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UNIVERSITÄT BERN

VIRTUAL TEAM COLLABORATION

OPPORTUNITIES AND PITFALLS OF FULLY VIRTUALIZED TEAM COLLABORATIONS WITH COMPLEX ROLE AND WORK CONTEXT CONNECTIONS IN HIGHER EDUCATION

Inaugural dissertation on obtaining the dignity of a
Doctor rerum oeconomicarum
of the Faculty of Business, Economics and Social Sciences
of the University of Bern

SUBMITTED BY
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Acknowledgments

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Clemens Rudolf Deinhofer

Abstract

Motivation. Fully virtualized team collaborations have become a key competency in higher education, especially in complex roles and work contexts connections (VTC+). This form of collaboration requires not only technical skills but also a deep understanding of communication, coordination, and social dynamics in digital environments. The intersection of complex roles—such as educators, researchers, and administrative staff—and the specific challenge of virtual collaboration is critical for enhancing the effectiveness of such teams. So far, the literature provides an abundance of research on VTC+ that examine handling, individual satisfaction, and group performance according to their tension potentials. In the end literature shows up to now shortcomings in design-oriented approaches that bring together the identified tension potentials to deliver a successful and effective VTC+. This dissertation project addresses this grievance by taking a fine-grained perspective and examining measures of how higher education can use VTC+.

Research gaps and research questions. Based on the systematic literature review, it was found that the conceptualization of a VTC+ is fundamentally feasible with the existing VTC+ literature if either the fragmented insights are independently synthesized, and or the media choice theory is applied as a conceptual foundation. In the latter case, the literature review revealed that this is possible by the instrumentalization of genre analysis, which must then be proactively and cognition-based applied. However, since this approach itself was not established, an independent evaluation of its methodological implementation was also necessary. Therefore, motivated by the urgent need of higher education institutions to develop a successful and effective application concept for a VTC+, as well as by the identified shortcomings in the literature, the aim of this dissertation was, to answer the following questions:

- Dissertation Project Question One: *"Which concepts of fully virtualized team collaboration with complex role and work context connections should be applied by higher education participants to lead a successful and effective VTC+?"*

- Dissertation Project Question Two: *"How much do effectiveness, performance, and practicality differ?"*

Methodology. This dissertation is based on a systematic literature review, a multiple case study, and a design science research study. All studies were conducted as part of a partly externally funded research project. For the literature review relevant future research opportunities were identified. The case studies were intended to use the scattered insights in the VTC+ literature in combination with the proactive cognition-based genre analysis approach. The aim was to conceptualize a VTC+ concept and then to implement, execute and evaluate the concept in higher education settings. Mainly qualitative data collection and data analysis methods were used. A single-choice survey questionnaire was used to determine whether participants in the case studies had experience with VTC+. Furthermore, archived documents were collected

during the research project. These range from course concept documents to deliverable object documents. In the case of the design science research study initial design principles were developed based on literature. These principles were then utilized with the use cases of the multiple case study. Furthermore, to gain new knowledge the principles were evaluated two times. One time with expert discussions and another time with expert interviews. Overall, the results of this dissertation come from the following data pools.:

- 15 Workshops
- 325 critical analyzed peer reviewed literature
- 6 Single-choice questionnaires
- 6 Longitudinal field observations
- 4 Semi-structured interviews
- 4 Semi-structured questionnaires
- 8 Expert workshops
- 8 Focus group discussions
- 11 Semi-structured expert interviews
- 28.40 GB archived documents

Contributions and theoretical implications. Based on the research undertaken in this dissertation, within the synopses cause-and-effect interdependencies were developed that examines the opportunities and risks based on the practicality of fully virtualized team collaboration with complex role and work context connections in higher education. The conceptual impact relationships relate the contributions provided by the individual investigations undertaken to the set research artifact of this dissertation. Using this it emerged as finding, that the application of VTC+ is highly valued and widely accepted. It was discovered that the willingness to apply a VTC+ is closely intertwined with organizational uncertainty. Thus, previous negative experiences with VTC+ concepts trigger the willingness to act to enable VTC+. It was also found that knowledge about the successful and effective design of a VTC+ additionally influences the willingness to act to implement a VTC+ in higher education.

Further it was observed that when providing VTC+, the collaboration concept should support the requirement of maintaining satisfaction, motivation, and willingness to participate and maintaining team identification. Without directly considering the concept of a potential VTC+, can lead to significant communication and coordination comprehension problems in the target agreement provision. Due to the virtuality, maintaining satisfaction, motivation, willingness to participate, and team identification is essential. Negative effects due to virtuality usually come to light late in the mature state.

Lastly it became apparent that VTC+ should be conceptualized so that effective information systems, task completion approaches, communication practices and coordination practices are available for all pending tasks essential for achieving the target definition. Providing appropriate communication and coordination practices before starting collaboration plays a key role. This can lead to considerable

communication and coordination comprehension problems without the provision. This can negatively impact satisfaction, motivation, willingness to participate, and team identification. Finally, disregarding the third finding also harms the willingness to act to apply a VTC+ concept because uncertainty can be increased.

Originality/value. Due to that only few research address the conceptualization, implementation, and execution of a VTC+ in higher education, this dissertation project addresses this shortcoming and closes it with providing a practice-oriented developed concept for VTC+ as well as with practice oriented developed design principles which were assessed in multiple cycles. Based on a theoretical conceptualization of a prototype, the developed concept was critically evaluated with a practice-oriented research project. In the process, a concept was found that considers the conceptualization, implementation, and execution of VTC+ in higher education and can utilize the potential of a successful and effective VTC+. VTC+ must be conceptualized, implemented, and executed with care. With this dissertation project, a concept could be found to use the potential. As well as relevant design principles could found that close the prescriptive knowledge gap towards the conceptualization, implementation and execution of VTC+ in higher education

Note: This cumulative dissertation consists of three research papers and is divided into two main parts: the synopses (Part A) and the presentation of the three studies (Part B). Part A introduces the topic and situates the studies within the broader research field. It outlines key theoretical concepts, methodological approaches, and overarching research questions while synthesizing the findings in a broader scientific context. Part B comprises the three manuscripts developed during this dissertation project, documenting their conceptual development, empirical implementation, and scientific reflection. The studies were conducted sequentially, reflecting the chronological progression of the research. Each study addresses distinct aspects of VTC+ in higher education, contributing to the academic discourse on digital collaboration:

Paper A   Deinhofer (2025). Reflection on successful and effective conceptualization, implementation, and execution of fully virtualized team collaborations with external stakeholders with IT consulting problems. What concepts are relevant? (under review)

Paper B   Deinhofer, C., & Myrach, T. (2024). Using genre analysis for conceptualising virtual team collaborations with complex role and work context connections: what implementation problems can occur? Behaviour & Information Technology, 1–19. https://doi.org/10.1080/0144929X.2024.2433033

Paper C   Deinhofer (2025). Design principles for fully virtualized team collaboration in higher education. The application of a design science approach on seminar development. (ready to submit)

Keywords: *virtual team collaboration, opportunities, pitfalls, handling of virtual teams, individual satisfaction, group performance, qualitative research*

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PART A

Dissertation´s Synopsis

1. Introduction

The COVID-19 pandemic has significantly disrupted higher education, challenging traditional teaching, learning, and collaboration practices (Raphael, 2021). One of the most profound transformations has been the shift from face-to-face to virtual team collaboration (VTC), a development that has reshaped academic work and study environments. While VTC offers promising opportunities for flexibility, efficiency, and inclusivity, it also presents considerable challenges that must be addressed to ensure its successful implementation in higher education (Waizenegger et al., 2020).

Despite extensive research on the difficulties associated with VTC (Greenhaus & Beutell, 1985; Jarvenpaa & Leidner, 1999; Kiesler et al., 1984), there remains limited knowledge about how to effectively integrate virtual team collaboration with complex role and work context connections (VTC+) into higher education. Existing studies have highlighted potential benefits such as enhanced work-life balance (Ahuja et al., 2007), reduced commuting time (Kelliher & Anderson, 2010), and increased focus by avoiding workplace distractions (Fonner & Stache, 2012). However, these advantages can only be fully realized if VTC+ is conceptualized and executed in a way that maintains or improves the quality and effectiveness of academic collaboration, particularly as universities continue transitioning toward hybrid or fully virtual models (Nguyen et al., 2021).

The rapid adoption of remote work and learning during the COVID-19 pandemic has provided substantial evidence that VTC+ can function effectively in higher education (Waizenegger et al., 2020). However, this structural shift raises critical questions about how it has reshaped expectations and behaviors among educators, students, and administrators. If higher education institutions are to harness the full potential of VTC+, it is essential to identify strategies that mitigate its pitfalls, such as reduced engagement, communication breakdowns, and challenges in maintaining academic rigor. The existing literature on VTC+ offers only limited guidance on how to design and implement virtual collaboration in a sustainable and effective manner, particularly in the post-pandemic era (Benlian, 2020; Seeber & Erhardt, 2023).

Motivated by the gap in research regarding the successful conceptualization and implementation of VTC+ in higher education, this dissertation seeks to explore both the opportunities and risks of VTC+. Specifically, it addresses the following research questions:

- Dissertation Project Question One: *"Which concepts of fully virtualized team collaboration with complex role and work context connections should be applied by higher education participants to lead a successful and effective VTC+?"*

- Dissertation Project Question Two: *"How much do effectiveness, performance, and practicality differ?"*

To answer these questions, a systematic literature review (Okoli, 2015; Webster & Watson, 2002) was conducted to establish a theoretical foundation and gain a

comprehensive overview of the research artifact. Based on these insights, a prototype of a VTC+ model for higher education was developed, addressing key conceptualization and evaluation constructs. The prototype was subsequently instantiated, implemented, and evaluated in a fully virtualized management education seminar at two universities. A deductive qualitative content analysis was employed to assess its effectiveness (Benbasat et al., 1987; Mayring, 2004). Following the design science approach, this dissertation derives design requirements, principles, and features that support and legitimize the application of VTC+ in higher education (Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020).

The structure of this synopsis is as follows: First, the research artifact is reviewed through a literature-based analysis. The practical background and theoretical foundation of the dissertation are then presented. Next, the characterization of the dissertation project is discussed, providing an overview of the methodological and scientific approach. The findings, including identified opportunities and challenges, are then outlined. Finally, the research questions are answered, and conclusions are drawn regarding the practical and theoretical implications of implementing VTC+ in higher education..

2. Input knowledge

2.1 Virtual team collaboration
This dissertation project systematically abstracted the literature on VTC and media choice theory. This abstraction resulted from the fact that working from home is largely based on the collaboration concept of virtual teams (VT) (Waizenegger et al., 2020), and collaboration concepts of VT can be operationalized with the help of media choice theory (Fiedler & Gallenkamp, 2007).

VTC differs from traditional forms of work in that the team members are (at least partially) geographically and/or organizationally separated and thus have significantly less or even no physical contact (Powell, 2004). Based on the degree of geographic and organizational separation of participants in a VTC, it can be divided into pure and hybrid VTC. For this dissertation project, both notions of VTC are relevant.

The term pure VTC is used when all participants in VT are at a different geographical location and do not meet at a geographical location during the entire collaboration period. Communication or coordination takes place exclusively in virtual spaces. The term hybrid VTC is used when there is some physical contact and/or when some, but not all, team members are in the same location (on-site) while other members are geographically dispersed (Webster & Wong, 2008).

As VTC has become increasingly relevant in practice due to digital transformation, research in this area has also increased (Hess et al., 2016). VTC has been studied at the individual, organizational, and societal levels (Waizenegger, 2015). Thematically, the research focused on two main factors, opportunities, and risks. Among others, leadership, team composition, and communication technologies (Fonner & Stache, 2012), VT processes and activities such as knowledge management (Rafaeli & Ravid,

2003), and output factors resulting from VT, such as performance indicators, team efficiency, and team satisfaction (Lurey & Raisinghani, 2001), have been studied more deeply.

Current research suggests that VTC is desired, appreciated, and used (Seeber & Erhardt, 2023; Xiaoxia Duan et al., 2023). The reasons for this are many and varied. Among them are, for example, the reduction of commuting time (Kelliher & Anderson, 2010) or the avoidance of distractions (Fonner & Stache, 2012). Finally, the VTC literature often points out that the individuals surveyed do not want to work from home daily but value the flexibility of freely arranging time and place (Delanoeije et al., 2020).

Furthermore, the research considers the specifics of VTC or VTC+. This is because several problems can occur along the successful and effective conceptualization, implementation, and execution (Benlian, 2020). Research indicates that team identity can fade much more easily during the implementation of a VTC than traditional collaboration concepts (Von Thülen & Hartl, 2021).

2.2 Media choice theory

Concerning the research artifact set, it was decided to use media choice theory instrumentalization theory because of its potential to operationalize application concepts of team collaboration. In this dissertation project, the line of thought of media choice approaches was selected. These elaborations build on the idea that collaboration concepts can be conceptualized using communication analysis techniques (Grieb, 2007; Reichwald et al., 1998; Riemer & Filius, 2009).

As with the different schools of thought, there are several ways to conceptualize collaboration approaches among the representatives of media choice approaches. Among the most cited can be listed papers on the task-oriented media choice model (Reichwald et al., 1998), Grieb's media model (Grieb, 2007), and genre analysis (Riemer & Filius, 2009). Specifically, it was decided to choose genre analysis to develop the prototype.

The genre analysis is based on the idea that possible communication and coordination situations in social communities, such as pure or hybrid VTC, are divided into genres and individual episodes. Based on these, the intended collaboration concept can finally also be conceptualized, implemented, and executed based on their occurring communication and coordination genres and episodes.

This approach is more feasible than media richness and hybrid approaches for proper conceptualization, implementation, and execution of a VTC (Fiedler & Gallenkamp, 2007; Riemer & Filius, 2009).

Concerning the operationalizability of genre analysis, however, recent research also shows weaknesses (Figl & Saunders, 2011). Potential collaborations are only analyzed theoretically based in advance on a situational approach. Proactive cognition-based conceptualizations are not considered so far. In this dissertation project the genre analysis was used proactive cognition-based to develop an application concept. Concerning the consideration of social aspects in proactive communication analyses,

recent research also shows grievances. In this regard, the paper (Riemer & Filius, 2009) foregrounds that the cause is the fundamental goal of generalization across social contexts.

3. Dissertation project´s characterization

3.1 Project horizon

This dissertation project was aligned with the requirements of a project plan and its essential planning steps (Jenny, 2014). Specific work packages were developed to meet the agreements outlined for the dissertation. As part of the established dissertation endeavor, it was agreed to produce three scientific publications. Additionally, it was agreed that publishing at least one of these in a prestigious Information Systems research journal would be highly desirable.

To adhere to this dissertation agreement, an initial planning horizon of 4 years was set. However, due to the outbreak of the COVID-19 pandemic, this planning horizon had to be extended to 6 years. Among other challenges, the period from 2020 to 2022 posed significant hurdles in research and teaching, which had to be overcome to meet the established qualification phase of this dissertation project.

The set planning horizon was broken down into individual task packages. In the first task package project initialization (TP.1), the task was to start the research project. TP.1 focused therefore on the initialization of the dissertation project; an in-depth literature review was written at the end of the package. Also, first focus group discussions, acquisition of collaboration partners and external stakeholders were made in this package. The main aim of TP.1 was to align the requirements for the research project. Overall, a critical review of peer reviewed literature was made to get in touch with the chosen research artifact.

The second task package development of the VTC+ prototype (TP.2), focused on developing the prototype of a VTC+ in higher education, a successful and effective prototype of a VTC+ in higher education. For this were first conceptualized prototype based on the knowledge gained in the critical review of the peer reviewed literature dealing about conceptualization, implementation and execution of VTC+ initiatives. Following up workshops were held to refine the concept of prototype. Overall, the aim of this package was to get a successful and effective prototype, which was able to implement into a lecture collection. In the end two seminars were instantiated with the prototype. Further another research paper was written.

The third task package development of design requirements, principles, and features (TP.3), the findings found from the previous research were synthesized using focus group discussions and the design science approach (Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020) was applied to develop serious design requirements, principles, and capabilities for a VTC+ initiative in higher education. Again, a paper was written and submitted at the end of this TP.

In the last task package project completion (TP.4), the insights gained from this set dissertation project were again critically reflected upon, and the research questions posed in this report were answered.

3.1 Paper A

This dissertation project was initially required to conceptualize, implement and execute a VTC+ in higher education. This was the return of the sponsors of this dissertation project. Thus, the initialization phase of the set dissertation project aimed to identify the essential expert-reviewed literature on VTC+. With this selection, a concept of a VTC+ could be conceived.

The opportunities and risks associated with VTC+ were also determined in the initialization with the help of the literature research. Furthermore, the research gaps to be focused on and the main categories of the entire dissertation project were identified to be able to answer the research questions in depth and completely. Table 1 has been added for clarity and readability. This characterizes the focus of the first paper.

Content	Description
Topic	Use of fully virtualized team collaboration in higher education
Title	Reflection on successful and effective conceptualization, implementation, and execution of fully virtualized team collaboration with external stakeholders with IT consulting problems. What concepts are relevant?
Questions	▪ What concepts are relevant for successful and effective conceptualization, implementation, and execution of fully virtualized collaborations with external stakeholders with IT consulting problems? ▪ Which future research opportunities could prove beneficial concerning fully virtualized collaborations with external stakeholders with IT consulting problems?
Literature	▪ Peer-reviewed literature on VTC (Jarvenpaa, 2005; Powell, 2004; Malhotra, 2021; von Thülen & Hartl, 2021; Waizenegger et al., 2020; et al.) ▪ Peer-reviewed literature on media choice theory ((Fiedler & Gallenkamp, 2007, Figl & Saunders, 2011; Riemer & Filius, 2009; et al.) ▪ Peer-reviewed literature on constant connectivity theory (Kolb, 2008; Geiger et al., 2016; Waizenegger et al., 2016; et al.)
Method	Systematic literature review (Okoli, 2015; Webster & Watson, 2002)
Data sources	Peer-reviewed manuscripts
Analysis	Paradigm Funnel (Nairn et al., 2006)
Software	Microsoft Office 365 Educational Edition
Results	Identification of specific research gaps and design-oriented approaches that can be used to conceptualize, implement, and execute a successful and effective VTC+ in higher education.

Tab. 1. Characterization of Paper A

The full manuscript is linked in Part B of this dissertation for in-depth information on the research gaps found and the main categories to focus on. Furthermore, the literature review findings will also be related to the set cause-and-effect interdependencies in the subsequent chapters of this synopsis to answer the questions of this synopses.

3.2 Paper B

After identifying the relevant peer-reviewed literature on the successful and effective conceptualization, implementation, and execution of VTC+ in higher education, it was deemed necessary to meet the practical requirements of this dissertation project. Thus, a prototype of a VTC+ in higher education was subsequently developed using the findings from the initialization phase.

In doing so, the media choice theory presented was first used to conduct a proactive theoretical communication analysis to determine which communication and coordination genres and episodes comprised the VTC+ to be created in higher education. This finding was adopted several times by the teaching staff, the program director, and the research team in focus group discussions. The goal here was to overcome the weaknesses found in the literature, such as the need for more consideration of social aspects.

Table 2 contains all essential key data, which were addressed with the development of the prototype, the instantiation, and the implementation and evaluation of the prototype of the second paper.

Content	Description
Topic	Operationalizability of the media choice theory
Title	Using genre analysis for conceptualizing virtual team collaborations with complex role and work context connections: What implementation problems can occur?
Questions	▪ Can a successful and effective fully virtualized seminar with external practice partners and real IT consulting problems be conceived, implemented, and conducted using the genre analysis proactively? ▪ Does the demonstration reveal socially and technologically induced communication and coordination problems that hinder or diminish the effectiveness and efficiency among the various actors?
Literature	▪ Peer-reviewed literature on VTC (Benlian, 2020; Jarvenpaa & Lang, 2005; Waizenegger et al., 2020; et al.) ▪ Peer-reviewed literature on media choice theory (Fiedler & Gallenkamp, 2007, Figl & Saunders, 2011; Riemer & Filius, 2009; et al.)
Method	Multiple case study approach (Benbasat et al., 1987).
Data sources	▪ Semi-structured interviews ▪ Semi-structured surveys ▪ Single-choice survey ▪ Long-term observations ▪ Focus group discussions ▪ Archived documents
Analysis	Deductive qualitative content analysis (Krippendorff, 2011; Kuckartz, 2019; Mayring, 2004)
Software	▪ Microsoft Office 365 Educational Edition ▪ MAXQDA Professional
Results	A successful and effective prototype on VTC+ that addresses the weak spots for conceptualizing, implementing and executing a VTC+.

Tab. 2. Characterization of Paper B

As a result, a functional prototype emerged that crossed the identified weaknesses based on the literature on VTC+ and media choice theory with focus group discussions. This was then instantiated using the communication analysis technique from media choice theory based on a list of activities in the lecture notes and finally demonstrated and evaluated.

For in-depth information on the conceptualization, implementation, and execution of the prototype, the full manuscript is linked in Part B of this dissertation too. Furthermore, as with the first paper, the findings will be related to the set cause-and-effect interdependencies in the subsequent chapters of this synopsis, thereby answering the questions of this dissertation project.

3.3 Paper C

The third paper aims to address the identified prescriptive knowledge gap by deriving and validating design principles for a successful and effective VTC+ in higher education. Based on the thorough literature review, key design requirements, principles, and capabilities were developed. These principles were then evaluated using data from the Paper A and Paper B within an expert panel discussion evaluation cycle and an expert interview cycle to assess their effectiveness and practical utility.

As a result, the design requirements, principles, and capabilities of VTC+ in higher education emerged through an iterative process grounded in both theoretical insights and empirical findings. This approach aligns with the continuous adaptation principle of design science research (Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020). To enhance transparency and clarity regarding the key data from the implementation phase of the second study and the subsequent third paper, Table 3 is attached, outlining the critical details of this research stage.

Content	Description
Topic	Design principles for practice-oriented virtual team collaboration concepts
Title	Design principles for fully virtualized team collaboration in higher education. The application of a design science approach on seminar development.
Questions	▪ How can design principles support successful and effective fully virtualized collaboration with complex role and work context connections? ▪ What design principles should be considered to ensure that collaboration participants effectively reach delivery target agreements?
Literature	▪ Peer-reviewed literature on VTC (Benlian, 2020; Seeber & Erhardt, 2023; Xiaoxia Duan et al., 2023; et al.) ▪ Peer-reviewed literature on media choice theory (Fiedler & Gallenkamp, 2007, Figl & Saunders, 2011; Riemer & Filius, 2009; et al.)
Method	▪ Literature reviewing approach (Okoli, 2015; Webster & Watson, 2002) ▪ Multiple case study approach (Benbasat et al., 1987) ▪ Design science research approach (Peffers et al., 2007; vom Brocke et al., 2020)
Data sources	▪ Semi-structured interviews ▪ Semi-structured surveys

	▪ Single-choice survey ▪ Long-term observations ▪ Archived documents ▪ Expert workshops ▪ Focus group discussions ▪ Expert Interviews
Analysis	▪ Design science research (Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020; et al.) ▪ Deductive qualitative content analysis (Krippendorff, 2011; Kuckartz, 2019; Mayring, 2004)
Software	▪ Microsoft Office 365 Educational Edition ▪ MAXQDA Professional
Results	Identification respectively formulation of relevant design principles that support the successfully and effectively conceptualization, implementation, and execution of VTC+ in higher education.

Tab. 3. Characterization of Paper C

4. Results

4.1 Formulation of cause-and-effect interdependencies

The COVID-19 pandemic has provided broad-based evidence that VTC+ has functioned effectively in regional, national, and international teams within organizations and public institutions (Waizenegger et al., 2020). This is regardless of whether all participants were satisfied with or comfortable using the applied concepts of VTC+, let alone whether the practicality of the applied concept has been deemed effective by all participating individuals.

Through conducted focus group discussions, field observations, interviews, surveys, and literature research, it was observed that participants in the studies held a highly positive view of the VTC+ concept developed for the research project at hand. Interviews revealed that the developed application concept was desired to be used again without adaptations. Positive attitudes towards the developed application concept were also observed in field observations. Therefore, to provide a qualitative and in-depth response to the research artifact of this dissertation project, cause-and-effect interdependencies were formulated. The goal of this endeavor is to establish a clearer connection between potential opportunities and risks after the structural disruption caused by the COVID-19 pandemic, to make profound statements regarding effectiveness and practicality. Considering the objectives of the cause-and-effect interdependencies, several expectations were set. First, the expectation that with the waning of the COVID-19 pandemic, the expectations of lectures, students and external practice partner have increased, and there is a greater desire to practice VTC+.

Second, the expectation that lectures, students and external practice partner, due to the increased demand for various forms of VTC+, also have a higher willingness to allow a significant portion of their work to be conducted through VTC+. This was evident in interviews and field observations, as a participating industry partner noted that they value VTC+ concepts, as it allows them to better balance their professional and personal lives.

Third, the expectation that significant uncertainty will persist in conceptualizing a concept post-COVID-19 pandemic. This is due to factors such as temporal and spatial availability, presence requirements, conducting meetings, and simultaneous use of traditional collaboration concepts. These observations were drawn from various data sources. Figure 1 illustrates the developed cause-and-effect relationships.
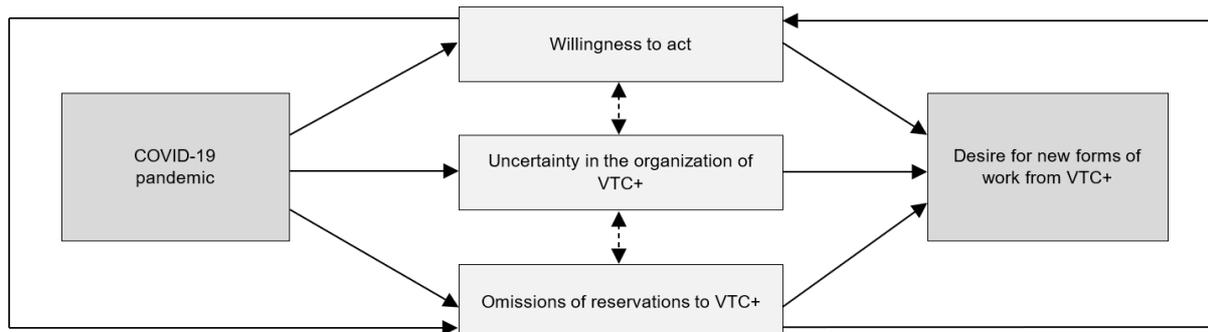
Fig. 1. Cause-and-effect interdependencies

To comprehensively evaluate the opportunities and risks, the main cause-and-effect interdependencies formulated is that many lectures, students and external practice partner through the broad practical experience gained with forced VTC during the COVID-19 pandemic, have recognized that VTC+ concepts fundamentally work. As a result, there has emerged an essential societal need to practice VTC+ (Nguyen et al., 2021). Practical experiences with enforced VTC+ concepts have likely eliminated several reservations, leading to a significant desire to continue using VTC+ (Waizenegger et al., 2020). Furthermore, to delve deeper into the opportunities and risks of VTC+, the main cause-and-effect interdependencies was supplemented with additional sub-interdependencies.

The first profound cause-and-effect interdependency observed is that the COVID-19 pandemic has led to an increasing willingness to act (Thülen & Hartl, 2021). However, there may also be a negative influence, which was found to be less pronounced than the positive effect on willingness to act (Seeber & Erhard, 2023). In the second study's findings, it was observed that all participants in the study, including faculty, coaches, industry partners, and students, exhibited an increasing willingness to practice VTC+. In summary, the first relationship underscores how external events, such as the COVID-19 pandemic, can drive an increased willingness to act, especially regarding the adoption and practice of VTC. While there may be some negative influences or reservations, the overall effect of the pandemic was to accelerate the adoption of virtual collaboration methods, emphasizing their importance and relevance in a rapidly changing world.

The second cause-and-effect interdependency is formulated as follows: the COVID-19 pandemic has led to increased uncertainty in the organization of VTC+. However, this uncertainty can also lead to a reduction in organizational uncertainty for VTC+ (Nguyen et al., 2021). In the conducted research, it was determined that the uncertainty in organizing VTC+ depends on participants' VTC+ experiences. In summary, the second

relationship suggests that while the COVID-19 pandemic initially led to increased uncertainty in organizing VTC+, this uncertainty can diminish over time as organizations and individuals gain experience and develop effective strategies for virtual collaboration. The ability to adapt and learn is key to reducing organizational uncertainty for VTC+ and improving its overall effectiveness.

The third cause-and-effect interdependency is formulated to address whether reservations about VTC+ have disappeared due to COVID-19 or if reservations about VTC+ have increased during the pandemic. Based on the findings, it is assumed that, overall, the acceptance of VTC+ application concepts have increased due to the COVID-19 pandemic, rather than being negatively viewed with reservations. In summary, the third relationship suggests that the COVID-19 pandemic has played a pivotal role in increasing the acceptance of VTC+ application concepts while decreasing reservations (Waizenegger et al., 2020). The experiences and lessons learned during this crisis have contributed to a more positive view of virtual team collaboration, potentially shaping its future usage (Benlian, 2020).

The fourth cause-and-effect interdependency is formulated to highlight that increasing willingness to act supports the elimination of reservations about VTC+. In the conducted research, it was observed that the removal of reservations encourages greater willingness to engage in VTC+. In summary, the fourth relationship highlights the intertwined nature of willingness to act and the elimination of reservations in the context of VTC+ adoption (Malhotra, 2021). As individuals or organizations become more willing to embrace virtual collaboration, they are more likely to take proactive steps to address and eliminate any reservations, leading to a positive cycle of VTC+ engagement and improvement (Chamakiotis et al., 2020).

The fifth cause-and-effect interdependency reveals that increasing willingness to act leads to heightened uncertainty in the organization of VTC+. However, it was also observed that uncertainty in the organization of VTC+ can decrease willingness to act. In summary, the fifth relationship illustrates the delicate balance between willingness to act and uncertainty in the context of VTC+ adoption (Waizenegger et al., 2020). While a strong desire to embrace VTC+ is essential, organizations must also address the uncertainties that can arise, ensuring that individuals and teams are adequately prepared to navigate the challenges associated with virtual collaboration (Seeber & Erhard, 2023).

The sixth cause-and-effect interdependency is like the fifth, as it indicates that increasing uncertainty in the organization of VTC+ can result in growing reservations about VTC+. Furthermore, the removal of reservations about VTC+ can lead to decreased organizational uncertainty for VTC+ (Caligiuri et al., 2020). In summary, the sixth relationship underscores how increasing uncertainty and reservations are interconnected and can reinforce each other within an organizational context. Addressing reservations and uncertainty is crucial for facilitating the smooth adoption and effective utilization of VTC+ practices and tools.

The seventh cause-and-effect interdependency suggests that increasing desire for VTC+ has emerged from the growing willingness to act. Simultaneously, a growing desire for VTC+ can have a positive impact on the willingness to act (Ahuja et al., 2007). In essence, this relationship underscores the interdependence between the desire for VTC+ and the readiness to act (Caligiuri et al., 2020). As one grows, it can propel the other, creating a powerful driving force towards the effective implementation and utilization of VTC+ within organizations.

The eighth cause-and-effect interdependency points out that uncertainty in the organization of VTC+ can negatively affect the desire for VTC+. Conversely, a desire for VTC+ can increase organizational uncertainty for VTC+ (Benlian, 2020). In essence, this relationship underscores the delicate balance that universities need to strike when considering VTC+. On one hand, a lack of clarity and confidence in how to implement VTC+ can deter people from wanting to use it (Malhotra, 2021). On the other hand, a strong desire for VTC+ can lead to hasty and potentially problematic implementations if not accompanied by adequate planning and strategies to address uncertainties.

The final cause-and-effect interdependency indicates that the removal of reservations about VTC+ can positively influence the desire for VTC+. Additionally, a desire for VTC+ can positively impact the removal of reservations about VTC+ (Waizenegger et al., 2020). In essence, this relationship underscores how desire, and the removal of reservations are interconnected and mutually reinforcing. So it describes that there is a positive feedback loop between desire and reservations (Seeber & Erhard, 2023). A strong desire can motivate individuals and organizations to work on removing reservations, which, in turn, fuels the desire for VTC+. As reservations are addressed and resolved, it can lead to increased enthusiasm for VTC+. Also, this relationship describes that organizations that want to encourage VTC+ adoption can benefit from fostering a supportive environment where concerns are acknowledged and addressed. This includes open communication, providing resources, and demonstrating the benefits of VTC to create a desire to use it. Table 4 summarizes all the described cause-and-effect relationships.

ID	Impact relationship
R1	Increasing or decreasing readiness to act due to COVID-19.
R2	Increasing and decreasing uncertainty, respectively, in the organization of VTC+ due to COVID-19.
R3	Elimination or increase of reservations to VTC+ due to COVID-19.
R4	Elimination of reservations about VTC due to increasing willingness to act or increasing willingness to act due to elimination of reservations about VTC+
R5	Decreasing or increasing uncertainty in the organization of VTC+ due to readiness to act exists.
R6	Increasing or decreasing reservations about forms of work of VTC+ due to the uncertainties in the organization of VTC+ exists.
R7	Increasing desire for VTC+ due to increasing willingness to act exists respectively increasing willingness to act due to desire for VTC+

R8	Decreasing desire for new forms of VTC+ work due to uncertainty in the organization of VTC, respectively Increasing uncertainty in the organization of VTC+ due to the desire for VTC+.
R9	Increasing desire for VTC+ due to elimination of reservations about VTC+ respectively Decreasing reservations of VTC+ due to desire for VTC+

Tab. 4. Formulated cause-and-effect interdependencies

4.2 Willingness to act

In the investigations conducted for this dissertation project, detailed in Part A, several observations emerged that support the formulated cause-and-effect interdependencies. Firstly, the research paper on the use of collaboration in virtual teams (Paper A) revealed that even in the aftermath of the COVID-19 pandemic, the concepts of VTC+ continue to hold substantial potential. There was a notable increase in the willingness to adopt VTC+, driven by a growing recognition of its value. This positive trend in the adoption of VTC+ concepts was attributed to the critical importance of their design, implementation, and execution. It was highlighted that the approach taken whether through technical frameworks or psychological coping strategies significantly influences the successful and effective application of VTC+ (Paper B).

This observation implies that lectures, students and external practice partners are increasingly willing to embrace the desire for VTC+ in the post-pandemic era. The literature underscores the necessity for further research on the future design possibilities of VTC+, emphasizing its evolving significance.

Moreover, this work (Paper B) demonstrates that the future practice of VTC+ concepts hold the potential to yield numerous benefits alike. The paper asserts that while VTC+ concepts are widely utilized within universities, they are frequently not implemented with a robust design-oriented approach. This shortfall often results in avoidable communication and coordination issues. The investigation concluded that VTC+ can have a positive impact on both professional and personal life, enhancing flexibility, mobility, freedom, accessibility, and innovation (Paper B).

It can thus be inferred that there has been an increased willingness to engage with VTC+. The identified cause-and-effect interdependency, wherein VTC+ offers significant advantages to organizations, suggests that these entities have acknowledged the potential for successful and effective VTC+ concepts. Consequently, there is a growing inclination among universities to seek comprehensive information on how to implement VTC+ effectively. This proactive stance is aimed at enabling them to navigate future challenges with greater confidence and efficacy.

4.3 Uncertainties in the organization of VTC+

For the formulated cause-and-effect interdependencies regarding the uncertainty in the organization of VTC+ concepts, several observations were also made during the investigations conducted for this dissertation project. For instance, in the paper (Paper B) on the complete virtualization of collaborative work concepts with complex role and work context connections, it was observed that increasing uncertainty in the

organization of VTC application concepts could arise due to participants' prior experiences.

During field observations and interview surveys, it became apparent that while VTC+ is generally appreciated, there were challenges in its implementation. Study participants had difficulty establishing effective organizational structures, leading to increased uncertainty in the organization of VTC+. Participants indicated that although they possessed in-depth knowledge of VTC+ organization, providing communication and coordination practices could help improve organizational structures. It was suggested that even a simple definition of roles and task assignments, along with setting deadlines for completing these tasks and determining collaboration partners, would have been immensely helpful (Paper A).

According to the findings of this investigation, uncoordinated handling of communication and coordination practices before collaboration begins can lead to uncertainties in VTC+ organization. The works (Paper B; Paper C) identified the identification and provision of suitable communication and coordination practices for each role and work context connection before collaboration begins as an effective mitigation measure. Furthermore, the paper concluded that, from a research perspective, there are no comprehensive explanations yet on how to design, implement, and execute a successful and effective VTC+ concept to be guided successfully by set objectives.

In this investigation, it was also noted that research on VTC+ sees significant potential in VTC in general, which is already being utilized by organizations. However, further research in the design-oriented approach is still needed. The key concern is why uncertainties arise in the organization of VTC+. It was mentioned that no specific details are provided on the actual design, implementation, and execution of a potential pure VTC+, which would be necessary to plan, implement, and execute a successful and effective VTC+ (Paper A).

This investigation clearly recognized that the occurrence of communication and coordination understanding problems, attributable to design flaws, will not increase the willingness to implement VTC+. Additionally, it does not contribute to reducing the uncertainty in the organization of future VTC+.

4.4 Omission of reservations to VTC+

Several observations related to the formulated main cause-and-effect interdependency as well as the resulting cause-and-effect interdependencies were found in the conducted investigations of this dissertation project, especially in the research paper that deals with the development of design requirements, principles, and capabilities for VTC+ in higher education (Paper C). In detail, the paper provides guidelines on how a VTC+ concept in higher education should be designed to effectively pursue a set objective. The guidelines from the study also contribute to future designs of successful and effective VTC+ in higher education.

Considering the established cause-and-effect relationships, it was observed that reservations about VTC+ were eliminated due to COVID-19. Without exception, all study participants, across all data collection methods, expressed a high appreciation for VTC+ and indicated a willingness to use it again in the same format. It was noted that the concept had proven to be successful, and the same format was suggested for future collaborations (Paper C).

Furthermore, it was also noted that increasing reservations about VTC+ exist due to uncertainties in VTC+ organization. As described earlier, these reservations increase due to communication and coordination understanding problems that arise during VTC+ execution. This ultimately leads to an increase in reservations about the future design, implementation, and execution of VTC+.

To counteract this, future VTC+ organizations should support the maintenance of satisfaction, motivation, willingness to participate, and team identification. The VTC+ should also be designed to provide effective information systems, task execution approaches, communication practices, and coordination practices for all necessary tasks to achieve the set objectives. Additionally, the VTC+ should be designed in a way that all participants reach a consensus on effective communication and coordination practices for all associated role and work context connections no later than at the start of collaboration.

In summary, it was revealed through this dissertation project that there is an increasing desire for VTC+. However, the categories of the quality of VTC+ handling, individual participant satisfaction, and group VTC+ performance play a crucial role. It was demonstrated that particularly in the design, implementation, and application of VTC+, the categories of quality of handling, individual satisfaction, and group performance should be considered (Paper B; Paper C).

In conclusion, it can be observed that VTC+ had many reservations since its inception. However, due to the COVID-19 pandemic, practical experimentation, and in-depth research in the field, these reservations have been dispelled. Additionally, this dissertation project has helped fill the knowledge gap related to design-oriented approaches in VTC+.

4.5 Desire for VTC+

In relation to the formulated cause-and-effect interdependencies characterizing the desire for VTC+, observations were also identified in the conducted investigations. When consulting the paper on the use of collaboration in virtual teams (Paper A), it becomes evident that VTC+ concepts have significant potential. Delving deeper into the paper, it becomes clear that there is still a need for further research on VTC+. Similarly, in the other two investigations of this dissertation project (Paper B; Paper C), it is apparent that VTC+ has substantial potential and is valued and desired.

Translating the results and findings from the investigations of this dissertation project to the formulated cause-and-effect interdependencies, it becomes apparent that an

increasing willingness to act exists due to the desire for VTC+. Furthermore, an increasing desire for VTC+ triggers an increasing willingness to act. It is suggested that it would not make sense to engage in VTC+ again under the same conditions without assuming a desire for increased VTC+. The concept of a pure and/or hybrid virtual collaboration concept is increasingly emphasized in the context of designing, organizing, and implementing innovative work forms in organizations with highly knowledge-intensive activities (Paper A).

Drawing from the elaboration (Paper C) on the design principles for VTC+ concepts in higher education, it also becomes clear that the formulated cause-and-effect relationships are confirmed. During the demonstration and evaluation of the prototypes with study participants, it was found that a decreasing desire for VTC+ only exists when problems arise during execution. Additionally, the emergence of problems leads to increasing uncertainty in VTC+ organization.

Finally, VTC+ is considered a term in all conducted investigations that will gain more significance in the future, triggered by various factors such as globalization or vertically oriented organizational structures. It has been noted that VTC+ has great potential in applications such as IT consulting or higher education, and it can even enhance effectiveness compared to in-person formats. However, it must be handled with care, as negative aspects can quickly lead to significant inefficiencies (Paper C).

Based on this definition of the term, it can be concluded that the formulated cause-and-effect interdependencies concerning the increasing or decreasing desire for VTC+ have been confirmed. This representation of VTC+ as a term that will gain importance in the future assumes that many reservations about the integration of VTC+ have already been addressed, and thereby, the need to conduct VTC+ is increasingly being recognized.

4.6 Merging the cause-and-effect interdependencies
Overall, it can be concluded from these observations that there is a growing societal need to work within VTC+ environments, where one can utilize the available application concepts of VTC+. The reasons for this are diverse and varied.

Additionally, the findings suggest that there remains a need for further research and practical action to explore the potential benefits and risks of VTC+ in greater depth. This is particularly important to avoid critical missteps in the conceptualization, implementation, and execution of VTC+ concepts in higher education. To better illustrate the observations supporting the impact relationship model, an overview is provided in Figure 2, which presents the key observations identified in the cause-and-effect interdependencies.

	Paper A	Paper B	Paper C
R1. Increasing or decreasing readiness to act due to COVID-19		x	x
R2. Increasing and decreasing uncertainty, respectively, in the organization of VTC+ due to COVID-19	x	x	x
R3. Elimination or increase of reservations to VTC+ due to COVID-19		x	x
R4. Elimination of reservations about VTC+ due to increasing willingness to act or increasing willingness to act due to elimination of reservations about VTC+		x	x
R5. Decreasing or increasing uncertainty in the organization of VTC+ due to readiness to act exists	x	x	x
R6. Increasing or decreasing reservations about forms of work of VTC+ due to the uncertainties in the organization of VTC+ exists	x	x	x
R7. Increasing desire for VTC+ due to increasing willingness to act exists respectively increasing willingness to act due to desire for VTC+		x	x
R8. Decreasing desire for new forms of VTC+ work due to uncertainty in the organization of VTC+, respectively Increasing uncertainty in the organization of VTC+ due to the desire for VTC+	x	x	x
R9. Increasing desire for VTC+ due to elimination of reservations about VTC+ respectively Decreasing reservations of VTC+ due to desire for VTC+		x	x

Paper A
Reflection on successful and effective conceptualization, implementation, and execution of virtual team collaboration with external stakeholders with IT consulting problems. What concepts are relevant?

Paper B
Using genre analysis for conceptualizing virtual team collaborations with complex role and work context connections: What implementation problems can occur?

Paper C
Design principles for a successful and effective practice-oriented fully virtualized team collaboration with complex role and work context connections in higher education. What design principles should be considered?

Fig. 2. Cause-and-effect interdependencies confirmations

5. Knowledge gain

5.1 Pitfalls of VTC+

VTC+ presents both significant opportunities and challenges. To effectively harness its potential, this dissertation underscores the necessity of carefully conceptualizing, implementing, and managing VTC+. The findings related to the pitfalls of effectiveness, performance, and practicality in VTC+ have yielded several critical insights.

One key finding challenges the argument presented by Riemer and Filius (2009), suggesting that prescribing specific communication media may not be beneficial in VTC+, particularly in contexts characterized by complex role and work connections. Given the diversity of roles and organizational structures in higher education, proactively defining communication tools can lead to misunderstandings and coordination difficulties, ultimately undermining target alignment. This issue was observed during the demonstration of the prototype (Paper B), where groups without predefined communication media struggled to gather necessary information while

working on deliverables. However, the absence of predefined communication tools for interactions with practice partners had a positive effect, as these partners typically operate within different IT landscapes.

Moreover, this study confirms that VTC+ concepts are generally well-received and widely accepted on individual, organizational, and societal levels, as also noted by Benlian (2020) and Waizenegger et al. (2020). However, the willingness to adopt VTC+ is closely linked to organizational uncertainty (Paper B; Paper C). Negative prior experiences with VTC+ can significantly reduce an organization's readiness to implement such models in the future (Nguyen et al., 2021). An increase in uncertainty regarding the appropriate design of a VTC+ framework diminishes enthusiasm for virtual collaboration, demonstrating that a well-structured approach is crucial for its success.

Findings also suggest that effectiveness, performance, and practicality in VTC+ are strongly dependent on a well-designed application concept. A major challenge is ensuring that the design explicitly supports social factors, including satisfaction, motivation, willingness to participate, and team identification (Paper B; Paper C). If these aspects are not directly integrated into the VTC+ framework, significant communication and coordination issues may arise, impeding target alignment (Figl & Saunders, 2011). Additionally, given the nature of virtual collaboration, challenges related to motivation and team cohesion often emerge belatedly, making proactive design even more critical.

Furthermore, the interdependence of effectiveness, performance, and practicality (Paper C) underscores the necessity of systematically integrating social dimensions into VTC+ design. A generalized approach to addressing social factors is insufficient to mitigate risks and fully leverage potential benefits. This was evident in the evaluation of the VTC+ prototype in higher education (Paper B) and the final adaptation of design requirements, principles, and essential features (Paper C). Therefore, a structured, research-based approach to defining design requirements, principles, and essential features—one that explicitly incorporates satisfaction, motivation, willingness to participate, and team identification—is recommended.

Finally, findings indicate that effective VTC+ collaboration models must include well-defined information systems, task completion strategies, communication frameworks, and coordination mechanisms to support goal achievement (Paper C). Establishing these components before the collaboration process begins is vital. For example, integrating structured task completion methodologies such as SCRUM could enhance efficiency. However, this study observed instances where the lack of predefined task completion strategies, communication frameworks, and coordination mechanisms led to unnecessary challenges (Paper B). Had these elements been clearly outlined beforehand, many of the coordination issues encountered could have been avoided.

Neglecting to provide structured information systems, task management approaches, communication practices, and coordination mechanisms increases the likelihood of

significant communication and coordination difficulties. Such oversights can negatively impact motivation, team cohesion, and the overall willingness to engage in VTC+ environments. Ultimately, failing to address these factors exacerbates organizational uncertainty, further diminishing the likelihood of successful VTC+ adoption and implementation.

5.2 Opportunities for VTC+

Considering the insights gained regarding the opportunities and challenges associated with VTC+ in terms of effectiveness, performance, and practicality, this dissertation project also yielded new perspectives. One key finding was that refraining from prescribing communication media can be beneficial if properly managed. This is particularly relevant in VTC+ environments, where complex role and work context connections exist. However, rather than the concept designer dictating the communication media, as suggested in media choice literature (Hertel et al., 2005; Fiedler & Gallenkamp, 2009; Riemer & Filius, 2009), participants should collaboratively determine appropriate communication channels at the outset of their collaboration. Specifically, working groups should establish agreements—preferably in written form— on the communication media to be used for various communication and coordination activities, especially with external stakeholders. This structured approach was found to significantly facilitate collaboration (Paper B; Paper C).

Failing to define communication media poses a risk to effectiveness, performance, and practicality. However, by implementing the proposed approach, these risks can be transformed into opportunities, ensuring that the effectiveness, performance, and practicality of VTC+ are maintained or even enhanced compared to face-to-face collaboration models. Moreover, this approach fosters a more positive perception of VTC+ concepts by reducing communication and coordination misunderstandings (Paper B). Furthermore, by enabling participants to engage with VTC+ more intuitively, this approach mitigates organizational uncertainty and enhances individual participants' confidence in VTC+, reducing the effort required to access relevant information. Ultimately, it fosters greater acceptance and willingness to adopt VTC+ application concepts.

Additionally, the application of the developed VTC+ concept within higher education was already highly valued, even before the full knowledge derivation of this dissertation was completed (Paper A). However, previous negative experiences with VTC+ have been shown to undermine willingness to engage with such concepts, exacerbate organizational uncertainty, and reinforce skepticism toward VTC+ (Waizenegger et al., 2020). Despite this, basic satisfaction and motivation remain resilient, even in the presence of communication and coordination challenges. This was particularly evident in the perspectives of participants engaged in an IT project and external practice partners, who sought more substantial deliverables (Paper B).

The findings further suggest that the effectiveness, performance, and practicality of VTC+ are closely intertwined with factors such as participant satisfaction, motivation,

willingness to engage, and team identification. However, this connection remains elastic until negative impacts on satisfaction and motivation begin to hinder effectiveness and performance. The study identified instances where excessive complexity in handling VTC+ led to participant withdrawal, adversely affecting performance outcomes. Furthermore, uncoordinated revisions without consultation were found to compromise both effectiveness and performance (Paper B; Paper C).

The study also highlighted that integrating social aspects into VTC+ conceptualization positively influences effectiveness, performance, and practicality (Paper A; Paper B; Paper C). Specifically, maintaining participant satisfaction, motivation, engagement, and team identification emerged as critical factors. In fully virtual environments, proactively addressing these social dimensions can significantly enhance or preserve overall effectiveness.

Empirical findings suggest that considering these social factors in VTC+ design can sustain or even improve effectiveness, performance, and practicality compared to face-to-face collaboration. Participants who felt valued and taken seriously demonstrated greater commitment to delivering high-quality outputs (Paper B). Additionally, participants who identified strongly with their project exhibited heightened focus and motivation, further reinforcing the importance of social cohesion in virtual collaboration settings.

Lastly, the research confirmed that VTC+ collaboration concepts must be designed to ensure the availability of effective information systems, task completion frameworks, communication protocols, and coordination mechanisms for all essential tasks aligned with project objectives (Paper B; Paper C). Addressing these elements can significantly enhance effectiveness, service delivery, and practicality. Moreover, mitigating the inherent risks of VTC+ requires the establishment of structured communication and coordination practices before collaboration begins.

Providing well-defined communication and coordination mechanisms can substantially improve the efficiency of task execution while alleviating observed communication and coordination challenges. Furthermore, this structured approach fosters higher levels of satisfaction, motivation, engagement, and team identification. The evaluation of the VTC+ prototype revealed that clear guidelines on document revisions and coordination with practice partners prevented common pitfalls associated with virtual collaboration. Additionally, implementing these measures was found to enhance organizational confidence in VTC+ and reduce associated uncertainties, ultimately increasing the willingness to adopt and apply VTC+ concepts.

6. Concluding remarks
This dissertation project has identified conceptualization and evaluation constructs, a VTC+ concept, and design principles that facilitate the successful and effective conceptualization, implementation, and execution of VTC+ in higher education.

First, extensive foundational research was conducted on the literature concerning both pure and hybrid VTC. Through a systematic literature analysis (Webster & Watson, 2002), key research gaps were identified, including the lack of comprehensive frameworks for the conceptualization, implementation, and execution of VTC+ concepts, the insufficient consolidation of literature regarding socio-technological communication and coordination challenges in VTC+ application, and the absence of practical implementation models for VTC+ concepts.

To address these gaps, a framework for the successful and effective conceptualization, implementation, and execution of VTC+ in higher education was developed. This contribution is particularly significant, as existing literature on VTC+ primarily focuses on the nature, implications, performance, and management of virtual teams rather than on their structured conceptualization and execution (Waizenegger et al., 2015). To date, there has been limited research on the practical implementation of VTC+ application models (Abarca et al., 2020; Nguyen et al., 2021).

Furthermore, this dissertation project critically analyzed, evaluated, and synthesized a conceptual model for a successful and effective VTC+ in higher education through the lens of media choice theory (Hertel et al., 2005; Fiedler & Gallenkamp, 2008; Figl & Saunders, 2011; Riemer & Filius, 2009). The objective was to assess the applicability and operational viability of media choice theory in the context of VTC+ conceptualization, implementation, and execution, and, if necessary, propose an extension to the theory (Fiedler & Gallenkamp, 2008; Riemer & Filius, 2009). Using systematic literature analysis (Webster & Watson, 2002), a multiple case study approach (Benbasat et al., 1986), qualitative content analysis (Mayring, 2004), and a design science research approach (Peffers et al., 2007; vom Brocke et al., 2020), it was observed that media choice theory requires refinement when applied to the research artifact of this dissertation. Existing VTC+ models based on media choice theory (Riemer & Filius, 2009) have predominantly been developed using situational ad-hoc approaches, often neglecting individual participant needs in the design process. This oversight can result in significant communication and coordination challenges, which may hinder collaboration.

In alignment with the principles of design science research (vom Brocke et al., 2020), this dissertation also contributes prescriptive knowledge for the conceptualization, implementation, and execution of a fully virtualized VTC+ framework. Through the development, demonstration, and evaluation of a prototype VTC+ model for higher education, prescriptive knowledge was generated regarding design requirements, principles, and essential features that integrate social aspects into the conceptualization process.

Like any research endeavor, this dissertation has certain limitations. The first pertains to the participants' experience levels. While some participants—particularly those in the first sub-study—possess extensive full-time work experience, others are students with limited professional exposure. Another limitation is that this study was conducted

exclusively within a VTC+ environment, making it difficult to isolate the extent to which identified challenges were solely attributable to the virtual collaboration model. Additionally, language constraints in data collection should be acknowledged. Since all data sources were collected in a language other than English, and the coding guidelines were also developed in a different language, translation may have introduced minor discrepancies in meaning.

Building on the findings of this dissertation, several avenues for future research emerge. One particularly promising direction would be to further investigate the applicability of media choice theory in the conceptualization, implementation, and execution of VTC+ models. The current operational viability of media choice theory remains relatively underexplored, particularly concerning virtual collaboration models involving complex role structures and diverse work contexts. Future research could examine these concepts in settings beyond higher education to establish a more generalizable understanding of the practical implementation and operationalization of VTC+ collaboration models.

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PART B

Research Papers

PAPER A

Reflection on successful and effective conceptualization, implementation, and execution of virtual team collaboration with external stakeholders with IT consulting problems. What concepts are relevant?

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Reflection on successful and effective conceptualization, implementation, and execution of fully virtualized team collaborations with external stakeholders with IT consulting problems. What concepts are relevant?

Recent technological advancements have profoundly transformed communication and work. Factors such as globalization, digital culture, widespread online communication tools, and the impact of the COVID-19 outbreak have prompted numerous organizations to adopt fully virtualized team collaborations. With the rapid increase in virtual team collaboration, researchers have focused on exploring various aspects, challenges, and factors. However, this research has resulted in a fragmented and dispersed understanding of what fully virtualized team collaboration truly entails. This literature review aims to synthesize these disparate definitions and insights to propose future research opportunities. By employing a systematic literature review combined with the paradigm funnel methodology, the review formulates key concepts, such as the general essence, implications, performance, and management of fully virtual team collaboration. These concepts help identify the necessary research opportunities to successfully conceptualize, implement, and execute fully virtualized team collaborations, particularly in IT consulting projects involving external stakeholders. The objective of this work is to provide a comprehensive overview of the literature on successful and effective conceptualization, implementation, and execution of fully virtual team collaborations with external stakeholders in IT consulting projects, and to identify future research opportunities that are pertinent to these endeavors.

Keywords: virtual team collaboration, work-life balance, team performance, multifaceted impacts, research avenues, literature review, research agenda

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1. Introduction

The occurrence of crises, wars, disasters, and epidemics has been associated with triggering or accelerating changes in a wide range of activities, including those related to how we live and work (Hofeditz et al., 2023; von Thülen & Hartl, 2021). Most recently, the global health challenge posed by the COVID-19 outbreak has led to the implementation of measures requiring businesses, hospitals, schools, universities, and citizens to collaborate whenever possible (Abarca et al., 2020). Consequently, numerous organizations, albeit involuntarily, were compelled to transition to and implement virtual team collaboration (VTC) to comply with health authorities' restrictions (Waizenegger et al., 2020).

The VTC is fundamentally characterized by geographically distributed locations (Hofeditz et al., 2023). In this context, it is possible to distinguish between pure and hybrid VTC. In a pure VTC, all team members are located in different geographical areas and collaborate fully virtualized. By contrast, a hybrid VTC allows for physical interactions among team members, with only a subset of members exclusively working at the same physical location (Powell et al., 2004). Compared to presence-based collaborations, VTC is considerably more complex because of its virtual nature (Boughzala & Vreede, 2015). This complexity arises from challenges in task allocation, assignment of responsibilities and authority, and application of various communication and coordination practices, along with the increased number of role and work context connections (Ahuja et al., 2007).

The conceptualization of a VTC is more complex than that of a presence-based team collaboration because of the additional considerations related to its virtual nature (Boughzala & Vreede, 2015; Hofeditz et al., 2023). In most cases, the application concept of a VTC primarily targets members within an organization, but it can also involve external participants (Webster & Wong, 2008). The inclusion of external participants presents an additional challenge (Waizenegger et al., 2020) as maintaining the satisfaction of all parties involved, including independent external participants, and adhering to goal agreements becomes significantly more complex (Kiely et al., 2021). Furthermore, task allocation, assignment of responsibilities and authority, and connections between roles and work contexts are further complicated (Magnus, 2011). Therefore, pure VTCs that include external participants (VTC+) involve particularly complex conditions to ensure successful and effective conceptualization, implementation, and execution.

At its core, VTC+ holds significant potential for improving productivity and effectiveness compared to presence-based collaboration (Ahuja et al., 2007; Vom Brocke et al., 2015). When properly conceptualized, VTC+ can increase efficiency, satisfaction, and group performance compared with presence-based collaborations (Benlian, 2020; Nurhas et al., 2021; Seeber & Erhardt, 2023). It is important to recognize that improper conceptualization can lead to significant negative consequences (Hofeditz et al., 2023). Issues such as unbalanced workflows (Sarabadani et al., 2021), difficulties in task allocation (Waizenegger et al., 2016), and grand expectations regarding connectivity (Waizenegger, 2015) can significantly negatively impact effectiveness,

satisfaction, and performance and even cause collaboration to fail (von Thülen & Hartl, 2021).

In my project, I conceptualized, implemented, executed, and evaluated a VTC+ initiative: a fully virtualized management education seminar in which a real information technology (IT) consulting project is edited successfully and effectively. The objective of the project was to create an immersive learning experience in which aspiring IT consultants, in collaboration with industry professionals, would exclusively tackle real IT consulting problems in VTC+.

However, the considerable number and diversity of publications on VTC+ leads to confusion and uncertainty in the careful conceptualization, implementation, and execution of VTC+. Existing publications are highly fragmented and scattered (Abarca et al. ,2020). Terminologies, theoretical approaches, and findings obtained vary significantly Hofeditz et al., 2023; Malhotra et al., 2007; Waizenegger, 2015). With the rapid development of IT, which brings continuous changes to workplaces, requirements, tasks, and challenges, the field of VTC+ is constantly evolving (Seeber & Erhardt, 2023; Webster & Wong, 2008). In this unstructured and constantly changing process, it is important to reflect on past ideas, topics, and accumulated knowledge, compare them with current developments, and structure existing insights to reflect on future opportunities (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002). To gain an overview of the fragmented and scattered results, as well as to identify beneficial future research opportunities for my research project, I applied this literature review. I posed the following research question:

- Research question 1: *"What concepts are relevant for successful and effective conceptualization, implementation, and execution of fully virtualized collaborations with external stakeholders with real-world IT consulting problems?"*

- Research question 2: *"Which future research opportunities could prove beneficial concerning fully virtualized collaborations with external stakeholders with real-world IT consulting problems?"*

To align with the requirements of the qualitative research questions (Creswell & Creswell, 2017; Mayring, 2004), I employed a combination of the author's concept-centered matrix analysis (Okoli, 2015; Webster & Watson, 2002) and paradigm funnel analysis (Berthon et al., 2003; Nairn et al., 2007). The following section describes the initial identified theoretical foundations. Subsequently, the process by which the literature was collected is outlined. The discovered convergences and divergences are then illustrated and described in terms of concepts. In the Discussion section, the epistemic subtractions of the discovered concepts are discussed, and relevant research approaches are presented.

2. Theoretical foundations

2.1 Team collaboration

Teams consist of several members who work together to achieve certain goals. Team members must collaborate (Hofeditz et al., 2023). Collaboration can be defined in several ways. Collaboration can be viewed as a social phenomenon involving multiple individuals when the action of one alone does not yield the expected outcome (Heled et al., 2016). Alternatively, it can be seen as a joint effort and purpose, where individuals work together towards a common group goal (Waizenegger, 2015). In the context of this research, collaboration is defined as a process in which two or more actors (individuals or organizations) share resources and skills to collaboratively solve problems and achieve one or more goals (Boughzala & Vreede, 2015).

Aspects of team construction, such as optimal team size and applicable practices, are at the forefront (Hackman, 1987; Marschak & Radner, 1972). The varying composition of teams, including the chosen team size and established practices, has a significant positive or negative impact on group performance (Cohen & Bailey, 1997; Webster & Wong, 2008). Team configurations, such as the application of agile project management approaches to achieve established goal agreements, are critical components of successful and effective conceptualizations (Roberts, 2004). One aspect of team collaboration concerns the location and timing of individual team members' interactions (Kiesler & McGuire, 1984).

2.2 Virtual team collaboration

VTC represents a specific case of team collaboration. Compared with presence-based team collaboration, VTC is significantly more complex because of its virtual nature (Vom Brocke et al., 2015). Furthermore, the level of complexity can further increase when various stakeholders are involved in team collaboration, especially when external peers are engaged, such as external practice partners, coaches, and instructors (Magnus, 2011). Regarding complexity, it is crucial to develop practices in VTC that consider all role and work context connections to ensure useful and effective communication and coordination (Fiedler & Gallenkamp, 2008; Kiesler & McGuire, 1984).

In terms of the degree of virtualization and involvement of external peers in collaboration, VTC+ epitomizes this concept (Andersson et al., 2016; Benlian, 2020). VTC+ is distinguished by its complete virtualization and integration of multiple diverse stakeholders within a collaboration. Compared to VTC or presence-based collaborations, VTC+ relies on extraordinarily complex roles and work context connections aimed at successfully achieving a delivery goal agreement (Jarvenpaa & Leidner, 1999; Riemer & Filius, 2009). Thus, VTC+ is also considered to be a process. This process entails an exceedingly elevated level of complexity in configuring relationships concerning tasks, responsibilities, and authority (Magnus, 2011; Powell et al., 2004).

2.3 IT Consulting Projects

A crucial aspect of IT consulting projects is the close collaboration between consultants and clients (Waizenegger et al., 2020). Consultants contribute their expertise and experience to developing tailor-made solutions that align with the specific needs and goals of the client (Sarigianni et al., 2017). This necessitates clear communication, a

profound comprehension of corporate culture, and ongoing alignment to guarantee that project objectives are met (Waizenegger et al., 2014).

Successful IT consulting projects are distinguished by their capacity to generate value and achieve long-term impacts (Sarigianni et al., 2017; Waizenegger et al., 2020). This can manifest itself as increased efficiency, cost savings, improved customer service, enhanced competitiveness, or other business benefits. As technologies and business practices continue to evolve, IT consulting projects remain a vital driver of innovation and growth across industries (Ko et al., 2011).

2.4 Role and work context connections

The concepts of roles and work context connections play a significant role in the successful and effective conceptualization of collaborations (Fiedler & Gallenkamp, 2008). Role and work context connections pertain to the structuring of tasks, responsibilities, and relationships within an organization or team (Briggs et al., 2003). Roles delineate the expectations of the behavior and performance of an individual occupying a specific position or function. They encompass not only formal job descriptions but also informal expectations and behavioral norms (Hofeditz et al., 2023). A clear definition of roles facilitates the orientation of employees, enhances efficiency, and contributes to the achievement of organizational goals (Riemer & Filius, 2009).

Contextual connections between roles and work contexts within an organization encompass the way tasks and responsibilities are interrelated as well as the interactions between various team members and departments (Powell et al., 2004). An effective conceptualization of these connections contributes to enhanced collaboration, creation of synergies, and minimization of conflicts (Hertel et al., 2005). In the context of successful and effective VTC+, role and work connections play a pivotal role in fostering teamwork, achieving organizational objectives, and cultivating a positive organizational culture (Waizenegger et al., 2020).

2.5 Communication and coordination practices

Communication and coordination are interdependent processes that form the backbone of successful and effective VTC+ (Chamakiotis et al., 2020; Kiesler et al., 1984; Webster & Wong, 2008). In general, communication involves the exchange of information, ideas, and feedback among team members to build shared understanding and ensure alignment (Roberts et al., 2002). On the other hand, coordination focuses on organizing tasks, managing interdependencies, and aligning actions to achieve collective goals (Benlian, 2020). Together, these processes enable teams to work efficiently, adapt to challenges, and maintain cohesion in both physical and virtual settings (Powell et al., 2004).

Effective communication practices include clear articulation of goals, active listening, consistent feedback, and use of appropriate channels for information exchange (Kiesler & et al., 1987; Roberts, 2004). Coordination practices emphasize task prioritization, role clarification, timeline management, and synchronization of team efforts (von Thülen & Hartl, 2021; Webster & Wong, 2008). In VTC+, leveraging digital

tools, defining shared norms, and fostering a culture of accountability are critical for the seamless integration of communication and coordination (Ahuja et al., 2007). These practices promote clarity, reduce misunderstandings, and enhance team group performance even in complex dynamic environments (Hertel et al., 2005).

2.6 Connectivity

Connectivity in VTC+ refers to the ability of team members to communicate effectively and continuously exchange information, and therefore, plays a crucial role (Kolb et al., 2008). It encompasses both technical aspects, such as the use of appropriate communication platforms and tools (Kolb, 2008), and social and organizational dimensions that influence the quality and frequency of interactions (Kolb et al., 2012; MacCormick et al., 2012). In VTC+, reliable connectivity is crucial for maintaining the flow of information, clearly delegating tasks, and developing a shared understanding of objectives (Sarigianni et al., 2017). A lack of stable connectivity can lead to misunderstandings, delays, and reduced team cohesion, which significantly affects the effectiveness of collaboration (Kolb et al., 2008).

The relevance of connectivity in the conceptualization of VTC+ lies in its central role in the success of such teams (Richardson & Benbunan-Fich, 2011; Russo et al., 2019). Well-planned and well-implemented connectivity ensures that all team members have access to relevant information at all times and can easily interact with others. Without a well-thought-out connectivity strategy, a virtual team can quickly become inefficient and disorganized (Waizenegger, 2015).

2.6 Media choice

The selection of media in VTC+ refers to the choice and utilization of communication and collaboration tools (Daft & Lengel, 1983). This selection is crucial to success as it directly impacts efficiency, productivity, and team member engagement (Figl & Saunders, 2011). The key factors determining media selection include the nature of tasks, team members' communication preferences, technology availability, and complexity of collaboration (Dennis & Valacich, 1999; King & Xia, 1997). For simple, informal conversations, instant messaging apps, or video conferencing tools may suffice. However, specialized collaboration platforms offering features such as shared document editing and project management may be required for VTC + (Hertel et al., 2005).

The selection of appropriate media helps avoid discrepancies, fosters effective collaboration, and enhances satisfaction Figl & Saunders, 2011). A prudent selection of media also facilitates the integration of virtual teams into the organization's overall strategy and culture, thereby ensuring seamless and effective collaboration (Powell et al., 2004). In essence, the selection of media is a pivotal aspect of VTC+ because it directly affects the quality of collaboration and, subsequently, the team's success (Riemer & Filius, 2009; Webster & Wong, 2008).

3. Methodology

3.1 Matrix formulation

To ensure the collection and coverage of only relevant literature on the chosen topic, various points of consideration can be defined within the author's concept-centric matrix framework (Okoli, 2015; Webster & Watson, 2002). In this investigation, to identify pertinent publications in the field of successful and effective conceptualization, implementation, and execution of a VTC+, I focused on the aspects of the research artifact, its motivation, the research questions posed, the theoretical foundations employed, the applied methodology, the key findings, the major contributions, and its limitations.

Within the paradigm funnel analysis framework, various levels (funnels) for analysis can be defined (Berthon et al., 2003; Nairn et al., 2007). In this study, the investigation was limited to four levels. I focused on the observed behavior of VTC+, methodologies, theoretical backgrounds, applied theories, and core assumptions. The decision to focus on these four levels emerged from the initial review of ten selected studies (Dery & MacCormick, 2012; Geiger et al., 2015; Greenhaus & Beutell, 1985; Gruber et al., 2018; Kolb et al., 2012; Mazmanian & Erickson, 2014; Russo et al., 2019; Sarigianni et al., 2017; Waizenegger et al., 2014; Wajcman & Rose, 2011).

1.2 Search process

To formulate an appropriate search query (Berthon et al., 2003), I conducted a preliminary investigation of the structured representation of VTC+ concepts (Okoli, 2015). This initial query yielded a substantial number of results, exceeding 19,000 hits on Google Scholar. To refine the selection to encompass high-quality literature and ensure a comprehensive understanding of the research subject, a two-phase search and selection procedure (Webster & Watson, 2002) was used. Figure 1 illustrates the two-phase search and selection process procedure.
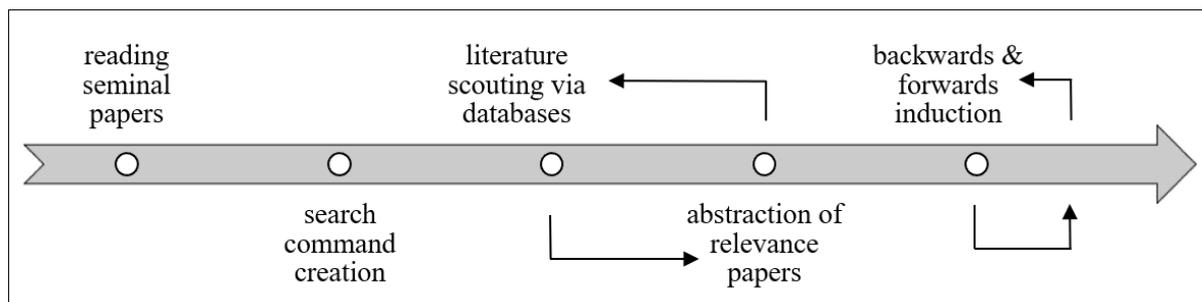
Fig. 1. two-phase search and selection process

In accordance with identifying only relevant reputable publications for literature analysis, I followed the recommended guidelines of systematic literature review as well as the paradigm funnel analysis (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002) and selected databases that are specifically relevant to the field of Information Systems (IS). Therefore, in this study, the literature collection stemmed from Google Scholar, IEEE Xplore Digital Library, Information System Electronic Library (AISeL), Web of Science (WoS), and EBSCOhost.

3.3 Literature collection

In the first iteration, I only included publications relevant to the research artifacts of this investigation in the collection. I categorized these as those addressed by VTC+ in

design-related, evaluation-related, and organizational-related contexts. In the second iteration, I only included publications addressed by VTC+ in a design-related evaluation context. The objective of this approach is to expand the scope of the search query in the second iteration to identify publications that may have been overlooked in the first iteration. Each identified and assigned relevant publication was subjected to comprehensive critical evaluation (Webster & Watson, 2002).

Each selected publication was evaluated for its suitability for the successful and effective conceptualization, implementation, and execution of a VTC+ initiative. Publications that completed the evaluation were analyzed to identify transferable insights for this investigation. All sources have been carefully curated for in-depth literature analysis and published in reputable journals and conferences. Table 1 provides an overview of the allocations selected and inspected in depth during the two-phase search and selection process procedure.

Initial Search Command	virtual teams AND its consultancy project				
Hits	19,000+				
1st Iteration	virtual AND teams* AND (design* OR implement* OR execut*) AND (balanc* OR evaluat* OR converg* OR eliminat* OR reduc* OR vot* OR jud*) AND (individuals OR organisations OR society OR types OR strategies OR mitigation OR norms OR skills)				
Database	Google Scholar	IEEE-XdL	AISeL	WoS	EBSCOhost
Relevant Hits	328	15	29	109	192
2nd Iteration	virtual AND teams* AND (design* OR implement* OR execut* OR balanc* OR evaluat* OR converg* OR eliminat* OR reduc* OR vot* OR jud*)				
Relevant Hits	-	-	39	122	-
Extracted Hits	55				

Tab. 1. Allocations within the two-phase search and selection process procedure

This methodological approach led me to compile a final set of 55 publications. These carefully curated publications form the basis for the forthcoming analysis and synthesis within the defined research topic using the paradigm funnel approach (Berthon et al., 2003; Nairn et al., 2007) and the author concept-centric matrix approach (Okoli, 2015; Webster & Watson, 2002).

3.4 Formulation of concepts

To identify concepts, I first transferred each selected publication into a formulated matrix following the guidelines of the systematic literature review approach (Okoli, 2015; Webster & Watson, 2002). All aspects deemed relevant to the matrix formulation were considered for each publication. Thus, for every publication relevant to this investigation, I critically evaluated and transferred the selected research artifact, motivation, research questions posed, theoretical foundations used, applied methodologies, key findings, major contributions, and limitations.

To ensure the development of meaningful and certain concepts, formulated questions were supplemented with matrix formulation approach (Berthon et al., 2003; Nairn et al., 2007). I evaluated, answered, and transferred each carefully selected publication's observed behavior of VTC+, qualitative or quantitative methodology, theoretical background, applied theory, and development of basic assumptions into a matrix.

3.5 Analysis process

To discover relevant concepts, the formulated matrix was converted into a concept-based matrix within the framework of the guidelines (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002). All formulated considerations were critically reviewed and examined for convergence and divergence. As part of the translation into the concept matrix, evolutionary prototyping was used to carefully assess the usefulness and effectiveness of the discovered relevant convergence (concepts) (Davis, 1992).

For each discovered concept, multiple evaluations were performed to determine whether the assignment of a selected publication was indeed due to observation. Sketches were developed for each discovered concept to verify the logical approach for grouping the discovered key concepts (Webster & Watson, 2002). In addition, the assignment was made according to the guidelines of isolation by units of analysis (Berthon et al., 2003; Nairn et al., 2007), making it easier to recognize when moving outside a discovered concept.

4. Results

4.1 Discovered concepts

Through the chosen methodological approach of the literature analysis, it was possible to systematically capture, structure, and synthesize the previously scattered and fragmented findings. This facilitated a comprehensive understanding of the research field by identifying relevant concepts, highlighting existing knowledge gaps, and elucidating key interrelationships.

In response to the first research question regarding the relevant concepts for the successful and effective conceptualization, implementation, and execution of VTC+ with external stakeholders in IT consulting projects, I discovered that the carefully curated final literature set focuses on four main concepts. All four concepts provide valuable insights into the factors contributing to the general essence, positive or negative implications, evaluation performance, and management of such collaboration. Furthermore, all four concepts highlight the importance of considering the technological, organizational, and social dimensions in VTC+, particularly when external stakeholders are involved.

Building on the approach outlined for the formulation of concepts and the analysis process, I identified and formulated the concepts "general essence of VTC+", "implications of VTC+", "performance of VTC+", and "management of VTC+" as relevant. Within the discovered concept of general essence, I further identified dimensions related to the main concept, illustrating VTC+ as a collaborative

phenomenon (Andersson et al., 2016) and VTC+ from different perspectives (Dery et al., 2014). Within the discovered concept of "implications of VTC+", I found publications investigating both positive (Richardson & Benbunan-Fich, 2011) and negative implications (Mazmanian et al., 2013). Therefore, within the concept of implications, I formulated two divergences. Regarding the convergence of "performance with VTC+", I discovered that performance is regarded both as a threat (Yang et al., 2017) and as an enabler (Mazmanian et al., 2013). Consequently, I retained these two divergences. Finally, concerning the convergence of "management of VTC+", I formulated additional divergences based on technical frameworks (Jarvenpaa & Lang, 2005) and psychological coping patterns (Gruber et al., 2018). Figure 2 illustrates the concepts discovered.

Convergence	Divergence	Description
General essence of VTC+	Collaboration as phenomenon	Strand of literature which focuses on the concept that VTC+ is a phenomenon. It is crucial to note that this divergence does not examine new perspectives but rather builds upon existing ones. The phenomenon of VTC+ is the central focus of this observed concept. E.g. how VTC+ affects presence-based collaboration concepts.
	Different perspectives	Strand of literature which focuses on the concept that pertaining to new perspectives in the observed context of VTC+. In this context, publications are evaluated in terms of their potential to contribute to the generation of new perspectives. E.g., the impact of Artificial Intelligence on VTC+ in the future
Implications of VTC+	Positive implications	Strand of literature which focuses on the concept that VTC+ has positive effects on various aspects of well-being. It includes empirical studies that investigate the ways in which the use of multiple mobile devices can positively influence the well-being of individuals engaged in VTC+. E.g., the utilization of multiple mobile devices may have a positive impact on the well-being of a participant in a VTC+ program.
	Negative implications	Strand of literature which focuses on the concept that VTC+ has negative effects on individual, organizational, and societal analysis units. It includes studies that aim to identify the negative implications of VTC+. E.g., it examines factors that contribute to dissatisfaction among participants in a VTC+ program as they pursue a specific goal.
Performance of VTC+	Threat on performance	Strand of literature which focuses on the concept on performance of VTC+. Performance is regarded as a potential threat, and therefore, the implementation of performance-related elements in VTC+ may result in unfavourable outcomes. For instance, the introduction of performance-related controls in IT project management in VTC+ may lead to inferior outcomes compared to flexible approach.
	Enabler for performance	This strand of literature focuses on the concept on performance of VTC+ in relation to enablers. In this context, VTC+ is regarded as a performance provider. This approach allows for the examination of VTC+ as a provider of performance, with the potential to identify instances where it outperforms traditional, in-person collaboration.
Management of VTC+	Technical frameworks	Strand of literature which focuses on the concept successful and effective management of VTC+. It identifies and classifies VTC+ in the context of technical frameworks, standards, norms, and models. E.g., it examines how VTC+ can be effectively utilized with technical frameworks, standards, norms, and models to achieve successful goal-setting.
	Psychological coping patterns	Strand of literature which focuses on the concept successful and effective management of VTC+. It identifies and subsequently classifies VTC+ in conjunction with psychological coping patterns. E.g., it examines how a VTC+ with psychological coping patterns can successfully pursue a goal.

Fig. 2. Discovered concepts

Each publication in the final literature set underwent comprehensive examination. Publications can be assigned to multiple concepts. E.g., the work about low connectivity (Waizenegger et al., 2020). In this investigation the authors evaluate the performance of virtual teams to identify how participants of the virtual teams can achieve a requisite flow of connectivity. In the discussion section recommendation actions are shown.

4.2 General essence of VTC+

At this concept, I discovered that research investigations conceptualize VTC+ as a general essence. These publications share the common characteristic of treating VTC+ as an independent phenomenon. More specifically, it could be found that the selected publications focused on conceptualizing the influence of VTC+ on various perspectives or domains. When assigning studies to this concept, it was ensured that they emphasized VTC+ as a distinct and noteworthy phenomenon. Within this formulated concept, publications collectively explore the multifaceted impact of VTC+ on different domains and concepts. Table 2 presents the assigned publications related to the discovered concept of the "general essence of VTC+".

Concept	Divergence	Relevant sources
General essence of VTC+	Collaboration Phenomenon	Andersson et al., 2016; Jarvenpaa & Leidner, 1999; Ko et al., 2011; Marlow et al., 2017; Mazmanian & Erickson, 2014; Powell et al.2004; Waizenegger, 2015, Wang & Wellman, 2010
	Different perspectives	Dulebohn & Hoch, 2017; Kolb, 2008; Murphy, 2007; Powell et al.2004; Purvanova, 2014; Richter et al., 2018; Richter & Richter, 2020; Wajcman & Rose, 2011

Tab. 2. Publications assigned to "General essence of VTC+"

To formulate the concept of collaboration convergence, the study of necessary connectivity and the discovery of flow in a connected world can be cited (Kolb, 2008). This study explores the role of connectivity in VTC+ by examining its attributes and dimensions. A key finding was that although the concept of connectivity existed in various forms, it had not previously been explicitly linked to VTC+. The study provides new insights into how individuals engage and navigate digital environments within virtual teams and the challenges associated with these interactions. Moreover, it has contributed to bridging the concept of connectivity with areas such as ubiquitous computing technology and general Internet accessibility.

All the assigned research investigations have significantly advanced the understanding of VTC+ by introducing new perspectives. Particularly noteworthy is the study of connectivity as a double-edged sword (Waizenegger, 2015). This study examined VTC+ from a societal perspective, highlighting that VTC+ is not solely a technological construct but also a social phenomenon. Through a comprehensive literature analysis, this study identified new research questions, especially regarding how VTC+ is integrated into broader societal structures. These findings play a crucial role in shaping the conceptualization of VTC+ as a general phenomenon.

For the formulation of convergence from different perspectives, the study of social connectivity in America serves as a relevant example (Wang & Wellman, 2010). This study challenged the widespread assumption that frequent Internet users have fewer offline social connections. Instead, it demonstrated that Internet users often maintain robust social networks when sociodemographic factors are considered. This study introduces a novel perspective on the relationship between digital communication and social interactions, contributing to a more nuanced understanding of VTC+.

Another important example of this divergence is research on communication in virtual teams (Marlow et al., 2017). This study underscores the critical role of communication patterns in determining virtual team effectiveness. This highlights that the way team members communicate directly influences collaboration and productivity. These insights are particularly valuable for the continued development of VTC+ as they inform strategies for enhancing communication in virtual team environments.

4.3 Implication of VTC+

Next, I could discover a concept that conceptualized VTC+ implications. The assigned publications exhibited the common characteristic of subjecting VTC+ to a comprehensive evaluation, either in terms of its negative or positive implications. Two dominant divergences were observed. On the one hand, the publications heavily focused on conceptualizing the negative implications of VTC+. On the other hand, publications emphasize the positive implications of VTC+. Table 3 provides a comprehensive overview of the selected publications that address the concept of the "implications of VTC+".

Concept	Divergence	Relevant sources
Implications of VTC+	**Positive Implications**	Bergiel et al., 2008; Diaz et al., 2012; Fiedler & Gallenkamp, 2008; Gant & Kiesler, 2002; MacCormick et al., 2012; Ragu-Nathan et al., 2008; Richter & Richter, 2020; Sarabadani et al., 2018
	Negative Implications	Ahuja et al., 2007; Bergiel et al., 2008; Dery et al., 2014; Diaz et al., 2012; Fiedler & Gallenkamp, 2008; Greenhaus & Beutell, 1985; Köffer et al., 2015; MacCormick et al., 2012; Maier et al., 2012; Maier et al., 2015; Mazmanian et al., 2013; Pearson et al., 2009; Ragu- Nathan et al., 2008; Reed & Knight, 2010; Richter et al., 2018; Sarabadani et al., 2018

Tab. 3. Publications assigned to "General essence of VTC+"

A notable disparity has emerged within the overarching concept of studies examining the negative implications of VTC+ and those addressing its positive implications. Research has disproportionately focused on the challenges and drawbacks associated with the implications of VTC+, while a smaller portion of the research is dedicated to its positive implications.

For instance, research on the convergence of cell phones and mobility (Gant & Kiesler, 2002) demonstrated how the blurring of boundaries between cell phones can positively influence both work and personal life. This study shows that individuals engaged in VTC+ exhibit increased mobility as they can communicate and coordinate seamlessly

anytime and anywhere. These outcomes underscore the substantial organizational and individual advantages accrued from enhanced flexibility through VTC+.

The positive aspects of VTC+ have been shown to influence both work and personal life, as evidenced by research in this area. For instance, a study on the effects of technostress on end users in organizations (Ragu-Nathan et al., 2008) found that individuals adept at managing technostress were more likely to leverage the positive attributes of VTC+. This research not only highlighted the potential benefits at the individual level but also suggested that the constructive aspects of VTC+ could lead to broader societal advantages in the long run.

Conversely, to illustrate the negative aspects of VTC+, research on the diverse applications of IT devices such as smartphones and notebooks (Köffer et al., 2015) can be utilized. This study refutes the hypothesis that the use of cell phones and mobility in VTC+ results in positive aspects. This study posits that the increasing blurring of boundaries between work and personal life, attributable to the pervasive use of information technology, is the underlying cause. Furthermore, this research underscores the pivotal role of the intricate interplay between technology and individual lifestyles in determining these outcomes.

An additional example that substantiates the adverse implications of VTC+ is a seminal study of the diverse impacts of email functionality on mobile IT devices (MacCormick et al., 2012). This study examines the effects of email usage on organizational dynamics and individual experiences. This study illuminates the intricacies and ramifications of utilizing mobile IT devices for email communication within the VTC+ paradigm, ultimately concluding that VTC+ entails unfavorable consequences.

4.4 Performance of VTC+

Additionally, I discovered a concept that conceptualized the performance of VTC+ and focused on evaluating the performance of VTC+. All the assigned publications share the common characteristic of subjecting VTC+ to performance assessments. Within this formulated convergence, two divergences were discovered. On the one hand, assigned publications focus on conceptualizing the performance of VTC+ as a threat. On the other hand, assigned publications focus on conceptualizing the performance of VTC+ as an enhancer. Table 4 shows the publications assigned to the discovered concept of the "performance of VTC+".

Concept	Divergence	Relevant sources
Performance of VTC+	**As a threat**	Ayyagari et al., 2011; Daim et al., 2012; Kolb et al., 2012; Sarigianni et al., 2017; Waizenegger et al., 2016; Yang et al., 2017
	As an enhancer	Kolb et al., 2008; Mazmanian, 2013; Richardson & Benbunan-Fich, 2011; Waizenegger et al., 2014; Waizenegger et al., 2016

Tab. 4. Publications assigned to "Performance of VTC+"

A notable paradox emerged within this discovered concept, as some VTC+ researchers conceptualized VTC+ performance as both an enhancer and a threat. Through a literature analysis, I discovered that those who viewed VTC+ as a threat to

performance did not necessarily negate its potential as a performance enhancer. Instead, it became clear that researchers who primarily viewed VTC+ as a facilitator of success grounded their work on the concept that VTC+ could also present challenges to performance. This duality highlights the multifaceted nature of VTC+ and emphasizes the need for proper conceptualization, implementation, and execution.

A seminal study on VTC+ is a potential threat to performance (Kolb et al., 2008). In this study, it was found that extensive IT usage play a crucial role in shaping job satisfaction. Furthermore, the research emphasized a nuanced relationship where excessive information and communication technology usage not only had the potential to diminish job satisfaction, but also to trigger conflicts between work and private life. Although these findings may not seem directly associated with the conceptualization of VTC+ performance as a threat, they demonstrate their profound implications when examined more closely. The lens of constant connectivity reveals how these insights into IT usage and its effects negatively impact job satisfaction and work-life balance.

Another example is a study on dealing with low-connectivity project work (Sarigianni et al., 2017). In this study, upon closer examination of constant connectivity, performance was conceptualized as a threat by VTC+. The varying levels of constant connectivity are the central aspect in considering performance as a threat. However, this perspective underscores that if connectivity is not effectively managed, it can significantly and negatively impact the performance of VTC+ in various contexts. Excessive connectivity consumes time and resources, and organizations struggling with its negative aspects inevitably experience performance setbacks that directly affect the efficiency of VTC+ initiatives.

In contrast, studies on moving from isolation to collaboration (Waizenegger et al., 2016) can be highlighted to conceptualize the performance of a VTC+ as an enhancer. This study explores the concept of performance as an enhancer, examining how the use of virtual teams in any form can have a positive impact on performance outcomes. The argument in this study is that meticulous planning and coordination within virtual teams could yield tangible benefits, enhancing the overall performance, satisfaction, and handling of VTC+.

Furthermore, this study examined the antecedents of workplace connectivity behavior during non-working hours (Richardson & Benbunan-Fich, 2011). In this study, human behavior surrounding the construct of work-related connectivity behavior during non-working time is explored, and its relationship with the distribution of wireless devices by the organization and organizational norms regarding connectivity is examined. In this study, performance was conceptualized as an enhancer. The results of this study also suggest that individual characteristics differ depending on the functionality of the device through which connectivity behavior is exercised.

4.5 Management of VTC+
Finally, I discover a concept in the literature that conceptualizes the management of VTC+. All the assigned publications share the common characteristic of conceptualizing, implementing, and executing VTC+ to formulate a comprehensive

evaluation. Throughout the analysis, two dominant divergences were discovered. On the one hand, assigned publications focus heavily on the conceptualization, implementation, and execution of VTC+ based on technical frameworks. On the other hand, assigned publications strongly emphasize the conceptualization, implementation, and execution of VTC+ based on psychological coping patterns. Table 5 shows the publications assigned to the discovered concept in the "management of VTC+."

Concept	Divergence	Relevant sources
Management of VTC+	**Technical frameworks**	Dery et al., 2012; Dery et al., 2017; Hoch & Kozlowski, 2014; Jarvenpaa & Lang, 2005; Malhotra et al., 2007; Riemer & Filius, 2009; Walter et al., 2016
	Psychological coping pattern	Armstrong et al., 2018; Geiger et al., 2016; Geiger et al., 2016; Geiger et al., 2017; Gruber et al., 2018; Russo et al., 2019; Zheng et al., 2016.

Tab. 5. Publications assigned to "Management of VTC+"

An exemplary representation of the concept based on technical frameworks was presented in (Jarvenpaa & Lang, 2005). This study has made a significant impact by identifying eight crucial paradoxes of IT that continue to profoundly influence user experience and behavior. These paradoxes underscore the complex and often contradictory nature of the influence on individuals and organizations. Their work emphasized the critical importance of considering these paradoxes throughout the entire lifecycle of VTC+, from conceptualization and implementation to execution, and suggested that a carefully crafted technical framework can enhance the successful and effective conceptualization, implementation, and execution of VTC+.

Another example is the study of contextualizing media choices by applying genre analysis (Riemer & Filius, 2009). This investigation presents a technical approach to improve the successful and effective conceptualization, implementation, and execution of VTC+ by analyzing a specific task set of a collaboration in a change management approach to identify which media and tools can be recommended for a specific task set. In particular, genre analysis examines the task set and identifies recurring genres (patterns) and episodes (sequences within a genre). These genres and episodes are then reorganized to ensure more effective collaboration.

An illustration of the convergence based on psychological coping patterns was presented in (Zheng et al., 2016). This study examines the impact of individual coping strategies and organizational work-life balance programs on employee well-being. This study derives communication and coordination practices from individual coping strategies, aiming not to rigidly structure but to analyze the well-being of participants in the study's work-life balance. One of the key findings was that individuals with modest personal and professional expectations tended to achieve better overall well-being in both personal and professional aspects of their lives than those with higher expectations.

Another example is the study of moving from a pragmatist to a passenger (Geiger et al., 2016). In this research, various coping patterns or strategies are identified based

on a qualitative survey, determining the types of organizational participants. Subsequently, a factor array analysis was conducted to determine which psychological coping patterns the different observed types of organizational participants prefer to ensure more effective conceptualization, implementation, and execution of VTC+ in the future.

5. Future research opportunities

5.1 Implementation of innovative processes

Research on the concept of the general essence of VTC+ has created new design-oriented processes for the conceptualization, implementation, and executed. In this context, the future of work will enable more efficient, flexible, and transparent conceptualization, implementation, and execution. Continuous efforts to investigate the general essence of VTC are crucial for successful and effective VTC+. In the analysis, it emerged that more knowledge about the conceptualization of the future of work should be found to explore new ways to benefit from the positive implications of VTC+ (Seeber & Erhardt, 2023).

On one hand, the ongoing integration of new design-oriented processes into a VTC+ can complicate the decision-making process. Constant consideration of new processes can lead to uncertainties, confusion, longer discussions, and decision-making phases, thereby affecting the efficiency of the project (Dulebohn & Hoch, 2017; Webster & Wong, 2008). Furthermore, the risk of conflict and resistance within a collaborative team increases. New processes may challenge existing assumptions and approaches, leading to tension among the team members. This can slow the implementation process and even lead to resistance to changes within the team (Jarvenpaa & Leidner, 1999). Additionally, the risks of information overload and decision paralysis increase. If new processes need to be considered repeatedly during goal pursuit, team members can become overwhelmed, making it difficult to make clear decisions (Kolb, 2008).

However, the ongoing integration of new processes into a VTC+ can improve the quality of decision-making. New processes within a shared goal pursuit can innovatively expand existing problem-solving practices and tap into undiscovered potential, leading to better overall project planning and implementation (Mazmanian, 2013). Moreover, the integration of new processes can foster creativity and innovation in collaborative teams. By integrating new processes, team members can be encouraged to think outside the box and bring new ideas, leading to innovative solutions that advance the project and open up new opportunities (Powell et al., 2004).

I argue that to conceptualize a successful and effective VTC+ initiative, it would make sense to further advance and deeply investigate the conceptualization of the future of work. The integration of new potential transformations of a VTC+ has considerable positive potential but also negative potential to influence the group performance, handling, and satisfaction of a participant of a VTC+. Finally, to benefit from the positive

potential of the new approaches, it would be advisable to conduct further practical research. Therefore, my proposal as a relevant research opportunity is to promote the practical-oriented conceptualizations of the future of work in VTC+ to gain new insights into how group performance, individual participant satisfaction, and handling can be balanced to profit from the positive aspects.

5.2 Requisite connectivity flow for satisfaction optimization

In the analysis of the concept of the implications of VTC+, it became apparent that the individual satisfaction of a participant in VTC+ is a crucial factor for the successful and effective conceptualization, implementation, and execution of VTC+ (Fiedler & Gallenkamp, 2008). Participant satisfaction with VTC+ was defined by the quality of the interaction (Kolb, 2008). When team members can effectively communicate with each other and feel heard and supported, their satisfaction can increase (Jarvenpaa & Leidner, 1999).

Research shows that when participants in VTC+ are not satisfied, their work performance and productivity decrease (Kiesler et al., 1987; Waizenegger et al., 2020; Webster & Wong, 2008). Dissatisfied team members are less motivated and engaged, leading to a decrease in work quality and slowdown in work processes (Jarvenpaa & Lang, 2005; Kiesler et al., 1984). Dissatisfaction can also lead to deterioration of collaboration and communication within the team. If team members are frustrated or have conflicts, this can affect the effectiveness of collaboration and lead to tensions or misunderstandings, hindering the achievement of common goals and negatively impacting the team climate (Ragu-Nathan et al., 2008).

Further research on satisfaction also shows that high satisfaction leads to better work performance and productivity among team members (Hofeditz et al., 2023). When participants feel comfortable with their work and team environment, they are more motivated to contribute and achieve high-quality results (Riemer & Filius, 2009). Furthermore, participant satisfaction leads to improved collaboration and communication within the team. When team members feel comfortable and trust each other, collaboration is more effective and constructive, promoting information exchange, idea generation, and problem-solving skills within the team (MacCormick et al., 2012).

In the literature, it was found that connectivity theory (MacCormick et al., 2012; Mazmanian, 2013; Ragu-Nathan et al., 2008; Sarabadani et al., 2018) plays a significant role as a theoretical foundation. This theory addresses how people are connected through technologies and the effects of these connections on their relationships and interactions. It defines how the strength and nature of connections between individuals, groups, or organizations determine communication, information exchange, and collaboration (Kolb, 2008). The theory postulates that higher connectivity, that is, a greater number and variety of connections, leads to improved information flow and more effective collaboration. It emphasizes the importance of networks and social relationships for the success of organizations and teams.

Connectivity theory describes various levels of connections, including personal relationships (Kolb et al., 2012).

I argue that, with connectivity theory as a theoretical foundation, one could determine how participants in VTC+ should be connected through technologies to achieve optimal participant satisfaction in a given VTC+ initiative. Using connectivity theory, individual preferences should be identified to achieve the requisite workflow. Therefore, my suggestion for a relevant future research opportunity would be to explore and further specify the idea of satisfaction optimization using connectivity theory.

5.3 Impact of new technologies on performance

It has become apparent that technologies have fundamentally changed how VTC+ is conceptualized, implemented, and executed (Seeber & Erhardt, 2023). Regarding the conceptualization, implementation, and execution of a VTC+ initiative, technologies enable an efficient, flexible, and transparent work environment that allows teams to collaborate across boundaries and achieve common goals (Hofeditz et al., 2023). These are crucial for the success and efficiency of VTC+ in an increasingly digital working world (Yang et al., 2017). From the analysis, it emerged that more knowledge about the application of new technologies in VTC+ should be gained to prevent or avoid dysfunctional VTC+ endeavors (Seeber & Erhardt, 2023).

On one hand, the application of new technologies in a VTC+ can have negative impacts on group performance despite its potential (Benlian, 2020). One issue is the potential dependency of team members on new technology (Sarigianni et al., 2017). If team members rely too heavily on new technologies to complete tasks or make decisions, they may neglect their skills and creativity (Kolb et al., 2012). This can lead to a loss of individual initiative and accountability, negatively affecting motivation and work quality (Waizenegger et al., 2016). Additionally, new technologies can disrupt knowledge exchange within teams (Ayyagari et al., 2011). When communication primarily occurs through new technologies, important aspects, such as personal relationships, empathy, and interpersonal dynamics, may be neglected. This can lead to a lack of trust and cohesion within the team, which can in turn negatively impact group performance (von Thülen & Hartl, 2021).

However, the application of new technologies in VTC+ can automatically create, edit, and optimize content, significantly improving the efficiency and quality of collaboration within the team (Richter & Richter,2020). New technologies can take over repetitive tasks, such as writing reports, creating presentations, generating ideas, reducing workload significantly, and allowing more focus on creative and strategic tasks (Yang et al., 2017). Team members can thus focus more on their core competencies and work more productively. Furthermore, new technologies can help to improve the quality of work (Richter & Richter, 2020). Precise suggestions can be formulated, optimizations made, or even new solutions can be found (Mazmanian, 2013). Overall, the application of the new technology in VTC+ offers great potential, including time

savings, improved quality of work, supported decision-making, and enhanced collaboration.

I argue that to conceptualize, implement, and execute a VTC+ initiative successfully and effectively, it would make sense to further investigate the integration of generative artificial intelligence in VTC+. The integration of generative artificial intelligence in VTC+ has considerable positive potential but also simultaneously negative potential to influence group performance, individual satisfaction, and handling. Additionally, research is still at the beginning of examining the impact of integrating generative artificial intelligence in VTC+ on performance. Therefore, my suggestion as a relevant research opportunity is to focus on the integration of generative artificial intelligence in VTC+. Specifically, the focus should be on areas where it would make sense for generative AI to take over IT project consulting tasks.

5.4 Conceptualizations with proactive cognition-based genre analysis

To achieve successful and effective goal setting, proper selection of media for collaboration plays a crucial role in leveraging shared resources and capabilities (Riemer & Filius, 2009). In the context of conceptualizing, implementing, and executing a VTC+ initiative, the correct selection of media and tools becomes even more critical, as the virtual nature of a VTC brings about more complex requirements for task distribution, responsibilities, and authorities (Waizenegger et al., 2016; Webster & Wong, 2008). Furthermore, in the light of a VTC+ initiative, it is highly critical because external peers collaborate with an internal workgroup and are confronted by different organizational cultures. Within the analysis of the concept of VTC+ management, it emerged that media choice theory, specifically genre analysis (Riemer & Filius, 2009), can be used as a basis for successful and effective conceptualization, implementation, and execution of a VTC+ initiative when some assumptions are made.

Where does this conclusion come from. As briefly described in the results section of the genre analysis, collaboration is conceptualized or reformed with a change management approach. In this approach, specific task sets within a selected observed collaboration are observed to determine the effective media and tools for the observed task sets (Fiedler & Gallenkamp, 2008). Existing communication genres and episodes were abstracted from the observations of the selected sets. These abstracted sets of converging communication genres and episodes were used to identify corresponding media and tools (Figl & Saunders, 2011). The found suitable communication media and tools were then integrated into the observed collaboration to enhance collaboration effectiveness.

Thus, the existing logic of genre analysis can be used to analyze existing collaborations and determine suitable media and tools for specific task sets. However, the existing genre analysis approach cannot be used as a guide for a fully proactive conceptualization of VTC+. It does not consider social factors, such as the socio-relational influences of team climate on group communication (Figl & Saunders, 2011;

Riemer & Filius, 2009) or the socio-technical impacts of global VTC on traditional coordination practices (Kiely et al., 2021).

Although not addressed in the existing genre analysis approach, I argue that the proactive formulation of genres and episodes is possible due to the communication analysis approach of the traditional existing genre analysis. My suggestion as a potentially relevant research opportunity is to apply genre analysis. Specifically, proactive cognition-based application of genre analysis. To ensure successful and effective conceptualization, implementation, and execution of a VTC+ initiative, proactive cognition-based genre analysis should be used as a kernel theory in a design science research study (vom Brocke et al., 2020). In a proactive cognition-based conceptualization with the help of genre analysis in a design science research study, the developed design principles should offer the possibility of developing an application concept that considers the individual satisfaction of a participant in a VTC+, the requisite handling of VTC+, and the requisite group performance by VTC+.

6. Concluding remarks

VTC+ has significant potential for collaboration (Seeber & Erhardt, 2023). This study discovered pathways that benefit from these positive aspects. Regarding the statement that proper conceptualization can even enhance efficiency, satisfaction, and ultimately performance compared to presence-based collaboration concepts (Benlian, 2020), this study also found possible future research opportunities to investigate new ways to conceptualize VTC+ to benefit from positive effects.

This study demonstrates that the highly fragmented and dispersed field of VTC+ (Abarca et al., 2020) can be systematically consolidated by applying a structured literature review approach in combination with the paradigm funnel approach analysis (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002). Through this methodological framework, the diverse and scattered insights within the field were synthesized into four key conceptual dimensions: the fundamental essence of VTC+, its implications, its impact on performance, and its management. By identifying and integrating these core concepts, the study addresses the uncertainties arising from the previously disjointed findings, providing a more structured and comprehensive understanding of VTC+.

Concerning the scope of this literature analysis, four relevant research opportunities have been identified, focusing on the development of concrete, design-oriented guidance for the conceptualization, implementation, and execution of a VTC+ within an IT consulting project. More broadly, the findings highlight the need for a deeper exploration of how the future of work is conceptualized (Waizenegger, 2015). Generating new insights and perspectives on innovative and effective approaches to structuring VTC+ initiatives is essential for their successful implementation.

Regarding the implications of VTC+, further research is required on the construct of individual satisfaction among VTC+ participants (Mazmanian, 2013). Design-oriented knowledge aimed at optimizing participant satisfaction is crucial, as it can significantly

enhance group performance. Similarly, in terms of VTC+ performance, additional research is needed to examine the impact of emerging technologies on overall effectiveness (Sarigianni et al., 2017; Waizenegger et al., 2016). The integration of such technologies holds substantial potential for improving VTC+ management, participant satisfaction, and team performance.

From a management perspective, existing research lacks design-oriented approaches that proactively conceptualize VTC+ while accounting for social dynamics (vom Brocke et al., 2015). Given the research artifacts analyzed in this study, addressing this gap represents one of the most pressing research priorities. A well-structured VTC+ initiative—where a management education seminar focuses on equipping participants with the skills to effectively manage an IT consulting project—would be particularly valuable, especially in light of the various challenges that emerged due to COVID-19.

Similar to any previous study, this study has its limitations. First, the scope of this study was limited to publications from five leading research databases. Although, with the selection of five databases, relevant publications should be comprehensive in principle, it cannot be assumed that further relevant literature was not excluded. Forward and backward inductions were performed to offset this bias. However, this is a noteworthy weakness. Furthermore, the allocation of literature into discovered convergences may be influenced by the subjective judgment of the author. Other researchers might have made different allocations. Additionally, the sample size of the selected literature sources is another limitation that introduces a potential bias in the results. Out of twenty-five relevant literature sources, fifty-five sources were selected. It can be questioned whether this sample size is sufficient to obtain a comprehensive picture of the successful and effective conceptualization, implementation, and execution of a VTC+.

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PAPER B

Using genre analysis for conceptualizing virtual team collaborations with complex role and work context connections. What implementation problems can occur?

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Using genre analysis for conceptualizing virtual team collaborations with complex role and work context connections: What implementation problems can occur?

Modern technology enables virtual team collaboration, offering new possibilities, particularly for geographically distributed teams. Traditionally, organizations favored presence-based collaboration, but the COVID-19 pandemic triggered a widespread reconsideration, highlighting the feasibility and advantages of virtual teamwork. In the post-pandemic era, the focus has shifted from whether to engage in virtual team collaboration to how to do so effectively and efficiently. Particularly, the COVID-19 pandemic revealed that virtual team collaborations with complex role and work context connections can still encounter fundamental problems. Thus, it is crucial to promote effective and efficient collaboration within virtual teams. This study employs a genre analysis proactively to conceptualize complex virtual team collaboration within a fully virtualized management education seminar addressing real-world IT consulting problems. Through a qualitative multiple-case study approach, the effectiveness and efficiency of this approach are evaluated. This study demonstrates the feasibility through handling, individual satisfaction, and group performance. It also sheds light on the potential of proactive use of genre analysis. The findings underscore the importance of using genre analysis in a proactive way and provide theoretical insights.

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1. Introduction

In modern societies based on the division of labor, working in teams is a normal phenomenon (Abarca et al., 2020). Team collaboration requires communication and coordination between the various team members to complete a task. Traditional and modern media enable different types of synchronous and asynchronous communication (Chamakiotis et al., 2020). These range from face-to-face communication to communication by e-mail or traditional letter correspondences (Riemer and Filius Citation2009). The variety of communication options raises the question of which media and tool should be used to best fulfil a particular task. Media choice theories provide normative statements about suitable media and tools regarding the type of task in question (Figl & Saunders, 2011). Among other limitations, these theories ignore the fact that the choice of media and tools may be predetermined or limited by certain constraints (Fiedler & Gallenkamp, 2008). These constraints can be given by the geographical distribution of team members.

The work of geographically distributed teams requires virtual team collaboration (VTC). Modern information and communication technologies open a wide range of possibilities for VTC concepts (Powell et al., 2004). The use of these concepts offers the individual team members several advantages. For instance, avoiding commuting times (Kelliher & Anderson, 2010) or better work-life balances (Ahuja et al., 2007). From the organizational perspective, however, most organizations traditionally preferred presence-based collaboration concepts and hesitated to endorse the large-scale use of VTC (Dery & van der Meulen, 2017). The outbreak of COVID-19 disrupted daily business and forced many organizations to adopt VTC for their work (Waizenegger et al., 2020). The experience of successful VTC concepts triggered their willingness to integrate VTC into their work (Garro-Abarca et al., 2021).

VTC concepts are primarily directed towards members within an organization but can also involve external participants. The inclusion of externals would ultimately enhance the effectiveness and efficiency of VTC concepts compared to presence-based collaboration concepts (Nurhas et al., 2021). However, incorporating externals also poses a particular challenge (Seeber & Erhardt, 2023) as VTC concepts must cover complex role and work context connections (VTC+). Especially when independent external participants are involved, maintaining the satisfaction of all participants (Kiely, Butler, and Finnegan Citation2021), and adhering to goal agreements become significantly more complex (Kiely & et al., 2021). Also, social aspects such as the individually preferred communication and coordination practices increase the complexity even further (Benlian, 2020).

In our project we had the challenge to conceptualize, implement, and execute a VTC+ concept. The aim was to create a fully virtualized management education seminar and evaluated it afterwards. Within the seminar, participants collaborated on real IT consulting problems with actual industry IT consultants. The objective was to impart crucial knowledge on how to solve consulting problems and successfully implement

them. In conceptualizing the seminar, we drew upon theories of media choice, particularly genre analysis (Riemer & Filius, 2009).

Currently, genre analysis conceptualize collaboration using an ex-post approach. In this approach, specific task sets within a collaboration are situationally observed to determine solely effective media and tools for observed task sets (Fiedler & Gallenkamp, 2008). Existing communication and coordination genres and episodes are abstracted from the observations of selected sets, which in turn can be used to identify the corresponding media and tools (Figl & Saunders, 2011). The formulation of role and work context connection, as well as the communication and coordination practices, are not considered. Thus, the existing logic of genre analysis could be used to analyze an existing presence-based collaboration to specify appropriate media and tools for specific task sets. However, the existing genre analysis approach cannot provide guidance for a fully proactive design of a collaboration concept, such as a VTC+ concept. Additionally, we posit that it is not always useful to specify media and tools. Especially when external parties are involved in a collaboration.

Although not addressed in the existing genre analysis approach, we found the proactive formulation of genres, episodes, role context connections, work context connections, communication practices, coordination practices and the freedom to choose media and tools relevant. We applied the traditional approach of genre analysis proactively to formulate cognition-based genres and episodes. Further we formulated role and work context connections as well as communication and coordination practices and did not specify the choice of media and tools. We posit that this adaptation of genre analysis leads to a successful and effective outcome when it comes to meeting goal agreements in the context evaluating the use cases. Therefore, we pose the following research questions:

- Research Question 1: "*Can a successful and effective fully virtualized seminar with external practice partners and real IT consulting problems be conceived, implemented, and conducted using the genre analysis proactively?*"

- Research Question 2: *"Does the demonstration reveal socially and technologically induced communication and coordination problems that hinder or diminish the effectiveness and efficiency among the various actors?"*

Due to the design-oriented motivation of this investigation, we chose a qualitative research approach to answer the research questions. To conceptualize and subsequently evaluate the effectiveness and efficiency of the VTC+ concept, we started the research by reviewing the extensive and growing body of VTC (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002). To obtain a holistic picture of the research questions posed, we then examined two cases using the multiple case study approach (Benbasat et al., 1987). We decided to take a deeper look at the collected data with a qualitative content analysis (Krippendorff, 2011;

Kuckartz, 2018; Mayring, 2004).

Based on the outlined research artifact so far, this study initially delves into the theoretical foundations. It establishes the understanding of the terms VTC, communication and coordination practices, and media choice theories pertinent to this investigation. Subsequently, the methodological approach employed is described in detail. Following this, the observed social and technology-related problems are presented which have been encountered during the realization of the seminars. Finally, the findings are discussed in terms of the insights gained.

2. Theoretical foundations

2.1 Virtual team collaboration
In essence, teams are comprised of multiple members collaborating to achieve specific goals (Boughzala & de Vreede, 2015). Collaboration can be defined in several ways: as a social phenomenon involving multiple individuals when the action of one alone does not yield the desired outcome (Heled et al., 2016); as a joint effort where individuals work together towards a common group goal (Briggs et al., 2003); or as actions of shared creation and/or discovery (Koch et al., 2006). In this study, collaboration is viewed as a process in which two or more actors (individuals or organizations) share resources and skills to collaboratively solve problems and achieve one or more goals (Boughzala & de Vreede, 2015).

Fundamentally team collaboration is considered as a process that describes the configuration of relationships in terms of tasks, responsibilities, and authority (Hackmann, 1987; Marschak & Radner, 1972). Thereby the composition of teams, including team size and established practices, significantly impacts group performance (Cohen & Bailey, 1997). Hence various team configurations, such as the application of agile project management approaches, should be seen as critical components of successful organizational design (Roberts, 2004).

In team collaboration, one aspect concerns the location and timing of individual team members' interactions. Traditionally, team members mostly work together in the same location and at the same time, engaging in presence-based collaboration (Abarca et al., 2020). In virtual teams, on the other hand, team members interact from different locations synchronously and sometimes at different times asynchronously (Powell, 2004). Therefore, VTC represents a specific case of team collaboration. Compared to presence-based team collaboration, VTC is significantly more complex due to its virtual nature (Palos-Sanchez et al., 2022). Furthermore, the level of complexity can further increase when various stakeholders are involved in team collaboration, especially when external peers are engaged, such as external practice partners, coaches, and instructors (Magnus, 2011).

The extensive growing body of research on VTC (Abarca et al., 2020) has been studied so far on the units of analysis of individuals, groups, organizations, and society (Waizenegger, 2015). Thereby, literature focuses thematically on characterization

(Dulebohn & Hoch, 2017; Kolb, 2008; Powell et al.2004; Purvanova, 2014; Richter et al., 2018; Richter & Richter, 2020; Wajcman & Rose, 2011) implications (Bergiel et al., 2008; Fiedler & Gallenkamp, 2008; MacCormick et al., 2012; Ragu-Nathan et al., 2008; Richter & Richter, 2020; Sarabadani et al., 2018), performance (Ayyagari et al., 2011; Daim et al., 2012; Kolb et al., 2012; Waizenegger et al., 2016; Yang et al., 2017), and concepts (Dery et al., 2012; Dery et al., 2017; Hoch & Kozlowski, 2014; Jarvenpaa & Lang, 2005; Malhotra et al., 2007; Riemer & Filius, 2009; Walter et al., 2016).

In terms of the degree of virtualization and the involvement of external peers in a collaboration, VTC+ epitomizes this concept (Garro-Abarca et al., 2021). VTC+ is distinguished by its complete virtualization and the integration of multiple diverse stakeholders within a collaboration. In comparison to VTC or presence-based collaborations, VTC+ relies on highly complex role and work context connections aimed at successfully achieving a delivery goal agreement (Seeber & Erhard, 2023). VTC+ is thus also considered a process. However, this process entails a very high level of complexity in configuring relationships concerning tasks, responsibilities, and authority (Magnus, 2011).

2.2 Communication and coordination practices

Communication can be defined as any transfer of information from one person to another (Roberts et al., 2002). Team members need to communicate with each other to establish team collaboration and effectively coordinate their tasks. Communication and coordination essentially encompass all collaborative actions within a working team of two or more individuals aimed at successfully achieving the pattern, timing, and content of a defined work objective (Chamakiotis et al., 2019; Roberts et al., 2002). Particular attention should be given to established communication and coordination practices (Benlian, 2020; Thülen & Hartl, 2021; Waizenegger et al., 2020).

In the case of VTC+, the consideration of communication practices in conceptualization becomes even more crucial. Due to the increased complexity resulting from complete virtualization and the integration of externals, collaboration in VTC+ is significantly more susceptible to occurring comprehension problems (Seeber & Erhard, 2023). However, the literature provides limited guidance on the conceptualization of a VTC+ concept, which considers communication and coordination practices. There are a few transferable suggestions on how communication practices can be conceptualized and implemented in a concept. For example, Figl & Saunders (2011) demonstrate that team spirit can significantly positively influence group communication and should be considered. Anyway, there is no discussion on how team spirit should be considered in the conceptualization of a VTC+ concept to benefit from team spirit´s positive influences.

Coordination or a coordination practice can be defined as a process aimed at intervening in and controlling group communication patterns, timing, and content (Chamakiotis et al., 2019). This includes tasks such as the division of roles and tasks (Waizenegger et al., 2020), the creation of a goal achievement strategy (Jarvenpaa &

Lang, 2005), the definition of individual milestones (Hertel et al., 2005), the setting of deadlines for the achievement of defined milestones (Riemer & Filius, 2009), and the agreement on interim and final meeting dates (Ahuja et al., 2007). About the definition of coordination practices in the context of the fulfillment of an established target agreement, coordination practices have a significant positive as well as a negative influence on the achievement of the established target agreement. Thus, when comprehension problems occur, goal agreement will be significantly affected, which in turn will negatively impact satisfaction and group performance outcomes (Waizenegger et al., 2020).

2.3 Media choice theories

Team collaboration is a process where two or more actors utilize resources and skills collectively through communication and coordination to solve problems or complete tasks (Boughzala & de Vreede, 2015). Therefore, in achieving a delivery goal agreement successfully and effectively, the proper selection of media and tools for collaboration plays a central role in terms of utilizing shared resources and skills (Riemer & Filius, 2009). In the context of conceptualizing a VTC+ concept, the proper selection of media and tools becomes even more crucial. This is because, in VTC+, the virtual nature of the collaborative environment introduces more complex requirements in the distribution of tasks, responsibilities, and authorities (Waizenegger et al., 2020).

The research extensively explored suitable concepts for team collaboration regarding the appropriate choice of media and tools (Hertel et al., 2005). In this context, research in the field of Information Systems (IS) has developed several theoretical approaches to support the selection of appropriate media (Figl & Saunders, 2011). These include the media richness approach (Daft & Lengel, 1983), the reduced-social-cues approach (Kiesler et al., 1984), the media synchronicity approach (Dennis & Valacich, 1999), the effects-of-experience-on-media-appropriateness approach (King & Xia, 1997), and the genre analysis approach (Riemer & Filius, 2009). The fundamental idea behind media choice theories is that each medium can be assessed based on its ability to support various aspects of communication (Fiedler & Gallenkamp, 2008). A medium is used to address the requirements of a specific communication situation or task (Riemer & Filius, 2009).

However, the practical utility of media choice theories is limited as they focus only on one or a few task sets (Riemer & Filius, 2009). Media choice theories solely evaluate media and tools for specific tasks (Hertel et al., 2005). Moreover, within media choice theories, approaches are applied ex-post to specific cases (Fiedler & Gallenkamp, 2008). Complex collaborations like VTC+ are not considered in existing approaches (Figl & Saunders, 2011).

In the genre analysis approach (Riemer & Filius, 2009), the key distinction from other media choice theory approaches lies in its situational communication analysis (Fiedler & Gallenkamp, 2008). This approaching allows categorizing communication situations

into genres and episodes on a case-by-case basis. Which in turn allows conceptualizing a collaboration proactively. In detail, by genre analysis (Riemer & Filius, 2009) genres are considered as meta-classifications, and episodes as sub-classifications. Within the genre classification, recurring communication situations like the elaboration of a result are categorized. Within the episode classification, all communication situations necessary for the elaboration of a result, such as giving and receiving feedback, are classified. Subsequently, after the formulation of the genres and episodes, the genres and episodes are evaluated concerning suitable media and tools (Figl & Saunders, 2011).

3. Research method

3.1 Categories formulation

For a successful and effective design, implementation, and measurement of the VTC+ concept, we formulated conceptualization and evaluation categories that could be used to determine the effectiveness and efficiency of the cooperation. For this purpose, we reviewed the extensive growing VTC literature (Berthon et al., 2003; Nairn et al., 2007; Okoli, 2015; Webster & Watson, 2002). We formulated the categories "Handling of VTC+", "Group performance by VTC+", and "Satisfaction of a participant of a VTC+". Figure 1 visually depicts them and illustrates the reciprocal´s influences.
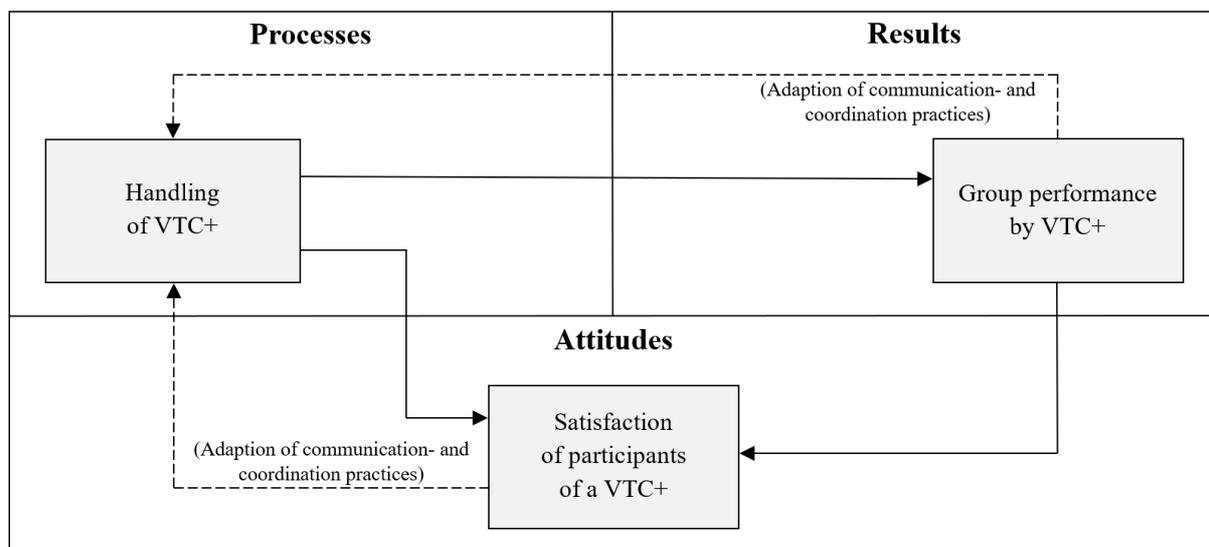
Fig. 1. Formulated categories reciprocal´s influences

The reciprocal influences on each other lead to dynamic effects that manifest themselves in adjustments to communication and coordination practices. Adaptations can be triggered by both social and technological causes (Waizenegger et al., 2020). Social triggers for such adaptations are, i.e., the experience of problematic manners or problematic group performance (Figl & Saunders, 2011). Technology-related triggers for these adaptations include technical difficulties during the development of a service (Riemer & Filius, 2009).

In essence, "Handling of VTC+" represents the communication and coordination

practices used to achieve the specified delivery objectives (Ahuja et al., 2007; Boughzala & De Vreede, 2015; Hertel et al., 2005; Lang & Jarvenpaa, 2005; Sarker et al., 2011; Vidolov, 2022; Waizenegger, 2015). These practices are reflected in specific actions taken by group members in the context of VTC+, constituting the procedural dimension of VTC+. As a process, it leads to the desired outcomes.

In contrast, "Group performance by VTC+" focuses on the results achieved in a project. When assessing group performance, it is crucial to consider the quality and effort required to achieve the goals (Altinay, 2017; Kiely et al., 2021; Reichwald et al., 1998). Hence, group performance can be negatively or positively influenced depending on how VTC+ is handled (Fiedler & Gallenkamp, 2008; Lurey & Raisinghani, 2001).

The "Satisfaction of a participant of a VTC+", i.e., team members and their external participating stakeholder, is also essential for evaluating the effectiveness (Fonner & Stache, 2012; Figl & Saunders, 2011; Seeber & Erhard, 2023). The satisfaction of involved participants depends on how the team's handling is perceived and whether group performance meets expectations (Chamakiotis et al., 2020; Fang et al., 2022; Kiely et al., 2022; Nordbäck & Espinosa, 2019; Waizenegger et al., 2020). If handling is perceived as problematic, it negatively affects satisfaction. Although the results to be achieved during the project initially have no direct impact on satisfaction, if the quality of the produced results is subpar and the effort to achieve these results is excessive, this criterion also affects satisfaction (Figl & Saunders, 2011; Kisler et al., 1984; Nordbäck & Espinosa, 2019).

3.2 Concept development approach

In contrast to the postulated application of genre analysis (Riemer & Filius, 2009), we used genre analysis proactively to develop a collaboration concept from scratch that considers role and work context connections, communication and coordination practices, and allows a free choice of communication media and tools. To this end, all potential communication and coordination genres and episodes needed for the seminar were evaluated and documented in focus group discussions. Likewise, all possible role and work context connections as well as communication and coordination practices were discussed for each genre and episode and relevant ones recorded. Figure 2 illustrates the VTC+ concept design.

All assumed communication genres, episodes, role and work context connections, as well as communication and coordination practices were recorded in an activity list. The activities list obtained in this manner was then subjected to critical evaluation through focus group discussions and further refined based on the feedback received. This approach ultimately facilitated the development of a theory-driven concept that applies proactive utilization of genre analysis while considering social aspects and allowing for free choice of media and tools.

	Milestone I	Transitional stage I	Milestone II	Transitional stage II	Milestone III	Transitional stage III	Milestone IV	Transitional stage IV	Milestone V	Final stage
Preparation	Kick-off		Interim pitch with coach and teaching staff		Interim pitch with coach and teaching staff		Final pitch with coach and teaching staff		Final pitch with external stakeholder, coach and teaching staff	

Arrows represent the role and work context connections
(a) The non-striped arrows represent editing processes like the coach's joint feedback revision.
(b) The dashed arrows represent evaluation processes, such as the coach's assessment of an intermediate phase.

Fig. 2. VTC+ concept design

3.3 Investigated cases

The first seminar what we evaluated (Seminar A) was intended to teach prospective IT consultants about a real IT consulting project. The seminar took place in the fall of 2020. From a didactic point of view, participants should learn how to approach a real IT consulting project and how to lead it successfully to a result using the example of a real consulting problem with the support of coaches during the seminar. Therefore, a virtual kick-off meeting was held at the beginning regarding the project procedure. Here the participants had their first contact with the external practice partner, the coach, and the teaching staff. In addition, the participants received initial instructions for the real IT consulting project.

In contrast, the second seminar what we examined (Seminar B) was conducted in the spring of 2020. It was originally planned to be conducted as presence-based teaching. The COVID-19 pandemic made it necessary to change the concept to a VTC+ setting. Due to this, Seminar B resembled conceptually the VTC+ setting of Seminar A. A slight difference has been the goal of both seminars. Participants in Seminar B had to develop and present an IT-based business idea on a current topic in groups. They had to develop a business concept and a prototype for a technical solution for their ideas and present it to the external practice partner. Seminar B was conducted in cooperation with an international management consultancy company in the IT sector. Consultants acted as practice partners to assess the business ideas and supported the students as coaches. This external coaching aimed to assess and further refine the innovative business models from a practical point of view.

3.4 Data collection

For Seminar A, we collected archival documents, single-choice questionnaires, multiple longitudinal field observations, and semi-structured interviews. For Seminar B, however, we collected archival documents and semi-structured questionnaires.

For all types of data collection except single-choice questionnaires and archival documents, semi-structured survey guides were developed based on the formulated categories (Kuckartz, 2018). These survey guides focus on two perspectives: the perspective of aspiring consultants and the perspective of externals (Mayring, 2004).

With regards to archival documents and single-choice questionnaires, the intention was to collect independent inductive data (Kuckartz, 2018; Mayring, 2004). For archival documents, the aim was to evaluate statements regarding their resilience. These archival documents span from initial conceptualization documents to final presentation documents. For single-choice questionnaires, the aim was to better assess the attitudes and experiences of aspiring consultants. The questions ranged from self-assessment in handling virtual communication tools to self-assessment in proficiency with virtual team collaboration coordination.

3.5 Data extraction

We created for the data extraction and analysis two coding guidelines. These, like the guidelines for the data collection procedure, were drawn up based on the formulated categories (Krippendorff, 2011; Kuckartz, 2018; Mayring, 2004). Thus, one coding rule was created, which made it possible to assign the collected data source types of the aspiring consultants to the formulated categories. While, the second coding rule was created, which assigned the corresponding data source types of the externals to the formulated categories. In total we recorded 372 assignments. Concerning the formulated categories, we categorized 88 assignments under "Handling of VTC+," 58 under "Satisfaction of a participant of a VTC+", and 226 under "Group Performance of VTC+." Table 1 provides examples of the assignment processes based on "Handling of VTC+".

Sub-Category	Coding guideline	Example
Communication and coordination practices of external stakeholders with a working group	All circumstances in which the handling, expectations, interpersonal relations, and design of the collaboration with the editing group are troublesome.	*"Unfortunately, the group could not completely understand the feedback right away. Moreover, it was not clear to them how to proceed in the project." (Seminar A, 2nd date, field observation)*
Internal communication and coordination practices within a working group	Situations in which the handling of the task, building trust, getting to know each other and communication and coordination within the project group come to the fore	*"However, constructive suggestions for improvement were not made by all group members in the same proportion." (Seminar B, Participant B, semi-structured interview)*

Working group communication and coordination practices with an external stakeholder	All circumstances in which the handling, expectations, interpersonal relations, and collaboration arrangements with external stakeholders are cumbersome.	*"Support from practice partners was not given. In the first round, the presentation of ideas, it was said that the status was far too immature." (Seminar B, Participant G, semi-structured interview)*

Tab. 1. Examples of the assignment processes based on "Handling of VTC+"

For reasons of reliability of the assignments, the collected data sources have been independently analyzed by three coders (Krippendorff, 2011). Thereby, the coders used the created coding guidelines and additional information regarding the set research artifact. The formulated categories of the coding guidelines were used as set variables concerning the types of data sources collected. The reliability of almost all set variables could be assessed as suitable (alpha > 0.75) or even excellent (alpha > 0.8).

3.6 Data analysis

To evaluate the effectiveness and efficiency of the developed VTC+ concept, we critically evaluated the problems observed during the demonstrations using the formulated conceptualization and evaluation categories. First, we examined how the observed problems affected the effectiveness and efficiency of the group performance. To do this, we examined how the observed problems affected the achievement of delivery targets, the handling of the collaboration and individual satisfaction. Subsequently, it was examined how the observed problems occurred based on the individual satisfaction of the participants. To this end, we examined how individual satisfaction was influenced both negatively and positively. Finally, the observed problems were analyzed considering handling. In doing so, we examined how the observed problems in the handling of the collaboration affected the effectiveness and efficiency of individual satisfaction as well as the group performance.

4. Results

4.1 Observed problems

The outcomes of this investigation revealed that are on par with the quality of a presence-based collaboration concept that involves the integration of externals in real project work. In one of the examined cases, the results were compared to those of previous seminars conducted with presence-based collaboration concepts. No fundamental disparities in the quality of outcomes were discernible. In this regard, this study provides anecdotal evidence that a VTC+, organized using genre analysis proactively, is a feasible and effective approach.

Regarding the findings revealed through the conducted content analysis, the study sheds some light on several observed problems related to comprehension problems in communication and coordination. As the root causes of these problems were identified ineffective communication and coordination within the working group and with the externals, a casual approach to communication and coordination practices in

the context of VTC+, and an overestimation of the necessary hard and soft skills for participation in a VTC+.

	Handling of the VTC+			Satisfaction of the participants of a VTC+		Group performance by VTC+		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
P1. Failure to pre-define or concretely formulate the use of communication and coordination practices	x	x	x	x		x	x	x
P2. Lack of participation on the part of the practice partners	x	x	x		x		x	x
P3. Lack of trust in each other and among themselves	x		x	x		x		x
P4. No or little knowledge about the handling of VTC+ and its possible negative consequences		x	x		x		x	x
P5. Lack of knowledge regarding effective self-management		x	x		x		x	x
P6. Complicated communication and coordination due to complete virtualization		x	x		x		x	x
P7. Ineffective communication and coordination within the working group and with the practice partner			x	x	x	x	x	x
P8. Careless use of communication and coordination practices associated with VTC+			x	x	x	x	x	x
P9. Overestimation of one's own hard and soft skills, which are a requirement of a VTC			x		x	x	x	x

Handling of the VTC+
(a) Communication and coordination practices of external stakeholders with a working group
(b) Internal communication and coordination practices within a working group
(c) Working group communication and coordination practices with an external stakeholder

Satisfaction of the participants of a VTC+
(d) Perceptions of an external stakeholder regarding the VTC+
(e) Perceptions of a participant in a working group regarding the VTC+

Group performance by VTC+
(f) Results of communication and coordination from the perspective of the external stakeholder
(g) Results of communication and coordination within a working group concerning the goals of the consultancy project
(h) Results of communication and coordination with an external stakeholder from the perspective of the working group

Fig. 3. Summarization of the observed problems

The observations in the study have revealed that design problems arise precisely where proactive communication and coordination practices are lacking, leading to tensions or inadequate collaboration. Furthermore, the identified comprehension problems are exacerbated by the fact that participants often fail to recognize the need for skill improvement from the outset. Instead, they frequently express confidence in their knowledge of new tools, resulting in excessive self-assurance and a degree of naivety in dealing with the communication phases.

Figure 3 provides an overview of the observed problems concerning the formulated

categories. Each marker represents at least one assignment. It should be noted, on the one hand, that although no observed problem is related to all formulated focus points of all categories, each problem affects all formulated categories. On the other hand, it should be noted that the observed problems were first found in each case in a formulated category and afterwards were also assigned in each case in the other applicable formulated category. In the analysis of the cause of the problems, reference was made to the results of the categories and their reciprocal influences on each other.

To maintain the integrity of the data collection process, the observed problems are presented within the respective categories in which they were first observed. Thus, in the handling of VTC+ subsection is described how the failure to pre-define or concretely formulate the use of communication and coordination practices, the lack of participation on the part of the practice partners, and the lack of trust in each other and among themselves was observed. Subsequently, in the satisfaction of a participants of a VTC+ sub-section, it is described how the no or little knowledge about the handling of VTC+ and its possible negative consequences, the lack of knowledge regarding effective self-management, and the complicated communication and coordination due to complete virtualization has been observed. Finally, the subsection group performance by VTC+ describes how the ineffective communication and coordination within the working group and with the practice partner, the careless use of communication and coordination practices associated with VTC+, overestimation of one's own hard and soft skills, which are a requirement of a VTC were observed.

4.2 Handling of VTC+

The analysis revealed that failing to pre-define or agree on communication and coordination practices could negatively impact participants' satisfaction within a working group. In addition, failure to pre-define or jointly agree on communication and coordination practices could also negatively impact group performance. Table 2 shows problems found concerning the "Handling of VTC+" to give an overview and increase readability.

ID	Observed problem	Trigger	Rel. source
P1	Failure to pre-define or concretely formulate the use of communication and coordination practices	socio-related	Seminar B, participant C, semi-structured questionnaire
P2	Lack of participation on the part of the practice partners	socio-related	Seminar A, 6th appointment, field observation
P3	Lack of trust in each other and among themselves	socio- and technically related	Seminar A, participant B, semi-structured questionnaire

Tab. 2. Problems found in "Handling of VTC+"

When using communication and coordination practices that were not explicitly formulated and coordinated, the survey of the two seminars revealed significant difficulties in task completion or group performance in the form of delays or barely acceptable delivery of objects. Thus, it was observed in both seminars that when

groups established communication and coordination practices openly or flexibly, there were considerable complications in handling the VTC+:

"Sometimes it was difficult with the presentations to know what the group member was thinking just by looking at the slides. Some people were impatient and changed the slides before the meeting". (Seminar B, participant C, semi-structured questionnaire).

Notably, this observation was made when working on the project in Seminar A. The working group had yet to agree on concrete communication and coordination practices within the working group and with the practice partner. Moreover this, although they claimed to know how to deal with VTC. The working group decided to communicate and coordinate spontaneously via different messaging platforms. There were no internal communication and coordination practices in a document, such as defining roles and tasks or deadlines by which tasks should be completed. In addition, no communication and coordination practices regarding communications and coordination with the practice partner were agreed upon or stored internally. Nor was it agreed with the practice partner which communication and coordination practices should apply to the upcoming collaboration. Finally, no project schedule, such as a GANTT chart, was designed for the project. However, all these missing definitions of communication and coordination practices hindered the handling of the VTC+. As briefly touched upon, this problem also affected the maintenance of the perceived satisfaction of all participants and the timely and satisfactory delivery of results. Thus, in the case of Seminar A, the timely delivery of the elaborated consultancy project proposal was negatively affected.

If working groups were observed not defining communication and coordination practices, they were provided with advice from the coach. Taking the example of the working group in Seminar A, the group was encouraged to have a clarification meeting with the practice partner to work together on the goal description of the IT consulting project. However, as an act of their initiative, the working group finally pushed the practice partner. This, in turn, had a considerable negative impact on the satisfaction of the practice partner and the delivery of the proposal for action for the IT consulting project. Towards the middle of the Seminar, with the help of the coaches, it was finally possible to find practices that allowed the team and the practice partner to reduce the communication and coordination comprehension problems significantly.

Another problem observed in the handling of VTC+ was the need for increased involvement of the practice partners in the assigned IT processing project. The lack of integration of the practice partner, as noted by the Seminar A processing group, was one of the many problems. It was also observed that the practice partner needed to actively engage in the project. Consequently, the handling of VTC+ and the satisfaction of the workgroup participants, as well as the successful completion of the assigned project, were significantly and adversely affected:

" The practice partner did not take much time. When he was asked for feedback, there

were usually no factual statements regarding the request." (Seminar A, 6th appointment, field observation).

No direct remedial actions were observed in this regard. Although the working group initially succeeded in involving the practice partner in the project proposal's development, it was evident during observations that, as the seminar progressed, both the participation and motivation of the working group and the practice partner declined. This decline was also evident in the comparison of Seminar A and Seminar B, where a notably more relaxed interpersonal atmosphere was observed during the final presentations of Seminar B.

Additionally, one problem observed in this category pertains to the inherent complexity of collaboration within a fully virtualized environment. This complexity became evident during the actual execution of the seminars:

"When you collaborate with someone you have never met before, I find it more difficult, yes." (Seminar A, participant B, semi-structured questionnaire).

Complete virtualization can also lead to a lack of trust in each other as a cause due to the complex handling. In Seminar B, it was observed that mistrust could be fostered by changes in relevant delivery object documents without consultation. In addition, it was observed in Seminar A that mistrust could arise due to the need for more definition of the integration of the practice partner. As a countermeasure, it was observed that the working groups also met in virtual rooms outside of work. Thus, participants met virtually to promote socio-emotional exchange. However, no alleviation measure could be observed regarding the communication and coordination comprehension problem with the practice partner. Occasionally, working groups held clarification talks with the practice partner following the advice of a coach. These also had a certain effect. Nevertheless, in the end, no satisfactory trust was built up with which it would have been possible to find a satisfactory and acceptable proposal.

4.3 Satisfaction of the participants of a VTC+

The analysis uncovered that participants' satisfaction was negatively impacted by their limited understanding of how to effectively use VTC+. It was observed that participants had minimal knowledge about the fundamental operation of VTC+ and the adverse outcomes stemming from improper usage. Furthermore, the research highlighted a deficiency in their awareness of efficient self-management, and it pointed out that communication and coordination became more challenging due to the complete virtualization. Table 3 shows this overview and highlights what relevant sources and triggers have led to the observed problems.

ID	Observed problem	Trigger	Rel. source
P4	No or little knowledge about the handling of VTC+ and its possible negative consequences	socio-related	Seminar B, participant E, semi-structured questionnaire

P5	Lack of knowledge regarding effective self-management	socio-related	Seminar A, 3rd appointment, field observation
P6	Complicated communication and coordination due to complete virtualization	socio- and technically related	Seminar A, 5th appointment, field observation

Tab. 3. Problems found in "Satisfaction of the participants of a VTC+"

Findings in both accompanying seminars highlighted a widespread lack of knowledge regarding the basic operation of VTC+ and the subsequent adverse effects. Notably, a significant portion of the participants encountered difficulties in this regard. The observations made in Seminar A were particularly substantial, shedding light on the prevalence of these problems and their implications. This underscored the urgent need for addressing knowledge gaps and improving the overall comprehension of VTC+ usage among the participants:

"Coordination was rather poor, most group members acted independently." (Seminar B, Participant E, semi-structured questionnaire)

Remarkable in this field observation was that participants stated that they had profound knowledge regarding the adverse effects and knew well how to deal with resulting possible negative consequences. However, this self-attribution could not be fully confirmed during the seminars. Participants complained about blurring the boundaries between work and private life and the complex handling. Regarding this, it was observed that awareness of the negative aspects of VTC+ was also initially assessed lightly. This was evident in the interpretation of the findings of the first field observation concerning the initial survey findings. In addition, the interpretation of the field observation of the first session of Seminar A also revealed that after the presentation of the work targets, most participants left the video conference without discussing how to proceed with the IT consulting project.

In the case of Seminar A, most of the study participants acquired the relevant knowledge of the different handling to presence-based collaboration concepts. However, they could still not wholly satisfy the practice partner. To illustrate this, the final situation of Seminar A is presented in the following. Here, the working group applied an open approach to the internal and external communication and coordination practices. However, this decision ultimately caused to a considerable extent a negative influence on the processing of the consulting project until about halfway through the seminar. This, in turn, led to the fact that the proposal was not satisfactory. Specifically, due to the non-agreed communication and coordination practices, the group had significant difficulties integrating the practice partner into the process to the extent necessary to elicit the actual process according to the ideas of the practice partner. This ultimately led to the practice partner losing even more interest and motivation in the consultancy project.

Furthermore, it was observed that there was a communication and coordination

comprehension problem of the lack of knowledge regarding effective self-management:

"Group struggled to get information from the stakeholder. It was not very easy to filter out targeted information and then to obtain the information in asynchronous ways." (Seminar A, 3rd appointment, field observation)

The decisive cause was that some study participants had difficulty organizing themselves and were perceived as ineffective by the other group members. In the scenario presented in the quote, one study participant was left out of the decision-making process because the rest of the team members assumed the person was a free rider. However, this was not the case. The affected person could not effectively communicate and coordinate with the team members. As an effective mitigation measure, the group itself could not find a way to clarify. In the example given, the coach had to intervene and overcome the misunderstanding with friendly and well-meaning clarification talks with the person concerned and the team colleagues.

Finally, in this study has been observed that complete virtualization can negatively influence satisfaction. In principle, complete virtualization of collaboration has the potential to make communication and coordination significantly more difficult than in a presence-based concept. This was observed in both seminars. With the help of the initial survey in Seminar B, it became evident that it does not play a significant role whether participants in a virtual team already have experience with VTC. Complete virtualization without corresponding defined or coordinated communication and coordination practices makes communication and coordination complex. In both seminars, it became apparent that the building of trust both within and outside of the working groups was made more complex:

"Perceiving individual states of mind is much more difficult in a completely virtualized environment." (Seminar A, 5th appointment, field observation).

The teaching staff and coaches also provided advice when this was noticed. In Seminar B, the advice was to meet in virtual spaces outside the processing of the set project to promote socio-emotional exchange. Following this, the team members also met outside the processing of the set delivery object and, thus, could considerably promote the socio-emotional exchange. As a result, the group learned to communicate and coordinate more effectively and efficiently.

4.4 Group performance by VTC+

It was observed that ineffective communication and coordination within the working group and with the practice partner significantly hindered the delivery of the defined deliverables. Ineffective communication and coordination were observed to decrease team identity, motivation, and participation in the set projects too. The problems described above also contributed to this, e.g., flexible communication and coordination practices, the lack of knowledge about the basic handling of VTC+, the resulting mishandling or negative consequences, the insufficient self-management. Table 4

shows problems encountered regarding "Group performance by VTC+" and highlights the triggers and relevant sources.

ID	Observed problem	Trigger	Rel. source
P7	Ineffective communication and coordination within the working group and with the practice partner	socio- and technically related	Seminar B, participant B, semi-structured interview
P8	Careless use of communication and coordination practices associated with VTC+	socio-related	Seminar A, participant C, semi-structured questionnaire
P9	Overestimation of one's own hard and soft skills, which are a requirement of a VTC	socio-related	Seminar A, participant D, semi-structured interview

Tab.4. Problems found in "Group performance by VTC+"

Initially, it was also observed that freely applied communication and coordination practices are more likely to cause negative consequences than fixed coordinated communication and coordination practices that could have been adapted to each other before the collaboration:

"It always took longer to get to the next version of the presentation. "(Seminar B, participant B, semi-structured questionnaire).

Here it is again worth mentioning that many participants of Seminar A stated in the initial survey that they had in-depth knowledge. Moreover, nevertheless, they assumed they could start or manage the upcoming collaboration without a written definition of communication and coordination practices. The group collaboration suffered significantly from the knowledge gap regarding the complex handling associated with VTC+. The occurrence of communication and coordination comprehension problems, such as the loss of team identity and motivation for the IT project, could have been largely avoided with adequate predefined communication and coordination practices.

Written specifications like simple project plans would have significantly alleviated the problems. This includes simple definitions of roles and tasks, scheduling of tasks and who would have to work with whom in the task completion:

"Appropriate communication and coordination practices given from the beginning would help for successful collaboration. " (Seminar A, participant C, semi-structured interview)

Participants in both seminars took various measures to get a grip on the inefficiencies in communications and coordination within the working group. They no longer worked alone when developing individual subtasks, such as researching a software solution. Video conferencing was used for more than just planning or exchanging work results. Increasingly, interactive block meetings were held where everyone could address everyone else as soon as a question arose. Furthermore, the actual situation and the achievement of the target situation of the processing projects were discussed in detail

verbally and, in some cases, also started to be recorded in written form. Short-term clarification meetings were scheduled to solve interpersonal problems.

Several triggers were observed in both seminars regarding the causes that hindered communication and coordination with the practice partners. As already mentioned, it became apparent that an upcoming collaboration with a practice partner can start with a lack of trust. It was also observed that not directly agreeing on communication and coordination practices with practice partners at a kick-off meeting can cause an inefficient collaboration. Ultimately, a fundamentally reduced participation of all participating peers in a project can cause inefficient or ineffective collaboration.

Regarding the applied mitigating measures, it should be added that none of the measures taken in the study could completely overcome the dissatisfaction. In Seminar A, the practice partner was urged to cooperate more intensively in developing the target description and achieving the target. Regarding the conviction of the project plan, the working group failed to establish this thoroughly.

Regarding the overestimating of the hard and soft skills associated with VTC+ as requirements, it was also observed that this could have a considerable negative impact on the delivery of a set delivery object:

"Whether this solution can be effectively used in practice is very questionable. I have to say that honestly. But it is certainly a good basis" (Seminar A, participant D, semi-structured interview)

Various measures were taken to counteract the observed overestimation of hard and soft skills in the respective IT processing project. Among other things, when an overestimation was detected, concerned persons were invited to friendly clarification meetings. The individual sensitivities were discussed with the persons concerned, and a solution was found to overcome the problems. The coach's help in Seminar A discussed what should be considered in situational communication and coordination practices. As the course progressed, the working group succeeded in integrating or motivating the practice partner to cooperate in elaborating the actual situation and an acceptable proposal, even if not entirely satisfactory.

5. Discussion

5.1 Using proactive genre analysis

In contrast to the existing logic of genre analysis (Riemer & Filius, 2009), the proactive postulation of genres involves developing a collaboration concept before collaboration begins. The proactive approach offers the advantage of being able to cognitively design a comprehensive collaboration, with complex role and work context connections such as a VTC+. Additionally, it's possible to consider social aspects for all formulated genres and episodes (Figl & Saunders, 2011). Suitable communication and coordination practices can, for instance, be discussed and formulated in workshops, which can then be incorporated into the development of the collaboration concept (Hertel et al., 2005).

In our project, we conducted several workshops or focus group discussions to develop a VTC+ concept with experts in IT consulting, academic instructional design, and IS field sciences. Additionally, we believed that the proactive application of genre analysis encompasses formulating genres and episodes for identified communication situations, as well as discussing and documenting all relevant role and task context connections, as well as communication and coordination practices (Fiedler & Gallenkamp, 2008). We believed this was necessary to formulate a collaboration concept that matches the quality of a traditional presence-based collaboration concept (Waizenegger et al., 2020).

The conceptualization of the genres for the course has been conducted very careful and the resulting genres have been transparent to the responsible persons. However, due to time constraints and other contextual factors, we did not communicate these genres, episodes, role and work context connections, as well as communication and coordination practices explicitly to the participants. They were only briefed on the general structure which of course has a certain relation to the conceptualized genres, episodes, role and work context connections, as well as communication and coordination practices. Given the problems observed (P1 – P9), the question can be asked whether the potential of the proactive conceptualization of genres, episodes, role and work context connections, as well as communication and coordination practices could not also be better used for the introduction to teamwork.

The study however demonstrated that conceptualizing a VTC+ using proactive genre analysis is feasible. The teams developed collaboration patterns that roughly matched the assumed genres, episodes, role and work context connections and communication and coordination practices. Therefore, we can assume that designing a VTC+ concept with proactive genre analysis is a valid approach that should be considered in both academic and practical contexts. Overall, our approach allowed us to surpass the boundaries of existing genre analysis (Riemer & Filius, 2009) and proactively conceptualize a comprehensive collaboration considering social aspects, complex role and work context connections, and the free choice of communication media and tools.

Our suggestion to enhance genre analysis lies in advocating for the consideration of proactive genre analysis in the literature (Fiedler & Gallenkamp, 2008; Figl & Saunders, 2011; Hertel et al., 2005; Riemer & Filius, 2009). For future implementations of proactive genre analysis, the developed concepts must offer the possibility to use efficient IS, that interactive methods must be chosen, and the formulated genres, episodes, role and work context connections, as well as communication and coordination practices are made available to the participants in the form of a kind of team alignment map. This ensures that the introduction of the proactively developed concept during implementation does not lead to significant conflicts or tensions.

5.2 Choice of communication media and tools
In our approach, we have deliberately refrained from prescribing specific communication media for the developed genres. The freedom to choose media and

tools also offers significant advantages in VTC+. This approach fundamentally enables participants to decide which tools to use for specific tasks. It also allows freedom to choose whether to use synchronous, asynchronous, or a combination of both media. Ultimately, this can increase participant satisfaction (Benlian, 2020).

The assumption of not specifying the use of media and tools (Fiedler & Gallenkamp, 2008; Figl & Saunders, 2011; Riemer & Filius, 2009) was confirmed to not always be advantageous. Especially in situations where complex role and work context connections converge, as in the specific context of the set research artifact, this could be counterproductive. Externals typically have access to IT devices provided by their organizations, which may have specific security settings that could, for example, prevent participation in scheduled Zoom conferences (Dery et al., 2014; von Thülen & Hartl, 2021).

Regarding the free determination of communication media and tools within a role and context connection, where internal workgroups pursue a goal alignment, it may make sense to specify the use of communication media and tools. In both seminars, it became evident that workgroups struggled to determine suitable communication media and tools, which in turn triggered some observed problems (P1 – P9). Primarily, this led to ineffective communication and coordination within the workgroup and with the externals (P7).

On the other hand, as team members usually prefer different individual communication and coordination practices (Waizenegger et al., 2020), allowing free choice of communication media and tools seems to make sense. Some participants even exchanged and coordinated their communication media and tools directly during the seminars' kickoff meetings. Considering this, allowing for the free determination of the selection of communication media and tools appears sensible.

Regarding the free determination of communication media and tools within a complex role and context connection, where workgroups collaborate with external parties to pursue goal alignment in a VTC+, it may make sense to specify the use of communication media and tools. This became evident following both seminars. Workgroups did not seek contact with externals during the kickoff meetings to schedule a time to determine communication media and tools (P1).

On the other hand, since externals typically use organization-specific configured IT devices (Dery et al., 2014; von Thülen & Hartl, 2021), allowing for free choice of communication media and tools makes sense. Nonetheless, in both seminars, workgroups were able to deliver viable delivery agreements despite observed problems (P1 – P9). Considering this, allowing for the free determination of the selection of communication media and tools for complex role and work context connections seems sensible and appropriate.

Overall, the study confirms the assumption that the free choice of media and tools in VTC+ leads to viable supply contracts. However, the free choice of media and tools

also has significant potential pitfalls (Abarca et al., 2020; Ahuja et al., 2007; Dulebohn & Hoch, 2017). Two core problems were observed in this study. First, ineffective communication and coordination within working groups and with external parties, primarily due to a lack of trust, different application of communication and coordination practices, and an overestimation of technical and interpersonal skills. Second, a loose approach to communication and coordination practices is mainly caused by a lack of knowledge in dealing with VTC and an overestimation of technical and interpersonal skills.

To overcome the observed problems (P1 - P9) our suggestions lie in demonstrating that within the logic of proactive genre analysis (Riemer & Filius, 2009), consideration should be given to role and work context connections more comprehensively. Particularly in the analysis of communication genres and episodes, all different role and work context connections must be carefully captured. Once a collaboration involves complex role and work contexts, the selection of appropriate communication media and tools should not be prescribed. However, participants in the collaboration should be informed that they need to determine the communication media and tools to be used with externals during the kickoff meeting. Ideally, this decision should be made no later than at the kickoff meeting before the collaboration begins. In terms of coordinating communication media, it would also be advantageous to document this in a document accessible to all collaboration participants.

Concerning the selection of communication media for internal workgroup role and work context connections, specifications of communication media and tools in general should be avoided. Specifically, during conceptualization, all "simple" role and work context connections should be carefully captured. Participants should be informed at the beginning of the collaboration that there is no obligation to specify communication media and tools for internal task execution processes within workgroups. However, given the complexity of virtuality (Boughzala & de Vreede, 2015) and the diverse individual preferred communication and coordination practices (Waizenegger et al., 2020), it is advisable to define these among themselves. Ideally, when an agreement is reached, it should also be documented in writing and made accessible to all members of the workgroup.

5.3 Specification of appropriate practices
Merely identifying suitable communication media is insufficient to fully address the identified problems regarding observed difficulties (P1 - P9). The study revealed that problems stemmed from various applied communication and coordination practices, such as (P1) or (P8). Additionally, the study confirmed that differently applied communication and coordination practices significantly affect handling (Altinay, 2017; Boughzala & De Vreede, 2015; Waizenegger et al., 2020), individual satisfaction (Figl & Saunders, 2011; Kisler et al., 1984; Nordbäck & Espinosa, 2019), and group performance (Boughzala & De Vreede, 2015; Przybilla et al., 2021; Sarabadani et al., 2018).

Challenges in identifying and adhering to suitable communication and coordination practices were evident in both seminars. For instance, no communication and coordination practices were discussed or defined for internal or external group roles and contexts (P1). This lack of agreements hindered effective collaboration (Benlian et al., 2020). Moreover, there were no agreements on how often externals should provide feedback on individual project milestones, which could aid in effective collaboration (Waizenegger et al., 2020). Conversely, findings following the seminars revealed that this flexible application of communication and coordination practices also led to useful outcomes in meeting delivery agreements. For example, despite the observed problems (P1 - P9), a workgroup in Seminar A developed a viable solution proposal on time. Although this proposal did not fully satisfy the industry partner, the successful collaboration under these challenging conditions should be noted.

To overcome the observed problems in this study, it would be advisable to pay more attention to communication and coordination practices suitable for specified role and work context connections, identified using genre analysis under proactive application (Riemer & Filius, 2009). Specifically, appropriate communication and coordination practices should be clearly communicated to participants. While our proactive approach using genre analysis specified communication and coordination practices for all relevant communication situations, genres, episodes, role, and work context connections, these were not effectively communicated to participants during kickoff events due to various contextual constraints, including our research team's limited influence.

Additionally, a thorough integration of social factors into the conception of VTC+ would also be advisable (Fiedler & Gallenkamp, 2008; Figl & Saunders, 2011; Riemer & Filius, 2009). Therefore, the formulation of appropriate communication and coordination practices should also consider individual preferences, such as the technological impacts of technological complexity on group communication (Roberts et al., 2002), the social effects of shared leadership on group coordination (Nordbäck & Espinosa, 2019), the social and technical impacts of global virtual teams on traditional coordination practices (Kiely et al., 2021), or the social effects of temporal coordination on virtual teams (Chamakiotis et al., 2019).

The suitable communication and coordination practices should be preliminarily shared with all participants before the start of the collaboration, for instance, in a project planning meeting. This allows all participants to express their preferences for the presented communication and coordination practices at the beginning of the collaboration, typically during a kickoff meeting. This way, they can be aligned with the most suitable communication and coordination practices based on the specific collaboration.

5.4 The impact of too-optimistic self-assessment
The study uncovered an issue related to participants' excessively optimistic self-assessment of their hard and soft skills in handling VTC+. This self-assessment

problem had significant impacts, particularly on observed problems identified as (P4 - P7).

Upon examining the results of the preliminary survey conducted before Seminar A and analyzing the data collected throughout the course, a remarkable pattern emerged. Participants' self-assessments regarding their hard and soft skills were overly optimistic and did not align with their actual competencies demonstrated during the study. Consequently, a significant insight was gained that problems arose because participants lacked the necessary hard and soft skills, as evidenced by (P4) and (P5).

The negative consequences of this misjudgment were twofold. On one hand, there was a noticeable limitation in independent analytical thinking when developing goal agreements, which, in turn, led to a limited ability to comprehend and effectively respond to feedback from the industry partner. The lack of skills hindered participants from independently devising strategies for effectively achieving the predetermined goal agreements. On the other hand, it became apparent that a casual approach to defining communication and coordination practices with industry partners revealed that participants had limited awareness of the potential negative impacts of VTC environments and faced difficulties in the practical implementation of efficient time management strategies.

It became evident that participants' excessively optimistic self-assessment of their required hard and soft skills was not only a significant observation but also a critical concern. This underscored the compelling need to align the definition of communication media to the various role and context connections during VTC+ sessions. This is crucial for developing a more efficient and practical concept that goes beyond the framework utilized in this study.

The key insight of the study, therefore, lies in the fact that the negative impacts of excessively optimistic self-assessments of hard and soft skills can indeed be alleviated or even entirely mitigated through the proposed adjustments to the proactive use of genre analysis research (Grieb, 2007; Reichwald et al., 1998; Fiedler & Gallenkamp, 2008; Figl & Saunders, 2011; Riemer & Filius, 2009; Walter et al., 2016). Essentially, the recommended additions have the potential to significantly alleviate or, in some cases, eliminate comprehension problems, regardless of participants' prior experiences with VTC+.

We assumed that the participants of the study knew what they were doing and trusted that their statements of hard and soft skills corresponded to what was indicated. Given this, in the future, for a potential VTC+, it would be advisable to challenge the skills of the potential participants. This may be done with an online self-assessment to evaluate their actual hard and soft skills concerning virtual teamwork. This way, it can be determined whether a training session needs to be conducted beforehand for the collaboration in question.

6. Concluding remarks

VTC+ holds significant potential for collaborations (Seeber & Erhard, 2023). This study confirms these findings. Proper conceptualization can even enhance efficiency, satisfaction, and ultimately performance compared to presence-based collaboration concepts (Altinay, 2016; Nurhas et al., 2021; Singh et al., 2002), which is also confirmed by this study. To harness this potential, problems such as unbalanced workflows (Sarabadani et al., 2018), difficulties in task allocation (Waizenegger et al., 2020), and high expectations regarding connectivity (Waizenegger, 2015) need to be considered during conceptualizations.

Regarding the proactive application of genre analysis, this study has shown that a proactively cognitive based development of a VTC+ is feasible and effective. However, the conceptualization of a VTC+ should approached with care during development, implementation, and execution (Seeber & Erhard, 2023; Waizenegger et al., 2020). Several workshops and focus group discussions should be held in which the communication situations, genres, episodes, role, and work context connections as well as communication and coordination practices in question are discussed, evaluated, and formulated in detail.

About the specification of communication media and tools within the traditional genre analysis logic (Riemer & Filius, 2009), this study has shown that specification is only beneficial in complex cases. Media and tools should only be specified for complex role and work context connections. In work groups with internal role and work context connections, the approach of traditional genre analysis logic still makes sense.

Concerning the communication and coordination practices, it was concluded that, within the logic of genre analysis (Riemer & Filius, 2009), these practices should be considered in the proactive analysis phase when designing a VTC+. The practices identified should be communicated to all participants before the collaboration begins. This should be particularly important in the context of VTC+ with elements of IT consulting (Benlian, 2020).

Regarding the optimistic self-assessments of hard and soft skills, this study concludes that, given this, it would be advisable in the future to scrutinize the skills of potential participants in a potential VTC+. In other words, before a VTC+ begins, the hard and soft skills should be assessed with an online self-assessment concerning the VTC+. In this way, it can be determined whether training needs to be carried out in advance for the VTC+ in question.

Like any study, this one has its limitations. The first limitation concerns the experience of the participants. Some of them, especially those in Seminar A, have full-time jobs and years of work experience, while others are students without practical background. However, none of the participants had prior in-depth practical experience in IT consulting, which was the overarching learning objective of the seminars. Another limitation is that this study was exclusively conducted in settings with VTC+. Therefore, it is not always possible to determine whether the problems encountered were solely

or primarily caused by VTC+ or to what extent they might have occurred similarly in traditional presence-based settings. Another limitation relates to the potential bias in the results due to the small sample size. Twenty-four data sources were collected, excluding archived documents. Whether this sample size is sufficient to provide a comprehensive picture of emerging communication and coordination comprehension problems in VTC+ may be questioned.

An interesting avenue for further research would be to continue to design conceptualizations based on the application of proactive genre analysis gained in this study for the development of a VTC+. This is because the proactive application of genre analysis is still relatively nascent when it comes to integrating communication and coordination practices. It would be worthwhile to explore the extension proposals presented in this paper and investigate them more extensively in different settings with complex role and work context connections.

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PAPER C

Design principles for fully virtualized team collaboration in higher education. The application of a design science approach on seminar development.

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Design principles for fully virtualized team collaboration in higher education. The application of a design science approach on seminar development.

In a world that is increasingly digitized, the possibility of virtual collaboration offers the potential for effective cooperation, without the quality of the collaboration being negatively affected in comparison to presence-based collaboration. Virtual team collaborations in higher education frequently encounters complex roles and work context connections. The ongoing challenges of the COVID-19 pandemic have demonstrated that concerning not considering complex role and work context connections can lead to fundamental problems. Consequently, it is of paramount importance to promote effective and efficient collaboration in virtual teams. Following the pandemic, the focus of scientific inquiry and practical application has shifted from the question of the viability of virtual team collaboration to the question of how it can be effectively and efficiently conducted. This study examines the application of fully virtualized collaboration in higher education, with a focus on the design of a management education seminar. By applying design science research, design principles are developed to support the successful and effective conceptualization, implementation, and execution of a fully virtualized management education seminar. This study underscores the significance of employing appropriate communication and coordination practices.

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1. Introduction

The increasing digitization of education have intensified interest in practice-oriented virtualized teaching formats to support knowledge transfer for both instructors and learners (Gadhela, 2018; Nguyen et al., 2021). The COVID-19 pandemic, in particular, forced many universities—often involuntarily—to adopt virtual team collaboration (VTC) concepts in administration, teaching, and research. However, this shift also revealed significant challenges in the conceptualization, implementation, and execution of VTC (Seeber & Erhard, 2023).

A key issue in successfully executing VTC lies in the complexity of its proper conceptualization. This complexity stems from the need to account for multiple factors, including different time zones, cultural differences, and communication barriers, which must be carefully addressed during the conceptualization phase (Lang & Jarvenpaa, 2005). Additionally, effective VTC requires the consideration of appropriate communication and coordination practices, as well as the selection of suitable information systems (Fiedler & Gallenkamp, 2008). Determining and establishing communication and coordination practices, along with selecting the appropriate technological infrastructure to accommodate these complexity factors, is a non-trivial task (Gadhela, 2018; Nguyen et al., 2021).

Another key issue in conceptualizing VTC is the consideration of diverse participants. Existing literature primarily focuses on VTC frameworks designed for teams without external participants (Abarca et al., 2020; Deinhofer & Myrach, 2024; Nguyen et al., 2021). However, in academic settings, at least two distinct groups—students and instructors—are typically involved, each with different objectives and technological requirements. This further complicates the proper design (Deinhofer & Myrach, 2024). The inclusion of an industry partner, who provides a real-world case study for students to work on, exacerbates the complexity of task allocation, responsibility assignment, authority distribution, communication, and coordination within the collaboration. Fully virtualized team collaborations involving more than two different peers (VTC+) are therefore particularly challenging to conceptualize effectively (Kiely et al., 2021).

The current possibilities for successfully and effectively conceptualizing, implementing, and executing VTC+ remain limited. On the one hand, existing VTC+ literature allows for the derivation of assumptions regarding success factors (Abarca et al., 2020). For instance, insights into appropriate communication and coordination practices (Deinhofer & Myrach, 2024), the relevance of work-life imbalances (Ahuja et al., 2007), blurred boundaries between work and personal life (Seeber & Erhardt, 2023), increased connectivity expectations (Waizenegger, 2015), declining team identity (Thülen & Hartl, 2021), and disengagement from collaboration (Benlian, 2020) could inform the conceptualization of a VTC+ model. However, there remains a lack of clarity on how these insights can be systematically translated into a structured VTC+ framework.

On the other hand, the conceptualization, implementation, and execution of a VTC+ model could be approached using media choice theory (Fiedler & Gallenkamp, 2008) in conjunction with proactive cognition-based genre analysis (Deinhofer & Myrach,

2024). Through media choice theory, appropriate information systems could be selected (Riemer & Filius, 2009) to support predefined communication and coordination practices, as well as role and work context connections—elements that proactive cognition-based genre analysis helps identify (Figl & Saunders, 2011). This method could account for complexity factors such as the proper integration of industry partners with distinct objectives. However, even this approach lacks a clear prescriptive framework.

From a design science research (DSR) perspective, the conceptualization, implementation, and execution of VTC+ in higher education represent a prescriptive research gap (Peffers et al., 2007). This study examines the problem through the lens of DSR, aiming to develop design principles that theoretically and practically support the conceptualization, implementation, and execution of VTC+ in higher education (Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019; Peffers et al., 2007; vom Brocke et al., 2020; Winter & Aier, 2020). By developing well-founded design principles, this research seeks to provide a theoretically grounded and practically applicable framework that offers prescriptive guidance for academics seeking to successfully and effectively manage VTC+ (Peffers et al., 2007). The study addresses the following research questions:

- Research question one: *" How can design principles support successful and effective fully virtualized collaboration with complex role and work context connections?"*

- Research question two: *"What design principles should be considered to ensure that collaboration participants effectively reach delivery target agreements?"*

The following section will present the theoretical foundations of selected literature on VTC+ as well as the conceptualization, implementation, and execution of VTC+ in higher education. Subsequently, design requirements will be established. Based on these requirements, the initial design principles will be developed. Following this, design features will be created to fulfill the identified design principles. The design principles will then be applied in two use cases. Finally, the evaluation of the design principles will be presented, and the discussion section will address the study's implications, followed by an examination of its limitations and potential future research directions.

2. Related work

2.1 Team collaboration

The concept of team collaboration has received significant attention in recent years from both scholars and practitioners (Marschak & Radner, 1972; Roberts, 2004; Waizenegger et al., 2020). It outlines the rationale behind the optimal positioning of workgroups to create value, considering factors such as team size, tasks, and role distribution (Roberts, 2004). In particular, aspects of team composition, such as the optimal team size and applicable practices, are highlighted (Liang et al., 2008). The composition of teams, including the size of the team and the established practices, has

a significant impact on group performance (Cohen & Bailey, 1997). Team configurations, such as the application of agile project management approaches to achieve set goal agreements, are a crucial component of successful and effective organizational design (Roberts, 2004).

Within the context of team collaboration research, teamwork is defined as a process that describes the configuration of relationships regarding tasks, responsibilities, and authority (Hackmann, 1987). The logic of team collaboration thus serves as a framework for developing relevant VTC+ concept respectively design principles to ensure the feasibility. In developing the design principles, it is essential to adhere to optimal team-building insights (Liam et al., 2008). In particular, the optimal team size and applicable practices must be considered. Failure to do so may result in negative impacts on achieving the set delivery goal agreements (Cohen & Bailey, 1997).

2.2 Virtual team collaboration

The extensive research on VTC (Abarca et al., 2020) on the conceptualization, implementation, and execution of VTC+, has focused so far on examining its general essence (Powell et al., 2004), the negative and positive implications (Fiedler & Gallenkamp, 2008), performance (Waizenegger et al., 2020), and management based on technical frameworks and psychologically based behavioral patterns (Lang & Jarvenpaa, 2005). Within this research, VTC is defined as a special case of team collaboration, as compared to face-to-face collaboration, VTC is significantly more difficult and complex due to its virtual nature (Powell et al., 2004; Magnus, 2011).

However, while design-oriented guidance cannot be derived from existing research, previous studies have mostly evaluated the feasibility of design decisions in terms of usefulness and effectiveness for VTC+. This allows for the transfer of design decisions for the development of design principles based on the evaluation framework of existing research. This research has identified development and evaluation constructs that should be considered in the design, implementation, execution, and evaluation of design principles. Namely the development and evaluation constructs, handling of VTC+ (Fiedler & Gallenkamp, 2008), satisfaction of the participants of a VTC+ (Benlian, 2020), and group performance by VTC+ (Waizenegger et al., 2020).

2.3 Communication and coordination practices

Communication, defined as the transmission of information between individuals (Roberts et al., 2002), plays a crucial role in promoting collaboration and task coordination within teams. Within teams, communication encompasses all collaborative efforts aimed at achieving defined work goals in terms of their patterns, timing, and content (Chamakiotis et al., 2020; Roberts et al., 2002). It is of great importance to pay special attention to established communication practices when developing a collaboration (Benlian, 2020; Thülen & Hartl, 2021; Waizenegger et al., 2020). In the context of VTC+, the evaluation of the literature has revealed that it is of even greater importance to consider communication practices during conceptualization

due to the increased complexity resulting from full virtualization and the integration of external parties.

Within the framework of VTC+, collaboration is particularly vulnerable to coordination problems (Seeber & Erhard, 2023). However, existing literature provides limited guidance on how a VTC+ can be designed to incorporate communication practices. While some studies have highlighted the potential of team spirit to enhance group communication (Figl & Saunders, 2011), few studies have addressed the integration of team spirit into the conceptualization of VTC+ in order to harness its positive effects.

The term "coordination" is defined as the implementation of interventions aimed at influencing the patterns, timing, and content of group communication (Chamakiotis et al., 2020). This includes a range of activities, including role and task assignment (Waizenegger et al., 2020), formulation of strategies to achieve goals (Lang & Jarvenpaa, 2005), definition of individual milestones (Hertel et al., 2005), setting deadlines for milestone achievement (Riemer & Filius, 2009), and agreement on interim and final meeting dates (Ahuja et al., 2007). The efficacy of coordination practices in attaining pre-established goal agreements is contingent upon a multitude of both positive and negative variables. Consequently, coordination issues can have a profound impact on the success of goal agreements, resulting in suboptimal group performance outcomes (Waizenegger et al., 2020).

Imbalances in workflow (Ahuja et al., 2007), blurred boundaries between work and personal life (Seeber & Erhardt, 2023), and high connectivity (Waizenegger et al., 2020) are crucial to consider when developing design principles. Furthermore, the fading of team identity (Thülen & Hartl, 2021), and the complete loss of engagement in collaboration (Benlian, 2020) have been identified as potential challenges for the successful and effective implementation of VTC+ concepts. Social factors, such as the influence of team climate on group communication (Figl & Saunders, 2011), the technical impacts of technological complexity on group communication (Sarker et al., 2011), and the social impacts of shared leadership on group coordination (Nordbäck & Espinosa, 2019) are also crucial to consider when developing design principles.

2.4 Role and work context connections
Roles and work context connections play a crucial role in organizational psychology and workplace design (Fiedler & Gallenkamp, 2008). The concepts of roles and work context connections refer to the structuring of tasks, responsibilities, and relationships within an organization or team (Briggs et al., 2003). The connections describe the expectations for behavior and performance of an individual occupying a particular position or function. Furthermore, collaboration connections encompass not only formal job descriptions but also informal expectations and behavioral norms. It has been demonstrated that clear role definition facilitates employee orientation, increases efficiency, and contributes to achieving organizational goals (Riemer & Filius, 2009).

The connections between roles and work contexts within an organization are crucial to consider when developing design principles. These connections involve the interconnection of tasks and responsibilities, as well as the interactions between

different team members and departments (Powell et al., 2004). The effective design of these connections helps to improve collaboration, create synergies, and minimize conflicts (Hertel et al., 2005). In the work context, roles and connections play a central role in promoting teamwork, achieving organizational goals, and fostering a positive corporate culture (Waizenegger et al., 2020). By means of clear role definition and effective connection design in the work context, organizations can create an agile and flexible work environment that can adapt to changing requirements and fostering innovation (Riemer & Filius, 2009).

2.5 Media choice theory

Achieving delivery goal agreement successfully and effectively, the proper selection of media and tools for collaboration plays a central role in terms of utilizing shared resources and skills (Riemer & Filius, 2009). Within the framework of media choice theory, the choice of media provides a fundamental understanding of how people select communication media based on context, objectives, and individual preferences (Daft & Lengel, 1983). In VTC+, where complex roles and work contexts are considered when developing a concept, it is even more crucial to understand who connects to whom and how. Media choice theory provides several approaches to clarify who connects to whom and how based on e.g. media richness or communication analysis (Daft & Lengel, 1983; Deinhofer & Myrach, 2024; Dennis & Valacich, 1999; Riemer & Filius, 2009). The fundamental idea behind media choice theories is that each medium can be assessed based on its ability to support various aspects of communication (Fiedler & Gallenkamp, 2008). A medium is used to address the requirements of a specific communication situation or task (Riemer & Filius, 2009).

The application of media choice theory is crucial to consider when developing design principles, as it directly influences communication effectiveness, collaboration efficiency, and information flow within virtual team environments (Riemer & Filius, 2009). Media choice decisions determine how team members interact, which communication channels are utilized, and how information is structured and disseminated (Deinhofer & Myrach, 2024). The effective application of media choice theory enables organizations to optimize communication strategies, reduce misunderstandings, and enhance engagement (Hertel et al., 2005). In the context of design principles, selecting appropriate media for specific tasks and interactions is essential for ensuring seamless coordination, fostering team cohesion, and supporting knowledge transfer (Waizenegger et al., 2020).

2.6 Proactive cognition-based genre analyses

This approach allows the categorization of a specific set of tasks into communication patterns (genres) and the resulting recurring communication sequences (episodes) on a case-by-case basis. This, in turn, enables the selection of appropriate media and tools (Fiedler & Gallenkamp, 2008). In detail, genres are considered meta-classifications, while episodes are viewed as sub-classifications (Riemer & Filius, 2009). Within the genre classification, recurring communication situations, such as the development of an outcome, are categorized. Within the episode classification, all

necessary communication situations for the development of an outcome, such as giving and receiving feedback, are captured (Fiedler & Gallenkamp, 2008). The proactive cognition-based genre analysis uses this approach in a slightly adapted form to conceptually shape the entire collaboration in a proactive cognition-based manner. Instead of determining suitable media and tools based on identified episodes, communication and coordination practices, along with their resulting roles and work context connections, are derived. This enables the proactive, cognition-based conceptualization of collaboration based on genres, episodes, practices, and connections (Deinhofer & Myrach, 2024).

From the perspective of DSR, the media choice theory, through the application of proactive cognition-based genre analysis, enables the development of well-grounded design principles for the effective design of virtual collaborations based on the identified genres and episodes (Peffers et al., 2007). The application of proactive cognition-based genre analysis is, therefore, a critical aspect in the development of design principles as it provides a structured approach to analyzing communication and coordination patterns in virtual team environments (Deinhofer & Myrach, 2024). By systematically identifying recurring communication genres and the associated episodes, this approach enables the derivation of tailored communication and coordination practices that are aligned with the specific requirements of a collaboration (Riemer & Filius, 2009).

3. Applied DSR methodology

3.1 Approach foundations

DSR has been identified as a prominent research approach within the domain of information systems (Meth et al., 2015; Nguyen et al., 2021; Winter & Aier, 2020). A distinguishing feature of this approach is its objective to expand the limits of human and organizational capacities by developing novel and innovative artifacts (vom Brocke et al., 2020). According to Peffers et al. (2007), these artifacts are defined as artificially created objects, intentionally designed for a specific purpose, that intervene in complex social processes by introducing changes into these processes. These artifacts, which can be application concept, embody conceptual knowledge and facilitate the resolution of practical problems.

This study adopts this approach to cultivate a more profound comprehension of the design of such artifacts. Another distinguishing feature of DSR is the interplay of abstract theoretical knowledge and specific practical knowledge that plays a role in the design process. Since Peffers et al. (2007) emphasized the DSR approach in the field of information systems, numerous scholarly discussions have emerged on this topic, further refining its application in the domain of information systems (Meth et al., 2015; Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019; vom Brocke et al., 2020; Winter & Aier, 2020). This study builds on these earlier discussions, particularly in relation to the role of theory in the design process and the design of the overall research process.

In terms to the role of theory, the present study builds upon the proposition by vom Brocke et al. (2020) that abstract theoretical knowledge serves a dual function in DSR. Firstly, it should serve as an input for a design cycle, representing a form of kernel theory, aligning with the notion that the scientific knowledge base generally informs design (Peffers et al., 2007). Secondly, it is expected to facilitate an abstract comprehension of the knowledge acquired through the design process, thereby serving as a template for the future creation of analogous artifacts (Nguyen et al., 2021; Winter & Aier, 2020). This design theory, akin to a blueprint, meticulously documents the intended construction of an artifact to achieve the desired interventions and outcomes.

In terms of the design of the overall research process, this study contributes to the DSR literature by emphasizing the iterative development of artifacts to facilitate continuous reflection on design outcomes and their incremental refinement (vom Brocke et al., 2020). In accordance with this overarching principle, several scholars have put forth models for conducting design-oriented research (Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019; vom Brocke et al., 2020; Winter & Aier, 2020).

3.2 Problem and solution space phase

The present study commenced with the identification and formulation of the problem and solution space (Peffers et al., 2007; vom Brocke et al., 2020). To this end, a critical evaluation of the literature in the context of the examined research artifact was conducted (Okoli, 2015; Webster & Watson, 2002). The findings indicate that, although scattered insights exist, there is no established design research for the effective conceptualization, implementation, and execution of VTC+ in this context.

At its core, two major challenges are the reasons for this. The first pertains to the selection of appropriate information systems (Seeber & Erhardt, 2023; Vidolov, 2022), while the second concerns the identification and application of suitable communication and coordination practices (Kiely et al., 2022; Waizenegger et al., 2020). Due to the multidisciplinary nature of higher education and the resulting high social complexity (Magnus, 2011), determining appropriate information systems that align with the defined learning objectives and incorporating them into design principles is particularly challenging (Nguyen et al., 2021).

Regarding the applicable communication and coordination practices, the challenge lies in identifying and establishing relevant communication and coordination practices, as well as the resulting role and work context connections (Riemer & Filius, 2009). The high social complexity of VTC+ plays a crucial role in this regard. Conceptualizing a VTC+ proactively cognition-based one that accounts for all inefficiencies in management, group performance, and individual participant satisfaction is highly complex (Deinhofer & Myrach, 2024).

3.3 Formulation phase

To meet the desired characteristics and functionalities of the research artifact, relevant design principles for this study were initially formulated based on insights found in the literature (Peffers et al., 2007). For this purpose, the design requirements were initially derived based on the selected literature (see section 4). Subsequently, design principles were derived from these requirements, and in combination with the selected literature, their consistency was evaluated. Finally, the design features were derived based on the formulated requirements and principles (Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020).

To meet the requirements of rigor, generalizability, and repeatability inherent in the DSR approach (vom Brocke et al., 2020), a core theory, the media choice theory (Fiedler & Gallenkamp, 2008), was selected. Specifically, the communication technique of proactive cognition-based genre analysis was chosen (Deinhofer & Myrach, 2024). This selection enables the navigation of the high social complexity and multidisciplinary nature of higher education. The complexity factor in determining and selecting suitable information systems is also eased by the establishment of the core theory, as the proactive cognition-based collection of genres, episodes, communication and coordination practices, and role and work context connections makes the identification and selection of information systems significantly more straightforward.

3.4 Design and development phase

In the design and development phase, an application concept was refined based on the developed design requirements, principles, and features derived from the DSR process (Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019; vom Brocke et al., 2020). These requirements and principles were further refined based on a preceding study that is part of this research project. Through this iterative process within the design and development phase, it was ensured that the application concept meets both the theoretical requirements and the practical needs (Peffers et al., 2007).

The refinement, feasibility, usefulness, and effectiveness were therefore thoroughly examined by the research team to identify any potential weaknesses (Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020). On one hand, the principles were evaluated using expert workshops, archived data, semi-structured questionnaires, multiple-choice surveys, longitudinal field observations, and semi-structured interviews collected in the preceding study. On the other hand, to ensure relevance and improve the quality of the formulations, the feasibility, usefulness, and effectiveness were repeatedly evaluated and adjusted through expert discussions (vom Brocke et al., 2020).

3.5 Demonstration and evaluation phase

In the demonstration phase, the design requirements, principles, and features were utilized in two use cases from the previous study. The focus was primarily on usability and effectiveness (vom Brocke et al., 2020). Each developed requirement, principle, and feature was critically assessed to determine whether usability and effectiveness

were met in the context of the use cases (Meth et al., 2015; Nguyen et al., 2021; vom Brocke et al., 2020).

To ensure relevance and quality, as well as to adapt to evolving requirements, the requirements, principles, and features were reviewed post-application through semi-structured expert interviews in combination with a qualitative content analysis (Mayring, 2021; Peffers et al., 2007; Sonnenberg & vom Brocke, 2012; vom Brocke et al., 2020). A guideline was developed that focuses on the usability and effectiveness of the design principles (Mayring, 2021). Due to time constraints, a direct instantiation and demonstration of the final set of principles was not feasible.

4. Development of the design principles

4.1 Deriving design requirements for the design

A VTC+ in higher education faces significant challenges in successful and effective execution due to its high social complexity, multidisciplinary nature and its complete virtualization (Magnus, 2011). To avoid major problems, the conceptualization should carefully consider the communication and coordination practices to be established and their resulting role and work context connections (Deinhofer & Myrach, 2024). Consequently, to develop relevant design principles, a VTC+ in higher education needs a requirement that focuses on the quality of handling. The requirement for the specification of communication and coordination (DR1) was developed for this purpose. Following the proactive, cognition-based approach of genre analysis, DR1 includes the assumption that for the successful and effective design of a VTC+ in higher education, all role relationships, work context connections and communication and coordination practices must be examined.

The way in which communication and coordination practices are used to pursue a delivery target agreement has a significant impact on the success of target achievement (Boughzala & De Vreede, 2015). The effective use of these practices depends on the selection of appropriate information systems (Waizenegger et al., 2020). The presentation of relevant data to process a delivery target agreement proves to be crucial for effective service delivery (Nguyen et al., 20221). Therefore, it is obvious that the information systems selected for a VTC+ must have the ability to present relevant data in such a way that all essential information for achieving the delivery target agreement is independently accessible. The requirement developed for the use of suitable information systems (DR2) addresses this need.

The establishment of an effective organizational workflow also proves to be crucial for the success of goal achievement (Boughzala & De Vreede, 2015). The formulation of strategies for goal achievement (Lang & Jarvenpaa, 2005), the definition of individual milestones (Hertel et al., 2005), the setting of deadlines for the achievement of these milestones (Riemer & Filius, 2009) and the planning of interim and final meetings (Ahuja et al., 2007) are essential for the effective and successful application of communication and coordination practices. Therefore, it is recommended that a VTC+ defines requirements that define appropriate service delivery (Benlian, 2020). The

requirement to establish an effective organizational workflow (DR3) addresses this need. Figure 1 illustrates the developed design requirements.

Fig. 1. Design quality goals extraction towards the design requirements

4.2 Deriving design principles from requirements

The initial design principle is derived from the identified requirements DR1, DR2, and DR3. It postulates that a VTC+ initiative must determine the suitability of the proactive cognition-based concept to be effective (Peffers et al., 2007; vom Brocke et al., 2020).

Aligned with DR1, all relevant communication and coordination episodes, role and work context connections, as well as communication and coordination practices, should be intuitively and simply integrated into a qualitative conceptualization (Magnus, 2011; Riemer & Filius, 2009; Waizenegger et al., 2020). Additionally, in line with DR2 and DR3, the conceptualization should enable the implementation of suitable information systems and organizational workflows that simplify and reduce workload (Boughzala & De Vreede, 2015; Lang & Jarvenpaa, 2005).

The first design principle (DP1) states that a concept should intuitively and effectively support all relevant communication and coordination genres and episodes, as well as the resulting role and work context connections, while ensuring appropriate communication and coordination practices. Table 1 presents the formulated principle DP1.

	Principle of suitability of the proactive cognition-based concept
DP1.	The concept should provide a comprehensive framework that supports established communication and coordination genres and episodes, as well as the resulting role and work context connections. It should also facilitate the intuitive and straightforward consideration of suitable and effective communication and coordination practices.

Tab. 1. Principle of suitability of the proactive cognition-based concept

DP1 legitimizes the qualitative design of the application concept for a VTC+ in higher education, forming the foundation for the development of effective information systems and organizational workflows. Without the proactive, cognition-based application of genre analysis, which examines relevant communication and coordination genres as

well as role and work context relationships, it is not possible to identify effective systems and practices (Figl & Saunders, 2011). Therefore, this analysis is crucial to ensure the principles are designed effectively. It highlights the need for a comprehensive analysis of communication and coordination needs to develop systems that meet the specific requirements of higher education and optimally support the VTC+.

Additionally, further principles must be formulated to ensure the conceptualization, implementation, and execution of a VTC+ (Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019). These principles should guarantee that information systems and workflows achieve the established goals in a thoughtful, successful, and effective manner (Benlian, 2020). They must also facilitate efficient communication and coordination (Waizenegger et al., 2020) and be flexible and adaptable to meet the dynamic demands of higher education, optimizing collaboration and information exchange (Nguyen et al., 2021).

The second design principle is based on the identified requirements DR2 and DR3. It asserts that a VTC+ requires a principle for selecting appropriate information systems to be effective and useful (Peffers et al., 2007; vom Brocke et al., 2020). In line with DR2, suitable and effective information systems can reduce and simplify workloads (Boughzala & De Vreede, 2015; Lang & Jarvenpaa, 2005). Moreover, according to DR3, the efficacy of organizational workflows must be considered when selecting systems. Information systems should be chosen based on their ability to achieve goals in the simplest and most intuitive way (Waizenegger et al., 2020), while ensuring independent access to relevant data for goal achievement (Lang & Jarvenpaa, 2005; Thülen & Hartl, 2021).

This principle (DP2) emphasizes the importance of selecting effective information systems that support relevant communication and coordination genres and work contexts for goal attainment. Additionally, these systems should be intuitive and easy for participants to use. Table 2 presents the formulated principle DP2.

	Principle of adequate information systems
DP2.	The concept should be designed in a manner that ensures established communication and coordination genres and episodes, as well as the resulting role and work context connections necessary for goal attainment, are supported by suitable, effective information systems and communication and coordination practices.

Tab. 2. Principle of adequate information systems

The DP2 process validates the technical efficacy of the proposed solution by ensuring effective information systems are available for all tasks necessary to achieve the goals. In line with DR2 and DR3, as well as DP1, DP2 emphasizes that without effective information systems, user-friendly communication and coordination practices cannot be developed. Therefore, systems must be robust, dependable, and intuitive to optimally support users (Nguyen et al., 2021). Effective information systems are crucial for designing efficient and intuitive communication and coordination practices (Deinhofer & Myrach, 2024).

Given the importance of DP1 and DP2, an additional principle is needed to establish optimal organizational workflows. Without effective workflows, challenges arise in setting goals, milestones, deadlines, and meeting schedules (Lang & Jarvenpaa, 2005; Hertel et al., 2005; Ahuja et al., 2007). Goal attainment cannot be ensured without effective workflows (Lang & Jarvenpaa, 2005).

The third design principle (DP3), developed with DR2 and DR3 in mind, emphasizes the need for an effective principle to ensure goal attainment (Peffers et al., 2007; vom Brocke et al., 2020). In accordance with DR2, appropriate information systems should reduce and streamline the workload (Boughzala & De Vreede, 2015; Lang & Jarvenpaa, 2005). Similarly, DR3 emphasize that organizational workflows should address communication and coordination genres, simplifying the workload (Lang & Jarvenpaa, 2005; Thülen & Hartl, 2021).

DP3 highlights the necessity of effective organizational workflows that consider relevant communication and coordination genres for successful goal attainment. It stipulates that systems should incorporate all necessary communication and coordination elements, supported by effective, intuitive practices. Table 3 presents DP3.

	Principle of effectiveness of target achievement
DP3.	The concept should be designed in a manner that ensures established communication and coordination genres and episodes, as well as the resulting role and work context connections necessary for goal attainment, are supported by suitable and effective communication and coordination practices that participants can utilize with minimal effort and complexity.

Tab. 3. Principle of effectiveness of target achievement

DP3´s concept justifies the efficacy of the application by ensuring the availability of effective organizational workflows for all tasks necessary to achieve the set goals. In light of DR2, DR3, and DP1, DP3 best represents the qualitative design of a VTC+. Without effective workflows, user-friendly communication and coordination practices cannot be developed. Therefore, organizational workflows must be efficient, reliable, intuitive, and easy to use to optimally support users (Nguyen et al., 2021). Effective workflows are essential for designing efficient and intuitive communication and coordination practices (Deinhofer & Myrach, 2024).

Considering DR1, DR2, and DR3, it is clear that an additional principle is needed to identify and ensure the necessary hard and soft skills for collaboration. Merely focusing on communication and coordination genres and roles will not lead to an effective VTC+ (vom Brocke et al., 2020). The concept must be operable by participants to avoid communication and coordination challenges (Waizenegger et al., 2020). Thus, identifying and cultivating the required hard and soft skills is essential.

The fourth design principle (DP4), developed with DR1, DR2, and DR3 in mind, posits that a VTC+ requires the identification of essential hard and soft skills (Peffers et al., 2007; vom Brocke et al., 2020). According to DR1, these skills should be based on the communication and coordination genres, roles, and work context connections (Boughzala & De Vreede, 2015; Lang & Jarvenpaa, 2005). In line with DR2 and DR3, skill identification should consider existing information systems and workflows

(Boughzala & De Vreede, 2015; Lang & Jarvenpaa, 2005). Participants should be able to use these systems and workflows without technical or organizational difficulties (Benlian, 2020).

DP4 focuses on the identification of the essential skills required for the effective use of a VTC+. It asserts that a concept should ensure participants possess the necessary hard and soft skills to handle communication and coordination genres, roles, and work context connections to effectively meet the delivery target agreement. Table 4 presents DP4.

	Principle of essential hard and soft skills
DP4.	The concept should be designed in a manner that ensures established communication and coordination genres and episodes, as well as the resulting role and work context connections necessary for goal attainment, are supported by suitable and effective communication and coordination practices that participants can utilize with minimal effort and complexity.

Tab. 4. Principle of essential hard and soft skills

DP4 legitimizes the participants' ability to effectively drive performance delivery. This principle ensures that participants can implement all tasks necessary to achieve the established goals. In conjunction with DR1, DR2, DR3, DP1, DP2, and DP3, DP4 also represents the qualitative design of the application concept for a VTC+. Without considering DP4, it is impossible to ensure that a developed application concept for a VTC+ can be successful and effective. Figure 2 illustrates all interconnections between the developed design requirements and design principles.
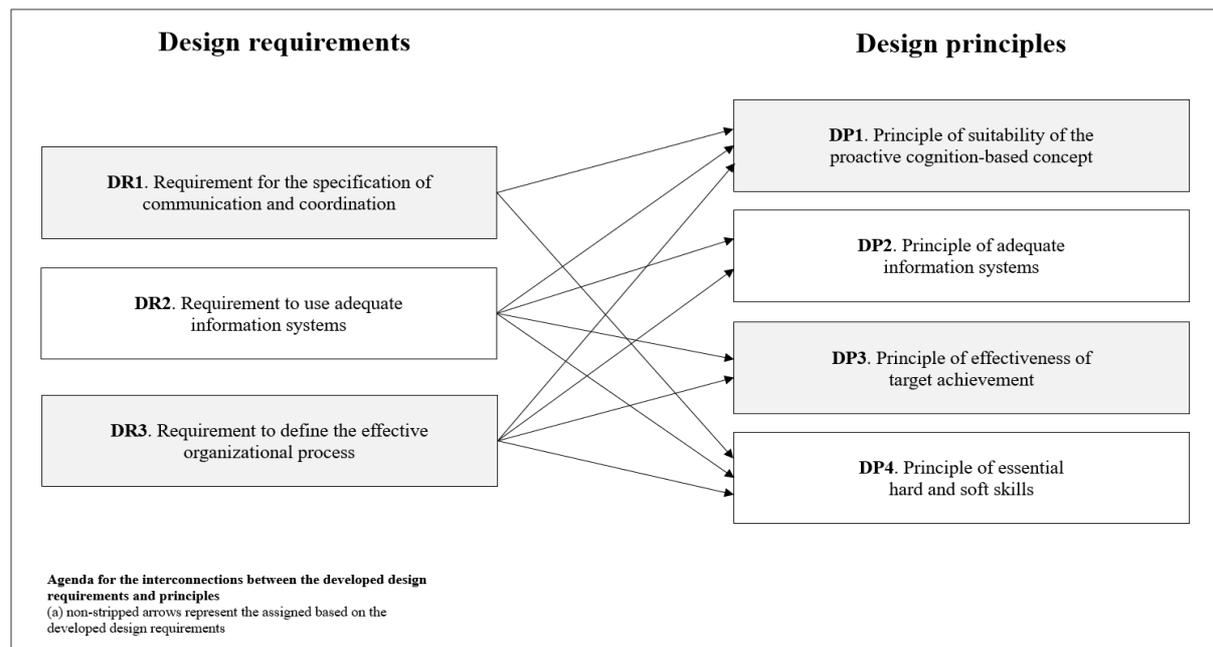
Fig. 2. Interconnections between the developed design requirements and design principles

5. Instantiation of the principles

5.1 Relevant features for the design

The instantiation of the principles is implemented through design features. In DSR, design features can be translated into specific artifact capabilities (Meth et al., 2015). Artifact capabilities must fulfill the developed principles and requirements (Morana et

al., 2017). In the context of this study, artifact capabilities are utilized to conceptualize, implement, and execute VTC+ in a manner that ensures compliance with the established principles and requirements. This necessitates that the instantiation is conducted in alignment with the conceptualization and implementation of the use cases.

The successful and effective execution of a VTC+ based on the developed design principles largely depends on the quality of design and instantiation (Waizenegger et al., 2020). DP1, DP2, DP3, and DP4 are considered for this purpose. Within the conceptualization of VTC+ in DSR, it was determined that an artifact capability addressing design is required (DF1). DF1 necessitates the application of proactive cognition-based genre analysis, enabling the careful development of a VTC+ application concept (Deinhofer & Myrach, 2024). The application of DF1 provides a comprehensive overview of all relevant communication and coordination genres and episodes, as well as the resulting communication and coordination practices, roles, and work context connections. Based on this foundation, suitable and effective information systems, necessary hard and soft skills, and communication and coordination practices for the relevant collaboration can be identified and established.

The careful instantiation of the artifact is directly linked to the suitability of the proactive cognition-based concept (Nguyen et al., 2021). To effectively manage all identified coordination genres and episodes, communication and coordination practices, and roles and work context connections, an artifact capability addressing instantiation is required. DP1, DP2, and DP3 are considered for this purpose. To trigger an effective and useful instantiation, the design feature of instantiation (DF2) was developed. DF2 describes how the results of the proactive cognition-based application of genre and communication analysis should be transferred into the necessary information systems, project completion descriptions, and time management descriptions for the upcoming collaboration (Deinhofer & Myrach, 2024). The transfer of analysis results creates an additional overview of the planned collaboration, transitioning from the conceptual phase to real-world implementation (Meth et al., 2015; Winter & Aier, 2020). This transfer provides the opportunity to identify potential gaps and mitigate tensions during the demonstration (Morana et al., 2017).

The successful and effective completion of a collaboration also depends on a useful and efficient execution (Seeber & Erhardt, 2023). To avoid significant communication and coordination issues during the execution of a VTC+, continuous monitoring of all communication and coordination episodes should be conducted (Riemer & Filius, 2009). DP2 and DP3 are critical in this context.

To ensure a useful and effective execution, the design feature of demonstration (DF3) was developed. DF3 describes how continuous monitoring of the formulated design requirements and principles should be applied throughout execution. Continuous monitoring of DP2 and DP3 is essential to prevent major communication and coordination issues (Deinhofer & Myrach, 2024). Through this approach can unforeseen communication and coordination issues be actively addressed, and appropriate short-term and long-term mitigation measures be developed and

implemented (Gregor & Hevner, 2013; vom Brocke et al., 2020; Winter & Aier, 2020). Figure 3 illustrates the interconnections between the application of features and the design principles and requirements.
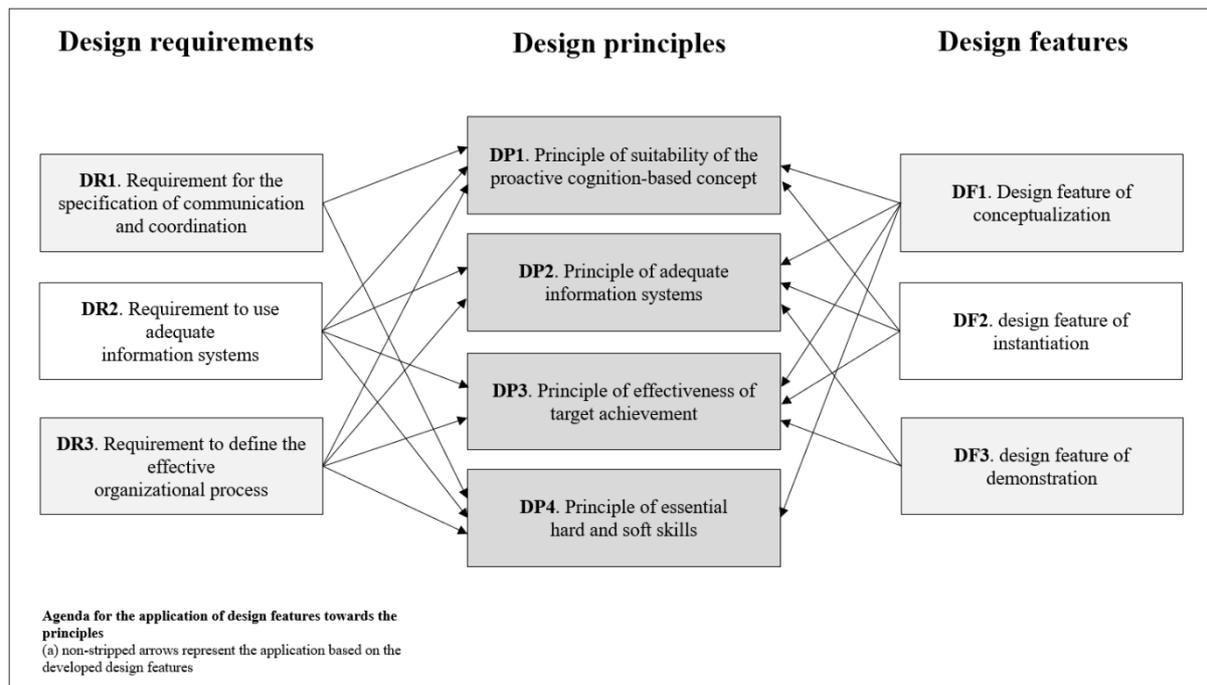
**Fig. 3.** Application of design features towards the design principles

5.2 Application of the features

The transfer of DP1, DP2, DP3, and DP4 into a prototype version is carried out with consideration of DF1. The resulting artifact prototype is based on an extracted list that includes detailed descriptions of all relevant communication and coordination genres and episodes, as well as communication and coordination practices, roles, and work context connections. These descriptions should be critically reviewed based on current research findings and supplemented with expert knowledge from multiple specialized workshops. This approach ensures the fulfillment of DP1.

The application of DF1 also supports the evaluation of suitable information systems, project completion descriptions, time management descriptions, communication and coordination practices, and relevant hard and soft skills that correspond to DP2, DP3, and DP4. In the research project, suitable information systems and organizational processes were identified for each established communication and coordination episode (Boughzala & De Vreede, 2015). Additionally, the aim was to maximize the effectiveness of goal agreements, ensuring that all participants (coaches, teaching staff, external practice partners, and prospective consultants) could work efficiently toward their goal agreements (Waizenegger et al., 2020). To enhance the comprehensibility of the proactive cognition-based genre analysis, Figure 4 presents an excerpt of its application.

The instantiation of the artifact should be carried out using DF2, with the prototype being instantiated based on the results of DF1. To ensure a comprehensive instantiation of the artifact, additional expert workshops should be conducted with selected teaching staff, e-didactic experts, and course leaders to implement any

necessary adjustments for goal attainment (Peffers et al., 2007; vom Brocke et al., 2020). As part of the research project, a detailed evaluation of specific information systems in which the artifact needed to be instantiated was conducted. This evaluation included a critical assessment of their feasibility in relation to the identified suitable and effective information systems, project completion descriptions, time management descriptions, and communication and coordination practices. Furthermore, the formulated communication and coordination practices, which involved external practice partners and work groups, were further refined. In these subsequent workshops, it is crucial to ensure that the provisions of DF2 are considered and implemented in alignment with DP1, DP2, and DP3. The following chapter explains how DF3 should be applied.
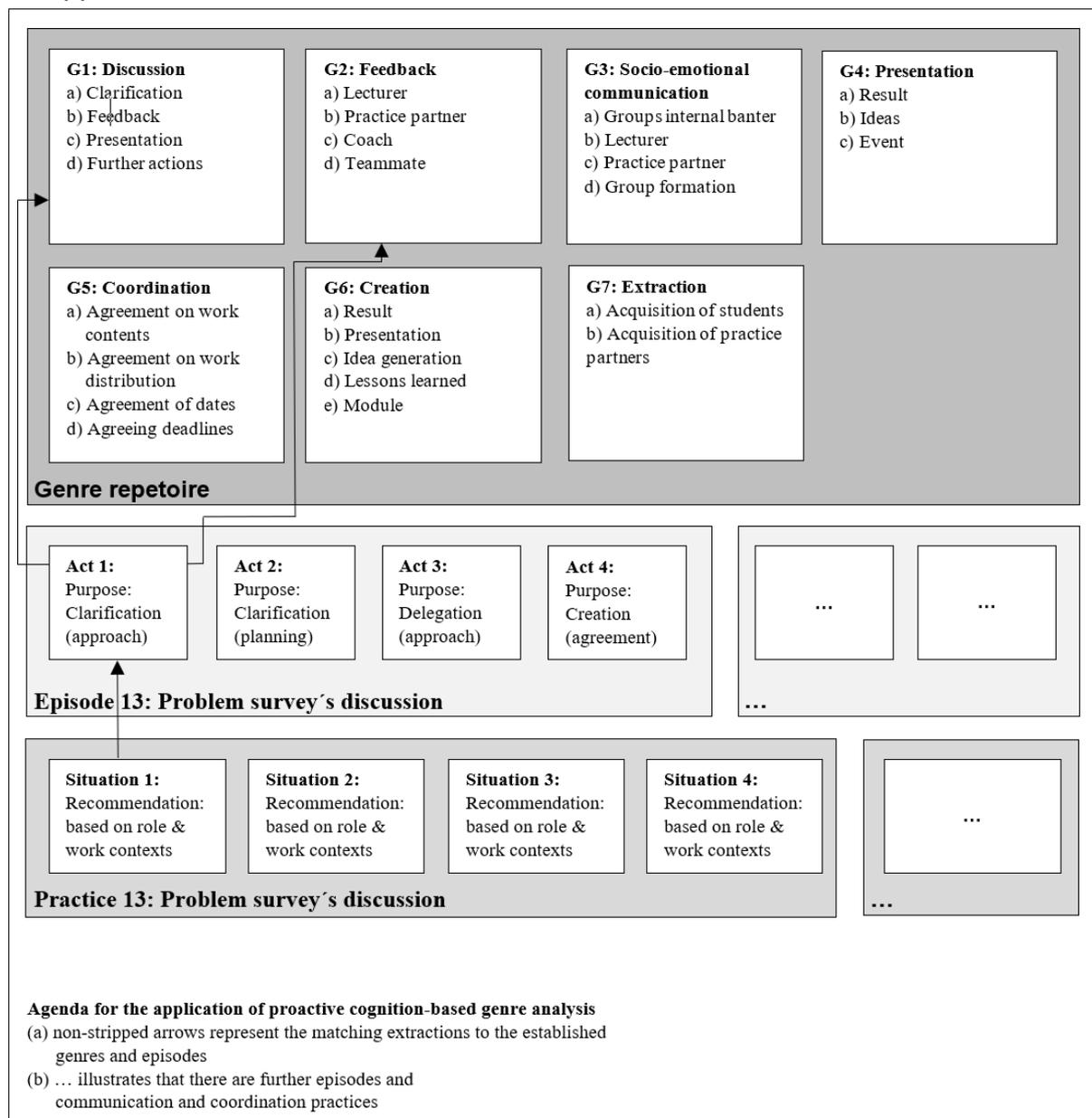
Fig. 4. Application of proactive cognition-based genre analysis

6. Utilization of the principles

6.1 Demonstration cases

As part of the research project, two IT consulting seminars were conducted at different universities. Seminar A took place in the fall semester of 2020 at University A and served as a pilot. Seminar B, originally designed as a presence-based course, was conducted in the spring semester of 2020 at University B but had to be virtualized on short notice due to COVID-19.

Seminar A trained prospective IT consultants through a real IT consulting project in a fully virtualized setting. Guided by coaches, participants learned to plan and execute an IT consulting project. A virtual kick-off introduced them to the practice partner and project objectives. The task was to design and implement an IT-supported disposition process for promotional items. After assessing the existing process, participants developed solutions while consulting the teaching staff and engaging with the practice partner.

Seminar B focused on IT innovation consulting through a fictitious innovation gap competition. Participants, supported by a consulting firm and teaching staff, learned to identify IT innovation gaps. The consulting firm served as both an external practice partner and coach, evaluating and refining business ideas. Teaching staff provided additional theoretical and practical feedback throughout the seminar.

6.2 Principles utilization

The VTC+ was methodically conceptualized, implemented and executed as prescriptively specified by the developed design requirements, principles and features (Sonnenberg & vom Brocke, 2012; vom Brocke & Maedche, 2019; vom Brocke et al., 2020; Winter & Aier, 2020). In the context of DP1, all of the assumed and presented considerations are fulfilled. DP1 requires that all relevant communication and coordination genres, episodes, roles and work contexts are determined and defined. This is the only way to ensure that effective and intuitive communication and coordination practices as well as information systems can be determined. In addition, the fulfillment of DR1, DR2 and DR3 is also fulfilled, as otherwise discrepancies between DP1 and these requirements would arise. The application of DF1 and DF2 addresses communication and coordination issues related to unbalanced workflows and helps to clarify boundaries between work and life (Deinhofer & Myrach, 2024). This includes restoring team identity (Thülen & Hartl, 2021), maintaining engagement in collaboration (Benlian, 2020) and promoting a positive work-life balance (Seeber & Erhardt, 2023).

In the context of DP2, the assumed and presented considerations are also fulfilled. For a VTC+ to effectively achieve the defined goals, it is essential that it is designed to provide appropriate and effective information systems, as well as communication and coordination practices for all relevant episodes and the resulting practices. This requires a comprehensive consideration of DR1 and DR2. Negative effects of team climate on group communication (Figl & Saunders, 2011), the technical impact of

technological complexity on group communication (Sarker et al., 2011), and the social effects of shared leadership on group coordination (Nordbäck & Espinosa, 2019) should be overcome. The socio-technological effects of global virtual teams on traditional coordination practices (Kiely et al., 2021) and the social effects of temporal coordination on virtual teams (Chamakiotis et al., 2019) can largely be avoided through the application of DF1, DF2, and DF3.

In the context of DP3, these considerations are also fulfilled. DP3 ensures that both DR2 and DR3 are met. This means that the selected organizational processes must be capable of effectively, simply, and intuitively incorporating the formulation of strategies for goal achievement (Lang & Jarvenpaa, 2005), setting milestones (Hertel et al., 2005), establishing deadlines for reaching milestones (Riemer & Filius, 2009), and making agreements for interim and final meetings (Ahuja et al., 2007). Therefore, DP1 and DP2 are also fulfilled, meeting the requirements of DR1 and DR2. In any case, the application of DF2 and DF3 design characteristics should resolve imbalanced workflows (Ahuja et al., 2007), clarify the boundaries between work and personal life (Seeber & Erhardt, 2023), and reduce expectations regarding connectivity (Waizenegger, 2015). The potential for reduced engagement in collaborative efforts (Benlian, 2020), the negative technical effects of technological complexity on group communication (Sarker et al., 2011), and the negative sociological effects of temporal coordination on virtual teams (Chamakiotis et al., 2019) can be mitigated.

In the context of DP4, fulfilling DP4, DR1, DR2, and DR3 is a prerequisite. This means that the selected concept must utilize relevant communication and coordination genres and episodes for the specified information systems and organizational processes, employing both hard and soft skills that participants bring to the collaboration (Cohen & Bailey, 1997; Cronin et al., 2021; Muukkonen et al., 2020). This implies that DP1, DP2, and DP3 must also be met to fulfill all requirements. In any case, applying DF3 design characteristics is essential to achieve DP4. The potential for diminished engagement in collaborative endeavors (Benlian, 2020), the negative technical effects of technological complexity on group communication (Sarker et al., 2011), and the negative sociological effects of temporal coordination on virtual teams (Chamakiotis et al., 2019) can be mitigated.

A comparison of the methodological approach with the framework of the developed principles shows that the design principles are useful in both cases. The clear delineation of responsibilities proves helpful in overcoming potential challenges in defining goal agreements. Additionally, the set goal agreements were successfully achieved. A concrete example illustrating the utility and effectiveness of the formulated principles in handling communication episodes is the situation of defining the deliverable for Seminar A. Prior to the course starting, potential challenges and communication points were thoroughly examined and integrated into the formulations of the concept. With the aid of the concept, bilateral communication between the project groups, coaches, teaching staff, and external practice partners was effectively conducted and purposefully facilitated. Therefore, the concept enabled the successful

delivery of the defined seminar deliverable by the end of the course (Peffers et al., 2007; vom Brocke et al., 2020; Winter et al., 2020).

7. Evaluation cycles

7.1 Expert discussion evaluations

The continuous evaluation of the usability and effectiveness of a developed artifact is a fundamental aspect of DSR. This process enables the identification of weaknesses in a developed artifact (Peffers et al., 2007). For this study, two evaluation cycles have been conducted to test the applicability of the design principles in a real-world context and to support their feasibility, effectiveness, efficiency, and reliability concerning real-world phenomena (Sonnenberg & Vom Brocke, 2012). In the first cycle (expert discussion evaluations), the design principles were cross-checked through expert discussions using the various data sources collected in the preceding study within this research project and adjusted as necessary. The objective of these discussions was to assess identified weaknesses and implement relevant adaptations to the design principles to mitigate the observed weaknesses (Peffers et al., 2007; Sonnenberg & Vom Brocke, 2012; Vom Brocke et al., 2020).

This evaluation approach was selected as a confirmatory method for several reasons. The multi-stage approach allowed the researcher to adapt the procedure as needed (Brocke & Maedche, 2019). Additionally, this approach enabled direct interaction with potential users, ensuring that the artifact was clearly understood (Sonnenberg & Vom Brocke, 2012). Moreover, it provided a deeper understanding of the artifact's feasibility, effectiveness, efficiency, and reliability (Vom Brocke et al., 2020).

To conduct the expert discussions, a series of meetings were held from early 2022 to late 2024 with a university lecturer in the field of Information Systems. This expert has decades of experience in the field of VTC+ and e-didactics in the context of information systems. The duration of these discussions ranged from one to three hours and were held both in presence based as well as virtual meetings. Additionally, further discussions were conducted with research assistants at the same university to incorporate their perspectives into the artifact development process. These research assistants have experience in the field of VTC+ from their academic teaching and their professional backgrounds in business and economics. One series of discussions took place with two assistants from 2021 to 2022, while another was conducted with two assistants from 2022 to 2024. The expert discussions typically lasted one hour and were also held in presence based as well as online meetings.

The results of the expert discussions indicate, on the one hand, that applying the kernel theory of media choice regarding proactive, cognition-based genre analysis can be considered both usable and effective. Overall, the participants in the expert discussions concluded that the concept developed is possible and leads to a successful and effective outcome. On the other hand, the findings also demonstrate that, the developed design principles proved to be both useful and effective. The discussions underscored that applying these principles helps manage the highly complex and uncertain task, thereby overcoming individual limitations. Overall, the

principles provide useful and effective guidelines for the conceptualization, implementation, and execution and fulfill the requirements for prescriptive knowledge generation in DSR (Peffers et al., 2007).

	Ineffective application of communication and coordination practices			Decreasing satisfaction by a participant		Declining group performance in terms of target achievement		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
W1. Lack of sufficient investigation into the requisite methodologies for evaluating the necessary hard and soft skills in relation to the pertinent genres, episodes, roles, and work contexts	x	x	x	x	x	x	x	x
W2. No evidence of the consideration of socio-emotional exchange between the processing groups and the external practice partner	x		x			x		x
W3. Lack of consideration of the relevance of the kick-off events during the design and development phase	x		x			x	x	x
W4. No document-based provision of efficient approaches to task completion contingent upon the relevant communication genres and episodes	x	x	x	x	x	x	x	x
W5. Insufficient communication and coordination between didactics, and instructors during the implementation and demonstration phases	x		x			x	x	

Ineffective application of communication and coordination practices
(a) Communication and coordination practices of stakeholders with learners
(b) Communication and coordination practices between learners
(c) communication and coordination practices of learners with stakeholder

Decreasing satisfaction by a participant
(d) Perceptions of an external stakeholder
(e) Perceptions of a participant in a working group

Declining group performance in terms of target achievement
(f) Results of communication and coordination from the perspective of stakeholder
(g) Results of communication and coordination learners concerning the set objectives
(h) Results of communication and coordination with stakeholder from the perspective of learners

Fig. 5. Observed weaknesses in relation to the potential consequences

However, the expert discussions also revealed certain weaknesses. For example, Assistant C expressed his concern that if a seminar requires certain hard and soft skills for participation, the principles insufficiently consider the necessary methods to assess these skills in relation to the relevant genres, episodes, roles and work contexts:

"*It is important to monitor the application of hard and soft skills and the use of communication and coordination media, and to seek feedback from team members to ensure that collaboration is effective and potential for improvement is identified. Possibly consider in DF2*"

Adequately incorporating an assessment of hard and soft skills would have significantly contributed to making the principles more useful and effective. Figure 5 illustrates the identified weaknesses that the initially developed design principles faced.

To address the observed weaknesses in DP1, DP2, DP3, and DP4 and develop more effective principles, adaptations are beneficial. These adaptations should aim to enhance participants' satisfaction, motivation, willingness to engage, and team identification. This requires a comprehensive approach in which each design principle is specifically tailored to incorporate these factors at every stage of the process. By doing so, the principles will not only address the technical and functional aspects but also foster a supportive and engaging environment for all participants. This holistic adaptation aims to build a more cohesive and motivated team, ultimately leading to more successful and satisfactory outcomes.

7.2 Adjustments to the principles

To address the identified weaknesses (W1–W5) more effectively, a series of adaptations were implemented. First, an independent requirement (DR4) was developed to ensure the maintenance of satisfaction, motivation, willingness to participate, and team identification. DR4 stipulates that a concept should be designed in a way that fosters individual satisfaction, motivation, willingness to participate, and team identification among all participants. By doing so, DR4 establishes a targeted requirement for the principles, which, prior to their adaptation, had only been implicitly incorporated through the application of the artifact capability DF2. Table 5 provides an overview of the adapted requirements.

DP	Design requirement	Description
DR1.	Requirement for the specification of communication and coordination	The concept should support all relevant communication episodes, coordination episodes, role connections, work context connections, communication and coordination practices and take them into account as intuitively and simply as possible
DR2.	Requirement to use adequate information systems	The use of suitable information systems that can effectively address the defined communication and coordination genres and episodes and reduce and simplify the workload should be supported so that the achievement of objectives can be achieved as effectively as possible
DR3.	Requirement to define the effective organizational process	The organizational processes of communication practices, coordination practices, task completion approaches, project completion descriptions and time management descriptions should effectively address the communication and coordination genres and episodes in question and reduce and simplify the workload so that goal achievement can be achieved as effectively as possible
DR4.	Requirement to maintain satisfaction, motivation, and team identification	The concept should support the maintenance of individual satisfaction, motivation, willingness to participate and team identification of all participants

Tab. 5. Adapted set of design requirements

To explicitly integrate DR4 into the principles, a standalone principle (DP5) was developed. DP5 postulates that a concept should be designed to facilitate the attainment of deliverable goal agreements within the designated timeframe while also providing opportunities for socio-emotional exchange among all participants. This is

particularly crucial, as the observed deficiencies were primarily attributed to inadequate communication and coordination (W2, W3, W5).

To further enhance the maintenance of individual satisfaction, motivation, willingness to participate, and team identification among all participants, DP3 was also adapted. Special attention was given to how the principles needed to be refined to better address the identified weaknesses (W1 & W4). In particular, DP3 was revised to ensure that a concept provides structured task completion approaches. By incorporating appropriate task completion approaches into the relevant genres and episodes, the diverse skill levels of participants can positively contribute to the achievement of deliverable goal agreements. Table 6 presents an overview of the adapted principles.

DP	Design principle	Description
DP1.	**Principle of suitability of the proactive cognition-based concept**	The concept should encompass established communication and coordination genres and episodes, as well as the resulting role and work context connections. It should also facilitate the consideration of suitable, effective communication and coordination practices in an intuitive and straightforward manner.
DP2.	**Principle of adequate information systems**	The concept should be designed in such a way that effective information systems, which are intuitive and simple to use, are made available for established communication and coordination genres and episodes, as well as the resulting role and work context connections, in order to achieve the desired outcome.
DP3.	**Principle of effectiveness of target achievement**	The concept should be designed in such a way that effective communication and coordination practices, task execution approaches, project management descriptions, and time management descriptions are available for established communication and coordination scenarios and episodes, as well as the resulting role and work context connections. Participants should be able to intuitively and easily utilize these descriptions to achieve the desired objectives
DP4.	**Principle of essential hard and soft skills**	The concept should be designed in such a way that established communication and coordination genres and episodes, as well as the resulting role and work context connections, require participants to possess the necessary hard and soft skills to achieve the set delivery target in a proper and effective manner
DP5.	**Principle of taking socio-emotional exchange into account**	The concept should be designed in a way that allows for the achievement of delivery targets within the context of the required time frame, while also facilitating socio-emotional exchange among all participants

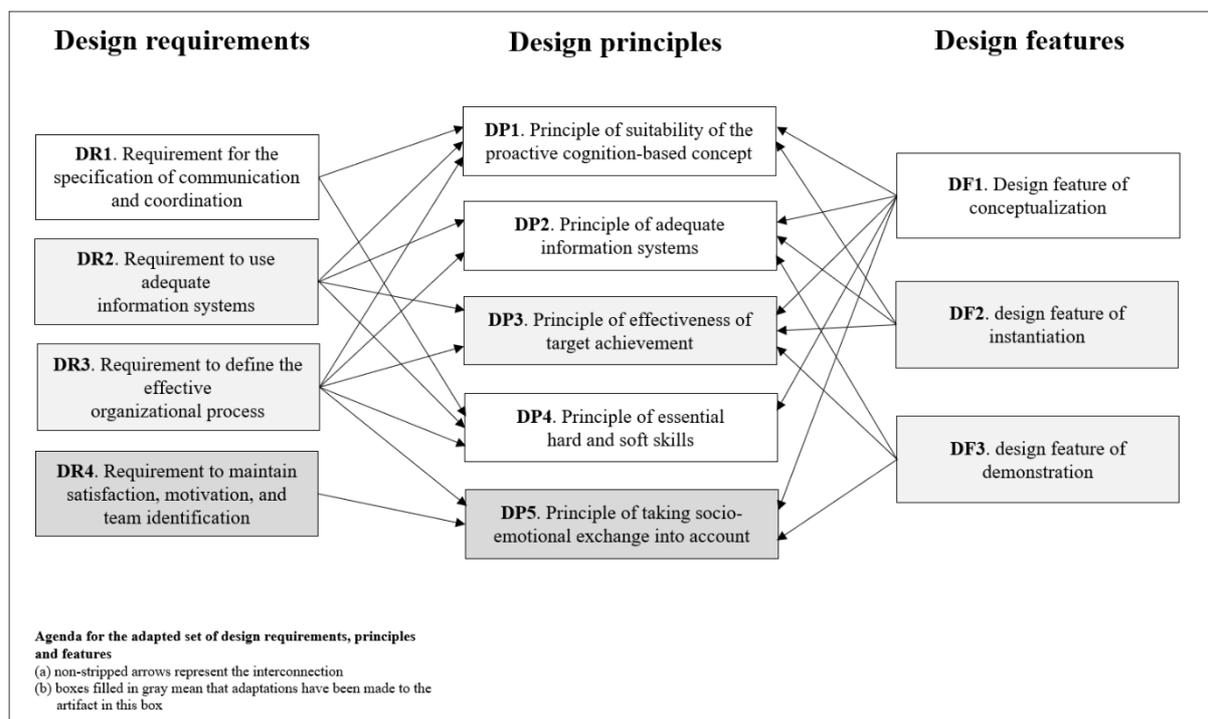**Tab. 6.** Adapted set of design principles

To integrate the consideration of suitable task completion approaches, further adjustments to the developed requirements, particularly DR2 and DR3, were necessary. In this context, it became evident that the design principles not only require the implementation of effective information systems, communication, and coordination practices but also demand a comprehensive approach to these elements. To address the identified weaknesses (W1 & W4), it was essential to incorporate a requirement into DP2 that mandates DP3 to provide task completion approaches. Consequently, the adapted DP3 specifies that the utilization of all established genres and episodes, along with the resulting roles and work context connections necessary for goal

achievement, must incorporate effective communication practices, coordination practices, task completion approaches, project completion descriptions, and time management descriptions. Table 7 gives an overview of the adapted features.

DP	Design feature	Description
DF1.	Feature of conceptualization	Proactive cognition-based application of genre analysis in combination with interactive expert workshops Meetings
DF2.	Feature of instantiation	Instantiation of the results of the communication analyses in the information systems, task completion approaches, project completion descriptions and time management descriptions required for the upcoming collaboration
DF3.	Feature of the execution	Continuous monitoring of the principles and sharing of the appropriate effective task completion approaches, project completion descriptions and time management descriptions found

Tab. 7. Adapted set of design features

To ensure the continuous monitoring of the adapted and newly developed requirements DR2, DR3, and DR4, as well as the principles DP2, DP3, and DP4 within DF3, it was also necessary to adapt DF2 and DF3. Regarding DF2, it was deemed essential to integrate task completion approaches into the instantiation of the results of the communication analysis. Leveraging insights from the proactive, cognition-based communication analysis, suitable task completion approaches should be developed for the identified genres and episodes and integrated into the information systems. The objective is to provide participants with access to these approaches at the onset of collaboration, enabling them to adequately prepare.

Fig. 6. Adapted set of design requirements, principles and features

DF3 was also modified concerning the provision of appropriate task completion approaches. Here, it was considered essential for instructors and stakeholders to

continuously evaluate task completion approaches, project completion descriptions, and time management descriptions throughout the execution of a VTC+. This ongoing evaluation process aims to mitigate weaknesses (W1 & W4). Furthermore, the adaptations and newly developed elements of DR2 and DR4, as well as DP2 and DP4, are intended to contribute to overcoming weaknesses (W1, W2, W3) through DF3. DF3 defines the continuous monitoring of requirements, principles, and components of the identified suitable and effective task completion approaches, project completion descriptions, and time management descriptions. Figure 6 provides an overview of the adapted principles, requirements, and features.

7.3 Expert interview evaluations

For the expert evaluation cycle interviews conducted in this study, only individuals with extensive experience in relevant research fields were selected. The interviewed experts from different institutions of higher education possess decades of knowledge in areas such as customer experience, higher education didactics, human-centered AI-based learning, sustainable digitalization in higher education, service design, and technology management. The interviews were conducted using a semi-structured questionnaire, either via Zoom or presence-based meetings, with each session lasting approximately one hour. Experts were asked how they would conceptualize, implement, and execute a VTC+ within the context of the adapted design principles. To ensure thorough preparation, each expert received the questionnaire in advance, along with supplementary materials. The materials included descriptions of proactive cognition-based genre analysis, communication and coordination practices and role and work context connections. During the interview, they were asked to evaluate each design principle in detail and assess whether the proposed formulations would contribute to a useful and effective VTC+.

The selection of interview partners was intentional, aiming to capture a broad yet high-quality range of perspectives from both academia and university management. Among the respondents was a director of a renowned distance-learning university with extensive experience in designing and implementing digital teaching and learning formats. Additionally, a vice-rector for teaching and sustainable development at a prestigious full university provided strategic insights into the cross-institutional integration of digital education. A head of a higher education didactics center at a leading university of applied sciences was also interviewed, bringing expertise in developing didactic concepts for technology-supported teaching. Furthermore, leading researchers in the fields of human-centered AI-based learning and service design in education contributed valuable insights into the potential and challenges of innovative digital teaching methods.

In addition to these individual interviews, a comprehensive presence-based interview was conducted with an interdisciplinary expert team from a well-established full university specializing in learning & development within higher education didactics. Participants included a dean of an economics and social sciences faculty, providing critical insights into curricular design for digital education formats; the head of the learning & development team, offering perspectives on the development and

implementation of institution-wide training programs; a postdoctoral researcher specializing in higher education didactics, focusing on innovative digital teaching and learning methods; and an expert on the use and strategic development of university learning platforms.

Regarding DP1, experts affirmed that the proactive, cognition-based approach of genre analysis is appropriate for conceptualizing a VTC+. The identification and definition of genres and episodes using DF1 were deemed feasible. Moreover, experts confirmed that communication and coordination practices for the intended VTC+ could be established based on the identified genres and episodes. Additionally, they validated that roles and work-context connections could be derived from these communication and coordination practices, emphasizing the importance of their early definition. However, it was noted that not all potential genres and episodes could be identified solely based on predefined learning objectives, as unforeseen events could always occur. A proactive, cognition-based design approach must, therefore, include risk evaluations for unexpected episodes and consider additional genres, as already suggested in DF2 and DF3.

Regarding DP2, experts recognized the growing importance of information systems in educational concepts, particularly for VTC+. Selecting the right information systems was identified as a crucial factor. Interviews revealed that communication, coordination, and material usage are key determinants for effectively defining system requirements. To assess usability and intuitive operation, experts suggested developing a test environment, refined through an iterative trial-and-error process combined with ad-hoc discussions with key stakeholders. One expert emphasized the need for a flexible selection process that considers the diverse backgrounds of participants in addition to the proactive, cognition-based approach.

DP3 was supplemented with insights into task management and time management strategies. Experts confirmed that structured approaches to task execution and time management positively influence the achievement of learning objectives. Learning goals should be structured to ensure their feasibility within an online context. Moreover, experts highlighted that support tools play a more critical role in online settings than in face-to-face environments. The interviews revealed that the type of support tools provided depends on the specific learning environment and that practices for offering such tools vary between institutions. Within a VTC+ initiative based on real IT consulting projects, seamless integration of roles and work-context connections across selected support tools was deemed essential.

Hard and soft skills, as described in DP4, should be actively considered in VTC+. Experts unanimously agreed that participants must effectively navigate the digital environment. Hard and soft skills play a pivotal role in this process. The interviews confirmed that possessing these skills positively impacts learning outcomes, while deficiencies hinder progress. However, experts cautioned that simple surveys are insufficient for assessing these competencies—an observation that aligns with identified weaknesses (W1–W5) in this study. Instead, online assessments and role-playing exercises were identified as effective evaluation methods. There was some

debate over how skill gaps should be identified, with experts acknowledging that institutional practices for competency assessment vary widely and depend on the specific learning environment. Nevertheless, the experts validated the study's approach within the VTC+ context.

DP5 highlights the importance of socio-emotional exchange, which should be actively incorporated into the design, implementation, and execution of a VTC+. Experts emphasized that merely providing breakout rooms for interaction during implementation is insufficient, as these are often underutilized. To maximize positive effects, an interactive approach should be established from the conceptual phase. For instance, incorporating gamified elements within an exercise framework during VTC+ sessions could encourage engagement. Bonus points could be used as incentives, but their allocation must align with the predefined learning objectives.

Overall, the ex-post expert evaluation yielded predominantly positive feedback on the adapted design principles. However, two key critiques emerged that should be addressed before applying these principles. First, expert B emphasized that implementing the proactive, cognition-based genre analysis requires predefined learning objectives. Only with clearly established learning objectives can relevant genres, episodes, communication and coordination practices, and corresponding role and work-context connections be effectively determined:

"Learning objectives serve as the foundation for structuring a course. Initially, overarching learning objectives are defined at the course level and then broken down into more specific sub-objectives, which form the basis for individual lectures or modules. Once learning objectives are established, the pedagogical framework can be determined: What role will application, feedback, or tutoring play? Only when the overall educational framework—including the vision and mission of the course—is clear can the structure of genres and episodes be meaningfully developed."

When formulating and refining the design principles, it was assumed that learning objectives had already been established.

Second, expert F underscored the importance of instructional design in supporting learning objectives within a VTC+. During the conceptual phase, collaboration with instructional design experts should be considered to identify an appropriate pedagogical approach tailored to the specific VTC+ requirements. Since each proposed VTC+ has distinct needs, these requirements should serve as the foundation for determining how participants can best achieve the learning objectives:

"Didactic interaction systems can always be described through three meaning dimensions: a factual, a temporal, and a social dimension. A course is therefore characterized by participants knowing the subject matter (factual dimension), understanding the course duration (temporal dimension), and having clearly defined roles along with corresponding expectations and behaviors (social dimension). This fundamental structure represents the minimal prerequisite for planning and design."

While instructional design was considered a central element in the formulation of the design principles, it was not explicitly integrated into the descriptions, as the process

of conceptualizing, implementing, and executing a VTC+ was assumed to begin after defining instructional design and learning objectives. However, noting these considerations in this section ensures that practitioners and academics account for it when applying the principles.

8. Discussion

8.1 Media choice theory as kernel theory

In this study, media choice theory (Daft & Lengel, 1983) was utilized as the kernel theory and operationalized through proactive cognition-based genre analysis (Deinhofer & Myrach, 2024; Riemer & Filius, 2009). This approach enables a reproducible, theory-based development (Peffers et al., 2018) while addressing complexity factors in identifying and defining appropriate information systems (Nguyen et al., 2021), communication and coordination practices, and their resulting role-task context connections (Deinhofer & Myrach, 2024).

The application of media choice theory facilitates the legitimization and rationalization of decisions throughout the entire design process of the design principles (Peffers et al., 2007). The validity of the explanations and predictions regarding the behavior and impact of the artifact is reinforced by positive expert feedback obtained during the interview cycle (see Section 7.3). Experts consistently agreed that the development of a VTC+ based on proactive cognition-based genre analysis is a viable and useful approach. The generated explanations and predictions derived from the application of DF1 and DF2, which are monitored through DF3, have proven to be both effective and beneficial (Sonnenberg & vom Brocke, 2012). Thus, the selected kernel theory continuously supports the development phase by enabling a deeper understanding of how and why the artifact functions (vom Brocke et al., 2020).

The assumptions regarding the application of kernel theory in DSR have been successfully validated. The refined guidelines and principles significantly contribute to structuring and guiding the design process (vom Brocke et al., 2020). In particular, the findings highlight the central role of media choice theory in systematically conceptualizing, implementing, and executing a VTC+. Experts confirmed the feasibility of this approach and emphasized its effectiveness in the development of virtual teaching formats. Furthermore, media choice theory not only strengthens the methodological foundation within the DSR context but also supports the systematic and reproducible derivation of relevant design principles for VTC+ development (Peffers et al., 2018). However, before initiating the conceptualization of a potential VTC+, it is essential to define the instructional design and learning objectives to ensure a coherent and goal-oriented approach.

The classification of genres, episodes, communication, and coordination practices, along with their resulting role-task context connections, enables a continuous evaluation of the efficiency and effectiveness of the design principles concerning usability, individual participant satisfaction, and group performance (Winter & Aier, 2020). Consequently, the selected kernel theory also provides the theoretical foundation for the artifact and its evaluation in terms of effectiveness and efficiency

(vom Brocke et al., 2020). On one hand, media choice theory facilitated the development of well-founded and relevant design principles (Meth et al., 2015). The expert interview cycle concluded that the conceptualization of a VTC+ through proactive cognition-based genre analysis represents a valid approach. On the other hand, media choice theory also reinforces that the development of design principles based on this method is a sound approach, warranting consideration in both academic and practical applications.

This study contributes to the field of information systems research by leveraging proactive cognition-based genre analysis to develop useful and effective design principles. Consistent with the findings of Deinhofer & Myrach (2024), the study confirms the feasibility of this approach in the context of VTC+ in higher education. Identifying and defining appropriate information systems, communication and coordination practices, as well as the resulting role-task context connections based on a proactive cognition-based genre-analysis, proved to be valuable for formulating relevant design principles. Furthermore, the study critically examines the limitations of proactive cognition-based genre analysis (W1–W5) and integrates mechanisms to address these challenges in the design process. The refined design principles explicitly incorporate aspects such as satisfaction, motivation, willingness to participate, and team identification (W2 & W4). Additionally, the study addresses key critiques from recent research (Waizenegger et al., 2020; Nguyen et al., 2021; Kiely et al., 2021; Seeber & Erhardt, 2023) by integrating social aspects into the conceptualization of VTC+.

This study also contributes to the DSR literature by providing prescriptive knowledge on the conceptualization, implementation, and execution of VTC+. It demonstrates how methodological requirements for utility and effectiveness can be systematically integrated into the development of design principles (vom Brocke et al., 2020; Winter & Aier, 2020). Moreover, the findings highlight that identified weaknesses (W1–W5) can be addressed through targeted modifications in requirements, principles, and functionalities. Another key contribution lies in the recognition that incorporating effective competency assessments (Muukkonen et al., 2020) and systematic approaches to task execution (Zid et al., 2020) is crucial for the successful implementation of the developed principles. Empirical findings further suggest that, while successful collaboration is possible even in the absence of these factors, their targeted integration enhances goal attainment, long-term satisfaction, and participant engagement. Thus, this study provides valuable insights for the DSR community, advancing the development of practice-oriented design concepts in virtual collaboration.

8.2 Provision of skill assessment approaches

The study identified several weaknesses (W1–W5), with the insufficient examination of methods for assessing the necessary hard and soft skills in relation to specific genres, episodes, roles, and work contexts being particularly significant. Within the expert discussion evaluation cycle, it was found that the initially formulated design principles regarding the assessment of hard and soft skills in a VTC+ were inadequate

(W1). The method originally used for evaluating the skills, a simple self-assessment, is not sufficient to accurately capture the actual skills of the participants (Muukkonen et al., 2020).

This misjudgment can have two main negative consequences. First, it may limit participants' ability to think analytically when developing goal agreements, which could result in a reduced understanding of the feedback from a potential participating external peer or lecturer and hinder their ability to respond appropriately, thus further exacerbating the identified weakness (W2). Additionally, the lack of targeted training to standardize competency levels (Cronin et al., 2021) may prevent participants from independently developing strategies to achieve the goal agreements. Second, an unclear definition of communication and coordination practices with a potential participating external peer or lecturer may significantly hinder collaboration. This could lead to misunderstandings and inefficiencies in the project process, thereby exacerbating the identified weaknesses (W2, W5).

The expert interview evaluation cycle of the design principles (Peffers et al., 2007; vom Brocke et al., 2020) clearly revealed that the inadequate method for assessing participants' soft and hard skills can be a critical issue if it is required. The negative consequences of this misjudgment emphasize the need for an effective method that accurately captures participants' competencies. Such a method must be capable of making well-informed decisions about whether training is needed before the initiation of a VTC+. This is essential for the development of a more efficient, practice-oriented concept and for the advancement of design principles that extend beyond the framework used in this study (Meth et al., 2015).

Both in practice and research, various approaches exist for assessing hard and soft skills (Cohen & Bailey, 1997; Cronin et al., 2021; Muukkonen et al., 2020). For the artifact developed in this study, theoretical tests, such as working on specific case studies, would be suitable for evaluating hard skills (Muukkonen et al., 2020). For instance, if a VTC+ program aims to address a real IT consulting project as a learning goal, participants should be given the opportunity to familiarize themselves with IT consulting projects before the kick-off meeting by working on realistic case studies. It is crucial to allocate sufficient time for this task. Completing it within a single day, similar to a simple self-assessment, is insufficient to make an informed decision about training needs (Nordbäck & Espinosa, 2019). A one-week duration would be appropriate for adequately assessing participants' technical accuracy, innovation capabilities, and problem-solving skills (Thülen & Hartl, 2021).

To assess soft skills, simulations or role-playing exercises would be well-suited for the developed artifact (Cohen & Bailey, 1997; Cronin et al., 2021; Muukkonen et al., 2020). For instance, if a VTC+ program requires both hard and soft skills, a virtual meeting should be organized before the kick-off meeting to simulate collaboration with participating peers. This approach would allow for a thorough evaluation of participants' communication, coordination, and negotiation skills (Lang & Jarvenpaa, 2005). One meeting would suffice, as long as it realistically mirrors the actual VTC+ situation

(Muukkonen et al., 2020). This would provide a more accurate assessment of participants' communication and coordination competencies.

Implementing these case studies and role-playing exercises could significantly reduce or even eliminate the identified weaknesses (W1–W5), regardless of participants' prior VTC+ experience. In the initial formulation phase of the design principles, it was assumed that participants were aware of their own competencies and that their self-assessments were accurate. However, during the evaluation cycles of this study, it became evident that this was not the case. The introduction of these proposed methods for identifying hard and soft skills may bring new weaknesses to light, which should be further examined and addressed through the iterative evaluation process within the DSR framework (Peffers et al., 2007; vom Brocke et al., 2020).

8.3 Consideration of project plans

Conceptualizing a VTC+ through proactive cognition-based genre analysis has proven to be both useful and effective (Deinhofer & Myrach, 2024; Fiedler & Gallenkamp, 2008; Riemer & Filius, 2009). This study reaffirms this insight. However, when it comes to the execution of a VTC+, the study arrives a new insight. During the evaluation cycle of expert discussions, it was found that in the implementation and execution of a VTC+ conceptualized using cognition-based genre analysis, the determination and establishment of communication and coordination practices, as well as their resulting role and work context connections, need to be leveraged more comprehensively. These predefined communication and coordination practices should be further utilized to determine and establish effective task completion approaches. This would ensure that the identified weakness (W4) could be mitigated or even entirely overcome. The failure to extend the use of communication and coordination practices poses the risk of inefficiencies in communication and coordination, ultimately hindering goal achievement.

To address the observed weakness (W4), it is necessary to provide effective task completion approaches in the execution of a VTC+ (Gadelha, 2018; Waizenegger et al., 2020; Zid et al., 2020). This would enable participants to systematically and effectively accomplish learning objectives (Waizenegger et al., 2020). Numerous suitable and well-established task completion approaches exist in both practice and research (Abarca et al., 2020; Benlian, 2020; Zid et al., 2020). Within the context of the framework conditions of the conducted seminars in this research project, it appears reasonable to introduce a task completion plan in the form of a fillable document. This plan should be a mandatory assignment during the kickoff meeting, to be completed within a designated deadline and continuously evaluated by instructors and coaches at each milestone. This approach ensures the integration of expert knowledge into the handling of the consulting project, thereby improving the quality of deliverables (Lang & Jarvenpaa, 2005). Additionally, it addresses the observed challenge faced by prospective consultants in identifying suitable task completion approaches.

To determine and establish appropriate task completion approaches in the context of the generalizability of design principles in higher education, the predefined learning

objectives should be analyzed in conjunction with the established communication and coordination practices, as well as their resulting role and work context connections. The goal of this analysis should be to identify a task completion approach that effectively supports key elements such as goals, milestones, and the assignment of roles and responsibilities necessary to achieve these milestones (Zid et al., 2020). Therefore, the task completion approach should be based on the predefined learning objectives, the identified and established genres, episodes, communication and coordination practices, and the resulting roles and contextual connections. The determination and establishment of a task completion approach should already take place during the conceptualization phase following the application of DF1 so that its specification can be discussed with responsible stakeholders during the application of DF2. Furthermore, this early consideration during the application of DF3 would allow for the earlier detection of ineffective implementation (W4). Such preparation ensures that specific context connections are considered and systematically addressed during evaluation (vom Brocke et al., 2020).

Implementing an appropriate and effective task completion approach presents a promising measure for optimizing the execution of a VTC+. In particular, it can help directly address the identified weakness (W4), thereby improving the efficiency and structure of learning objective execution. Furthermore, systematic task completion may contribute to reducing or even completely eliminating additional weaknesses (W2, W3, W5). By optimizing task completion, the overall quality of the VTC+ is enhanced, as both the organization and the substantive depth of the seminar implementation are improved (vom Brocke et al., 2020). Such a quality improvement has a positive impact on participant satisfaction. Students benefit from clear structures and better support throughout the seminar, reducing uncertainties. Instructors gain a solid foundation for supervising participants and can more effectively address emerging challenges (Deinhofer & Myrach, 2024). Ultimately, the implementation of a well-structured task completion concept significantly contributes to the sustainable enhancement of the learning experience.

At the same time, it is essential to consider that implementing a task completion approach may present various challenges and potential negative consequences (Benlian, 2020). One of the primary challenges is the increased workload for all stakeholders, particularly instructors and students. While instructors must allocate additional effort toward the design, implementation, and continuous supervision of the approach, students face new demands concerning independent application and execution. This additional workload should not be examined in isolation but rather systematically assessed during the planning phase. A particularly critical aspect is a thorough evaluation of the didactic design and the definition of targeted learning objectives. The primary goal must be to strike a balance between meaningful curricular enhancement and feasible implementation (Deinhofer & Myrach, 2024). Only through proactive planning can participant and instructor overload be avoided (Waizenegger et al., 2020), as excessive demands could ultimately jeopardize the success of the initiative and the quality of the VTC+.

Additionally, it must be recognized that the implementation of a task completion approach may introduce unforeseen challenges. Potential new weaknesses that arise during implementation and execution cannot always be fully anticipated beforehand (vom Brocke et al., 2020). These weaknesses may be both technical and didactic in nature, potentially manifesting in inadequate adaptation to participant needs or difficulties in practical application (Deinhofer & Myrach, 2024). To effectively address these challenges, a systematic and iterative evaluation process is required. Within the continuous Design-Science-Research (DSR) process (Peffers et al., 2007), newly emerging weaknesses must be promptly identified, analyzed, and addressed through targeted modifications. This ongoing optimization ensures a continuous improvement of the conceptualization, implementation, and execution of the VTC+. Furthermore, such an evidence-based iterative process enables the sustainable development of teaching and learning processes by continuously assessing the effectiveness of didactic measures and adapting them to evolving requirements.

Concluding remarks

In light of the challenges associated with the increased complexity of the conceptualization, implementation, and execution of VTC+ in the higher education context, the present study provides interesting insights. Firstly, through addressing the formulated research questions, a feasibility proof has been established. Specifically, the feasibility of the developed and adapted design principles was confirmed within the expert interview cycle. Furthermore, these principles were evaluated as both useful and effective. Secondly, this study closed the existing prescriptive knowledge gap concerning the successful and effective conceptualization, implementation, and execution of VTC+ in higher education. By applying the DSR methodology (Peffers et al., 2007; vom Brocke et al., 2020), this study developed design principles that prescriptively explain how VTC+ can be successfully and effectively conceptualized, implemented, and executed in the higher education context.

Particularly noteworthy in this study is the heightened complexity of the demonstration cases in the research project. These cases posed the additional challenge that the defined learning objectives included the successful and effective execution of real consulting projects. The integration of external stakeholders into the conceptualization of VTC+ significantly increases the already existing complexity (Abarca et al., 2020; Deinhofer & Myrach, 2024; Nguyen et al., 2021). In particular, identifying and defining suitable information systems, communication and coordination practices, as well as their resulting role and work context connections, proves to be especially challenging in this context (Riemer & Filius, 2009). In this study, design principles were developed that provide a feasibility proof despite these heightened complexity factors. The application of the design features allows for a systematic approach that can effectively address and overcome these particular challenges. The underlying kernel theory of media choice, combined with the instrumentalization method of proactive cognition-based genre analysis, proves to be particularly helpful (vom Brocke et al., 2020). This is primarily due to the fact that the focus of proactive cognition-based genre analysis is on identifying and defining communication and coordination practices, as well as the

resulting role and work context connections, based on potential genres and episodes (Deinhofer & Myrach, 2024). The feasibility proof was thus provided from the perspective of a particularly demanding and complex situation for VTC+. The successful implementation of such complex connections underscores the relevance and applicability of the formulated principles even in challenging and highly complex scenarios.

Like any scientific investigation, this study also has certain limitations that must be considered. A central limitation concerns the development of the requirements, principles, and features (Peffers et al., 2007). The conceptualization of these elements predominantly focused on manageability, individual satisfaction, and group performance of potential VTC+ and may therefore have been subject to biases, potentially overlooking other relevant factors. Nonetheless, manageability, individual satisfaction, and group performance were identified through critically inspecting literature and internal expert discussions as the most relevant evaluation and construction factors. Another limitation pertains to the evaluation rounds. A practical instantiation of the adapted and expert-reviewed design principles may reveal new weaknesses not previously addressed in this study. In particular, the different professional backgrounds and specific expertise of the experts could have introduced potential biases that were not fully reflected in the adaptation processes. Additionally, the researchers' background in information systems might have influenced the adaptation of the design principles. However, particular attention was paid during the evaluation cycles to ensuring a diverse selection of interviewees, aiming to integrate all relevant perspectives for the conceptualization, implementation, and execution of VTC+ in higher education. Finally, the scope of data collection in the expert interviews should be considered another limitation. Whether eleven experts are sufficient to make a robust statement regarding the legitimacy of the formulated principles remains a debatable and questionable assumption.

In conclusion, it is evident that the successful and effective conceptualization, implementation, and execution of VTC+ in higher education remains a highly relevant field of research. The present era is characterized by unprecedented levels of human interconnectedness, with educators and learners increasingly confronted with new technologies that must be integrated into daily life in meaningful and effective ways. In particular, within the context of generative artificial intelligence (AI), there exists a significant research need to further advance the successful and effective implementation of VTC+ in higher education. One promising avenue that this study aims to inspire is the application of the developed design principles in conjunction with generative AI. Specifically, a research project could be initiated that focuses on the instrumentalization of the design principles and proactive cognition-based genre analysis with the aid of generative AI. The successful realization of such an initiative could hold substantial potential to relieve both academics and practitioners, allowing them more time for strategic and creative endeavors.

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Declaration of interest statement

There are no potential conflicts of interest to declare in this manuscript.

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