Development Patterns of Shared Understanding Among IT and Business: A Longitudinal Case Study

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Abstract

Shared understanding is imperative for effective business/IT collaboration. In the past, research has frequently employed a situational snapshot approach, focusing on the degree of business/IT shared understanding at specific points in time. To understand the evolution of shared understanding over time, we conducted a study of four distinct IT projects within a global IT service provider firm. A longitudinal cross-case analysis is employed to identify patterns in the development of shared understanding over time and to uncover explanations for these patterns. We identify common challenges, such as team member involvement or technical details, at various phases of IT projects and provide recommendations on the timing and design of critical actions to overcome these challenges and facilitate a shared understanding. By doing so, we develop propositions on the development of shared understanding and lay the foundation for a process theory of business/IT shared understanding in IT projects.

Keywords: Business/IT Shared Understanding; Longitudinal Cross-Case Analysis; Process Theory.

Introduction

Shared understanding between business and IT professionals has frequently been raised as a critical component for achieving harmonized and effective collaboration between business and IT units (e.g., Reich & Benbasat, 2000; Wagner et al., 2014; Ahmed et al., 2025). In particular, IT project management research has demonstrated that a high level of shared understanding facilitates requirements engineering and software development (e.g., Charaf et al., 2013; Rathor et al., 2024) or IT implementation (Lech, 2022). Research focusing on the development and introduction of enterprise systems also acknowledges the fundamental impact of shared understanding between IT personnel and business/user groups (Chua et al., 2012; van den Hooff & de Winter, 2011; Vermerris et al., 2014), and empirical studies have confirmed its importance for business/IT collaboration at every level of the firm.

However, these findings are primarily based on situational snapshots within companies, i.e., data collected at a single point in time. This is true not only with regard to IT projects but also in research on teams in general (Kozlowski & Chao, 2018). However, understanding how business/IT shared understanding (B/IT-SU) evolves and can be altered over time is essential, as it informs management actions and helps avoid pitfalls in IT project management. For instance, our results show that a high level of B/IT-SU at one point in time does not imply a high level of B/IT-SU at

a later point in time because, if a team perceives a high level of shared understanding at the beginning of a project, they might reduce communication in the team since they believe everything is clear. This false assumption can lead to a drop in shared understanding in subsequent stages.

Although project management research suggests that shared understanding is not stable over time, few papers provide empirical evidence for this assumption (such as He et al., 2007; Levesque et al., 2001; Wagner & Weitzel, 2012). Most IS studies analyzing the development of B/IT-SU do so retrospectively (e.g., Vermerris et al., 2014; Hetemi et al., 2022; Rathor et al., 2024), while others conduct experiments (e.g., Bittner & Leimeister, 2014; Chiravuri et al., 2011), often using students as subjects (He et al., 2007; Levesque et al., 2001; McKinney et al., 2023). The findings have been inconclusive or even contradictory. For instance, Vermerris et al. (2014) found that ensuring a high level of shared understanding at the beginning is critical for project success. He et al. (2007) reported that shared understanding typically begins at a low level and increases over time, and that an initial low level of shared understanding has no impact on collaboration success. By contrast, Levesque et al. (2001) found that shared understanding commonly *decreases* in IT projects due to the specialization of roles.

To address these inconclusive findings and shed further light on the development of shared understanding in project teams, scholars have called for more research on changes in shared understanding over time (Wolfson et al., 2022) and for the development of process theories on organizational interventions (Braun et al., 2022). Process theories aim to "explain how and why change unfolds in social or biological entities" (van de Ven & Poole, 1995, p. 511). Therefore, a process theory is best suited to describe and understand how B/IT-SU evolves from the beginning to the end of a business/IT collaboration and *why* it changes. In the case of an overconfident team, a process theory can help us understand the effects on B/IT-SU (the How) and the reasons for these effects (the Why). Therefore, we adopt a process-oriented perspective to analyze the development of B/IT-SU and formulate our research question as follows:

> How does B/IT-SU evolve over time, and what are the important (intertemporal) triggers?

To address this research question, we conducted an exploratory study of four system development projects. We collected longitudinal data on B/IT-SU development and conducted interviews to identify its antecedents and effects over time. These antecedents are characterized along structural, relational, and cognitive dimensions before we extract common patterns in the intertemporal development of B/IT-SU in a cross-case analysis.

The next section outlines the theoretical basis of our work, defines and conceptualizes B/IT-SU, and summarizes previous related research and process theories. We then explain how we collected data from four IT projects. The findings section presents five notable patterns of how B/IT-SU developed over time, derived from the cases. It then synthesizes these findings in a cross-case analysis and links them to causal managerial antecedents. We conclude with a summary of the study's contributions and limitations and present recommendations for future research.

Theoretical Background

Business/IT Shared Understanding

Business/IT shared understanding (B/IT-SU) plays an important role in various strands of IS research. Some examples include alignment research, in which shared understanding represents a key factor in enabling social alignment between business and IT executives and managers (e.g., Eom et al. 2024; Reich & Benbasat, 2000; Schlosser et al., 2015); systems development research, where B/IT-SU has been described as a critical factor in requirements engineering (e.g., Charaf et al., 2013); agile development practices (Drury-Grogan, 2021; Rathor et al., 2024); system implementation (e.g., Chua et al., 2012; Lei et al., 2024); and even in the post-deployment phase (Carraher-Wolverton et al., 2021). As "the ability of IT and business […], at a deep level, to understand and [thus] be able to participate in the other's key processes" (Reich & Benbasat, 2000, p. 86), shared understanding enables knowledge transfer and thus contributes to project performance (Drury-Grogan, 2021; Ghobadi & Mathiassen, 2017) and service quality provided by IT (e.g., Ko et al., 2005; van den Hooff & de Winter, 2011).

Research on B/IT-SU builds on the broader research and theoretical conceptualization of shared mental models (SMMs) in teams, defined as "team members' shared, organized understanding of knowledge and mental representation about key elements of the team's relevant environment" (Mohammed & Dumville, 2001, p. 90). This embraces an understanding of the team's task, team composition (e.g., roles, responsibilities, interaction mechanisms), and situation (goals, stakeholder preferences, resources, restrictions, etc.) (Cannon-Bowers et al., 1993).

Most research has conceptualized the shared understanding between business and IT professionals as either one-dimensional or two-dimensional. The one-dimensional conceptualization usually focuses either on the shared understanding of the work environment (Nelson & Cooprider, 1996) or of the

objectives in the partnership (Chang et al., 2014; Reich & Benbasat, 2000). With regard to the work environment, the focus is on a shared understanding of each other's processes (e.g., Ray et al., 2005; Stoel & Muhanna, 2012), roles and responsibilities (e.g., Cannon-Bowers et al., 1993; Dhaliwal et al., 2011), or the current role of IT in the organization (Preston & Karahanna, 2009). By contrast, the shared understanding of objectives has been discussed in terms of understanding the system requirements (e.g., Charaf et al., 2013) or, more broadly, joint strategies and visions (e.g., Cohen & Toleman, 2006). Like some other researchers (e.g., Johnson & Lederer, 2007; Reich & Benbasat, 2000), we combine these two perspectives of shared understanding and distinguish between shared understanding of *collaborative objectives* (Chang et al., 2014; Johnson & Lederer, 2010) and shared understanding of the *work environment*. Thus, we follow Reich and Benbasat (2000) and define shared understanding between business and IT professionals for this study as their shared cognition of each other's work environments as well as of the joint objectives within their collaboration.

Development of Business/IT Shared Understanding Over Time

Analyzing the development of B/IT-SU over time, a contingency perspective provides a useful approach for understanding the intertemporal effects of management mechanisms on B/IT-SU. Mathiassen et al. (2007) establish requirement volatility over time as a critical contingency factor influencing the design of IS development approaches. The authors argue that requirements volatility is driven by changing internal or external conditions and learning effects during the development process. IT-related collaborations, as well as the internal/external conditions, needs, and opinions of team members, evolve over time, causing the intensity and content of collaboration to change over time as well. Internal conditions were analyzed by Cho et al. (2008), who captured time-dependent changes in the stakeholder network across an IT implementation project. Based on a case study, the authors found that the stakeholder network underwent constant changes throughout the project. In the initial phases of the project, there was a strong focus on functional, i.e., business-related, topics involving a high number of business representatives. At the same time, technical details made the involvement of IT professionals more important in the second half of the project. This change of the network over time and its effects on collaboration were also confirmed by Jarvenpaa et al. (2004), who found that the impact of trust fundamentally depends on the underlying (time-dependent) situation.

In research on teams' shared mental models, investigations of dynamics are rather rare (Kozlowski & Chao, 2018). Moreover, if studies claim to examine the dynamics, they often still use retrospective or snapshot data instead of observing developments and changes over time (see, e.g., Lei et al., 2024; Rathor et al., 2024). Only very few studies have explicitly monitored changes over time, and either they did this outside an IT-project context, or they did not explicitly investigate shared understanding but team interaction in a broader, inductive sense (McLeod & Doolin, 2012). One work quite comparable to our analysis is Drury-Grogan (2021). However, it examines temporal changes in shared understanding within a single sprint, i.e., applies a more operational, short-term conceptualization of the content of shared understanding.

Theoretical Foundations for Investigating the Development of B/IT-SU

Various process-oriented theories in psychology, philosophy, and IS research have emerged to understand the development of shared understanding between individuals, like the theory of communicative action (Habermas, 1985) or the theory of team knowledge emergence (Grand et al., 2016). While the first focuses on the interaction between two individuals only, the process-oriented theory of team knowledge emergence focuses on a micro-level development of shared understanding in a group by sharing knowledge and learning from others' knowledge. According to Grand et al. (2016), team knowledge emergence consists of two basic mechanisms: learning (information processing) and sharing (communication). In the learning phase, an individual acquires novel knowledge by selecting an appropriate data source to elicit new information and then encoding (learning from environmental events) or decoding (learning from others) the data. The processed information will be integrated and stored in the individual's knowledge stock. In the sharing phase, the individual selects appropriate team members to share the information with. In the subsequent retrieval process, the individual identifies the piece of information from memory and brings it into active awareness. Next, the individual shares the information with the selected team members. Sharing can be enabled through various media, where the suitability of media channels depends on the novelty and potential for negotiation of the information (see media synchronicity theory by Dennis et al., 2008). Lastly, the team member who receives the information must verbally acknowledge it (see acceptance of validity claim in the theory of communicative action). This theory allows the emergent team knowledge to be mapped by identifying (1) which team member has processed which information, (2) which processed

information has been shared between team members, and (3) which team member has been selected to share the information.

Since the theory of team knowledge emergence was established relatively recently, empirical evidence from real-world settings remains scarce (Braun et al., 2022). However, since it combines critical components of previous theories on information processing and knowledge sharing, it proves to be a valuable approach to describe the development of shared understanding at the team level.

Research Methodology

In our research, we lay the foundation for a process theory of business/IT shared understanding by developing propositions about the intertemporal effects of antecedents on the longitudinal development of B/IT-SU. To answer our research question, we chose an exploratory cross-case study approach (Eisenhardt, 1989; Yin, 2018). We selected a qualitative approach to consider the wide variety of mechanisms that may appear in different IT projects and to contribute to the fact that shared understanding can only be investigated and "measured" in a highly contextual environment.

To structurally build our foundation for a process theory, we follow Pentland's (1999) recommendation, which suggests a narrative approach. Pentland identified five narrative properties: sequence (the structure and pattern of events), focal actors (i.e., the role and demographics of key individuals), voice (the point of view), evaluative context (cultural values and assumptions), and other indicators (aspects that describe the context). First, the *sequence* in time in our research is provided by longitudinal structured and unstructured data collected from the start to the closure of an IT project. To structure the sequence in time, we oriented our data collection based on a traditional project life cycle (PMBOK, 2013). Second, the *focal actors* in our story are all team members of a respective IT project. They are affiliated with either the business side or the IT unit. Therefore, the *voices* in our stories (as the third narrative property) are assigned to these two groups: the business unit (BU) and the IT unit. The fourth property—the *evaluative context*—is the central issue in our stories. Pentland (1999) argues that analyzing the evaluative context of an organization provides insights and explanations for certain organizational choices and key events. An example of an evaluative context in our stories is whether the projects are planned in conjunction by business and IT or if the planning process is executed by one side. In our stories, we look for contextual specificities, categorize them into three types of mechanisms, and determine development patterns driven by the evaluative context.

The subsequent section will present a concise overview of the analyzed cases and the data collection approach employed.[1] The exploratory analysis of these case observations, as well as a determination of patterns across the cases, will then occur in the "Findings" section.

Context of the Case Studies

This study intends to gain insights into the determinants that influence the development of shared understanding over time. We focus on traditional, waterfall-related system development methodologies rather than agile methodologies, as these are still more common in larger IT projects. Table 1 outlines the steps of a traditional project life cycle (PMBOK, 2013), along which we collected our data (Step 1, cf. above), assuming that the effect of certain drivers may change between phases.

We collected data in multiple IT projects within a large European IT service provider firm. This enabled us to conduct an embedded case study, with multiple sub-cases observed within the same environment (Yin, 2018), which increases the level of comparability since many contextual factors are set equal. Table 2 provides basic information on each project (=case).

Table 1. Project Phases (Adapted from PMBOK, 2013)

Phase 1 Initialization	Phase 2 Planning	Phase 3 Execution	Phase 4 Closure
The general idea for a project is specified. Elements of this phase are initial draft of project objectives, rough-cut planning of resources and schedule, and feasibility analysis. Objectives and rough-cut planning are formalized in a project charter.	Drafts of Phase 1 are specified in detail. Typically begins with a kick-off workshop, where all team members discuss their understanding of the project objectives. The team breaks them down and defines detailed work packages, deadlines, and resources.	Defined work packages get realized. The project manager is responsible for coordination between the work packages and for monitoring performance.	Termination of the project. The core element in this phase is a final report by the project manager, including relevant indices and project success or performance rates.

Table 2. Details of Analyzed Projects

Case	Project Volume	Team Members (IT/Business)	Project Focus	Brief Description
A	85 person days (p/d)	6 (3 / 3)	Software implementation	Implementation of a VideoIdent process for a client from the banking industry
B	89 p/d	4 (2 / 2)	Software development	Development and implementation of new functionalities in the company's own intranet
C	170 p/d	6 (3 / 3)	IT infrastructure	Upgrading cash systems of staff canteens, including process and interface documentation
D	146 p/d	4 (2 / 2)	Interface implementation	Implementation of an interface for a client's fraud prevention system, which detects irregularities in the payment behavior of the end customer

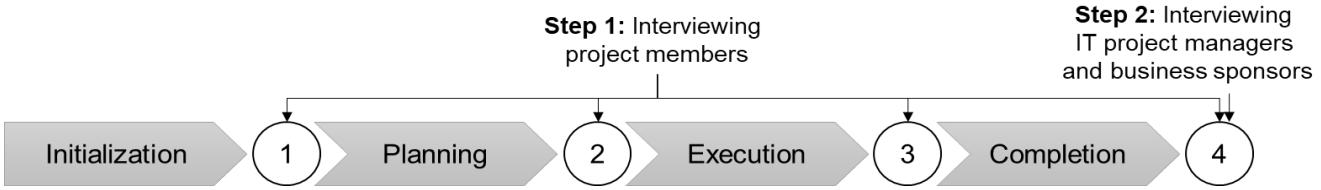


Figure 1. Data Collection Process

All projects were business-driven, meaning a business unit was both the initiator and sponsor of the project, and also a part of the project team. B/IT-SU becomes especially relevant in such business-driven projects, as the collaboration between business and IT is intense. All participants in our study were exclusively involved in only one of the analyzed projects, allowing us to exclude learning effects and interferences across the cases. At the end, all projects were reported as successfully completed, although some did not fully meet business expectations.

Case A: Implementation of a VideoIdent Process

In Case A, the project team implemented a VideoIdent process for a client in the banking industry. Customers who want to open a bank account can prove their identity by showing their ID card and appearing in front of the camera on their laptop/smartphone. The project team's task was to implement the backend of the process, including developing data interfaces, implementing the video software, and implementing further VideoIdent functionalities. According to the project manager, the main challenges of this project were the novelty of the underlying technologies and the fact that the client was a new customer for the firm.

Case B: Applications Development

In Case B, two IT members (a software developer and an IT project leader) and two business representatives jointly developed new features for their own firm's intranet. The objective was to develop a project portfolio management dashboard that presents up-to-date project KPIs, including milestone completion, expenses, remaining budgets, and time schedules, across all ongoing projects. The management board initiated and delegated the project to a business unit. During the project's progress, the business unit and the management board had weekly meetings to discuss the project status. Thus, the business unit acted as an information broker between the management board and the IT members who developed the system.

Case C: Upgrading a Cash System

Case C is an internal IT infrastructure project in which the project team had to modernize the cash systems of the firm's four staff canteens. The tasks in the project included exchanging hardware, documenting new processes and interfaces, and providing staff training on the new systems.

Case D: Implementing a Fraud Prevention Pool

In Case D, the team had to implement new interfaces for a transactional system used by a client in the telecommunications industry. The client requested interfaces to their fraud prevention pool (FPP) to facilitate customer assessments, including evaluating credit and payment history.

Data Collection

In each project, we collected data at several points in time (Figure 1), as described below. Furthermore, we reviewed project-related documentation and reports to gain a detailed understanding of the project's context and the situation within the teams.

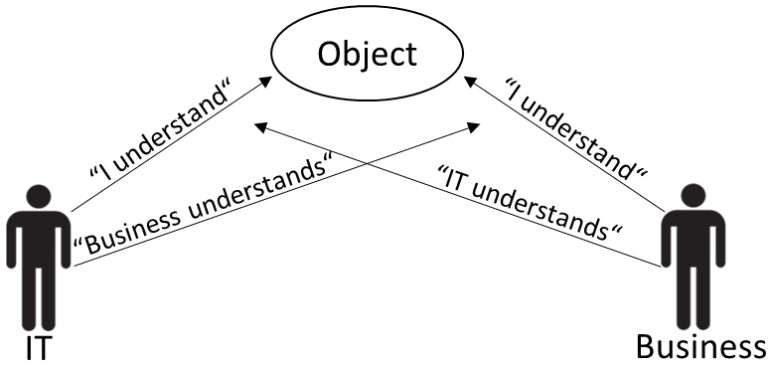


Figure 2. Concept of Measuring Business/IT Shared Understanding (B/IT-SU)

Table 3. Coding Framework

Project ID	Interviewee	B/IT-SU Dimension	Statement	Antecedent	Impact on B/IT-SU	Project Phase
1	IT	Project objectives	"Statement about the course of B/IT-SU"	Description of antecedent of B/IT-SU	Positive	Initialization
2						Planning
3	Business	Work environment			Negative	Execution
4						Closure

Step 1: Evaluating the Level of Business/IT Shared Understanding Over Time

After every project phase, we measured the current state of the perceived level of B/IT-SU in each project, using structured interviews with closed assessment questions in the form of online polls.[2] These questions were adapted from the literature (cf. Appendix C) and designed to indirectly assess the perceptual distance between evaluating one's own and others' understanding (Figure 2). Thus, we asked both groups (IT and business) to share their *own* understanding of the object (e.g., functional requirements). Next, we asked for their perception of the *partners'* understanding, e.g., we asked IT employees how they perceived their business partners had understood the functional requirements. By comparing individuals' understanding to the perception of their partners' understanding, we can determine a perceptual distance. The higher the distance, the lower the level of shared understanding perceived by the respondent.

The assessment questions captured the understanding of *project objectives*, such as requirements specifications (Chang et al., 2014; Jiang et al., 2009), timelines, and cost objectives, as well as the understanding of the *joint work environment* (Nelson & Cooprider, 1996), such as challenges in the daily work of IT/business (Cohen & Toleman, 2006), formal working tools (Cannon-Bowers & Salas, 2001), or functional/technical procedures and practices (Stoel & Muhanna, 2012). As result of Step 1, we got longitudinal data about the development of B/IT-SU over time, which are multi-dimensional (shared understanding about objectives versus work environment) and from multiple perspectives (IT versus business side of the team).

Step 2: Determining B/IT-SU Antecedents

In the second step, we employed an inductive approach (Glaser & Strauss, 1967) to explore the development of B/IT-SU and its driving forces throughout the project's lifetime. Since our research was conducted within a specific structure (project structures and timing, roles, and backgrounds of team members, dimensions of B/IT-SU), we followed a more structured approach, particularly the detailed coding procedures outlined by Strauss and Corbin (1998). To collect the data in this step, we discussed the results from Step 1 (the level of B/IT-SU in each project phase and changes over time) with the respective IT project managers and business sponsors in an open-ended interview format, which lasted between 30 and 80 minutes each. The interviews were transcribed and coded using MAXQDA. We employed a "classical" coding procedure, first applying open coding to identify reasons for intertemporal B/IT-SU changes and related drivers, and then applying axial coding to categorize them. Table 3 shows the coding framework. For each relevant quote, it was determined from which side (IT or Business) the interviewee ("interviewee") was, which B/IT-SU dimension the statement was addressing (project objectives or work environment), which determinant ("Antecedent") of shared understanding could be distilled from the quote

("Statement"), whether the determinant had a positive or negative effect on shared understanding, and to which of the four project phases the quote was referring to. An exemplary extract from our coding protocol can be found in Appendix D, Table D.1.

We analyzed the openly coded statements to derive factors that impact the level of B/IT-SU over time and discussed these factors in a group of three researchers. As a categorization scheme for the subsequent axial-coding step, we differentiated between structural, relational, and cognitive mechanisms, i.e., mechanisms that explicitly or implicitly affect the structural, relational, or cognitive dimensions of shared understanding (Wagner & Weitzel, 2012). This helped us identify and generalize the respective antecedent, which has the major impact according to this statement. We added a brief description that links a statement to the respective mechanism. This description provides the linkages between the objective data and the interpretation of the result. During the identification of antecedents, we only considered those that fulfilled at least one of the following criteria: An antecedent had to have been…

1. identified by both respondents (business sponsor and project manager) of the same project as an important determinant, and it had to be…
2. mentioned more than three times in one interview, *and/or*…
3. identified specifically as one of the most critical determinants in the development of B/IT-SU.

Findings

In the following, we follow Pentland's (1999) and Abbott's (1990) recommendations for building a process theory using narratives. Abbott (1990) states that the central questions should address the existence of categorization of sequential patterns, as well as the antecedents that form the development of these patterns. We will compare the different cases to identify similarities in the mechanisms that facilitate or inhibit the development of B/IT-SU. First, we present the antecedents found in the case studies. Then, we focus on the different phases of the project life cycle and examine how the antecedents affected the development of B/IT-SU over time. Based on this, we will identify five different development patterns formed by the identified mechanisms.

Antecedents That Affect the Development of B/IT-SU

In the case studies (see Appendix A for detailed descriptions and analyses), we identified different antecedents that influence the development of shared understanding. We sorted these antecedents into structural, relational, and cognitive mechanisms (see Table 4). *Structural* mechanisms focus on the overall interaction patterns within a network of individuals. *Relational* mechanisms address qualitative aspects such as trust, team norms, team identification, and obligations. *Cognitive* mechanisms, as the third category impacting the level of B/IT-SU, concentrate on shared interpretation and representation among individuals in a group. We corroborated the case findings with concepts from the project management literature that addressed antecedents in IT projects, such as *joint planning* (e.g., Lech, 2022; Nelson & Cooprider, 1996), *feedback provision* (e.g., Jani, 2011; Vermerris et al., 2014), and *reports & documentation* (e.g., Mueller, 2015; Rosenkranz et al., 2014). Whenever possible, we consolidated multiple drivers into a single category.

Patterns of B/IT-SU Development Found in the Respective Project Phase

Based on the antecedents of B/IT-SU development, as presented in the previous section, we analyze the commonalities and differences in B/IT-SU development triggered by these antecedents across cases. We look for similar patterns regarding the development of B/IT-SU mentioned in the interviews with IT project managers and business sponsors. Figure 3 provides an overview of the development of the B/IT-SU in all cases, based on the data collection in Step 1. Each of the eight charts visualizes the development of B/IT-SU from project initialization (t=1) to closure (t=4). Each column represents one case. The upper row represents the findings for business/IT units' understanding of *project objectives*, while the lower row highlights the development of business/IT units' understanding of the *work environment*. In each graph, the x-axis represents the project phases (t=1 to t=4), and the y-axis represents the level of understanding from low to high. As described above, we captured the perceptions of both their own and the partners' understanding of the project objectives and work environment. This approach enables various interpretations of the results. Most insightful is the analysis of the distance between the circles (self-perception) and the triangles (perception of others' understanding). As an illustrative example, the first graph indicates that there is an agreement that the business side's understanding of project objectives is high in t=1 and t=2, followed by less consensus in the later phases (gray elements). With respect to the understanding of IT (white elements), business and IT do have different perceptions throughout the project, with IT's self-perception being higher than BU's perception. Reasons for the specific developments of each graph are provided and discussed in detail in Appendix A.

Table 4. Antecedents of B/IT-SU

Antecedent Identified in Cases	Mechanism	Description of Effect on B/IT-SU
Joint planning	Structural mechanism	Joint planning implies (at least) a *collaboratively* developed description of work packages and roles and responsibilities (Cases C, D) involving all or the majority of the project members, and particularly both the IT and the business side. Ideally, joint planning begins with the joint execution of a feasibility analysis and rough-cut planning (Cases A and C).
Reports & documentation	Structural mechanism	Reports and documentation provide effective information platforms that serve as a communication channel between business and IT members. Status reports need to transparently indicate the project's status and any changing conditions that affect the project. Additionally, the recipients of the status reports should carefully read them and discuss any questions that arise (Case C). Too many technical terms may hinder the development of B/IT-SU (Cases C, D). Better visualizations and initial prototypes facilitate the development of B/IT-SU (Cases A, D). Documentation must meet the following requirements: First, general objectives and work packages must be incorporated into a business concept, highlighting the system requirements and their purpose (Case B). Second, documentation should describe the setting and processes in which the project takes place (Case D). Third, documented guidelines, like role descriptions and documentation processes, help structure and formalize information for the team (Cases A, B).
Feedback	Relational mechanism	Providing feedback on one's own understanding reveals potential misunderstandings of the technical complexity (Case A) or functional requirements (Case B).
Previous experience	Cognitive mechanism	We found two different types of (lack of) experience in our cases: experience regarding the targeted business domain (Case D) and expertise in the technical implementation of the requirements (Cases A, C). A lack of experience can be a source of (false) expectations.

The different patterns of B/IT-SU development that could be identified across cases are labeled as EC for Early Collaboration, LK for Lack of Knowledge, FC for Feedback Culture, and IC for Information Channels; they will be discussed below, followed by a fifth pattern, Tacit Knowledge (TK), which cannot be displayed in the charts.

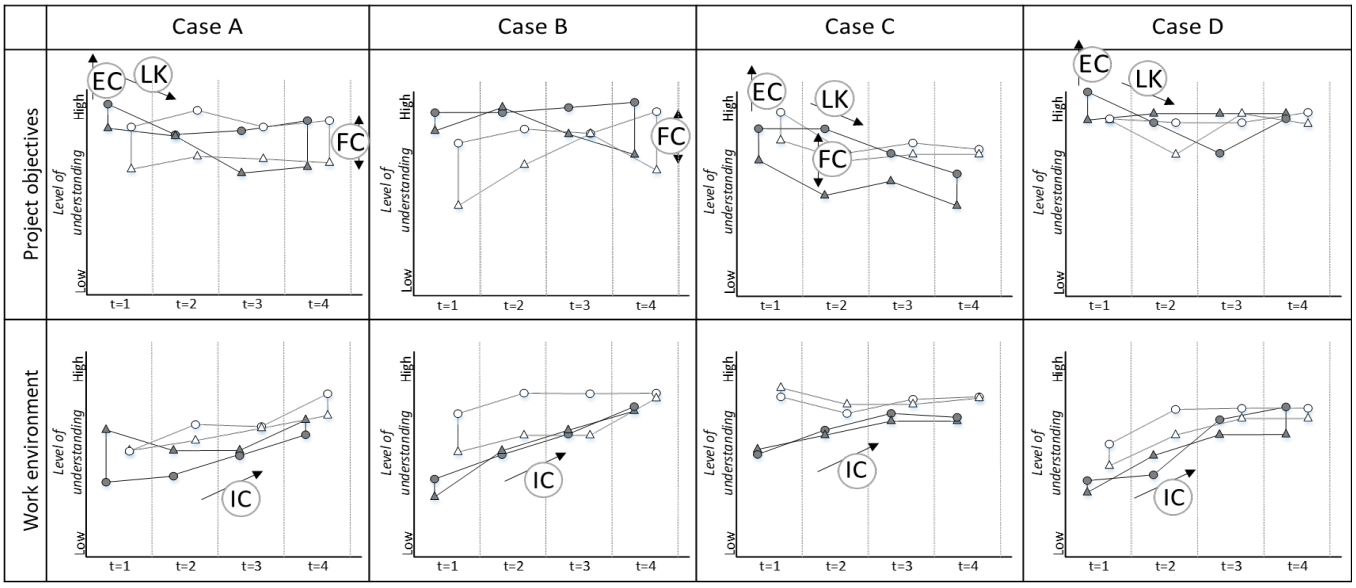
Development Pattern EC (Early Collaboration): Joint Planning Between Business and IT Representatives Enables High B/IT-SU of the Objectives in the First Phase

In the EC pattern (Early Collaboration), we can see that (especially the business side's) understanding of the project objectives started at a very high level and decreased in the following phases (Cases A, C, and D). In all three cases, the team members developed the project charter together. In Cases A and C, the project teams conducted the entire feasibility analysis, rough-cut planning, and work structure breakdown together. In Case D, the IT project manager developed the project charter independently but presented and discussed it in detail with the team well before the planning phase began. Hence, early collaboration initiatives, such as joint planning sessions, in Phase 1 contribute to a very high B/IT-SU of project objectives. Joint planning, a structural mechanism, serves as a communication platform at an early project stage, where business and IT representatives can jointly discuss the project objectives (Cohen & Toleman, 2006).

What has been different in Case B? As we can see, the business side perceived IT's understanding of the project objectives as inadequate in Phase 1. In Case B, the management board initiated the project, and the business unit (BU) specified the project charter together with the management board. IT members were not involved in this first phase and never met with the management board. The level of IT's understanding of the project objectives was perceived as low initially because "not all objectives have been clearly defined in a formal project charter" (business sponsor). Some requirements were formulated, while others were only discussed between the board and the BU. In addition, the IT project manager also acknowledged that the IT unit was not involved in the initialization or the planning phase ("We were just listeners," cf. above).

Therefore, establishing an early linkage between business and IT is essential to achieving a high level of B/IT-SU of project objectives at the very beginning of the project. At the same time, we see that this has no effect on the B/IT-SU of the work environment, which seems to require more time to develop. We therefore propose:

> Proposition 1: An early implementation of structural mechanisms in t=1 positively affects B/IT-SU of project objectives in t=2.



○ Self-perception of IT unit
△ Business side's perception of IT unit's understanding

Note: EC – Early Collaboration; LK – Lack of Knowledge; IC – Information Channel; FC – Feedback Culture. Please note that the fifth pattern (Tacit Knowledge – TK) cannot be visualized since it would require a link between the upper and lower diagrams.

Figure 3. Overview of Case Findings: Development of B/IT-SU and Common Patterns[3]

Development Pattern LK (Lack of Knowledge): (Technical) Details, Lack of Experience, and (False) Expectations Reveal a Lack of B/IT-SU

The absence of cognitive mechanisms, often driven by a lack of knowledge or experience, can explain a drop in shared understanding of project objectives between Phases 1 and 2. The level of complexity (Case D) or underlying cost structures (Case C) was underestimated in Phase 1. In Phase 2, these false assumptions were then uncovered. The business sponsor in Case D stated, "We went into this project way too starry-eyed. We thought all requirements were written in the contract with our customer." In the subsequent phases, the business sponsor realized the complexity of the requirements.

In contrast, IT's understanding of the project objectives remained stable. The business sponsor argued that the IT unit has extensive experience working with this particular customer and is familiar with their processes and objectives. Case A has a similar background. The team raised the novelty of the targeted solution as the main challenge in this project. They argued that they understood the objectives of the project, but "underestimated the technical complexity of the IT solution" (business sponsor). The IT project manager, however, stated that his IT unit is very experienced in IT projects of this kind. In Case C, the challenge was not the technical complexity or novelty of the project but rather the issues that had not been discussed at the project's outset. The business sponsor said that she felt well-informed after the first meeting but realized that cost-related issues had not been discussed. During the planning phase, she realized that cost is a critical issue in an IT project of this kind, yet she could not understand the cost statements.

Thus, joint planning at the beginning is insufficient to *maintain* a high level of B/IT-SU. Furthermore, under certain circumstances, joint planning can even create a "fake" or superficial shared understanding, which will be revealed as such in later phases. This risk increases if the project team lacks experience or if the project task is novel in terms of its structure or approach. To maintain a high level of B/IT-SU of the project objectives, it is vital to discuss complexity-related and cost-related issues in detail. This finding corroborates previous research suggesting that a thorough shared understanding of technical details is essential for projects with novel structural approaches to succeed (Tiwana, 2012). This is again primarily true for the project details and not for the shared understanding of the work environment. Therefore, we propose:

> Proposition 2: Cognitive mechanisms in t=1 positively affect B/IT-SU of project objectives in subsequent phases.

Development Pattern FC (Feedback Culture): Perceptual Differences Arise from Low Relational Mechanisms, Like a Weak Feedback Culture

In Cases A, B, and C, we observed gaps in perception between the understanding of one side and that of their partner. These perceptual differences were caused by superficial discussions and little (consideration of) feedback. A healthy feedback culture can be described as a team norm or a relational mechanism (Robert et al., 2008). Especially in Cases B and C, we identified two distinct examples: a lack of feedback provision (Case B) and a lack of feedback consideration (Case C). While in Case B, both the business and IT units stated that IT members had not been involved in the project planning for providing feedback ("We were just listeners"), the business sponsor in Case C seemed to ignore feedback that did not align with her (cost) expectations ("I guess she understood the situation [based on the cost statement], but she did not want to accept it"). Thus, the lack of feedback consideration or provision disrupted how both sides assessed the current situation, leading to a significant perceptual gap.

What was different in Case D? Here, the business sponsor admitted that the business side sometimes struggled to understand the concrete project objectives due to their high technical complexity. Initially, the business sponsor did not ask detailed questions because she thought "it would look unprofessional." However, after some time (in t=3), she realized that this belief was nonsense, and that the IT unit was happy to answer technical questions ("they were very patient and sympathetic"). Thus, providing and receiving feedback at eye level was an important mechanism for achieving a high level of B/IT-SU.

More generally speaking, our data indicates that a high level of relational interactions (here: providing and receiving feedback at eye level) drives the level of B/IT-SU in the long term. While this is particularly true for B/IT-SU of the project objectives and underlying details, there is no reason to assume that it would be different for the shared understanding of the work environment. Therefore, we propose:

> Proposition 3: Relational mechanisms positively affect B/IT-SU across all phases of IT projects and for all types of B/IT-SU.

Development Pattern IC (Information Channel): Formal Communication and Information Channels, Like Reports and Documentation, Facilitate the B/IT-SU of the Work Environment

All cases show that, particularly, the business side's understanding of the work environment increased over time. The most substantial increases were found in Cases B and D.

In Case B, the interviewees mentioned initial problems due to the absence of a business concept, which resulted in a lack of transparency. The business unit did not understand "which technical specifications had to be implemented" and "the challenges and problems in the backend development" (IT project manager). This changed when regular and frequent reporting, along with an OIL (open issue list), were introduced during the planning and execution phases. Since all status reports were now documented in the OIL, the business side could develop an understanding of the technical challenges.

Similarly, in Case D, the interviewees mentioned initial problems due to a lack of transparency. However, in this case, the business members knew little about the client or the IT solution, and their understanding of the work environment started very low. The business sponsor also mentioned the lack of information and insights that the business side could have used to learn more about the client's situation as an additional challenge in developing B/IT-SU. However, frequent status reports improved the business side's understanding of the work environment. As the business sponsor pointed out, the quality of reporting is as important as its frequency. Status reports are more effective when they use business terminology rather than technical jargon and present information visually, rather than providing lengthy descriptions.

Additionally, in Case A, we observed an increasing level of understanding over time, largely due to the frequency of reports and documentation. The business sponsor mentioned that frequent (visual) reports helped everyone stay informed. However, our interviewees also mentioned that the information exchange had been very technical and challenging for business members to understand, which caused the development described earlier as the FC pattern.

In summary, we found that mechanisms that frequently inform and, therefore, continuously update all stakeholders provide a structural channel or linkage between business and IT, supporting B/IT-SU. Although we did not observe the same pattern for B/IT-SU of project objectives, there is no reason why we would not have observed the same if it had started at a low level at the beginning of the projects. Therefore, we state the following proposition:

> Proposition 4: Continuously applied structural mechanisms positively affect all types of B/IT-SU.

Development Pattern TK (Tacit Knowledge): Increasing Shared Understanding of the Work Environment Does Not Automatically Imply an Increase in the Understanding of Project Objectives

A final pattern emerged when comparing the BU's understanding of the project objectives and work environment (which could not be visualized in Figure 3 above). Especially in Cases B, C, and D, IT's perception of BU's understanding of the project objectives decreased steadily over time, while their perception of the business side's understanding of the work environment increased. One explanation lies in the fundamental difference between the two types of knowledge. Studies on knowledge distinguish between implicit and explicit knowledge (Polanyi, 1958). While explicit knowledge refers to knowledge "transmittable in formal, systematic language […], tacit knowledge has a personal quality, which makes it hard to formalize and communicate" (Nonaka, 1994, p. 16). Similar differentiations can be found in the B/IT-SU. Project objectives are typically formalized in the project charter or during the planning phase, representing explicit knowledge. In contrast, the everyday work environment is more ambiguous, requiring tacit knowledge to achieve a full understanding. Knowledge or expectations codified in a project charter can be made obsolete more quickly than tacit knowledge based on experience. During the interviews, we observed a decrease in understanding of the project objectives when there was a lack of knowledge and (false) expectations regarding technical complexity or cost estimates. The respondents commonly reported that they had not expected this level of complexity when formalizing the project charter. In the development of B/IT-SU of the work environment, we found that the BUs had no experience with similar IT projects in cases B, C, and D. They argued that, at the beginning of the project, they had not been able to understand the concrete tasks within the work packages or reasons for specific reporting lines—even if attempts were made to codify this knowledge during the project. The respondents commonly argued that frequent discussions with the IT unit increased their understanding. These findings support our assumption that a deep understanding of the work environment requires a great deal of tacit knowledge gained through experience. In contrast, project objectives can, to some degree, be formalized in a project charter, although technical details are still challenging to formalize within the project charter.

This pattern is in line with the findings of other scholars, such as van den Hooff and de Winter (2011). They could not identify a direct effect of cognitive mechanisms (which they define as "a common ability that helps in understanding, interpreting and valuing other people's knowledge" (p. 3)) on the degree of knowledge sharing regarding the respective work environment. However, they found that cognitive mechanisms influence the level of trust and commitment within a group, which in turn influences knowledge sharing. In our study, we found no evidence of such a positive interlinked effect. This may be because our data collection period was too short to observe these effects. However, we can confirm that cognitive mechanisms do not immediately affect the level of B/IT-SU of project objectives.

For this reason, our final proposition consists of two sub-propositions, as follows:

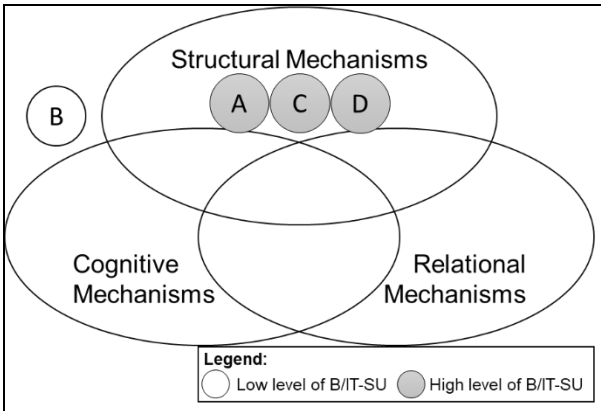
> Proposition 5a: Cognitive mechanisms established after t=1 do not directly affect B/IT-SU of project objectives.
>
> Proposition 5b: Cognitive mechanisms established after t=1 positively affect relational mechanisms.

Figure 4 consolidates the findings from the four cases and summarizes our insights from the cross-case analysis from a longitudinal perspective.

Conclusion

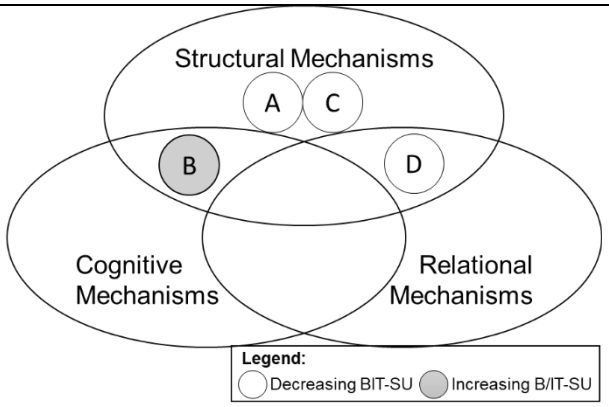
Contribution to Literature

In our exploratory cross-case analysis, we observed and analyzed different events and mechanisms that impact the development of business/IT shared understanding (B/IT-SU) in IT projects. We categorized these antecedents as structural, cognitive, and relational mechanisms. We collected data over the life span of four different IT projects to determine the intertemporal development of B/IT-SU over the project lifetime and to find explanations for changes in the development of B/IT-SU. We identified common development patterns that explain the commonalities and differences in the development of B/IT-SU across the cases. Thus, the major contribution of our study lies in analyzing the intertemporal effects of different project management actions and their impact on the development of B/IT-SU along the different phases of a project, laying the groundwork for a process theory on B/IT-SU. In summary, our study contributes to the literature as follows.



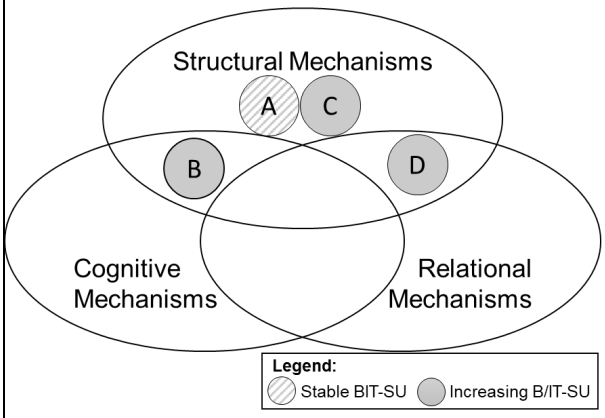
Situation at t=1

Cases A, C, and D implemented structural mechanisms in Phase 1 by joint planning. By contrast, the IT unit in Case B was not involved in the rough-cut planning, so shared understanding started at a relatively low level.



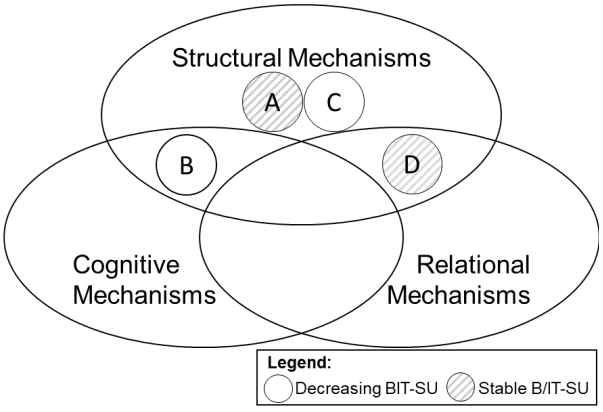
Development from t=1 to t=2

From t=1 to t=2, the level of B/IT-SU regarding project objectives decreased in Cases A, C, and D because project complexity had been underestimated. Since expectations in Case B had been quite clear due to previous experience (cognitive mechanism), the perceived level of B/IT-SU remained stable. In addition, the team started implementing structural mechanisms (IC pattern), which positively affected B/IT-SU.



Development from t=2 to t=3

From t=2 to t=3, B/IT-SU of project objectives remained relatively stable while B/IT-SU of work environment increased in Cases B, C, and D, due to frequent reports. In Case D, the team began discussing the procedure more frequently (FC pattern), which stabilized B/IT-SU. In Case A, these mechanisms showed no effect. Information shared between business and IT was very technical, which is why the gap between self-understanding and perception of others' understanding of project objectives increased on both sides.



Development from t=3 to t=4

A missing feedback culture (FC pattern) became a problem for Case B in the last phase when the team realized that it was not the feedback provision that was the problem, but the feedback acceptance. Also, Case C suffered from the FC pattern, which showed its symptoms in t=2. Cases A and D remained stable since the responsibilities and work packages had been clearly defined. Also, in Case D, frequent feedback impeded further drops of B/IT-SU.

Figure 4. Summary of the Longitudinal Findings of the Cross-Case Analysis

Structural mechanisms for enabling B/IT-SU need to be implemented across the entire project life cycle. Although joint planning facilitates a high level of B/IT-SU at the beginning of the project (cf. Proposition 1), it does not guarantee a consistently high level of B/IT-SU throughout all project stages. Only when combined with frequent reports and documentation in the later phases can the level of B/IT-SU remain high (cf. Proposition 4). A drop in B/IT-SU after the first phase seems to be quite common when the team lacks knowledge and experience (cognitive mechanism) (cf. Proposition 2). In such teams, technical details are often underestimated, and expectations are too high. These deficiencies can and must be compensated for with intense structural mechanisms, such as frequent reports and documentation, which provide an

omnipresent information platform for business and IT (cf. Proposition 4). However, these structural mechanisms are only necessary but not sufficient conditions to achieve a high level of B/IT-SU. If the information transferred by structural mechanisms is not processed and absorbed by the recipients of the information, a gap in perceptions will occur, leading to an insufficient shared understanding. Considering the provided information is a critical component of relational mechanisms, in which most of our cases exhibit insufficiencies (cf. Proposition 3). This mechanism is also one of the most important in building a shared understanding and successfully completing the project.

The development patterns are summarized in Figure 5 (except pattern TK, which focuses on the relationship between the types of B/IT-SU and thus cannot be visualized here).

We also shed light on the debate over whether shared understanding increases due to structural mechanisms (He et al., 2007) or decreases due to specialization (Levesque et al., 2001). Our study reveals that structural mechanisms have the potential to contribute to a shared understanding between business and IT *when maintained across the whole project runtime*. We found that a drop in shared understanding is commonly associated with a threat to the project rather than being an explanation for specialization.

Our study formalizes a dual-domain view of B/IT shared understanding—objectives and work environment—and shows that they follow partially independent trajectories over a project's life cycle. We identify domain-contingent antecedents and timing: early joint planning primarily increases understanding of objectives, while sustained reporting/documentation and a feedback culture are pivotal to understanding the work environment. Using an explicit–tacit knowledge lens, we explain why objective understanding (more codifiable) can dip as technical complexity surfaces, whereas work environment understanding (more tacit) typically accumulates through interaction—yielding distinct longitudinal patterns (EC, LK, IC, FC, TK). Overall, we extend SU from a static snapshot to a processual, dual-domain construct with propositions about when and how interventions should differ across domains.

Our longitudinal evidence also extends the literature on shared mental models (SMMs) by showing phase-specific levers (structural, cognitive, and relational) that differentially shape these two SMMs over time (e.g., joint planning boosts task/objectives early; reporting and feedback build team/work environment later). We also caution against assuming co-movement across SMM types: team-based understanding can rise while task-based understanding stalls or dips, as illustrated by our TK pattern. Thus, we bridge the gap between SMM content and the SMM emergence process by linking targeted interventions to the evolution of each SMM type in IT projects.

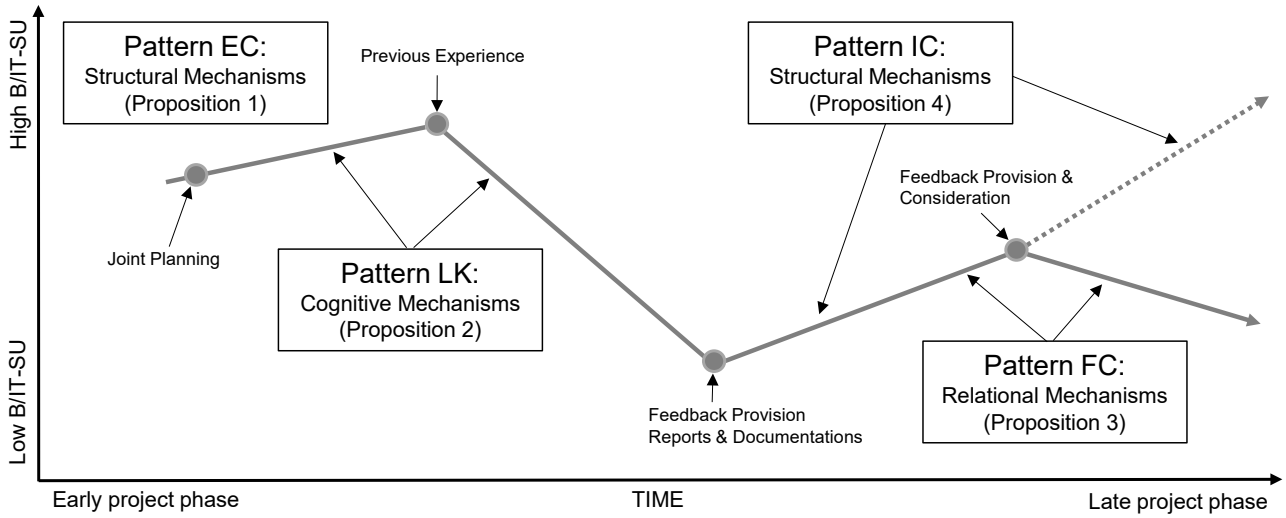


Figure 5. Common Development Patterns of B/IT-SU and Their Reasons

Managerial Implications

Through our study, we have gained a deeper understanding of how to design management actions over time to facilitate these concrete antecedents. For instance, we found indications that a lack of experience can hinder the development of B/IT-SU during the planning phase. This limitation can be overcome over time by fostering a culture of giving and receiving feedback in a partnership. The most relevant managerial implications derived from the case analysis are as follows:

1. Starting *joint* planning early in the project leads to a high level of shared understanding of project objectives. Managers should establish cooperative planning from the very beginning of the project, such as joint feasibility analyses and work-package breakdowns. This joint planning will also soften the drop of B/IT-SU when it comes to the (technical) details.
2. A lack of knowledge and experience intensifies the drop from the initialization phase to the planning and execution phases. Based on different experiences, team members may make (false) assumptions that will become apparent later when the details are foregrounded. Thus, if the team lacks experience, managers must actively request sufficient information from more experienced sources to mitigate and ultimately increase the level of B/IT-SU during the project execution.
3. Frequent feedback about shared understanding helps to recover from a too low level of shared understanding. However, it is important not only to provide feedback but, in turn, also to consider and accept feedback from partners for further discussion. Managers should focus on implementing a constructive and bidirectional feedback culture when the project proceeds.
4. A shared understanding of the work environment—a much more tacit domain of understanding than project objectives—can be improved by high transparency of project-related processes. Frequent reports and documentation contribute to the creation of this transparency. In contrast, explicit knowledge of project objectives can be established by clearly formulating them at the beginning of the project.

Limitations and Future Research

Some limitations must be considered when interpreting our findings. First, we cannot guarantee that we have not overlooked other critical drivers or inhibitors of B/IT-SU. Our findings are primarily based on the interviews with IT project managers and business sponsors of each project. We cannot exclude the possibility that the project leaders misinterpreted or overlooked other insightful aspects. For future research, we recommend broadening the data collection approach by examining more cases and collecting more data per case. Second, our findings are based on only four case studies from one company. Although the four projects differ significantly in terms of their objectives, internal structures, and stakeholders, findings from another study in a different firm and industry may also vary. Further research could focus on different projects in different industries. Third, we had to subsume the detailed case findings into fewer meta-drivers, especially for the cross-case analysis. Although we followed the coding process carefully, other possibilities for combining and describing the different case-specific findings in a cross-case analysis may exist. Fourth, due to our case study approach, we could not ensure a high level of variance in the cases' shared understanding. Indeed, we found a relatively high level of shared understanding in all four cases. Future research should compare the effects of B/IT-SU antecedents in teams with high versus low levels of shared understanding.

Future studies should test our propositions on a large scale and across a variety of IT projects using quantitative approaches. Additionally, future research could qualitatively extend our work to examine the interrelationship between shared understanding and cross-understanding. While we focused on shared understanding, it may sometimes be sufficient to simply understand what the other side knows. This would address inconsistencies in team literature, such as when low shared understanding does not lower project performance "because cross-understanding may be high" (Mohammed et al., 2021, p. 468).

The advent of generative AI as a coworker in IT projects has raised another question and research opportunity. Initial field studies and experiments have examined the interactions and success factors of human-AI teams (e.g., Endsley, 2023; Fuegen et al., 2021). While smaller, less complex projects with fewer interdependencies can be developed by the business side using AI alone, larger, more complex IT projects will continue to require collaboration between people from both the business and IT sides. These projects will still require business and IT understanding, and the findings of our study remain relevant. However, the question remains: To what degree can AI moderate communication between the two sides, and how will AI tools promote and accelerate the formation of B/IT-SU while reducing misunderstandings?

In conclusion, our study offers valuable and in-depth insights into the organizational development of shared understanding within the IT project life cycle. Our study contributes to the literature by unveiling the

intertemporal effects of drivers on B/IT-SU. Based on these findings, we uncovered five patterns that researchers can apply to further understand the effects of structural, relational, and cognitive mechanisms, ultimately helping practitioners manage their software projects in an effective and efficient manner.

Notes

[1] Appendix A provides a detailed summary of each case, including information about the development of B/IT-SU and the effects of events and mechanisms in each case.

[2] Please note that we do not intend to conduct a quantitative analysis in a statistical sense. The goal was to achieve scores and intertemporal changes of those that could be discussed in follow-up interviews (see Step 2).

[3] Detailed descriptions of the eight charts in this figure can be found in Appendix A and Appendix B. Also, please note that this is *not* a quantitative (in terms of statistical) approach—we are not looking for a statistical validation of the different mechanisms' impacts on the development of B/IT-SU. Instead, we are interested in the ups and downs in the development of B/IT-SU, which can be assessed by numerical data and serve as foundation for the interviews in Step 2.

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Appendix A

Analysis Results of Each Case

In the following, we provide a description of the results in every single case. The results are consolidated in the Findings section in the main body of this paper.

Analysis Results of Case A

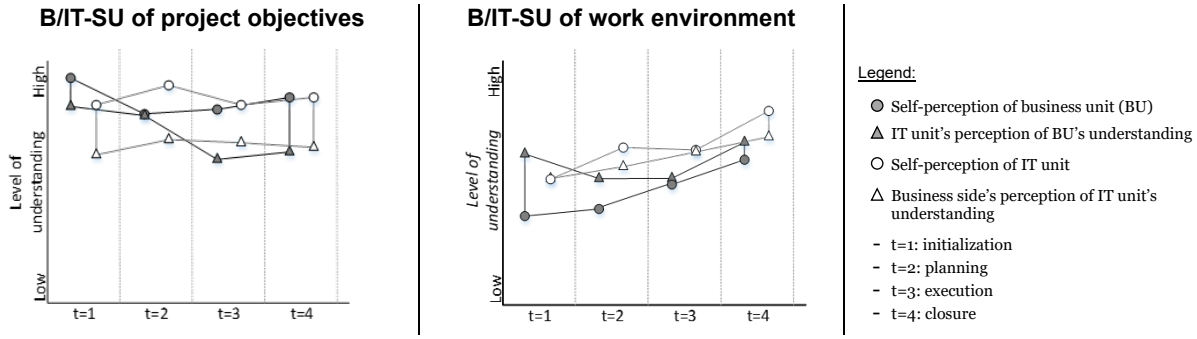

Figure A.1. Level of B/IT-SU in Case A

Figure A.1 illustrates the evolution of B/IT-SU project objectives (left) and the work environment (right) over time. Especially regarding the business unit's (BU) perception of their own understanding, we found a slight dip in t=2, followed by a decline in IT's perception of it in the subsequent period. In the next phases, BU's understanding recovered slightly. At the end of the project, the business and IT members' understanding was met at a high level, with some remaining discrepancies between self-perception and perception by the other unit.

The interviews with the IT project manager and business sponsor uncovered reasons for this development of B/IT-SU: The initially very high level of (perceived) understanding could be explained by **joint planning** in the initialization phase. Business and IT members jointly discussed and developed the requirements and conducted the feasibility analysis in the initialization phase: "All members were equally involved in the development of the work breakdown structure and project contract" (business sponsor).

The subsequent decrease in BU's understanding in the subsequent phase (as also perceived by the IT unit in the following step) can be explained by the collaboration's focus shifting from functional to technical details in the planning and execution phase. Due to the project's novelty (i.e., lack of **experience**), the business members underestimated the technical complexity in Phase 1. When the team began planning the details, business members realized they did not fully understand the full scope of the project objectives. The IT project manager mentioned that, from then on, business members focused on non-technical issues, such as monitoring the completion of work packages and milestones. Business members did not involve themselves in discussions about the technical content of the work packages. Both sides (IT and business) mentioned that the discussions centered on the functional requirements, while IT was very aware of the technical requirements as well. More detailed discussions and **feedback** about the individuals' understanding might have helped solve or at least minimize BU's underestimation of technical complexity.

However, understanding rose again towards the end of the project. An essential aspect highlighted by the business sponsor was the need for constant **reporting** on project status, achieved through visualizing and modeling user stories and business processes. Based on these visualized models, discussions between IT and business were more focused on the project's status. Besides the modeled user stories and business processes, the sponsor mentioned that a project management handbook (representing **formalized guidelines**) describing the project roles and responsibilities in detail helped facilitate an understanding of the collaborative work environment, which has increased over time.

In summary, our interviews revealed several indications for a harmonious business/IT partnership in the project. Both partners **perceived each other as equal partners** during the project, and responsibilities were allocated clearly enough in the team. While IT members were responsible for the technical details, business members monitored the project's progress and defined the system's functional requirements. Across all phases, the business

sponsor emphasized that detailed **reporting** of the underlying processes, the content of work packages, and the project's current state was essential in keeping everyone well-informed.

Analysis Results of Case B

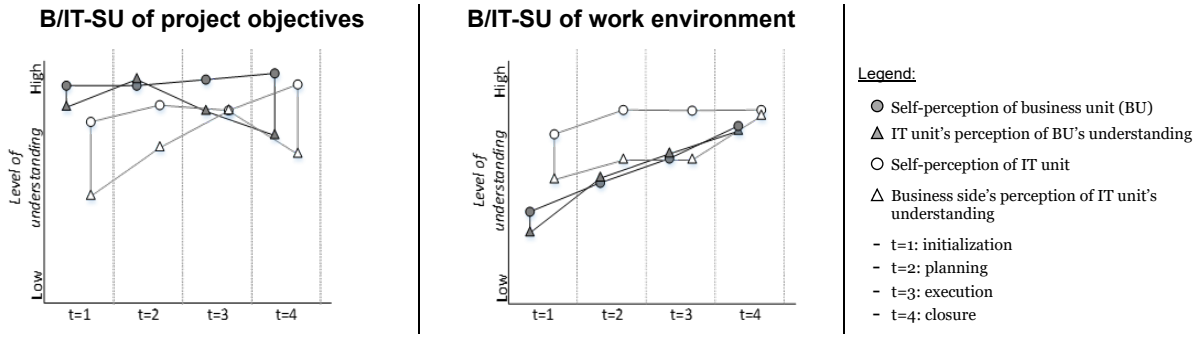

Figure A.2. Level of B/IT-SU in Case B

Figure A.2 illustrates the level of shared understanding between business and IT professionals in Case B at the four pre-defined points in time. There are some notable peculiarities: first, regarding the B/IT-SU of project objectives, we find high perceptual distances at the beginning and the end of the project; while IT and business were very confident about their own understanding of the project objectives, they perceived their partners' understanding as relatively low. Second, at the beginning of the project, the business side ranked IT's understanding of the project objectives as very low. This perception rises until the project execution phase (t=3) and then drops sharply again at the end of the project (t=4). Third, the only notable and consistent rise in B/IT-SU can be found in BU's understanding of the work environment.

To understand the first particularity of the divergent perceptions of each other's understanding, it is essential to grasp the project's starting point and the situation during project planning. The underlying project objective was to develop a management dashboard that visualizes the performance of existing projects in the company. However, there was no official project charter or formalized requirements description. In the kick-off meeting, the business unit presented a visualized draft of the dashboard, and the IT project manager left the meeting with the impression that "everything is clear now, and we know what to do." In contrast, the business sponsor perceived the IT colleagues as more skeptical. He mentioned that IT members were present in the meeting but did not actively participate in developing the requirements. The IT project manager even agreed with this perception: "We were just listeners." The business sponsor would have hoped that the IT unit would provide more **feedback** to verify the shared understanding.

After the kick-off, the IT unit started developing the dashboard. Due to the lack of formalized requirements, the business sponsor suspected that the IT unit "had to make assumptions every 15 minutes during the development about the intent of the single requirements" (business sponsor). Additionally, the requirements changed several times, which increased the complexity during development. As early as the planning phase, but especially in the execution phase, the IT project manager stated that he did not understand the functional usefulness of several of the requirements. However, the IT unit believed they understood the requested composition of the system features and did not question the content of these requirements. These miscommunications ultimately led to the revelation of divergent perceptions regarding the understanding of project objectives. The business sponsor mentioned that IT did not implement several critical features but instead developed unnecessary features. For their part, IT stated that the business unit constantly changed the requirements during the execution and did not seem to understand the requirements themselves. Both the IT project manager and the business sponsor mentioned the lack of a detailed **business concept** specifying the requirements and system objectives as the fundamental problem in this project.

Regarding the development of shared understanding about each other's work environment, the development approach proved to be a source of misunderstandings. Although the IT project manager mentioned that they had applied Scrum, the business sponsor stated that critical components of the Scrum approach had not been defined (e.g., assigning roles such as Scrum master or product owner). Furthermore, the business sponsor expected shorter sprints, enabling more intense communication between parties. Actually, the IT project manager explained that they did not work in sprints at all but delivered only the final version to the business unit for testing. Both interviewees

argued that these confusions about the **development approach** "led to several conflicts between business and IT" (business sponsor) at the beginning of the project.

Nonetheless, the team achieved a high level of shared understanding in the last phase of the project. The business sponsor and project manager mentioned that the lack of transparency at the beginning of the project could be managed by an "open issue list" (OIL), which allows team members to mark project tasks as open or completed. This list could be used as a platform for in-depth discussions. We found several indications that management actions formalizing the project's task packages, such as an OIL, provide an ideal communication base to further structure and develop the applied development approach. Since the OIL is a reporting tool that identifies and summarizes open and completed tasks for all team members, we use the more generic term **"reports"** as a factor that explains the increase in B/IT-SU of the work environment.

Analysis Results of Case C

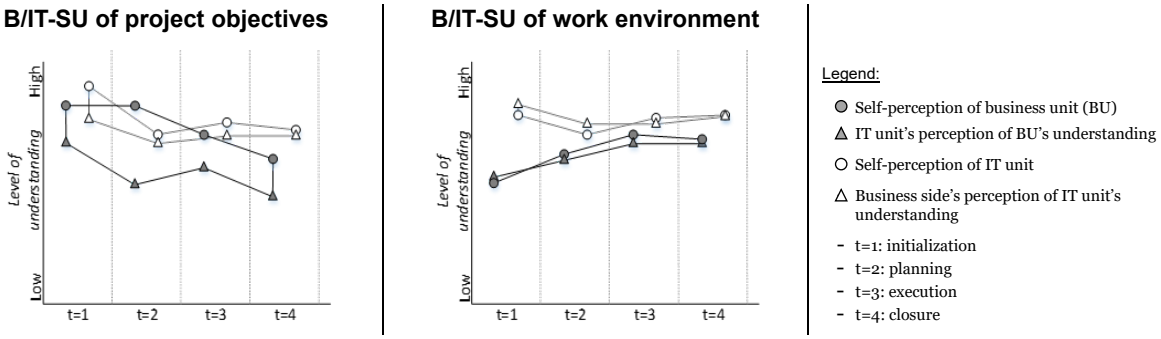

Figure A.3. Level of B/IT-SU in Case C

As illustrated in Figure A.3, all team members were initially quite confident about their level of understanding regarding the project objectives. While the level of the business side's understanding of the project objectives remained stable during planning (t=2), IT's understanding of the objectives dropped in this early phase. The results for B/IT-SU of the work environment are quite different. While the business side's understanding increased over time and remained stable at a high level from t=3 to t=4, IT's understanding was consistently moderate throughout the project duration. Additionally, we found nearly no perceptual distance between IT's and BU's perceptual understanding.

But why did the B/IT-SU of project objectives drop while the B/IT-SU of the work environment increased over time? One factor was that the project was initially embedded in challenging circumstances. The IT project manager stated that the corporate controller would usually be the business sponsor of projects like this. However, in this case, the responsibilities were transferred to another BU, which had no experience with this kind of project. This transfer of responsibilities might explain the BU's lack of enthusiasm for the project. In the interviews with the (new) business sponsor, she mentioned that she did not have time for this project and could not fulfill the tasks assigned to her. The IT project manager mentioned that she even questioned the necessity of the project and asked for reasons for this modernization.

Starting with the project initialization phase, we observed a good level of B/IT-SU of the project objectives. The project charter developed by the IT project manager had been discussed with the BU. Hence, the project started with a **jointly formulated project charter**. Already at this stage, the business sponsor mentioned that the objectives regarding cost statements were not sufficiently transparent. However, the business members had the (false) impression that the general objectives were clear for both sides.

In the following project planning phase, the business sponsor requested more **transparency** regarding the cost statements. At this stage, it became clear that her priority remained the budget constraints ("we had to find a cost-efficient solution"), while the IT project manager focused on the quality of the systems ("The project manager's only goal is to have an innovative system," business sponsor). At the end of this phase, the business sponsor had the impression that the objectives had been discussed sufficiently, and she felt well-informed. The IT unit, in contrast, seemed to be disoriented by this new prioritization of project objectives, which is reflected by the results of the MU measurement and the interview with the IT project manager ("I sent her the cost statements, which highlighted in great detail the resources necessary to achieve the objectives in the project. I guess she understood the situation, but she did not want to accept it").

In the next phase, the project additionally suffered from continuous changes. For example, one of the four staff canteens decided to leave the project right before the implementation of the new system. The reasons remained unclear. Furthermore, after the project planning phase, the accounting unit decided to change the order of the hardware to more cost-efficient hardware. The IT project manager reported that these changes caused many adjustments to the project objectives. While the project manager stated that he (the project manager) constantly delivered status reports to the BU, the business sponsor mentioned her impression that he (the project manager) was constantly distracted by these changes from the initially established project objectives. She would have wished for more continuity regarding the project objectives. We cannot determine whether the business sponsor and business members did not understand (or even did not care for) these changes, or if the reports were indeed insufficiently transparent regarding these changes. However, both interviewees attributed the drop in BU's understanding of project objectives to a lack of transparency (or a lack of BU's understanding) of the **status reports**.

Even though BU's understanding of project objectives decreased over time, the understanding of the work environment constantly increased from t=1 to t=3. Both interviewees argued that the **joint formalization** of work packages, reporting lines, and responsibilities significantly helped increase understanding of the work environment. The IT project manager mentioned that most of the formalization techniques reflect common project management techniques that have been applied in previous IT projects. Since the IT unit is familiar with these techniques for structuring their projects, IT's understanding of the work environment was consistently at a high level, while the BU's understanding increased over time.

Analysis Results of Case D

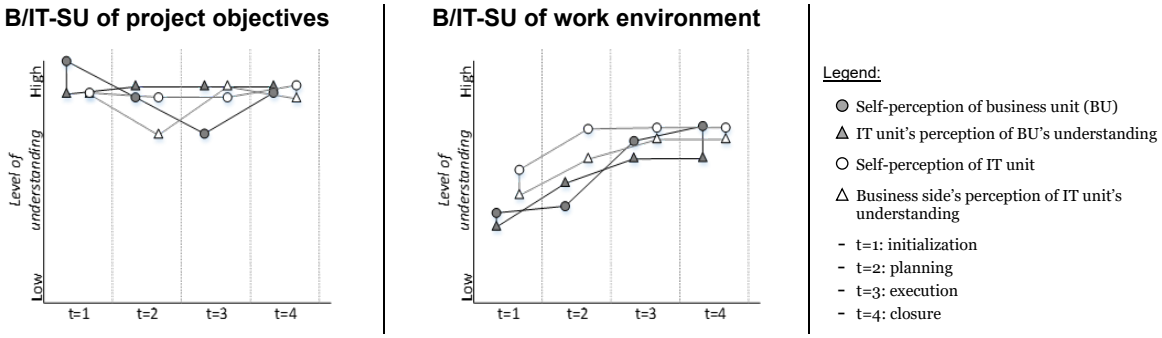

Figure A.4. Level of B/IT-SU in Case D

In Case D, we found a quite stable and high level of B/IT-SU of the project objectives (Figure A.4, left). Interestingly, while IT perceived a high level of shared understanding among business members, they themselves are not that confident (at least at t=2). The self-perception decreases slightly from t=1 to t=3 but then increases again to a high level in t=4. In addition, they believed in t=2 that IT's understanding of project objectives dropped as well. This development can be explained by the BU's **lack of experience**. The business sponsor stated they had been "very naive at the beginning of the project. We saw the contracts with our client and believed that we just needed some minor adjustments in the system." In t=2, the business unit noticed that they had underestimated the project's complexity and overlooked several (more technical) objectives. However, **intense discussions and examinations of the target system** helped the business unit get involved in the process and gain a high level of understanding of the project objectives over time.

Focusing on the development of B/IT-SU of the work environment, we can find a remarkable positive development and also very congruent perceptions among business and IT members during the whole project. The level of B/IT-SU starts at a very low level and constantly rises over time; the very low level at the beginning of the project is a consequence of the novelty of the involved BU. The business sponsor stated that her team had significant difficulties at the beginning of the project because most members of the business unit, including herself, had just recently started their jobs at the company and lacked sufficient **experience** with the client's industry. The business sponsor further argued that they encountered problems due to a lack of documentation of the processes and functions, making it difficult to familiarize themselves with the working routines and procedures at the start of the project. She stated that this lack of understanding and the difficulties of learning about the work environment made it difficult for her to provide the necessary information to the IT unit.

At the start of the planning phase (t=2), the team intensively **discussed the work packages**, which helped the business unit to get a better understanding of the appropriate procedures and tasks in the project. The IT unit also benefited from these discussions, which gave them detailed insights into the targeted business domain. Nevertheless, the business unit was not sufficiently satisfied after the meeting. The business sponsor mentioned that she and her team colleagues from the business side did not understand the content of the work packages because they were "very technical, so I did not understand what exactly had to be done in the work packages." In addition, she stated that she had problems because the discussions in the meeting were not well structured. Work packages and tasks in the project were discussed randomly, and the IT project manager switched rapidly between the different work packages. Thus, effective discussions need to be sufficiently structured, and members should apply the "same language" to describe the work packages.

In the project's subsequent phases, IT's understanding of the work environment remained stable. "All necessary information has been transferred" in the planning phase (IT project manager). On the other hand, the understanding of the business unit increased sharply and reached the level of understanding of the IT unit. The business sponsor attributes this sharp increase to the constant interaction between IT developers and the business unit, facilitated by **status reports**. The developers frequently reported the programming developments to the BU. The business sponsor mentioned that she initially struggled to understand the IT unit's reports due to the technical language. However, after the unit reported more visualized and prototype-based results, the business sponsor stated that she had an "aha moment" in which she understood all the previous discussions and reports.

Appendix B

Results of Polls

Table B.1 and Table B.2 highlight the results from the online polls regarding perceived understanding (for the questions, see Appendix C) at each point in time and for each case. The scores are averaged across the participants in each group. The number of participants in each case is highlighted in Table 2 in the main paper. Since the number of participants is small, we do not attempt to statistically analyze the results.

Table B.1. Average Scores for B/IT-SU of Project Objectives

B/IT-SU of Project Objectives *(for scales see Appendix C)*							
	Point in time	**Self-perception of business**	**Perception of IT on business**	**Distance**	**Self-perception of IT**	**Perception of business on IT**	**Distance**
Case A	1	4.67	4.17	0.50	4.17	3.17	1.00
	2	3.83	3.83	0.00	4.50	3.42	1.08
	3	4.08	3.08	1.00	4.08	3.33	0.75
	4	4.25	3.17	1.08	4.25	3.25	1.00
Case B	1	4.50	4.38	0.12	3.75	2.25	1.50
	2	4.50	4.63	-0.13	4.13	3.25	0.88
	3	4.63	4.00	0.63	4.00	4.00	0.00
	4	4.75	3.50	1.25	4.50	3.13	1.37
Case C	1	4.17	3.33	0.84	4.50	3.83	0.67
	2	4.17	2.50	1.67	3.58	3.33	0.25
	3	3.50	2.83	0.67	3.75	3.58	0.17
	4	3.00	2.25	0.75	3.67	3.58	0.09
Case D	1	5.00	4.38	0.62	4.38	4.38	0.00
	2	4.25	4.50	-0.25	4.25	3.25	1.00
	3	3.25	4.50	-1.25	4.25	4.50	-0.25
	4	4.38	4.50	-0.12	4.50	4.25	0.25

Table B.2. Average Scores for B/IT-SU of Work Environment

B/IT-SU of Work Environment *(for scales see Appendix C)*							
	Point in time	**Self-perception of business**	**Perception of IT on business**	**Distance**	**Self-perception of IT**	**Perception of business on IT**	**Distance**
Case A	1	1.87	3.20	-1.33	2.67	2.60	0.07
	2	2.00	2.67	-0.67	3.27	2.80	0.62
	3	2.47	2.67	-0.20	3.20	3.20	0.00
	4	3.00	3.40	-0.40	3.93	3.47	0.63
Case B	1	1.9	1.5	0.4	3.5	2.6	0.9
	2	2.5	2.6	-0.1	3.9	3	0.9
	3	3	3.1	-0.1	3.9	2.9	1
	4	3.7	3.6	0.1	3.9	3.4	0.5
Case C	1	2.47	2.67	-0.2	3.93	4.2	-0.27
	2	3.13	3	0.13	3.5	3.73	-0.23
	3	3.47	3.33	0.14	3.8	3.73	0.07
	4	3.4	3.53	-0.13	3.9	3.8	0.1
Case D	1	1.8	1.6	0.2	2.7	2.2	0.5
	2	2	2.5	-0.5	3.6	3	0.6
	3	3.3	3	0.3	3.6	3.4	0.2
	4	3.6	3	0.6	3.6	3.4	0.2

Appendix C

Questions for Online Polls

Table C.1. Questions for Measuring Understanding and Determining B/IT-SU

	Self-perception	*Perception of business/IT unit on IT/business unit*
Project Objectives	How do you perceive your own understanding of … - … functional requirements of the IT solution. - … technical requirements of the IT solution. - … objectives regarding the schedule. - … objectives regarding costs and expenses.	How do you perceive the understanding of your colleagues in the business/IT unit regarding the … - … functional requirements of the IT solution. - … technical requirements of the IT solution. - … objectives regarding the schedules. - … objectives regarding costs and expenses.
Work Environment	How do you perceive your own understanding of … - … functional/technical procedures and approaches - … available resources (time, budget, HR) - … formal working tools (documentation, forms, workflow structure) - … specific challenges in realization - … organizational structure and reporting lines - … roles and responsibilities in the project	How do you perceive the understanding of your colleagues in the business/IT unit regarding the … - … functional/technical procedures and approaches - … available resources (time, budget, HR) - … formal working tools (documentation, forms, workflow structure) - … specific challenges in realization - … organizational structure and reporting lines - … roles and responsibilities in the project

Appendix D

Exemplary Coding Extract

Table D.1. Exemplary Extract of the Coding Approach

ID	Dimension	Interview Response	Statement	Antecedent	Impact	Project Phase
A	Objectives	IT	"However, after we documented the feedback of our business partners as well as a bug report, the communication has been improved, and everybody knew what to do."	Formalization of feedback and reports helps the team to get on the same page (cognitive mechanism).	Positive	Execution Closure
			"I wrote down the major topics that we [business and IT] had planned in a document. That helped a lot in the latter discussions."	Formalization of requirements and plans provides a foundation for discussions (cognitive mechanism).	Positive	Planning Execution
		Business	"The objectives have been documented in the project plan based on the work packages, so that I knew when and what milestone should be achieved by whom, as well as the current degree of completion."	Documentation and reporting of the objectives and milestone completion builds a common ground between business and IT (cognitive mechanism).	Positive	Planning Execution Closure
			"The formulization of the work packages has been an integrated part of the development approach, for which reason I was up to date at all times during the project."	The formulation and status report of the work packages keep everyone informed. (cognitive mechanism).	Positive	Planning Execution Closure