standards reflect these trends.

The comparative analysis shows that the Project Management Institute (PMI) has been the most proactive in addressing these changes. Its updated PMBOK Guide (7th edition, 2021) includes practical guidance for managing distributed teams and supports remote collaboration. PMI also reinforces these developments through ongoing events and thematic discussions focused on disruption in project environments. The International Project Management Association (IPMA), while not formally updating its ICB standard after 2020, reflects current issues through community-driven initiatives and conferences that address topics such as virtual teamwork and organizational change. However, the absence of direct updates in its guidebook limits its immediate applicability. PRINCE2, in contrast, shows little adaptation. Its latest edition predates the pandemic, and no supplementary materials or events have been introduced to reflect the shift toward remote or digital project settings.

In conclusion, the findings show that current project management standards differ significantly in their ability to reflect trends in digitalization and remote collaboration. PMI leads with formal and practical integration, IPMA shows partial responsiveness through its community, and PRINCE2 remains largely static in this regard.

RQ no. 3: Is there an increase in the application of enterprise information systems implementation projects and an increased frequency of use of digitalization and remote collaboration elements?

The research confirms a long-term upward trend in the adoption of enterprise information systems, particularly ERP systems, within the EU. The share of companies using ERP rose from 22.6% in 2010 to 43.3% in 2023, although national variations remain significant. In the Czech Republic, for example, ERP adoption declined from a high of 38% in 2019 to 29% in 2023, indicating that growth is not uniform.

In parallel, the research suggests an increased use of digitalization and remote collaboration tools, especially following the COVID-19 pandemic. More than half of surveyed Czech and Slovak companies (55.2%) adopted new digital tools in response to the pandemic. Additionally, over 80% of respondents reported actively working to improve the quality of remote meetings. Importantly, a statistically significant correlation was found between proactive efforts to enhance virtual communication and a more positive perception of service quality from software providers.

These findings indicate that while ERP adoption varies by country and company size, there is a clear and growing tendency among companies to integrate digital and remote collaboration tools into implementation projects. The success of these tools, however, appears to depend on how actively companies address the challenges of remote work.

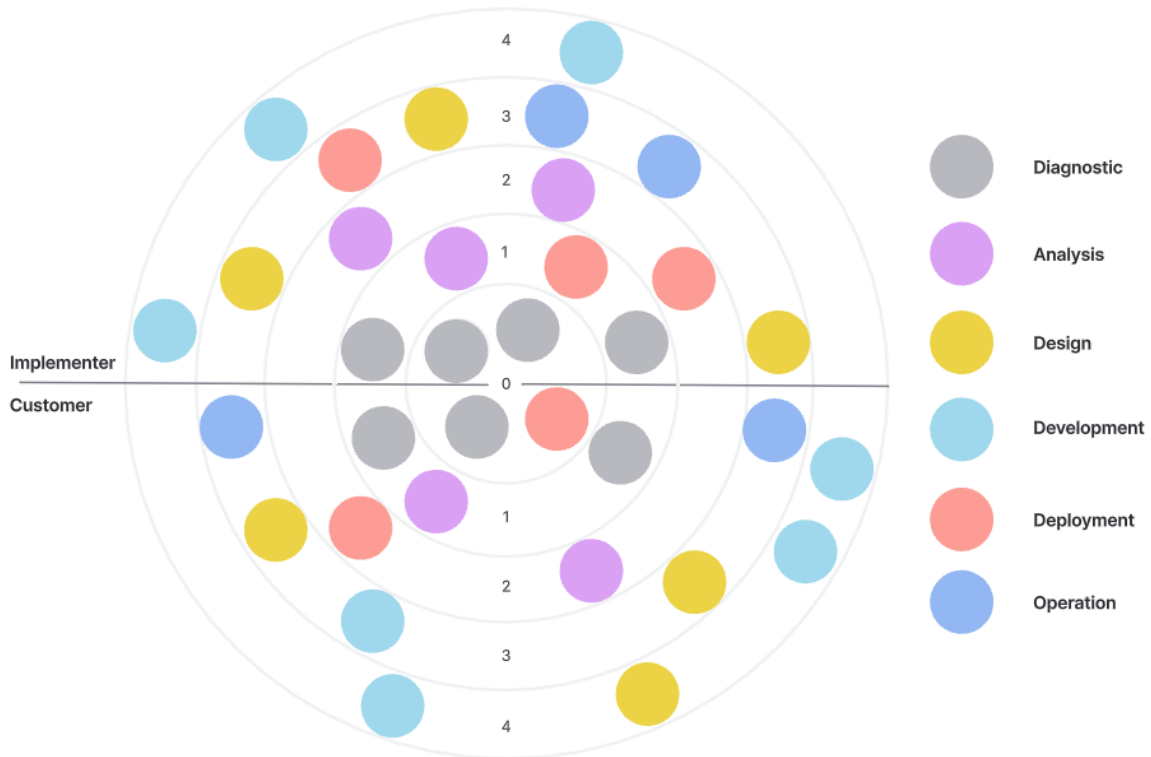
RQ no. 4: At what phases of information systems implementation and how intensively is it appropriate to use selected elements of digitalization and remote collaboration?

The findings from the qualitative research, based on multiple rounds of focus group interviews, show that the appropriateness and intensity of digitalization and remote collaboration vary significantly across different phases of an information system implementation project. Personal presence was seen as most meaningful in the early phases – especially Diagnostic and Analysis – where relationship-building and understanding of complex business processes are essential. In these phases, the use of remote collaboration was considered limited and less meaningful.

From the Design phase onward, remote collaboration becomes increasingly meaningful. In the Development phase, all participants agreed that remote communication supports project activities in a meaningful way. The Deployment phase was more complex; while data migration

was widely accepted as meaningful to carry out remotely, go-live support was viewed as requiring on-site presence. Opinions on user training were mixed, with preferences depending on training type, complexity, and user experience. In the final Operation phase, remote collaboration was considered fully meaningful, as issues are generally less critical and the system is already stabilized.

Figure 5: Radial Map with Remote Collaboration in Project Phases



Source: own elaboration in Confluence Whiteboard.

Digital tools followed a similar pattern of selective use. Communication platforms, document management systems, and project/task management tools were seen as meaningful across all phases. CRM tools were mainly relevant in early stages, while automation and risk management were associated more with Development and Deployment. Prototyping tools were valued in Analysis and Design but faced resistance due to time and budget constraints. Overall, the success of using tools and collaboration depends on choosing options that are meaningful for the specific phase and aligned with project needs.

RQ no. 5: Are there any extraordinary parts of the project phases in terms of using digitalization and remote collaboration elements?

The research identified two extraordinary areas within project phases that stand out in terms of the use of digitalization and remote collaboration: the Deployment phase and training activities.

The Deployment phase is particularly complex because it contains highly diverse activities. While data migration is considered almost universally meaningful to perform remotely, go-live support emerged as a moment where physical presence is crucial. Participants emphasized that having consultants on-site during system launch builds user confidence, allows for quick issue handling, and provides a more meaningful level of support in a critical moment. This contrast within a single phase makes Deployment an extraordinary case requiring tailored approaches depending on the sub-activity.

Another extraordinary area is user training, which generated a wide range of views. Some participants insisted on face-to-face training to ensure clarity and confidence, especially when user skills were limited. Others supported remote training in shorter, more focused blocks, citing practicality and evolving habits. A clear conclusion was that both formats are meaningful depending on factors such as training complexity, user experience, and company culture. This insight led to a hybrid training model, where the form is adapted based on specific conditions.

These two areas stand out as requiring special attention in implementation methodology. Their complexity and diversity highlight the importance of selecting digital and collaborative elements that are meaningful and adapted to the real context of each activity.

RQ no. 6: How does the approach to the modified methodology of the implementation of enterprise information systems differ from the point of view of the size of the enterprise?

The final iteration of the research focused on examining whether the size of an enterprise has any impact on the applicability of the modified methodology for implementing enterprise information systems. Participants represented all three company categories as defined by the European Union: small, medium, and large enterprises. All participants, both from the customer and implementer sides, had experience with implementations across these categories.

The research findings show a clear consensus: the size of the enterprise does not meaningfully affect the applicability of the modified methodology. According to respondents, elements such as remote collaboration and the use of digital tools can be applied in a similar way regardless of the company's size. What may vary, however, are contextual factors such as the number of

people involved in the project, the complexity of internal processes, and the corporate culture – whether it leans more toward digital-first or in-person collaboration.

Implementers emphasized that while the core structure of the methodology remains consistent, the role of internal coordination becomes more important in smaller teams, where project managers or coordinators must ensure clear communication and a collaborative environment. Nevertheless, no participant expressed any doubt that the methodology itself could be meaningfully applied across different enterprise sizes.

Figure 6: Modified Methodology

Project Phases		Remote Collaboration		Digital Technology & Application Involvement	
Phase	Brief Description	Level	Comments	Category	Comments
Diagnostic	<ul style="list-style-type: none"> Evaluate a customer's business processes and infrastructure. Assist the customer with their due diligence cycle, including ascertaining requirements and their fit with the solution, and assessing the resource needs. Prepare the project plan, proposal, and the Statement of Work. 	★	The importance to build relationships and address concerns expediently.	<ul style="list-style-type: none"> CRM Online Communication DMS & Storage 	In CRM system, the process ends with the conclusion of the contract. The collection of additional data during the project is not necessary.
Analysis	<ul style="list-style-type: none"> Analyze current business model and finalize the Functional Requirements document Finalize the fit-gap analysis. Develop the Environment Specification documentation. 	★★	Personal interaction is important to identify critical processes and potential issues. The design of the analysis itself can be done remotely without difficulty.	<ul style="list-style-type: none"> Online Communication High Fidelity Prototyping DMS & Storage Project Planning and Task Management Reporting 	Quality communication through online tools requires arrangements that bring it closer to In-person meetings. A digital-first corporate culture is an essential aspect.
Design	<ul style="list-style-type: none"> Develop the Functional Design, Technical Design, and Solution Design documents. Finalize the data migration design Establish test criteria. 	★★★	Most of the activities can be done remotely. At some moments, on-site presence can be beneficial to ensure alignment with the client's vision and to refine design elements.	<ul style="list-style-type: none"> Online Communication High Fidelity Prototyping DMS & Storage Project Planning and Task Management Risk Management Reporting 	Separate environment for client and supplier in DMS & Storage is appreciated. Content management systems could be an interesting, even more efficient alternative. The customer would appreciate a high fidelity system to get a better idea, the supplier is concerned about the time commitment.
Development	<ul style="list-style-type: none"> Finalize configurations and setup of the standard solution. Develop and finalize the custom code that is required to support the solution. Conduct functional and feature testing of the solution. Create the user training documentation. 	★★★★	All the activities are expected to be done remotely. Care must be taken to keep the client in the loop.	<ul style="list-style-type: none"> Online Communication DMS & Storage Project Planning and Task Management Automation Reporting 	Universal project tools that provide complete project management from planning and task management to resource management are all-in-one possibility that resonates.
Deployment	<ul style="list-style-type: none"> Set up the production environment. Migrate data to the production environment. Conduct user acceptance test of the system. Train users and finalize the user documentation. Conduct go-live check and promote the system to production. 	★★★	Setup and data migration is doable remotely. Views on training vary (see Table 13: Decisive detail). GO-LIVE support is clearly recommended on-site.	<ul style="list-style-type: none"> Online Communication DMS & Storage Project Planning and Task Management Risk Management Reporting 	Reporting continuously for internal needs, at the end of the phase also for the client. Risk management tools are not widely used by suppliers, whereas customers would appreciate them.
Operation	<ul style="list-style-type: none"> Resolve pending issues. Finalize user documentation and knowledge transfer. Conduct a post-mortem of the project. Provide on-going support (activities that continue through any future involvement with the customer after the project is closed). 	★★★	Once the system is in operation, remote support is adequate. Except for partial milestones, it is convenient to collaborate remotely.	<ul style="list-style-type: none"> Online Communication DMS & Storage Project Planning and Task Management 	Automation functionalities have their place in so-called unit tests for automatic testing of key system features.
Level of Remote Collaboration: 0 – 4 stars.					
Digital Technology & Application Categories: CRM, Online Communication, High Fidelity Prototyping, DMS & Storage, Project Planning and Task Management, Risk Management, Automation, Reporting.					

Source: own elaboration in Confluence Whiteboard.

7 Discussion

7.1 Confrontation of the Results with Existing Sources

This research has led to a number of findings that have been examined from other perspectives or in other contexts by other researchers. This research has reached a number of findings that have been examined from other perspectives or in other contexts by other researchers. Terms of the quality of the research, it is important to confront the results of this dissertation with other sources, whether they will confirm or deny individual findings.

One of the authors who also address the issue of digitization in projects are Kier, Aaltonen and Huemann (2020). This article focuses on the impact of digitalization on stakeholder management in projects, especially in the context of virtual teams and remote collaboration. It mentions how digitalization is changing the way projects are managed, how communication and collaboration takes place, and how project management is adapting to new trends. The conclusions of their study align with the findings of this dissertation, particularly in emphasizing that successful stakeholder engagement in a digital environment requires not only the appropriate selection of technologies but also a suitable organizational culture and value-oriented collaboration framework. The authors also confirm a general shift in project management from a control-based approach toward a value-focused and co-creative model. In contrast, this dissertation provides a more detailed breakdown of the phases of information system implementation, specifically assessing the appropriateness of remote collaboration and the use of digital tools in each stage. This adds a practical dimension to the conceptual framework presented in Kier, Aaltonen and Huemann's work. Both studies agree on the importance of face-to-face interaction during the early phases of a project and the increasing acceptance of remote work in later stages. Their study thus offers a valuable theoretical foundation for understanding the impact of digitalization on stakeholder management, while this dissertation builds on it with a more applied focus on enterprise information systems implementation.

As stated in this dissertation, of all the major project standards, PMI is the most active in working with the idea of digitalization in project management. Bushuyev, Ding and Radujkovic (2023) confirm this in their work and emphasize that project managers must adapt their methods to the new digital reality. According to this source, it is essential for project

management to respond flexibly to the new demands of digitalization. At the same time, Halonen (2011) confirms in his work that traditional methodologies often fail in the issue of organizing information systems due to their rigidity. More recent research complements this by Zimmermannová et al. (2022), who focuses on the hospital environment. According to her conclusions, the pandemic has changed the dynamics of work and methodologies must adapt. Only those that reflect new tools and ways of collaboration will be useful.

In addition to the issue of digitization and the use of digital tools in project management, some sources also deal with collaboration in a virtual environment and remote collaboration. This issue is addressed, for example, by Kraljic and Kraljic (2018) even in the time before COVID-19. These authors emphasize the importance of creating a digital environment that supports remote collaboration. They talk about improving processes and supporting collaboration in modern enterprises. What differs from this dissertation is that they see digitalization as a result of implementation, not as an opportunity to improve implementation. Prokopi (2021) adds that digital collaboration tools, such as video conferencing and document management platforms, play a key role in successful project management. This article confirms the finding that effective management of virtual teams depends on quality collaboration and communication tools, which is consistent with the results of this dissertation.

The usefulness of using communication tools to support remote collaboration is also addressed by Kordova and Hirschprung (2023). They examined how effective digital platforms were for communication in project teams during the COVID-19 pandemic. In their experimental research involving around 160 university students divided into three types of teams – fully face-to-face, mixed (individual and virtual), and fully online (using tools like Zoom, WhatsApp, and Trello). They found that face-to-face collaboration led to the highest team performance and synergy. Virtual teams, despite using modern tools, did not perform better than individuals working alone and sometimes even performed worse. These results suggest that virtual communication cannot fully replace face-to-face interaction, especially in the early phases of a project when building trust and understanding is critical. This finding strongly supports the results of this dissertation, which also highlights the limited effectiveness of remote collaboration during the diagnostic and analysis phases of information system implementation. In this dissertation research, participants repeatedly emphasized the importance of in-person engagement in early project stages, while remote work was seen as more appropriate and efficient during later technical phases such as design, development, and

operation. While the study by Kordova and Hirschprung focuses mainly on communication outcomes in educational project settings, its conclusions align closely with the professional experiences gathered in this dissertation from real-world ERP implementation projects. Both studies show that digital tools alone do not guarantee success and that the combination of remote collaboration and structured planning, adapted to the specific project phase, is essential for achieving positive outcomes.

The research of this dissertation also dealt with the applicability of the modified methodology from the perspective of the size of the company in which the information system is implemented. The results of the qualitative research indicate that the size of the company does not affect whether the use of digitalization elements and remote collaboration will be meaningful in individual phases of the projects. The research participants also repeatedly added that they give much greater weight to the successful use of the modified methodology to the organizational culture. These results are completely consistent with the statement of Vuchkovski et al. (2023), who claim in their work that the digital maturity of the company and organizational culture play a significantly more important role than the size of the company.

7.2 Limits of the Research

In the future, it would be beneficial to complement this research approach with long-term case studies that track projects in companies over an extended period. Such an approach would allow for better verification of causal relationships and the creation of stronger theoretical models that could be applied in other situations.

Another limitation concerns the data used in the research. The secondary data came from publicly available statistics (Eurostat, Czech Statistical Office) and the ZEFIS survey, which included 203 companies. However, this type of data is based on self-assessment by respondents, which may lead to an overestimation of the use of digital tools, as respondents tend to present their practices in a more favorable light. Furthermore, national reporting methodologies differ, making it difficult to accurately compare data between countries. In the future, it would be advisable to verify this data using other sources, such as logs from implementation partners or analytics from cloud platforms.

Another limitation is the deliberate definition of the scope of the research:

- Technological Focus: Digitization was limited to the area of digital technologies & applications and did not include dynamically evolving technologies such as advanced AI/ML features, blockchain, or IoT.
- Choice of Reference Life Cycle: The Microsoft Sure Step methodology was chosen, which was preferred over methodologies such as SAP Activate and general standards (PMI, IPMA, PRINCE2), which were not empirically tested in the research. The reference life cycle mainly serves the purpose of calibration and theoretical alignment between the researcher and the research participants, so its choice does not impact the quality of the research.
- Project Type: The outcomes focus primarily on ERP implementations, meaning they are not automatically transferable to green-field software development projects or short agile sprint projects.

The research took place during and soon after the COVID-19 pandemic, which had a significant impact on work practices and the use of digital tools. This context may have influenced participants' perceptions and the data, as the pandemic accelerated the adoption of remote collaboration and digital tools. However, it is uncertain whether these practices will remain as widespread and stable after the pandemic. Therefore, it is recommended to conduct longitudinal studies to verify whether these changes in the use of digital tools will be sustained after the pandemic ends.

Geographical and cultural factors may also influence the transferability of the results. Participants were primarily from Central Europe, where cultural attitudes towards hierarchy, risk, and work culture differ from other regions. In countries with higher digital maturity, such as the Nordic countries, or in other cultural environments, such as Asia, opinions on the use of digital tools and remote collaboration may differ. It would therefore be useful to conduct comparative studies in other regions.

Regarding generalizability, the research findings were valid for companies of various sizes, as shown by the validation group, but caution should be exercised when applying the conclusions to very small companies, highly regulated industries, or global projects with multiple geographic locations where time synchronization is more complex. These areas were not examined in detail in this research, so it would be helpful to replicate the study in these contexts to confirm the universality of the proposed methodology.

8 Contributions of the Dissertation Thesis

8.1 Scientific Contribution

The primary scientific contribution lies in the identification of meaningful uses of digitalization and remote collaboration elements depending on the various stages of the project lifecycle. Previous research primarily focused on the application of these elements in other contexts, often considering digitalization as the outcome of an implementation project, rather than an integral tool during the project itself. By focusing on the triple constraints of project time, cost, and quality, and demonstrating how digitalization and remote collaboration positively impact these factors, this dissertation adds valuable insights to both the academic community and industry professionals seeking to understand the evolving landscape of information system implementations.

Furthermore, the dissertation contributes to the scientific field by applying the Design Science Research methodology, a less common but effective approach in this area. This methodology enables the creation and evaluation of artifacts that bridge the gap between theoretical knowledge and practical implementation strategies. The use of DSR in this context is novel and enriches the research field by demonstrating how it can be utilized to address the complexities of modern project management in information systems.

8.2 Field of Managerial Practice

The conclusions and implications of this research will be broadly applicable to all participants and stakeholders involved in implementation projects. This includes representatives of international project management methodologies, certified and non-certified project managers, and software manufacturers who have a significant interest in ensuring the successful implementation of their products as frequently as possible.

Through the President of IPMA Czech Republic, the results of this dissertation will be made available to all scientific researchers and representatives of the project management community. This topic is frequently discussed in forums and conferences. This work contributes to the strategic decision-making of project managers, as it offers a clear roadmap for applying these tools at different stages of the project.

8.3 Pedagogical Contribution

The announced results of the dissertation will also find their application in the field of education. By focusing on the meaningful involvement of digitalization and remote collaboration elements, the doctoral thesis can significantly enhance the pedagogical framework for teaching corporate information systems. The work offers a novel perspective on how information systems implementation projects can be managed more meaningfully in a digital-first world. It integrates theoretical knowledge with practical examples of digital tool usage, providing educators with a structured methodology that can be applied in both academic and professional training settings. By presenting a modified methodology that includes the latest advancements in digitalization and remote collaboration, the work helps bridge the gap between traditional project management practices and the needs of the modern business environment.

9 Conclusion

This dissertation's core focus is on modifying the methodology for the implementation of enterprise information systems, with a primary emphasis on incorporating elements of digitalization and remote collaboration. These elements are considered key to meaningful and successful project management of information system implementations. The motivation arose from increasing demands for the relevance and flexibility of implementation processes, particularly evident during the global pandemic that accelerated the transition to digital technologies and new forms of remote collaboration. This necessitated a reassessment of traditional methodologies and adaptation to newly emerging requirements, such as remote communication, flexible work environments, and the integration of digitalization into all project phases.

The main goal of the dissertation was to design and verify a modified methodology for implementing information systems that would integrally consider elements of digitalization and remote collaboration in each phase of the project lifecycle. Challenges identified related to the optimal use of digitalization and remote collaboration tools depending on the specific project phase. Research results indicated that digital tools and remote collaboration can significantly contribute to improving the quality, relevance, and cost control within the project

cycle. The design science research methodology was employed, noted as "relatively innovative, less widely used" and enriching the academic community.

In conclusion, the proposed methodology not only fills a gap in research but also offers practical and scientific contributions. It is designed to be flexible and ready for future challenges, such as the integration of new technologies like artificial intelligence and blockchain. However, the dissertation also reflects challenges of multi-year development, including a "shift in my career focus" and, more significantly, the aging of the topic. The use of digital tools and remote collaboration has seen a diametric difference in the five years since the topic's initial relevance. Consequently, some of the dissertation's outputs have more of an inspirational character for environments that are not at the forefront of technological and process innovations, rather than being progressive and looking into the future.

Bibliography

A guide to the project management body of knowledge: PMBOK guide. (2013) (5th Ed.). Project management institute.

Adam, D. (2024). What science says about hybrid working — and how to make it a success. *Nature*, d41586-024-00643-2. <https://doi.org/10.1038/d41586-024-00643-2>.

Arena, L., Mola, L., Remond, N., & Rowe, F. (2020). How do enterprise software providers adapt their strategies to the cloud? An analysis through SAP Hana journey based on the evolution of SAP's discourse (2010-2018). *Proceedings of the 53rd Hawaii International Conference on System Sciences*. <https://doi.org/10.24251/hicss.2020.679>.

Aroles, J., Mitev, N., & de Vaujany, F. -X. (2019). Mapping themes in the study of new work practices. *New Technology, Work and Employment*, 34(3), 285-299. <https://doi.org/10.1111/ntwe.12146>.

Atkinson, R. (1999). Project management: Cost, time, and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, 17(6), 337-342. [https://doi.org/10.1016/S0263-7863\(98\)00069-6](https://doi.org/10.1016/S0263-7863(98)00069-6).

Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital Affordances, Spatial Affordances, and the Genesis of Entrepreneurial Ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72-95. <https://doi.org/10.1002/sej.1266>.

Ayat, M., Imran, M., Ullah, A., & Kang, C. W. (2020). Current trends analysis and prioritization of success factors: a systematic literature review of ICT projects. *International Journal of Managing Projects in Business*, 14(3), 652–679. <https://doi.org/10.1108/IJMPB-02-2020-0075>.

Balakrishnan, A. D., Fussell, S. R., & Kiesler, S. (2008). Do visualizations improve synchronous remote collaboration? In *Proceeding of the twenty-sixth annual CHI conference on Human factors in computing systems – CHI '08* (s. 1227–1236). ACM Press. <https://doi.org/10.1145/1357054.1357246>.

Barbour, R. S. (2007). *Doing focus groups*. SAGE Publications.

Ballatore, M. (2023). *Le(s) rôle(s) de la blockchain dans l'évolution des relations inter-organisationnelles : Une analyse de la servicisation digitale dans l'industrie automobile* (Doctoral dissertation, Université Côte d'Azur). Université Côte d'Azur. <https://theses.fr/2023COAZ0011>.

Baskerville, R. L., Elliman, T., Kiesler, S., & Kang, C. W. (2008). Investigating Information Systems with Action Research: The Role of Stakeholders in Managing Change. *Communications of the Association for Information Systems*, 2(3), 1227-1236. <https://doi.org/10.17705/1CAIS.00219>.

Basl, J., & Blažiček, R. (2012). *Podnikové informační systémy: podnik v informační společnosti* (3rd Ed.). Grada.

Beheshti, H. M., & Beheshti, C. M. (2010). Improving productivity and firm performance with enterprise resource planning. *Enterprise Information Systems*, 4(4), 445–472. <https://doi.org/10.1080/17517575.2010.511276>.

Berman, S. J. (2012). Digital transformation: Opportunities to create new business models. *Strategy & Leadership*, 40(2), 16-24. <https://doi.org/10.1108/10878571211209314>.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *MIS Quarterly*, 37(2), 471-482.

Bouwman, H., Nikou, S., Molina-Castillo, F. J., & de Reuver, M. (2018). The impact of digitalization on business models. *Digital Policy, Regulation and Governance*, 20(2), 105-124. <https://doi.org/10.1108/DPRG-07-2017-0039>.

Brucks, M. S., & Levav, J. (2022). Virtual communication curbs creative idea generation: Correction. *Nature*, 606(7915), E17. <https://doi.org/10.1038/s41586-022-04852-5>.

Bushuyev, S., Ding, R., & Radujkovic, M. (Eds.). (2023). *Project management in the digital transformation era: The proceedings of the 32nd World Congress of the International Project Management Association (IPMA)*. Springer.

Camilleri, E. (2012). *Project Success: Critical Factors and Behaviours* (324 p.). Farnham: Gower Publishing. ISBN 978-0-566-09228-2.

Costa, E., Soares, A. L., & Sousa, J. (2018). Exploring the CIMO-Logic in the design of collaborative networks mediated by digital platforms. In L. M. Camarinha-Matos, H.

Afsarmanesh, & Y. Rezgui (Eds.), *Proceedings of the 19th Working Conference on Virtual Enterprises (PRO-VE)* (pp. 266-277). Cardiff, United Kingdom. https://doi.org/10.1007/978-3-319-99127-6_23.

Costa, E., Soares, A. L., & de Sousa, J. P. (2020). Industrial business associations improving the internationalisation of SMEs with digital platforms: A design science research approach. *International Journal of Information Management*, 53, 102070. <https://doi.org/10.1016/j.ijinfomgt.2020.102070>.

Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed methods approaches* (4th Ed.). SAGE

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Cyr, J. (2019). *Focus groups for the social science researcher*. Cambridge University Press. <https://doi.org/10.1017/9781316987124>.

Czech Statistical Office. (2024). ICT in enterprises. Retrieved November 13, 2024, from <https://csu.gov.cz/ict-in-enterprises?pocet=10&start=0&podskupiny=403&razeni=-datumVydani>

Daft, R. L., & Lengel, R. H. (1986). Organizational Information Requirements, Media Richness and Structural Design. *Management Science*, 32(5), 554-571. <https://doi.org/10.1287/mnsc.32.5.554>.

Denyer, D., Tranfield, D., & Van Aken, J. E. (2008). Developing design propositions through research synthesis. *Organization Studies*, 29(3), 393-413. <https://doi.org/10.1177/0170840607088020>.

Dobson, M. (2004). *The triple constraints in project management* (1st Ed.). Management Concepts.

Doering, C., Schmidtner, M., März, J., Müller, V., & Timinger, H. (2020). Agile working during COVID-19 pandemic. *Research Notes on Data and Process Science*, 2020(1), 27. <https://doi.org/10.5281/zenodo.5801219>.

Doležal, J., Máchal, P., & Lacko, B. (2012). *Projektový management podle IPMA* (2nd Ed.). Grada.

Downey, L., Fonzone, A., & Fountas, G. (2022). DATASET: The impact of Covid-19 on travel behaviour, transport, lifestyles and residential location choices in Scotland. [Dataset]. <https://doi.org/10.17869/enu.2022.2853752>.

Erhan, T., Uzunbacak, H. H., & Aydin, E. (2022). From conventional to digital leadership: exploring digitalization of leadership and innovative work behavior. *Management Research Review*, 45(11), 1524-1543. <https://doi.org/10.1108/MRR-05-2021-0338>.

Ernst & Young. (2011). "Digital Transformation for 2020 and Beyond: A Global Survey." *Ernst & Young Global Limited*.

Estagnasié, C. (2023). *'Working the time': Time self-management practices of remote workers*. Cambridge University Press. <https://doi.org/10.1017/9781009297288.010>.

Eurostat. (2024). Enterprise statistics by size class and NACE Rev.2 activity. Retrieved November 13, 2024, from https://ec.europa.eu/eurostat/databrowser/view/SBS_SC_OVW/default/table?lang=en

Freeman, T. (2006). 'Best practice' in focus group research: making sense of different views. *Journal of Advanced Nursing*, 56(5), 491-497. <https://doi.org/10.1111/j.1365-2648.2006.04043.x>.

Gála, L., Pour, J., & Šedivá, Z. (2015). *Podniková informatika: Počítačové aplikace v podnikové a mezipodnikové praxi* (3rd Ed.). Grada Publishing.

Gartner. (2020, April 14). Gartner HR survey reveals 41% of employees likely to work remotely at least some of the time post coronavirus pandemic [News release]. Gartner. Retrieved December 3, 2020, from <https://www.gartner.com/en/newsroom/press-releases/2020-04-14-gartner-hr-survey-reveals-41--of-employees-likely-to->.

Glass, G. V. (1976). Primary, Secondary, and Meta-Analysis of Research. *Educational Researcher*, 5(10), 3-8. <https://doi.org/10.3102/0013189X005010003>.

Gilson, L. L., Maynard, M. T., Jones Young, N. C., Vartiainen, M., & Hakonen, M. (2015). Virtual Teams Research. *Journal of Management*, 41(5), 1313-1337. <https://doi.org/10.1177/0149206314559946>.

Gobble, M. M. (2018). Digitalization, Digitization, and Innovation. *Research-Technology Management*, 61(4), 56–59. <https://doi.org/10.1080/08956308.2018.1471280>.

- Hadjikhani, A. I., & Lindh, C. (2020). Digital love – inviting doubt into the relationship: the duality of digitalization effects on business relationships. *Journal of Business & Industrial Marketing*, 36(10), 1729–1739. <https://doi.org/10.1108/JBIM-05-2020-0227>.
- Halonen, R. (2011). Removing obstacles when implementing inter-organisational information systems. *International Journal of Information Technology and Management*, 10(2–4), 242–259. <https://doi.org/10.1504/IJITM.2011.042587>.
- Haugan, G. (2013). *The new triple constraints for sustainable projects, programs, and portfolios* (393 p.). Boca Raton: CRC Press. ISBN 978-146-6505-186.
- Hendl, J. (2012). *Kvalitativní výzkum: základní teorie, metody a aplikace* (3rd Ed.). Portál.
- Hevner, A., & Chatterjee, S. (2010). *Design research in information systems: Theory and practice*. Springer. <https://doi.org/10.1007/978-1-4419-5653-8>.
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. *MIS Quarterly*, 28(1), 75-105. <https://doi.org/10.2307/25148625>.
- Hox, J. J., & Boeije, H. R. (2005). Data Collection, Primary vs. Secondary. *Encyclopedia of Social Measurement*, 593-599.
- Chandrachoodan, G., & Radhika, R. (2022). Exploratory factor analysis for identifying the factors affecting adoption of project management methodology in information systems development in Kerala. In *AIP Conference Proceedings* (s. 1–15). American Institute of Physics. <https://doi.org/10.1063/5.0102981>.
- Chanias, S., Myers, M. D., & Hess, T. (2019). Digital Transformation Strategy Making in Pre-Digital Organizations: The Case of a Financial Services Provider. *The Journal of Strategic Information Systems*, 28(1), 17-33. <https://doi.org/10.1016/j.jsis.2018.11.003>.
- Charmaz, K. (2001). Grounded theory. In R. M. Emerson (Ed.), *Contemporary field research: Perspectives and formulations* (2nd ed., pp. 335–352). Waveland Press.
- Chesbrough, H. (2020). To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective. *Industrial Marketing Management*, 88, 410–413. <https://doi.org/10.1016/j.indmarman.2020.04.010>.

Chiu, Y. (2010). *An introduction to the history of project management: From the earliest times to A.D. 1900* (1st Ed.). Delf.

ICB – IPMA Competence Baseline Version 3.0. (2006) (3rd Ed.). International Project Management Association.

Johnston, M. (2014). Secondary Data Analysis: A Method of which the Time Has Come. *Qualitative and Quantitative Methods in Libraries*, 3(3), 619-626.

Jugdev, K., & Thomas, J. (2002). Project management maturity models: The silver bullets of competitive advantage? *Project Management Journal*, 33(4), 4-14. <https://doi.org/10.1177/875697280203300402>.

Kala Kamdjoug, J. R., Bawack, R. E., & Tayou, A. E. T. (2020). An ERP success model based on agency theory and IS success model. *Business Process Management Journal*, 26(6), 1577–1597. <https://doi.org/10.1108/BPMJ-04-2018-0113>.

Kazakov, S., Ruiz-Alba, J. L., & Muñoz, M. M. (2020). The impact of information and communication technology and internal market orientation blending on organisational performance in small and medium enterprises. *European Journal of Management and Business Economics*, 30(2), 129–151. <https://doi.org/10.1108/EJMBE-04-2020-0068>.

Kerzner, H. (2017). *Project management: A systems approach to planning, scheduling, and controlling* (12th ed.). Wiley.

Kier, C., Aaltonen, K., & Huemann, M. (2020). Digitalization as a game changer in project stakeholder management. In S. Bushuyev, R. Ding, & M. Radujkovic (Eds.), *Project management in the digital transformation era: Proceedings of the 32nd IPMA World Congress* (pp. 101–114). Springer. https://doi.org/10.1007/978-3-030-34629-3_8.

Koch, M., Dovrtěl, J., Hrůza, T., & Neničková, H. (2010). *Management informačních systémů* (3rd Ed.). Akademické nakladatelství CERM.

Kock, A., Schulz, B., Kopmann, J., & Gemünden, H. G. (2020). Project portfolio management information systems' positive influence on performance – the importance of process maturity. *International Journal of Project Management*, 38(4), 229–241. <https://doi.org/10.1016/j.ijproman.2020.05.001>.

Kordova, S., & Hirschprung, R. S. (2023). Effectiveness of the forced usage of alternative digital platforms during the COVID-19 pandemic in project communication management. *Heliyon*, 9(8), e21812. <https://doi.org/10.1016/j.heliyon.2023.e21812>.

Kousholt, B. (2007). *Project Management* (1st ed., 503 p.). Copenhagen: Nyt Teknisk Forlag. ISBN 978-87-571-2603-7.

Kraljic, A., & Kraljic, T. (2018). ERP integration: Enhancing collaboration in virtual and extended enterprises. In R. J. Howlett, L. C. Jain, & S. Tonfoni (Eds.), *Proceedings of the International Conference on Business Informatics Research* (pp. 190–201). Springer. https://doi.org/10.1007/978-981-99-8111-3_16.

Krueger, R. A., & Casey, M. A. (2015). *Focus groups: A practical guide for applied research* (5th ed.). SAGE Publications.

Lester, A. (2014). *Project management, planning, and control: Managing engineering, construction, and manufacturing projects to PMI, APM, and BSI standards* (6th ed., 592 pages). Oxford: Butterworth-Heinemann. ISBN 978-008-0983-219.

Leyh, C., Köppel, K., Neuschl, S., & Pentrack, M. (2021). Critical Success Factors for Digitalization Projects. In *Proceedings of the 16th Conference on Computer Science and Intelligence Systems, FedCSIS 2021* (s. 427–436). Institute of Electrical and Electronics Engineers. <https://doi.org/10.15439/2021F122>.

Liu, Z., Ding, R., Gong, Z., & Ejohwomu, O. (2023). Fostering Digitalization of Construction Projects through Integration: A Conceptual Project Governance Model. *Buildings*, 13(3). <https://doi.org/10.3390/buildings13030825>.

Lock, D. (2007). *Project management* (9th ed., 544 pages). Hampshire: Gower Publishing Limited. ISBN 978-0-566-08772-1.

March, S. T., & Smith, G. F. (1995). Design and natural science research on information technology. *Decision Support Systems*, 15(4), 251-266. [https://doi.org/10.1016/0167-9236\(94\)00041-2](https://doi.org/10.1016/0167-9236(94)00041-2).

Microsoft Learn. (2021). Implementation Methodology. Retrieved October 30, 2024, from <https://learn.microsoft.com/en-us/dynamicsax-2012/appuser-itpro/implementation-methodology>

- Molnár, Z., Mildeová, S., Řezanková, H., Brixí, R., & Kalina, J. (2012). *Pokročilé metody vědecké práce* (1st Ed.). Profess Consulting.
- Morgan, D. L. (1996). Focus groups. *Annual Review of Sociology*, 22, 129-152. <https://doi.org/10.1146/annurev.soc.22.1.129>.
- Morgan, D. L. (1997). *Focus groups as qualitative research* (2nd ed.). SAGE Publications.
- Morgan, D. L. (1998). *The focus group guidebook*. SAGE Publications.
- Morris, P., Pinto, J., & Söderlund, J. (2011). *The Oxford handbook of project management*. Oxford University Press. ISBN 978-019-1629-389.
- Munns, A. K., & Bjeirmi, B. F. (1996). The role of project management in achieving project success. *International Journal of Project Management*, 14(2), 81-87. [https://doi.org/10.1016/0263-7863\(95\)00057-7](https://doi.org/10.1016/0263-7863(95)00057-7).
- Moulin, C., Kaeri, Y., Sugawara, K., & Abel, M. -H. (2016). Capitalization of remote collaborative brainstorming activities. *Computer Standards & Interfaces*, (48), 217–224. <https://doi.org/10.1016/j.csi.2015.11.006>.
- Muszyńska, K. (2016). Project communication management patterns. In *Proceedings of the 2016 Conference* (pp. 1179-1188). <https://doi.org/10.15439/2016F235>.
- Nagel, L. (2020). The influence of the COVID-19 pandemic on the digital transformation of work. *International Journal of Sociology and Social Policy*, 40(9/10), 861–875. <https://doi.org/10.1108/IJSSP-07-2020-0323>.
- Nair, K. (2019). Overcoming today's digital talent gap in organizations worldwide. *Development and Learning in Organizations: An International Journal*, 33(6), 16–18. <https://doi.org/10.1108/DLO-02-2019-0044>.
- Němec, V. (2002). *Projektový management* (1st ed., 182 pages). Praha: Grada. ISBN 80-247-0392-0.
- Niederman, F. (2021). Project management: openings for disruption from AI and advanced analytics. *Information Technology & People*, 34(6), 1570–1599. <https://doi.org/10.1108/ITP-09-2020-0639>.

Nurbossynova, S., Sautbekov, A., Zholdaskhan, B., Abdallah, Y., & Shehab, E. (2021). Critical Success Factors of Digitalization of Kazakhstan Manufacturing Industry. In *2021 IEEE International Conference on Smart Information Systems and Technologies (SIST)*. IEEE. <https://doi.org/10.1109/SIST50301.2021.9465926>.

Nyandongo, K. M., & Lubisi, J. (2019). Assessing the use of project management information systems and its impact on project outcome. In *Proceedings of the International Conference on Industrial Engineering and Operations Management* (s. 1501–1512). IEOM Society.

Ogunbukola, O. (2024). *The impact of digital transformation on project management*. Business Publishing House.

Olson, D. L., & Kesharwani, S. (2009). *Enterprise Information Systems: Contemporary Trends and Issues* (1st Ed.). World Scientific.

Olson, M. H., & Primps, S. B. (1984). Working at home with computers: Work and nonwork issues. *Journal of Social Issues*, 40(3), 97-112.

Palumbo, R. (2020). Let me go to the office! An investigation into the side effects of working from home on work-life balance. *International Journal of Public Sector Management*, 33(6/7), 771–790. <https://doi.org/10.1108/IJPSM-06-2020-0150>.

Peffer, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2014). A design science research methodology for information systems research. *Journal of Management Information Systems*, 24(3), 45-77. <https://doi.org/10.2753/MIS0742-1222240302>.

Pejtersen, J. H., Feveile, H., Christensen, K. B., & Burr, H. (2011). Sickness absence associated with shared and open-plan offices – a national cross sectional questionnaire survey. *Scandinavian Journal of Work, Environment & Health*, 37(5), 376–382. <https://doi.org/10.5271/sjweh.3167>.

Pinto, J. K. (2013). *Project management: Achieving competitive advantage* (4th ed.). Pearson.

Prokopi, E. (2021). Leading virtual project teams. *Project Management Journal*, 52(6), 586–600. <https://doi.org/10.1002/pmj.20659>.

Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the Nutrition Society*, 63(4), 655-660. <https://doi.org/10.1079/PNS2004399>.

Raymond, B. B. (2023). *The potential of augmented reality for tackling environmental sustainability challenges: An approach combining design science and behavioral science* (Doctoral dissertation, Université Côte d'Azur). Université Côte d'Azur. <https://tel.archives-ouvertes.fr/tel-04167165>.

Reis, J., Amorim, M., Melão, N., & Matos, P. (2018). Digital Transformation: A Literature Review and Guidelines for Future Research. *Procedia Computer Science*, 164, 411-416.

Rose, K. (2005). *Project quality management: Why, what, and how* (192 p.). Boca Raton: J. Ross Publishing. ISBN 19-321-5948-7.

Ruivo, P., Mestre, A., Johansson, B., & Oliveira, T. (2014). Defining the ERP and CRM Integrative Value. *Procedia Technology*, 16, 704–709. <https://doi.org/10.1016/j.protcy.2014.10.019>.

Saldana, J. (2015). *The coding manual for qualitative researchers* (3rd ed.). SAGE Publications.

SAP Activate. (2023). SAP Discover Phase Activities. Retrieved October 30, 2024, from <https://www.leanix.net/en/wiki/tech-transformation/sap-activate-discover-phase-activities>

Seale, C. (2012). *Researching society and culture* (3rd ed.). SAGE Publications.

Shaanika, I. N., & Amunkete, K. N. (2021). A critical review of the Namibian Government IS/T Projects assessments for readiness before deployment– a STOPE view. In *2021 3rd International Multidisciplinary Information Technology and Engineering Conference (IMITEC)* (s. 1–8). IEEE. <https://doi.org/10.1109/IMITEC52926.2021.9714673>.

Sherstobitova, A. A., Glukhova, L. V., Sergeeva, I. G., & Tihanova, N. Y. (2019). The Remote Process Support for Collaborative Work. In *Smart Education and e-Learning 2019* (s. 631–641). Springer Singapore. https://doi.org/10.1007/978-981-13-8260-4_55.

Sodomka, P., & Klčová, H. (2010). *Informační systémy v podnikové praxi* (2nd Ed.). Computer Press.

Stanford, J. (2020). *Ten Ways the Covid-19 Pandemic Must Change Work for Good* (1st Ed.). Canadian Centre for Policy Alternatives.

Svozilová, A. (2006). *Projektový management* (1st Ed.). Grada.

Špatenka, J. (2014). *Analysis of IPMA and PMI standards and their comparison* [Diploma thesis, Mendel University in Brno]. Brno, Czech Republic.

Špatenka, J., & Koch, M. (2022). *Project Management Standards and Their Ability to Adapt to Global Changes*. Vydavateľstvo EKONÓM, University of Economics in Bratislava.

Stewart, D. W., & Shamdasani, P. N. (2014). *Focus groups: Theory and practice* (3rd ed.). SAGE Publications.

Taboada, I., Daneshpajouh, A., Toledo, N., & de Vass, T. (2023). Artificial Intelligence Enabled Project Management: A Systematic Literature Review. *Applied Sciences*, 13(8). <https://doi.org/10.3390/app13085014>.

Tait, M., Tsai, T., Sakata, N., Billingham, M., & Vartiainen, E. (2013). A projected augmented reality system for remote collaboration. *2013 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, 1-6. <https://doi.org/10.1109/ISMAR.2013.6671838>.

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social & behavioral research* (2nd ed.). Sage.

Taylor, R., & Martindale, S. (2014). Alternative and complementary research approaches. *The essentials of nursing and healthcare research*, 155–174.

Toscano, F., & Zappalà, S. (2020). Social Isolation and Stress as Predictors of Productivity Perception and Remote Work Satisfaction during the COVID-19 Pandemic: The Role of Concern about the Virus in a Moderated Double Mediation. *Sustainability*, 12(23). <https://doi.org/10.3390/su12239804>.

Trisnawaty, N. W., Raharjo, T., Hardian, B., & Prasetyo, A. (2021). Success Criteria and Factor for IT Project Application Implementation in Digital Transformation Era: A Case Study Financial Sector Industry. *2021 IEEE International IOT, Electronics and Mechatronics Conference*, 1-7. <https://doi.org/10.1109/IEMTRONICS52119.2021.9422578>.

Turner, J. R., & Müller, R. (2005). The project manager's leadership style as a success factor on projects: A literature review. *Project Management Journal*, 36(2), 49-61. <https://doi.org/10.1177/875697280503600206>.

- Urbaniec, M., Małkowska, A., Włodarkiewicz-Klimek, H., & Kang, C. W. (2022). The Impact of Technological Developments on Remote Working: Insights from the Polish Managers' Perspective. *Sustainability*, *14*(1), 427-453. <https://doi.org/10.3390/su14010552>.
- Van Aken, J. E. (2004). Management research based on the paradigm of the design sciences: The quest for field-tested and grounded technological rules. *Journal of Management Studies*, *41*(2), 219-246. <https://doi.org/10.1111/j.1467-6486.2004.00430.x>.
- Varajão, J., Fernandes, G., & Silva, H. (2020). Most used project management tools and techniques in information systems projects. *Journal of Systems and Information Technology*, *22*(3), 225–242. <https://doi.org/10.1108/JSIT-08-2017-0070>.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118-144. <https://doi.org/10.1016/j.jsis.2019.01.003>.
- Vrana, J., & Singh, R. (2021). Digitization, digitalization, and digital transformation. *Handbook of Nondestructive Evaluation 4.0*, 1–17.
- Vuchkovski, D., Zalaznik, M., Mitreĝa, M., & Pfajfar, G. (2023). A look at the future of work: The digital transformation of teams from conventional to virtual. *Journal of Business Research*, *163*, 113912. <https://doi.org/10.1016/j.jbusres.2023.113912>.
- Vuorinen, L., & Martinsuo, M. M. (2018). Lifecycle view of managing different changes in projects. *International Journal of Managing Projects in Business*, *12*(1), 120–143
- Wallmüller, E. (2017). *Praxiswissen Digitale Transformation: Den Wandel verstehen, Lösungen entwickeln, Wertschöpfung steigern*. Munich: Hanser. <https://doi.org/10.3139/9783446452732>.
- Wang, B., Liu, Y., Qian, J., & Parker, S. K. (2021). Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective. *Applied Psychology*, *70*(1), 16-59. <https://doi.org/10.1111/apps.12290>.
- Wang, C., Zhang, M., & Alzubi, O. A. (2022). The road to change: Broadband China strategy and enterprise digitization. *PLOS ONE*, *17*(5). <https://doi.org/10.1371/journal.pone.0269133>.
- Westerman, G., Bonnet, D., & McAfee, A. (2014). The Nine Elements of Digital Transformation. *MIT Sloan Management Review*, *55*(3), 1-12.

Wu, T. (2021). Digital project management: rapid changes define new working environments. *Journal of Business Strategy*, 43(5), 323–331. <https://doi.org/10.1108/JBS-03-2021-0047>.

Yang, L., Holtz, D., Jaffe, S., Suri, S., Sinha, S., Weston, J., Joyce, C., Shah, N., Sherman, K., Hecht, B., & Teevan, J. (2022). Author Correction: The effects of remote work on collaboration among information workers. *Nature Human Behaviour*, 6(1), 164-164. <https://doi.org/10.1038/s41562-021-01228-z>.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage

ZEFIS. (2024). ZEFIS - audit informačních systémů. Retrieved November 13, 2024, from <https://www.zefis.cz/index.php?p=1>

Zháněl, J., Hellebrandt, V., & Sebera, M. (2014). *Metodologie výzkumné práce* (1st Ed.). Masarykova univerzita.

Zhang, L., Mohandes, S. R., Tong, Y., Cheung, C., Banihashemi, S., & Shan, M. (2023). Sustainability and Digital Transformation within the Project Management Area: A Science Mapping Approach. *Buildings*, 13(5). <https://doi.org/10.3390/buildings13051355>.

Zillner, J., Mendez, E., & Wagner, D. (2018). Augmented reality remote collaboration with dense reconstruction. In *2018 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)* (pp. 38–39). IEEE. <https://doi.org/10.1109/ISMAR-Adjunct.2018.00028>.

Zimmermannová, J., Pavlík, L., & Chytilová, E. (2022). Digitalisation in hospitals in COVID-19 times—A case study of the Czech Republic. *Economies*, 10(3), Article 68. <https://doi.org/10.3390/economies10030068>.