Journal of the Association for Information Systems

Volume 26 | Issue 6 Article 5

2025

Toward Triadic Delegation: How Agentic IS Artifacts Affect the Patient-Doctor Relationship in Healthcare

Pascal Fechner
University of Bayreuth / inContAlert GmbH, pascal.fechner@incontalert.de

Luis Lämmermann
University of Bayreuth / TRUSTEQ GmbH, luis.laemmermann@uni-bayreuth.de

Jannik Lockl
University College London / inContAlert GmbH, jannik.lockl@incontalert.de

Maximilian Röglinger
University of Bayreuth / Frauenhofer FIT, maximilian.roeglinger@fim-rc.de

Nils Urbach
Frankfurt University of Applied Sciences / Fraunhofer FIT, nils.urbach@fim-rc.de

Recommended Citation
Fechner, Pascal; Lämmermann, Luis; Lockl, Jannik; Röglinger, Maximilian; and Urbach, Nils (2025) "Toward Triadic Delegation: How Agentic IS Artifacts Affect the Patient-Doctor Relationship in Healthcare," *Journal of the Association for Information Systems*, 26(6), 1703-1736.
DOI: 10.17705/1jais.00954
Available at: https://aisel.aisnet.org/jais/vol26/iss6/5

Journal of the Association for Information Systems (2025) **26**(6), 1703-1736
doi: 10.17705/1jais.00954

RESEARCH ARTICLE

ISSN 1536-9323

Toward Triadic Delegation: How Agentic IS Artifacts Affect the Patient-Doctor Relationship in Healthcare

Pascal Fechner,[1] Luis Lämmermann,[2] Jannik Lockl,[3] Maximilian Röglinger,[4] Nils Urbach[5]

[1]FIM Research Center, University of Bayreuth, / inContAlert GmbH, Germany, pascal.fechner@incontalert.de
[2]University of Bayreuth / TRUSTEQ GmbH, Germany, luis.laemmermann@uni-bayreuth.de
[3]University College London, UK / inContAlert GmbH, Germany, jannik.lockl@incontalert.de
[4]FIM Research Center, University of Bayreuth / Fraunhofer FIT, Germany, maximilian.roeglinger@fim-rc.de
[5]FIM Research Center, Frankfurt University of Applied Sciences / Fraunhofer FIT, Germany, nils.urbach@fim-rc.de

Abstract

The emergence of agentic information systems (IS) in healthcare marks a shift in the patient-doctor relationship. As agentic IS artifacts are increasingly exhibiting autonomous behavior with expanding decision-making latitude, the traditional dyadic patient-doctor relationship transitions into a triad of patient, agentic IS, and doctor. Agentic IS artifacts no longer merely perform tasks on humans' behalf but now actively delegate. Leveraging an in-depth case study on an agentic health companion designed for neurogenic lower urinary tract dysfunction management, we investigate how agentic IS artifacts alter the patient-doctor relationship. Drawing on phenomenon-based theorizing, we synthesize our observations through the lens of delegation and expand existing delegation theory in terms of triadic perspectives. Our findings reveal relevant changes in agent attributes and agentic interactions as well as the emergence of conflicts. Based on our theoretical advancements, we derive a framework of triadic delegation. Our research contributes to both theory and practice by providing meaningful theoretical insights into the triadic delegations of humans with increasingly autonomous agentic IS artifacts.

Keywords: Agentic IS Artifacts, Delegation, Patient-Doctor-Relationship, Personalized Healthcare

Matthew Jones was the accepting senior editor. This research article was submitted on September 20, 2023 and underwent three revisions.

1 Introduction

Health information systems (IS) are pivotal for healthcare delivery (Haux, 2006; Wager et al., 2022; Yeow & Goh, 2015). They improve medical workflows and decisions based on advanced information processing capabilities, and they increase the efficiency of and performance in healthcare (Chaudhry et al., 2006). Healthcare is becoming more patient-centric to better meet patients' individual needs (Kraus et al., 2021; Spruit & Lytras, 2018; Tian et al., 2019). Patients benefit from more accurate diagnoses and tailored therapies facilitated by advanced decision support systems (van der Linden et al., 2023), while doctors can rely on health IS to improve medical practices and reduce workload (Shademan et al., 2016).

Particularly, the advances in artificial intelligence (AI) are driving the capabilities of IS in healthcare (Ploug & Holm, 2020; Sauerbrei et al., 2023). Owing to the ever-evolving frontier of computational advancements, IS artifacts are increasingly autonomous and capable of performing tasks that are complex, dynamic, and uncertain (Baird & Maruping, 2021; Berente et al., 2021). With these increasing capabilities, however, IS artifacts are also becoming more inscrutable (Berente et al., 2021). All these advances challenge our understanding of IS artifacts' agency and their

relationship to patients and doctors (Lorenzini et al., 2023).

From an IS agency perspective, research has traditionally recognized IS artifacts primarily as subordinate agents that support human agents and act on their behalf (Baird & Maruping, 2021; Orlikowski & Iacono, 2001). With recent advances in AI, however, IS artifacts are increasingly seen as demonstrating agency comparable to humans (Dattathrani & De', 2023). The new generation of IS artifacts are becoming capable of transferring both rights and responsibilities from and to human agents, emphasizing their agentic behavior (Baird & Maruping, 2021). Such agentic IS artifacts are currently transitioning into multiple healthcare domains. For instance, in diabetology, patients can now give a medical companion the right and responsibility to autonomously monitor blood glucose levels and inject insulin (Jendle & Reznik, 2023; Vettoretti et al., 2020). Similarly, mental health professionals can give conversational agents the right and responsibility to support patients with depression (Inkster et al., 2018).

So far, patients and doctors have maintained their close and direct dyadic relationship, retaining the unique knowledge and oversight needed to perform healthcare tasks while relying on passive IS artifacts only for support (Sechrest, 2010). However, with the rise of agentic IS artifacts, the roles and interactions of patients and doctors are being redefined (for example, in the case of a doctor giving an intelligent glucose meter the right and responsibility to monitor a patient's glucose levels and administer insulin; see Jendle & Reznik, 2023). Developing on an equal footing, we propose that the dyadic patient-doctor relationship is transforming into a triadic relationship involving the patient, an agentic IS artifact, and the doctor. Therefore, we ask: *How do agentic IS artifacts affect the dyadic patient-doctor relationship in patient-centric healthcare delivery?*

To answer this question, we follow phenomenon-based theorizing (Fisher et al., 2021; Gregory & Henfridsson, 2021). We study our phenomenon—the changing roles and interactions of patients and doctors through agentic IS artifacts—within an exploratory single-case study (Eisenhardt & Graebner, 2007; Lee, 1989) of an AI-enabled IS artifact from a health technology company that can manage patients with incontinence, specifically those with neurogenic lower urinary tract dysfunction. We investigate the relationship between patients, doctors, and the agentic IS artifact through the theoretical lens of delegation, which is also the core research stream that we are seeking to expand through our phenomenon-based theorizing. We rely on the delegation framework of Baird and Maruping (2021), examining how an agentic IS artifact can affect the patient-doctor relationship and theorizing novel agentic behaviors, including role behaviors, interaction patterns, and social constructs. Further, we shed light on potential conflicts that may arise from the triadic patient-IS-doctor relationship. Our results contribute to theory in two ways: First, we increase the understanding of the effects of agentic IS artifacts on healthcare delivery by showing how their increased agency allows them to become an intermediary in the patient-doctor relationship. In doing so, we show how the patient-IS-doctor triad evolves into a sequence with the agentic IS artifact interposing between doctor and patient. Second, we augment delegation theory by describing the changing roles, interactions, and emerging conflicts in triadic human-IS-human delegations due to the increased agency of the agentic IS artifact.

2 Theoretical Foundations

2.1 Emergence of Agentic IS Artifacts in Human-IS Interactions

Prior literature on IS use research has referred to IS artifacts as passive tools while human users have possessed the primary role in their hierarchical relationship (Demetis & Lee, 2018; Orlikowski & Iacono, 2001). This paradigm has mainly accounted for IS artifacts carrying out tasks on behalf of humans. Given this view, IS artifacts were not considered capable of ascending to a hierarchically equal or even a superior role. However, considering the novel frontiers of AI (Berente et al., 2021), we recognize tensions within the academic discourse on IS agency.

Agency has long been explored across various disciplines, including philosophy (Schlosser, 2015), economics (Shapiro, 2005), sociology (Emirbayer & Mische, 1998), and IS research (e.g., Leonardi, 2011; Orlikowski, 2005), leading to various theoretical concepts (Dattathrani & De', 2023). In IS research, the primary agency concepts are human and material agency, which focus on the theoretical understanding of the behaviors of and interactions between humans and technology (Dattathrani & De', 2023; Zhang et al., 2021). While the coherence of and differences between human and material agency have been researched in the IS community, the discourse has intensified due to the rise of AI, which has led to the increasing autonomy of IS (Berente et al., 2021; Zhang et al., 2021).

Considering the autonomous capabilities of agentic IS artifacts, Stelmaszak et al. (2024) introduced the term *algorithmic agency* as the "ability of algorithms to accept rights and responsibilities for ambiguous tasks and outcomes under certainty and to decide and act autonomously" (Baird & Maruping, 2021, p. 316). Given that view, agentic IS artifacts can exhibit different levels of decision-making latitude (i.e., *reflexive*, *supervisory*, *anticipatory*, and *prescriptive*) spanning an agency continuum from very simple tasks to full autonomy and responsibility for task completion and outcomes (Baird & Maruping, 2021). Subsequently, the autonomy of an agentic IS artifact refers to its ability to

take control over its actions and internal state and make independent decisions and to perform its agency without the direct intervention of other agents (e.g., humans) (Jennings et al., 1998). The increasing capabilities and autonomous goals of the agentic IS artifact enable reciprocal exchanges of tasks between humans and agentic IS artifacts (Baird & Maruping, 2021). However, despite being on par with humans, IS agency is not entirely independent. Instead, IS agency develops upon the behavior of human agents (e.g., initial artifact design based on human conception, ongoing human-IS interactions), leading to a bond between human and IS agency goals (Castelfranchi, 1998; Dattathrani & De', 2023; Murray et al., 2021). Table 1 provides a comprehensive summary of our literature review on relevant themes of recent IS agency theory, highlighting the dynamics of IS agency and its integration with human agency.

2.2 Towards a Conceptual Understanding of IS Delegation

Generally, when agents interact by exchanging tasks, this is considered a social action (Conte & Castelfranchi, 1995; Sichman et al., 1997). The study of such social interactions is at the core of social sciences (Giddens, 1984) and, provided that IS artifacts are involved, of IS research (Jeyaraj & Zadeh, 2020). Both research disciplines offer a wide range of theories to explain such agentic interactions, such as actor-network theory (e.g., Cresswell et al., 2010; Hanseth et al., 2004; Latour, 2005), principal-agent theory (e.g, Borch, 2022; Jensen & Meckling, 1976; Kim, 2020), sociomateriality (e.g., Cecez-Kecmanovic et al., 2014; Leonardi, 2013), IS use research (Burton-Jones et al., 2017), and delegation theory (e.g., Baird & Maruping, 2021; Castelfranchi & Falcone, 1998; Lubars & Tan, 2019). In particular, delegation theory has drawn increasing attention in IS research owing to its focus on the bidirectionality of the agentic relationship (i.e., reciprocal task exchange), which further intensifies through agentic IS artifacts' increasing autonomy (Baird & Maruping, 2021; Baskerville et al., 2020; Schuetz & Venkatesh, 2020).

Concerning delegation theory, various conceptualizations have emerged over the past decades as our literature review indicates (see Table 2). Generally, delegation represents a type of information exchange between agents, implying the transfer of a task in order to achieve a certain goal of the delegating agent (Castelfranchi & Falcone, 1998). Following Baird and Maruping (2021, p. 317), we refer to delegation as "transferring rights and responsibilities for task execution and outcomes to another [agent]." Thus, delegation implies a loss of control and the transfer of authority from the delegating agent (the delegator) to the adopting agent (the proxy) (Baird & Maruping, 2021; Leyer & Schneider, 2019). Accordingly, delegation not only creates tasks but also changes the interacting agents' role attributes, which is why both tasks and roles must be considered as interdependent constructs within delegation (Castelfranchi & Falcone, 1997). Regarding the roles of delegation, existing delegation theory considers agents' heterogeneity concerning their knowledge, capabilities, and goals (Borch, 2022; Dennis et al., 2023; Fuegener et al., 2021; Lubars & Tan, 2019). While delegation typically occurs between two agents in a dyadic delegation (Baird & Maruping, 2021; Fuegener et al., 2022), delegation involving three or more agents is also possible (Khumalo & Gharaie, 2023; Wooldridge, 2009; Wu et al., 2021). For instance, a delegator can delegate a task to a proxy, who then subdelegates this task to another agent (Burnett & Oren, 2012). Such delegation chains are common in cooperative networks and multi-agent systems (Castelfranchi & Falcone, 1998; Wu et al., 2021).

An agent's decision to delegate depends on various factors and constraints. Individual factors such as expertise (Castelfranchi & Falcone, 1997; Pinski et al., 2023), confidence (Lee & Moray, 1994), and risk (Candrian & Scherer, 2022; Ross et al., 1997) have key roles in assessing whether or not to delegate. Task-related factors—including factors such as task complexity (Castelfranchi & Falcone, 1997), urgency (Hemmer et al., 2023), and expected costs (Candrian & Scherer, 2022)—further influence delegation decisions. Organizational factors—including organizational culture, policies, and hierarchical structure—either facilitate or hinder a delegation decision, based on established norms and regulations (Castelfranchi & Falcone, 1997). Further, interpersonal relationships—such as trust (Lubars & Tan, 2019; Taudien et al., 2022) and appreciation (Logg et al., 2019)—also contribute to the delegation decision. Together, these multifaceted elements form a complex interplay that affects an agent's delegation decision, reflecting a nuanced balance between individual capabilities, task requirements, organizational context, and interpersonal dynamics.

Owing to the complex interplays between factors, delegation decisions and agentic relationships are prone to conflicts (Castelfranchi & Falcone, 1998). When making delegation decisions, most of the aforementioned constraints may be associated with costs, allowing the agents to estimate whether or not to delegate a task. In optimal environments, agents act rationally and, based on their preferences, only delegate when a delegation's benefits exceed the costs of achieving a desired goal (Candrian & Scherer, 2022). In real-world environments, however, information and role asymmetries, as well as cognitive biases, lead to irrational delegation decisions (Baird & Maruping, 2021; Ross et al., 1997).

Table 1. Relevant Agency Themes in Agentic IS Literature

Relevant themes	Theme conceptualization	Literature
Autonomy	Autonomy allows agentic IS artifacts to act upon external stimuli without the need for human intervention and human knowledge.	Berente et al. (2021), Dattathrani and De' (2023), Dung (2024), Herath Pathirannehelage et al. (2024), Schmitt et al. (2023), Zhang et al. (2021)
	Autonomy enables agentic IS artifacts to act agentic but on behalf of humans.	Ågerfalk (2020), Lyytinen et al. (2021)
Socio-enhanced materialism	Agent's advanced intelligence enhances material agency with new capabilities enabling social behavior.	Baird and Maruping (2021), Dattathrani and De' (2023), Lyytinen et al. (2021), Stelmaszak et al. (2024), Schmitt et al. (2023)
Collectivism	Agency develops upon human agents' behavior from the past and interferes with human agents' goals, leading to a collective symbiosis between human and IS agency.	Baird and Maruping (2021), Dattathrani and De' (2023), Castelfranchi (1998), Murray et al. (2021)
Dynamism	Agency dynamically emerges in the agentic IS artifact's behavior and interaction depending on situational criteria.	Baird and Maruping (2021), Dattathrani and De' (2023)
Evolutionism	Agentic capabilities are constantly evolving reshaping the internal state, agentic performance, and scope of action.	Baird and Maruping (2021), Berente et al. (2021)

Table 2. Relevant Themes in IS Delegation Theory Literature

Relevant themes	Theme conceptualization	Literature
Interaction architecture	Dyadic delegation relationships with two agents exchanging tasks with each other.	Baird and Maruping (2021), Fernández Domingos et al. (2022), Fuegener et al. (2022)
	Triadic delegation between user, designer, and IS agent.	Khumalo and Gharaie (2023)
	Multi-agent delegation with multiple agents delegating tasks within an agent network.	Dennis et al. (2023), Castelfranchi and Falcone (1998), Stelmaszak et al. (2024), Wooldridge (2009),
Delegation direction	Human agents delegating tasks to an IS agent unidirectionally.	Candrian and Scherer (2022), Fernández Domingos et al. (2022), Husairi and Rossi (2024), Lubars and Tan (2019)
	IS agents delegating tasks to the human agent unidirectionally.	Guggenberger et al. (2023), Hemmer et al. (2023)
	Both human and IS agent delegating tasks to each other bidirectionally.	Baird and Maruping (2021), Dennis et al. (2023), Fuegener et al. (2022), Lyytinen et al. (2021)
Agentic roles	Delegation occurs between a delegator transferring rights and responsibilities to a proxy executing the task and responding with a delegation outcome.	Baird and Maruping (2021), Castelfranchi and Falcone (1997), Castelfranchi and Falcone (1998), Leyer and Schneider (2019)
	Agents have heterogeneity/ asymmetries concerning their knowledge, capabilities, and goals.	Baird and Maruping (2021), Borch (2022), Dennis et al. (2023), Fuegener et al. (2021), Lubars and Tan (2019)
Decision rationale	Agent's decision to delegate relies on idiosyncratic factors, task-related factors, organizational factors, and inter-agent relationships.	Candrian and Scherer (2022), Castelfranchi and Falcone (1998), Hemmer et al. (2023), Husairi and Rossi (2024), Lubars and Tan (2019), Pinski et al. (2023), Taudien et al. (2022)

Overall, delegation theory offers valuable concepts that capture the relationship between human agents and agentic IS artifacts (see Table 2). Baird and Maruping (2021) developed a theoretical framework for dyadic human-IS delegation, considering both an agentic IS artifact and a human agent as entities that are capable of becoming a delegator. The authors conceptualized dyadic delegation between human agents and agentic IS artifacts, incorporating their agent attributes as well as the fundamental mechanisms of delegation. However, delegation theory is not limited to dyadic relationships. Scholarly work such as Stelmaszak et al. (2024) and Castelfranchi and Falcone (1998) theorize delegation beyond dyadic relationships in the context of multi-agent settings. According to the delegation frameworks, agents are endowed with resources (i.e., assets and capabilities) and have preferences (i.e., decision models and goals) (Castelfranchi & Falcone, 1997, 1998). The resources, preferences, and decision power are distributed asymmetrically into two roles: the delegator role or the proxy role (Stelmaszak et al., 2024). The delegator delegates a task to the proxy, which is then executed, and the outcome is ultimately sent back to the delegator. Tasks, situations, and outcomes are crucial to the delegation relationship. Baird and Maruping (2021) define tasks via action requirements (cognitive, digital, or physical), the degree of complexity associated with a task (uncertainty, interdependence, and dynamics), as well as the potential for decomposability (i.e., the ability to subdivide). The de facto delegation procedure relies on delegation mechanisms, such as appraisal, distribution, and coordination (Baird & Maruping, 2021; Stelmaszak et al., 2024).

The theoretical framework from Baird and Maruping (2021) is a powerful lens through which to observe human-IS interactions from a delegation perspective. However, the delegation framework focuses on providing a theoretical scaffolding for dyadic agent relationships and does not capture the effects of triadic interactions. Baird and Maruping highlighted this limitation, calling for research into the direction of triadic relationships and beyond. Dyadic delegation can only explain individual binary delegation interactions, and interdependencies between delegation relationships within a delegation triad are insufficiently captured and reflected by existing theory. When existing dyadic relationships—such as a human-human relationship—transform toward a triadic relationship with an agentic IS artifact, the interactions change. Tasks are carried out in new ways, changing humans' behavior.

2.3 Transformation of the Patient-Doctor Relationship through Agentic IS Artifacts

To understand the effects of agentic IS artifacts on the dyadic patient-doctor relationship, it is vital to have a theoretical understanding of patient-doctor interactions and their interactions with IS artifacts. In healthcare, the use of IS to facilitate medical processes and decision-making has been widely embraced for decades (e.g., Berg, 2001; Fichman et al., 2011; Haux, 2006). In this regard, the research has focused on examining the influence of IS on both the patient and the doctor and the impact of their dyadic relationship (e.g., Botrugno, 2021; Cresswell et al., 2010). More recently, along with the rise of AI, dedicated research into AI's impacts on healthcare has intensified (e.g., Davenport & Kalakota, 2019; Jiang et al., 2017), which also increasingly considers agentic IS artifacts' roles in the patient-IS-doctor relationship (e.g., Lorenzini et al., 2023; Sauerbrei et al., 2023).

According to Lorenzini et al. (2023), agentic IS artifacts strongly influence dyadic patient-doctor interactions. The introduction of agentic IS artifacts transforms the dyadic patient-doctor relationship into a triad consisting of a patient, a doctor, and an agentic IS artifact (Lorenzini et al., 2023). The agents' triadic relationship can take the shape of an equilateral triangle (Lorenzini et al., 2023; Mueller et al., 2019; Scott & Purves, 1996) or be sequential, with patients and doctors interacting through the IS agent (Botrugno, 2021; Lanza et al., 2020). Within the triadic relationship, the agentic IS artifact may act as a standalone agent with its own responsibility and decision autonomy, significantly transforming the interaction dynamics (Grüning et al., 2023; Lanza et al., 2020; Sauerbrei et al., 2023). Alternatively, it may serve as a subordinate agent that primarily supports human agents without independent responsibility, subtly enhancing traditional roles without altering the fundamental structure of the interaction (Agarwal et al., 2024; Tanaka et al., 2023). Thus, agentic IS artifacts can contribute to shared decision-making, which refers to the mutual medical decision-making of a patient and a doctor based on individual preferences and strengths (Čartolovni et al., 2023; Légaré et al., 2014; Légaré & Thompson-Leduc, 2014). For decision-making to be shared in such circumstances, the contribution of all three parties needs to be understood by both doctor and patient (Lorenzini et al., 2023; Sauerbrei et al., 2023).

The agentic IS artifact's hierarchy also relates to the agent's task distribution within the triad. Both the agentic IS artifact and the human agents can disrupt decision-making, which may potentially lead to conflicting outcomes in the medical process (Sauerbrei et al., 2023; Triberti et al., 2020). This poses the risk of indecision or even decision paralysis, especially when faced with conflicting opinions between an agentic IS artifact and a doctor, requiring lengthy evaluation for resolution (Triberti et al., 2020).

Overall, agentic IS artifacts can improve the patient-doctor relationship (Sauerbrei et al., 2023). However, considering the existing literature on the patient-doctor-IS relationship, we recognize various themes with opposing conceptualizations underpinning the ambiguities of how agentic IS artifacts will affect the patient-doctor relationship (see Table 3).

3 Research Design

To answer our research question, we followed a qualitative research approach. We opted for phenomenon-based theorizing, which combines inductive and deductive theorizing (Fisher et al., 2021; Gregory & Henfridsson, 2021). Phenomenon-based theorizing focuses on the study of emerging phenomena that are difficult to understand with existing theory or that alter existing theory (Fisher et al., 2021). For instance, phenomena induced through the transformational impact of information technology—such as agentic IS artifacts—are particularly suitable for phenomenon-based theorizing (Gregory & Henfridsson, 2021; Krogh, 2018). Deductive theorizing moves from the discovery of a concrete theoretical problem to a concrete solution (Fulk et al., 1990), while inductive theorizing focuses on studying specific instances and developing new theories through observation and abstraction (Shepherd & Sutcliffe, 2011). In combination, "phenomenon-based theorizing starts with the identification of an undertheorized phenomenon that is then evaluated through existing theories" (Fisher et al., 2021, p. 632). In our case, the evolution from dyadic human delegation relationships to triadic relationships through an agentic IS artifact marks a new phenomenon that changes agentic relationships and behaviors. By evaluating the phenomenon through existing theories, we recognized that related theories, such as delegation theory (e.g., Baird & Maruping, 2021; Candrian & Scherer, 2022) and agency theory (Dattathrani & De', 2023), cannot fully explain the changing roles and interactions in triadic delegation, thus requiring theoretical advancement to account for them. In doing so, our research moves from the analysis of a specific phenomenon to the advancement of theory, following case study research, which is considered to be a valuable research approach for phenomenon-based theorizing (Fisher et al., 2021).

Table 3. Relevant Themes in Patient-Doctor-IS Relationship Literature

Relevant themes	Theme conceptualization	Literature
Agent structure	Agents interacting with each other in the form of an equilateral triad.	Lorenzini et al. (2023), Mueller et al. (2019), Scott and Purves (1996)
	Interaction between patient and doctor through the IS agent in the form of a sequence.	Botrugno (2021), Lanza et al. (2020)
Agent hierarchy	IS artifact as a stand-alone agent with its own responsibility and decision autonomy.	Grüning et al. (2023), Lanza et al. (2020), Sauerbrei et al. (2023)
	IS agent as a subordinate agent primarily supporting the human agents; without its own responsibility.	Agarwal et al. (2024), Čartolovni et al. (2023), Lorenzini et al. (2023), Tanaka et al. (2023)
Decision primacy	IS agents promoting shared decision-making among the triad by fostering information sharing.	Čartolovni et al. (2023), Lorenzini et al. (2023), Sauerbrei et al. (2023), Triberti et al. (2020)
	IS agent promoting paternalization of patient and doctor through its advanced decision capabilities.	Lorenzini et al. (2023), Sauerbrei et al. (2023)
Task distribution	IS agent and human agents having interfering tasks, potentially leading to opposing outcomes.	Sauerbrei et al. (2023), Triberti et al. (2020)
	IS agent taking over tasks from human agents, displacing the exclusive task ownership.	Kasperbauer (2021), Lorenzini et al. (2023), Tanaka et al. (2023)
Inter-agent relationship	IS agents inducing loss of personal contact between patient and doctor, increasing emotional distance.	Botrugno (2021), Čartolovni et al. (2023), Sauerbrei et al. (2023)
	IS agents reducing social discomfort by mitigating interhuman exposure.	Botrugno (2021), Čartolovni et al. (2023)

3.1 Research Method

We conducted an exploratory case study centered on an agentic IS artifact designed to counteract neurogenic lower urinary tract dysfunction. Our primary unit of analysis was the delegation relationship, encompassing interactions between a patient, a doctor, and an agentic IS artifact. Generally, case study research allows for theory-building, especially in areas where there is little previous research yet emerging phenomena are being studied (Eisenhardt, 1989). In the realm of case study research, scholars typically opt for either a single-case or a multiple-case approach (Eisenhardt, 1989). Multiple-case studies are recommended to increase the generalizability and robustness of the findings, while single-case studies facilitate more comprehensive theories (Eisenhardt & Graebner, 2007). Single-case studies excel at illuminating phenomena through their focus on revelatory, extreme, or unique instances, often leveraging unusual circumstances for profound insights (Eisenhardt & Graebner, 2007).

Our case of neurogenic lower urinary tract dysfunction provided unique access to a research device and allowed for the analysis of a well-defined subarea of digital companions in healthcare that is also generalizable and applicable to other areas of individualized healthcare employing agentic IS artifacts (e.g., smart blood glucose meters, see Jendle & Reznik, 2023). Capitalizing on the emerging phenomenon of agentic IS artifacts in healthcare and the richness of data available from our unique case study in the field of neurogenic lower urinary tract dysfunctions, we opted for a single-case approach (Eisenhardt & Graebner, 2007; Klein & Myers, 1999). Considering the phenomenon's novelty and the absence of sufficient quantitative data, a single-case study is a viable approach for theory-building on the triadic delegation relationship between patients, doctors, and agentic IS artifacts (Benbasat et al., 1987; Eisenhardt & Graebner, 2007). To reduce the subjectivity of data analysis, we used well-established mechanisms to provide evidence and reduce bias, such as team-based research, data triangulation with data from different sources of evidence, and the inclusion of direct quotations, among others (Dubé & Paré, 2003). Appendix A provides a detailed examination of the mechanisms of Dubé and Paré (2003), and Appendix B presents the interview guide we used.

3.2 Case Description

Incontinence affects approximately 200 million people worldwide (Rozensky et al., 2013). As part of the broader field of incontinence, neurogenic disorders of the bladder result in partial or complete loss of bladder-filling sensation and the ability to void voluntarily (Ginsberg et al., 2021; Tudor et al., 2016). Neurogenic lower urinary tract dysfunction is common among patients affected by multiple sclerosis, Parkinsonism, spina bifida, and spinal cord injury (Dorsher & McIntosh, 2012). The health and social consequences associated with this limitation are severe and include long-term irreversible kidney damage, anxiety, and depression (Madersbacher, 1990; Oh et al., 2006; Verpoorten & Buyse, 2008). Over 90% of patients with neurogenic lower urinary tract dysfunction must empty their bladder using clean intermittent catheterization (Dorsher & McIntosh, 2012; Verpoorten & Buyse, 2008). Although clean intermittent catheterization has been used for several years (Lapides et al., 1972), this method is associated with complications such as urethral bleeding and bladder stones (Igawa et al., 2008).

In daily life, not having information about the bladder filling level leads to various challenges for patients and doctors. For example, patients must set timers themselves to remind them to void their bladder every three hours (Dorsher & McIntosh, 2012; Verpoorten & Buyse, 2008). This scheduling presents a considerable challenge to them, as the catheterization process involves finding an appropriate place for catheterization and is likely to interrupt sleep routines. Since the voiding schedule is time-driven instead of need-driven, voiding amounts can be below target (making the catheterization process unnecessary and increasing the likelihood of urinary tract infections [Berger et al., 2022; Wyndaele et al., 2012] or above target—representing serious health threats like irreversible kidney damage [Dik et al., 2006]). Even though patients develop routines through year-long practice in their bladder management, they still report incontinence episodes and bladder distention (Hansen et al., 2010). Doctors also face challenges, for example, in accurately assessing the need for bladder-soothing medication. As the bladder of many patients demonstrates spasticity resulting in both incontinence and irreversible kidney damage, doctors need to determine the time and dose of bladder-soothing treatments (e.g., the injection of botulinum toxin A into the bladder wall—i.e., the detrusor muscle; see Schurch et al., 2000—or the use of pharmacotherapy, e.g., oxybutynin; see Gray et al., 1995).

To counter the lack of knowledge about patients' own bladder-filling levels, several non-invasive and wearable approaches for bladder monitoring have been developed by researchers (Jonas et al., 2023; Kristiansen et al., 2004; Reichmuth et al., 2020) and companies (DFree, as published in Hofstetter et al., 2023; Sens-U, as published in van Leuteren et al., 2019). To measure bladder-filling levels, different technologies are employed, from ultrasound (Kristiansen et al., 2004) to near-infrared spectroscopy (Fechner et al., 2023) and bio-impedance analysis (Reichmuth et al., 2020). Studies have examined the AI-driven analysis of complex sensor data to continually monitor bladder-filling levels (Dunne et al., 2018; Fechner et al., 2023).

Through a strategic public-private partnership, we were granted access to the designated research device of the medical technology start-up inContAlert GmbH, serving as a health companion. The health companion consists of a small sensor device, worn non-invasively on the body surface of the hypogastric region directly over the bladder, and an associated software-based agent instantiated on an edge device (i.e., a smartphone). Users attach the sensor device to their body using a belt-like fixation unit. The sensor device is designed for continuous use throughout the day and night. Users are directed to take the sensor device off only for charging, cleaning, and during excessive physical activities (e.g., workouts). Upon fixation, the sensor device begins monitoring the urinary bladder for filling and voiding while sensing complementary body parameters (i.e., acceleration and temperature). The sensor device transmits the captured data to the associated edge device, which represents the interface to the user. Users interact with the health companion through the edge device. The core task that is primarily delegated between the health companion and the patient consists of the right to monitor the bladder and the responsibility to act in the interest of the patient's health (i.e., the directive for prescribing the time interval for bladder voiding).

For the task of bladder filling monitoring, the health companion autonomously analyzes the monitored sensor data and performs additional delegations to achieve the goal of optimal micturition management. For instance, the health companion autonomously analyzes the monitored sensor data and prompts the patient to take actions, such as voiding the bladder, necessary for optimal micturition management. It also creates protocols for drinking behavior, responses to illnesses such as diarrhea, and planned physical activities. The agentic IS artifact, instantiated through the health companion, ultimately empowers the patient to compensate for their inability to accurately sense the time for bladder voiding, enhancing their overall quality of life (Lockl et al., 2022). While the bladder voiding prediction marks the primary patient use case of the health companion, the captured data allows for a wide range of other tasks. The primary use case for doctors is the possibility of delegating advanced analyses, such as the cognitively demanding and time-consuming evaluation of longitudinal micturition data for treatment planning, to the health companion. Doctors regularly analyze patients' long-term micturition behavior (e.g., by examining changes in the time between two voiding events and/or the voiding volume) to estimate the need and dosing for bladder soothing medication.

Besides the aforementioned delegation cases on the patient and doctor side, current development efforts comprise further delegations from and to doctors or patients, such as early disease detection (e.g., urinary tract infections), therapy supervision (e.g., the effectiveness of bladder soothing medication), and longitudinal data collection of patients' physical condition.

To perform such complex tasks, the health companion requires the ability to autonomously perceive (i.e., record measurements) and act (i.e., analyze data and delegate tasks) while striving to reach a goal. In that regard, the health companion exhibits agentic behavior by autonomously interacting with its environment to achieve its design objectives (i.e., improving patients' health). The health companion represents an agentic IS artifact by acting responsively without direct human intervention, leveraging its prior history and knowledge, and achieving objectives through interactions with other agents (Baird & Maruping, 2021).

3.3 Data Collection

For the data collection, we employed a longitudinal, multi-source approach with a focus on interviews (Dubé & Paré, 2003; Walsham, 1995). Two of the authors formed part of a large ongoing research project on the establishment of an agentic IS artifact to compensate for neurogenic lower urinary tract dysfunction. Both authors have been working on the project for five years, allowing for an exceptional longitudinal in-depth perspective.

We collected data in two phases and used a variety of data sources to develop our theory (Klein & Myers, 1999). Ramping up the project, the first and third authors first conceptualized and later developed a sensor system: an agentic IS artifact that can compensate for neurogenic lower urinary tract dysfunction. In Phase 1 (May 2021 to December 2022), we conducted preliminary e-mail conversations, phone calls, and interviews with patients and doctors about the agentic IS artifact. We used this information to gain a deep understanding of the health domain and neurogenic lower urinary tract dysfunction. This information laid the groundwork for later interviews and in-person visits. In Phase 2 (December 2022 to July 2023), we conducted semi-structured interviews and in-person meetings with patients, doctors, and delegation experts discussing AI-enabled features of the agentic IS artifact. In this phase, we validated the findings and the theory that emerged from Phase 1. In parallel with the interviews, we triangulated our key findings through on-site visits, participation in patient-doctor meetings, and reviews of technical documents on the artifact by validating new findings with at least one other data source (Eisenhardt & Graebner, 2007). Conversations were not recorded during the interviews to maintain an environment in which interviewees could express themselves freely without being influenced or constrained by the presence of a recording device. We stopped our interview study once we had reached theoretical saturation.

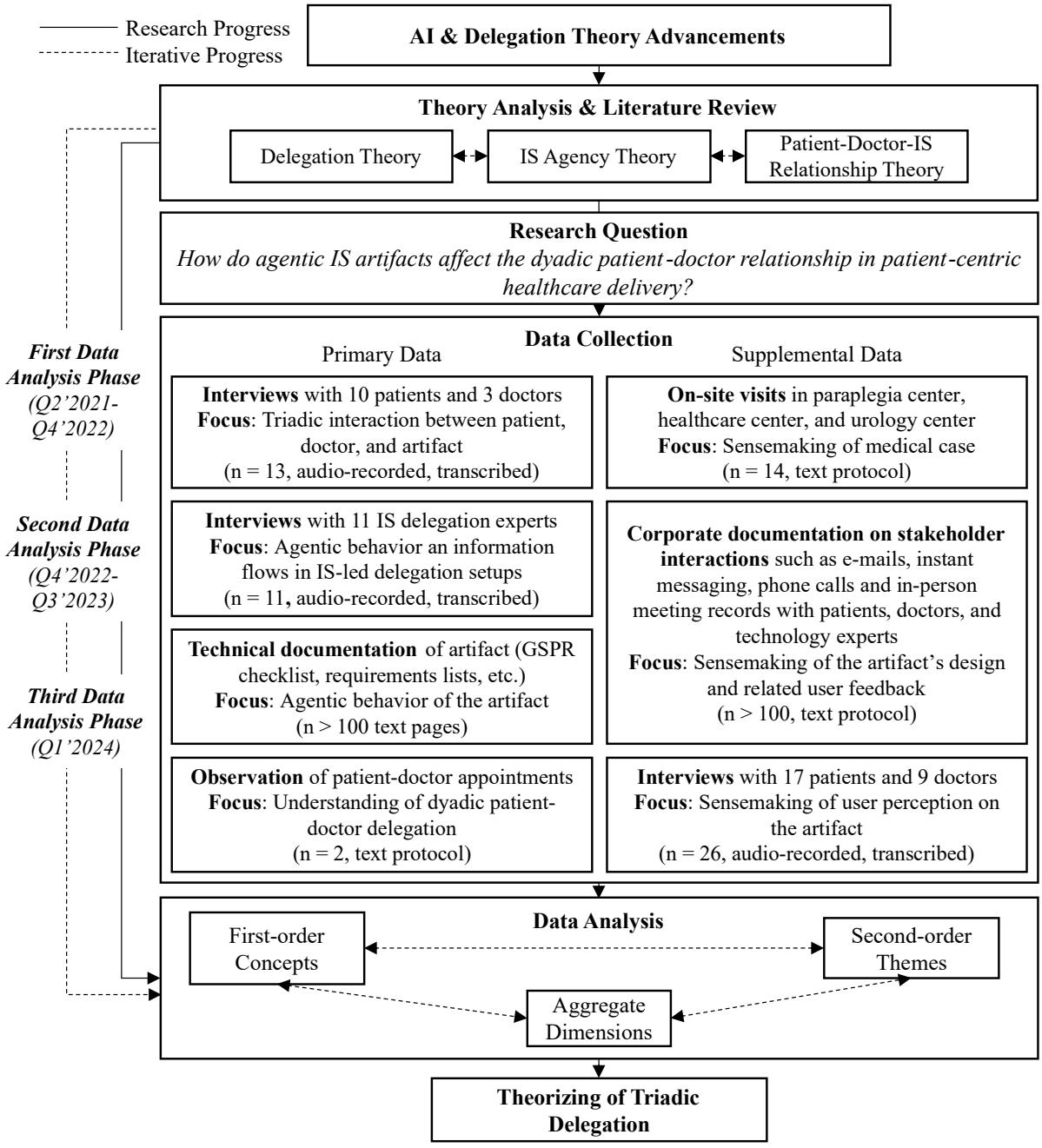

Figure 1. Data Collection and Analysis Roadmap (Adopted From Möhlmann et al., 2023, p. 42)

In total, we gathered 50 recorded and transcribed interviews and notes from more than 100 face-to-face meetings, phone calls, emails, and instant message conversations with patients, doctors, and delegation experts. We also analyzed more than 100 pages of technical documentation, as well as notes from two observations of a patient-doctor appointment and 14 site visits to a spinal cord center, a healthcare center, and a urology center. Figure 1 depicts our data collection and data analysis procedure. While supplemental data helped us to understand the particularities of neurogenic lower urinary tract dysfunction and increased contextual sensemaking of the case at hand, primary data focused on delegation-related aspects of the patient-IS-doctor triad.

3.4 Data Analysis

For our data analysis, we followed the guidelines of Gioia et al. (2013). We analyzed the interview data in three successive coding rounds. In Phase 1, we independently identified open codes anchored in our data and derived first-order concepts from these. During

Phase 2, we categorized and bundled the first-order concepts we had identified to shape more abstract second-order themes. In the final phase, we further distilled the second-order themes into aggregate dimensions.

Thus, Stage 1 of our analysis involved a detailed process of extracting codes directly from our informants' spoken words (i.e., patients, doctors, and delegation experts), using minimal interpretation (Gioia et al., 2013). As exemplary first-order concepts, the interviews with patients and doctors revealed their intended delegation scope and the fear of losing control over the medical procedures. The delegation experts enriched the understanding through a more abstract perspective on control loss. The coding process was conducted independently by two of the authors, with each creating their own set of codes, which were then reviewed, compared, and improved on.

During Stage 2 of our analysis, we examined the preliminary results and began to identify emerging themes. We reviewed both the codes and interview transcripts iteratively and grouped the data into broader themes that connected several concepts. This coding process involved identifying themes that were at a higher level than the codes used in Stage 1. During this process, we distilled first-order concepts, such as the exemplary individual informants' perspectives on data-sharing control, into second-order themes. The following exemplary *statement* was part of a first-order concept, *"autonomous communication of agentic IS artifact with the patient marginalizes the role of the doctor,"* that we distilled into the second-order theme *autonomy conflicts*:

> *So, I just thought [to] myself that I have a contradiction in my statement. On the one hand, I don't really want to give the AI [i.e., the agentic IS artifact] any data from me that goes beyond micturitions, but then I would also like to have a complete analysis that replaces the doctor. That just doesn't work.* (Patient, interview)

In frequent discussions between the authors, we discussed the developed second-order themes and compared them to our theoretical focus on delegation theory (Baird & Maruping, 2021; Candrian & Scherer, 2022; Castelfranchi & Falcone, 1998). Therefore, we evaluated our second-order themes against the delegation constructs provided by our theoretical lens—the delegation framework of Baird and Maruping (2021)—including roles, tasks, delegation models, and delegation outcomes. Through comprehensive deliberations and iterative refinements, we refined our second-order themes until we reached a point of mutual exclusivity. This process continued until a unanimous consensus was reached among all the authors on the final set of themes.

After consolidating the complete set of second-order themes, we proceeded to further abstract them into aggregated dimensions. During this process, we distilled the second-order theme *autonomy conflicts* (among other conflicts) into the more abstract aggregate dimension *conflicts*. During the third coding round, we built and refined our aggregated dimensions, relating them to our theoretical lens in multiple discussion rounds. The resulting data structure helped us examine the underlying beliefs that drive the relationship between patients, doctors, and the agentic IS artifact.

4 Findings

In our case study, we investigated *how agentic IS artifacts affect the dyadic patient-doctor relationship in patient-centric healthcare delivery* through the theoretical lens of delegation. Based on the theoretical constructs provided by the delegation framework of Baird and Maruping (2021), we explored how the agents and their interaction relationships evolve within triadic delegation. In doing so, we particularly focused on the effects arising from the agentic IS artifact's novel agency. Three aggregated dimensions emerged from our case study analysis, as depicted in Figure 2. We present our findings regarding the changes in agents' *roles*, followed by a discussion of novel *interaction* types and *conflicts* arising from triadic relationships. While we investigated the changes in agents' attributes, we identified novel attributes and interferences between attributes (see Section 4.1). Regarding the interactions between the three agents, we observed novel types of interaction patterns, relationship-building, and delegation choices (see Section 4.2). Then, we present the conflicts that arose within the triadic delegation. Conflicts encompass autonomy conflicts, communication barriers, information asymmetries, and attribute interference conflicts (see Section 4.3).

4.1 Agentic Roles in Triadic Delegation

The transformation from a dyadic patient-doctor interaction to a triadic interaction between a patient, a doctor, and an agentic IS artifact induces a change in agents' attributes. The novel capabilities of the agentic IS artifact directly affect the triad as a whole and the attributes of the human agents, independent of their role. The primary capabilities that the agentic IS artifact adds to the triad are analytics capabilities concerning data intelligence and inference, which enable autonomous decision-making. The agentic IS artifact thereby leverages improved collection and analysis of medical data to influence the agentic attributes of humans.

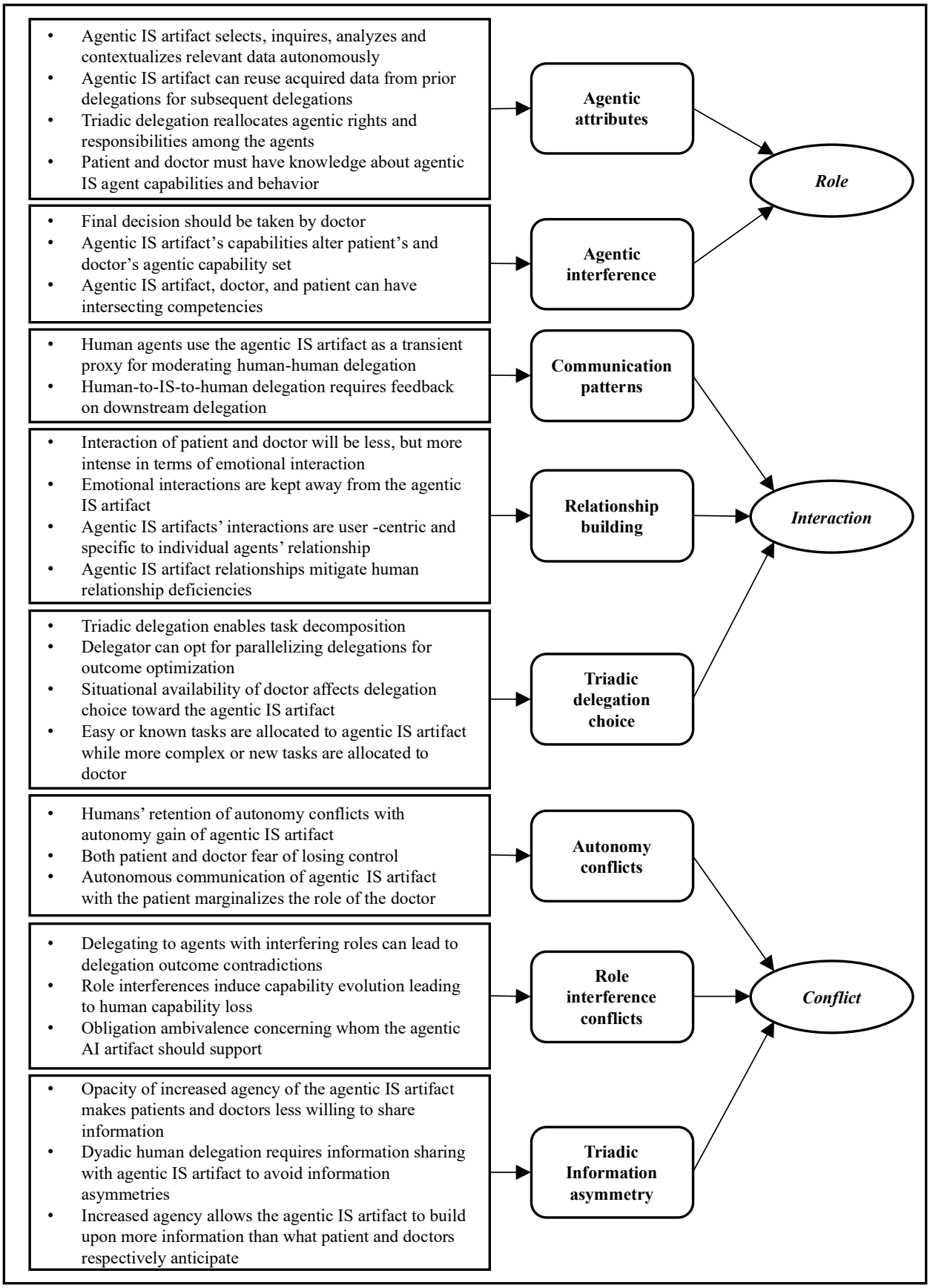

Figure 2. Data Structure Resulting from the Analysis of the Interviews

4.1.1 Agentic Role Attributes

With the increasing capabilities of the agentic IS artifact, human agents can now delegate tasks that were previously hard or impossible to delegate. For instance, a patient can now delegate bladder monitoring and voiding management to the agentic IS artifact. Also, a doctor can delegate certain tasks (e.g., therapy monitoring) to the agentic IS artifact, increasing overall healthcare delivery. The agentic IS artifact of our case has its own goals, responsibilities, and rights—as initially determined by the designer—allowing this agentic IS artifact to act as a delegator. For instance, based on the technical documentation, we found that the agentic IS artifact inherently has the goal to optimize patients' catheterization frequency and owns the responsibility to prescribe the optimal time for the patients' bladder voiding, as defined by the designer. When bladder voiding is deemed necessary, the agentic IS artifact prompts the patient to conduct the voiding. While supervised by the agentic IS artifact, the physical action of voiding the bladder remains the responsibility of the patient.

Considering the agentic IS artifact's effects on the patients and the doctors, we saw that the artifact even influenced the human agents' attributes—it not only changes the triad's overall attributes through its own capabilities but also enhances human agents' attributes. For instance, a patient can expand their knowledge by learning from interactions with the agentic IS artifact:

> *So, a new injury [i.e., a person who has just been affected by neurogenic* lower urinary tract *dysfunction] could be able to take this device and be able to … understand how their body works and when they're taking in fluids and when they're accumulating fluids, to void. … It [i.e., the agentic IS artifact] would teach someone very quickly, probably within the first year of how many, especially if they're using intermittent catheters, how often they would need to void at a certain time of the day.* (Patient, interview)

While the enhancement of human agents' assets and capabilities is perceived as beneficial from both the doctor's and the patient's perspectives, our case study revealed that the attribute gains are also associated with requirements and prerequisites. For instance, both the doctor and the patient must understand the functioning of the agentic IS artifact and its attributes (e.g., responsibilities, rights, goals, capabilities, etc.). Otherwise, the agentic IS artifact's effects on the patient's and the doctor's attributes may be impeded.

Beyond the enhancement of agentic attributes, we also observed the reallocation of attributes among the agents in the triad through the novel capabilities of the agentic IS artifact. For instance, responsibilities previously possessed by a patient or a doctor permanently moved to the agentic IS artifact. Examples of responsibility reallocation from the patient to the agentic IS artifact are the recording and analysis of micturition data (e.g., voiding volume, time between consecutive micturitions, and incontinence episodes), ensuring appropriate placement on the body, checking whether a micturition was performed, and supporting the adoption of behaviors aimed at sustaining optimal bladder health.

Regarding the documentation of micturition data (done previously by the patient with a paper chart), the agentic IS artifact is expected to be better suited to this task. This way, human effort can be minimized for the sake of convenience, and errors resulting from manual task execution can be avoided. According to a doctor we interviewed, "a common problem when it comes to documenting and reporting micturition and micturition volumes is that patients struggle to document times well, document volumes well, document the urge to urinate and urine losses well."

The agentic IS artifact's monitoring and recording of the patient's bladder activity both require and enable agentic capabilities of the agentic IS artifact. To monitor the bladder filling, the agentic IS artifact must initially process the sensed bio signals to generate understandable filling levels. Beyond using the data for the task of managing the patient's bladder activity, the captured data also expands the agentic IS artifact's internal state, leveraging data for further tasks. The bladder voiding data, for example, is considered relevant information. It enables the agentic IS artifact to conduct a first-level medical evaluation of the bladder's medical condition (e.g., indication for urinary tract infections) or to oversee treatment progress (e.g., the effectiveness of bladder soothing medication). The agentic IS artifact also takes over the responsibility for the correct placement of the sensor device on the body (i.e., above the pubic bone) of the user by using internal controls to prevent lack of contact with the user's body and mispositioning. If the user misplaces the sensor device, the agentic IS artifact issues a warning message. Another responsibility taken over by the agentic IS artifact is the adherence to specific time intervals between successive micturitions. As the agentic IS artifact can continuously monitor the bladder filling level, it can supervise whether patients empty their bladder as prescribed or even at times not prescribed by the agentic IS artifact. Alongside the aforementioned responsibilities, the agentic IS artifact can also analyze the filling velocity of the bladder. Leveraging the filling velocity, the agentic IS artifact can take over the responsibility to assist with the implementation of behaviors beneficial to bladder health (e.g., by encouraging the user to ensure sufficient liquid intake if the filling velocity is low).

Further, the agentic IS artifact can leverage its prior history by reusing acquired data from prior delegations (e.g., bladder activity monitoring) for subsequent

delegations. Based on past events and comparisons with current circumstances, the agentic IS artifact can update its internal state. For instance, when the determination of the bladder volume in milliliters is delegated to the agentic IS artifact, it can learn from its own errors or inaccuracies through feedback from the patient: "Just every time that it gets something wrong, we'll let it know so we [i.e., both the patient and the agentic IS artifact] can improve with time" (patient, interview).

4.1.2 Agentic Interference

While investigating the development of novel attributes in the triad, along with the reallocation of attributes, we observed overlaps between agents' attributes, beyond sharing the same knowledge or goals, which in turn influences the agentic relationships. The agents' attributes within the triad are not exclusively allocated; instead, they can overlap across attribute types. We refer to this phenomenon as *attribute interference*, which describes the overlapping of identical attributes between two or more agents (as depicted in Figure 3). We differentiate the attribute *interference* into *dyadic attribute interference* (i.e., attribute interference between two agents) and *triadic attribute interference* (i.e., attribute interference between all three agents).

Attribute interferences primarily arise from the novel competences being added to the triad through the integration of the agentic IS artifact. While such interferences also exist in regular patient-doctor relationships without IS involvement, they are usually limited to asset interferences (e.g., overlapping knowledge about medical conditions) or goal interferences (e.g., maximizing patient well-being). In contrast, certain responsibilities, capabilities, or rights (e.g., patient data access and medical assessment) were widely held exclusively by one agent (by either the patient or the doctor). However, through the integration of the agentic IS artifact, there are notably more interferences than in conventional patient-doctor relationships. We observed how the attribute interferences are no longer limited to interfering assets or goals. Instead, the interferences spanned all attribute categories. The increasing capabilities of the agentic IS artifact, in conjunction with its autonomous behavior, particularly induce the correct interferences and responsibility interferences among the agents. In our case, both the agentic IS artifact and the doctor had competing dyadic capabilities regarding the ability to analyze data and derive medical decisions (e.g., simultaneously decreasing micturition volume and time between micturitions could indicate a urinary tract infection). The patient and the agentic IS artifact had competing dyadic capabilities regarding the documentation of the micturition data (e.g., incontinence episodes, voiding times, or voided volumes). Further, we observed triadic interference in our case in accessing patient data and in determining the correct placement of the sensor device above the pubic bone.

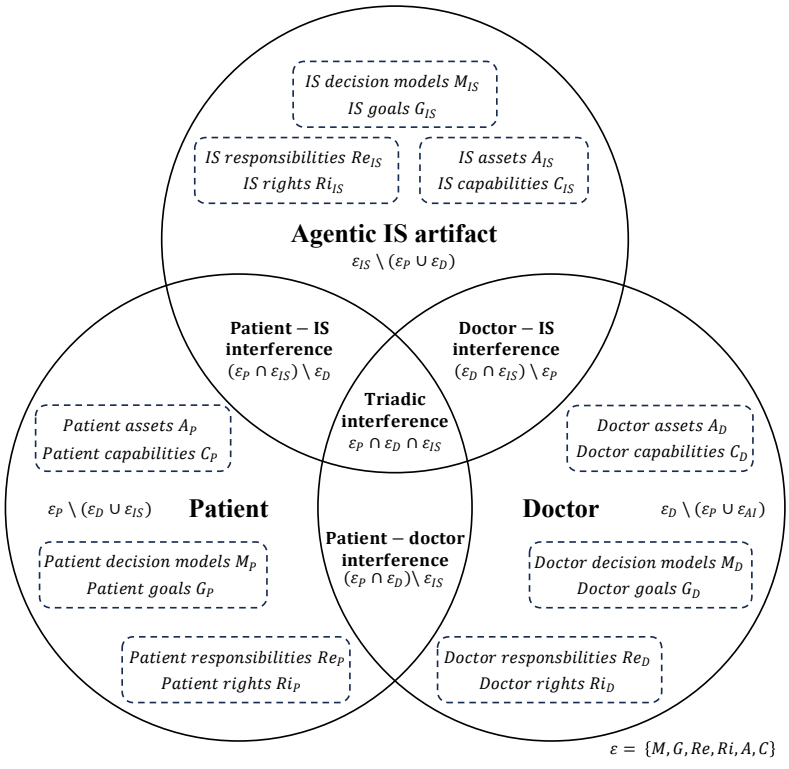

Figure 3. Attribute Interference in Triadic Agent Relationships

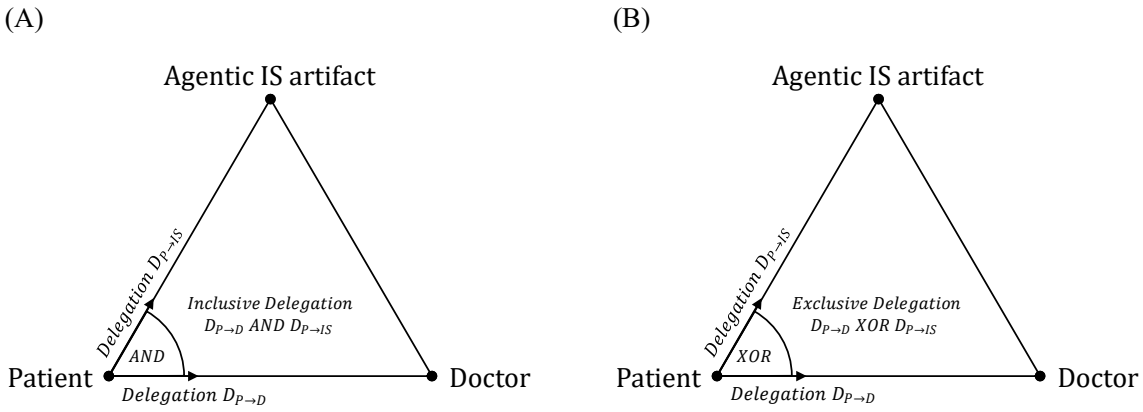

Figure 4. Delegation Choices in Triadic Interactions (Illustrated from the Patient's Perspective)

4.2 Agentic Interaction in Triadic Delegation

The integration of the agentic IS artifact affects not only the agentic attributes of a patient and a doctor but also the agentic relationship in the triad, inducing novel types of delegation and communication.

Owing to the increasing agent count (n = 3) in conjunction with the agents' attribute interferences, a delegating agent now has the choice of delegating tasks to more than one agent in the triad, which we refer to as *triadic delegation choices*. Accordingly, an agent's delegation appraisal is no longer limited to assessing its own task performance against the costs and benefits of another agent. Instead, it also expands to the assessment of a third delegation alternative. For instance, when a patient seeks to achieve a certain goal that can be fulfilled by all three agents in the triad, the patient can complete the task on their own or delegate the task to either one or both agents in the triad. When delegating the task, the patient has the choice to delegate to the agentic IS artifact (i.e., $D_{P\rightarrow AI}$) and the doctor (i.e., $D_{P\rightarrow D}$) either inclusively (i.e., $D_{P\rightarrow AI}\ AND\ D_{P\rightarrow D}$) or exclusively (i.e., $D_{P\rightarrow AI}\ XOR\ D_{P\rightarrow D}$), as depicted in Figure 4. Inclusive delegation refers to delegation situations when the delegator chooses to delegate an identical task to both agents in the triad. One exemplary inclusive delegation that we observed in our case study was the delegated assessment of long-term bladder voiding behavior (i.e., changes in the time between two consecutive voidings and the respective voided volume). Long-term bladder voiding behavior could indicate the need for a change in therapy (e.g., different bladder soothing medication dose) or complications (e.g., urinary tract infections). In contrast, exclusive delegation refers to delegation situations where the delegator chooses to delegate exclusively to one of the two proxies, although both were deemed suitable to perform the task. One example of an exclusive delegation in our case was the delegated evaluation of the present need to void the bladder, which can be determined either by the doctor (using conventional methods like ultrasound) or the agentic IS artifact.

What makes the concept of delegation choice particularly relevant from a research perspective is the underlying factors that determine the outcome of the delegation choice. In our study, patients and doctors evaluated the other agents' availability, performance, safety, and trustworthiness, as well as the task complexity and task context, when making a delegation choice. Task context refers to the situational circumstances associated with a task. For instance, patients and doctors reported that they still favored delegation to a human agent when a task was associated with emotionally challenging characteristics, such as requiring empathetic communication of the delegation outcome. One doctor stated:

> *I think that there is also this empathy moment somehow in this patient-doctor conversation, which I personally cannot imagine handing over to an AI [i.e., the agentic IS artifact], even if there are, of course, empathic AIs. But I still can't imagine that because the AI [i.e., the agentic IS artifact] doesn't see how the patient reacts or perhaps can't comprehend to the same extent what that might mean for the patient or what the consequences might be.*

Accordingly, both the patients and doctors in our study tended to prefer delegating to a human agent if the task context had emotional characteristics. In contrast, we saw that delegation choices regarding non-emotional or routine tasks were based on a proxy's availability and performance. However, delegation to doctors can be hampered by their limited availability, which is why the ubiquitous availability of the agentic IS artifact favors patients' delegation to it, provided that the agentic IS artifact meets expected performance standards.

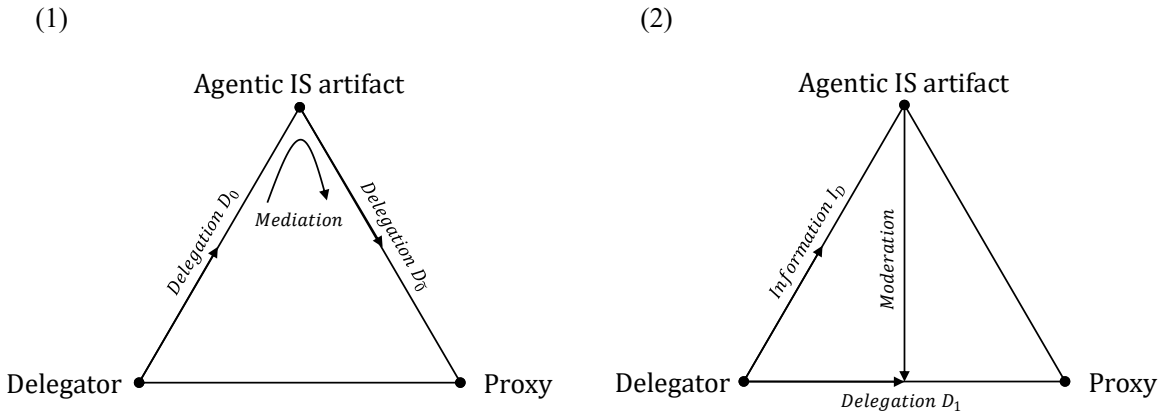

Figure 5. Triadic Delegation Patterns Enabling Agency

In contrast to human agents' similarity concerning the factors that determine their delegation choice, we saw notable differences between the factors that determine the agentic IS artifact's delegation choices. Based on the artifact's technical documentation, we found that the agentic IS artifact rarely faced ambiguous delegation choices because the interference between doctors and patients was very low, which is why the tasks usually delegated by the agentic IS artifact have only one suitable recipient. Further, the agentic IS artifact's responsibilities and rights are usually directly associated with either the doctor or the patient. For instance, the responsibility to monitor a patient's bladder filling level results in delegations predefined by the IS designer. Accordingly, whom the agentic IS artifact must delegate to is mostly unambiguous; nonetheless, the agent must appraise both human delegation options.

Besides delegation choices that determine who an agent delegates to in the triad, we further explored how the delegations evolved regarding their content and routing, representing the agents' interaction. In dyadic delegation, the only possible delegation route is a direct delegation from the delegator to the proxy executing a task. In triadic delegation, we saw advanced delegation patterns that go beyond the conventional dyadic delegation. The increased agency of agentic IS artifacts enables novel delegation patterns between a delegator and a proxy through the agentic IS artifact as a transient proxy. We refer to the transient proxy as a temporary role that facilitates the delegation between the two other agents, enhancing the collective agency—either mediating or moderating the delegation. In both delegation patterns, the agentic IS artifact's increased agency—achieved through a high degree of decision-making latitude (i.e., through anticipatory and prescriptive actions)—temporarily augments the overall available agency, allowing it to better fulfill the delegation task and to enable better delegation outcomes. Yet mediation and moderation manifest differently depending on the context and the degree of autonomy granted to the agentic IS artifact.

In Delegation Pattern 1 (as illustrated on the left of Figure 5), the delegator (the patient or the doctor) delegates D_0 to the agentic IS artifact. The agentic IS artifact accepts the delegation but is unable to fulfill the task on its own. Thus, the agentic IS artifact intervenes in the delegation and performs a mediated delegation $D_{\tilde{0}}$ to the other human agent (i.e., the doctor or the patient) in the triad. For instance, a patient delegates the analysis of long-term micturition data (e.g., voiding times and voided volumes) to the agentic IS artifact. However, when the agentic IS artifact detects through internal controls that confidence in the analysis is too low (e.g., confidence falls below a critical threshold), it recognizes that the additional expertise of a doctor is needed. It then delegates the task to the doctor, who carries out the analysis instead. Concurrently, a doctor can delegate the task of continuously documenting the voiding volumes of a patient to the agentic IS artifact. However, if the agentic IS artifact (e.g., due to non-use by the patient for several days) then determines that it cannot comply with the delegation, it delegates the task to the patient, who is then responsible for performing the documentation. While this mediation pattern is similar to the concept of subdelegation in multi-agent systems, it differs in a significant way. In subdelegation, there is a full or partial delegation of a task, yet the components of the delegation D_0 remain the same when subdelegated (Castelfranchi & Falcone, 1998). However, in mediation, the agentic IS artifact intervenes in the delegation ($D_0 \rightarrow D_{\tilde{0}}$), for instance by adapting the delegation goals, adding task-relevant information, or preprocessing the task. In the first given example, the agentic IS artifact can analyze voiding behavior and provide the doctor with aggregated information about voided volumes when mediating the delegation to the doctor. In the second example, the agentic IS artifact can provide the patient with the documented micturition data, which in turn can be used by the patient to continue their documentation.

In Delegation Pattern 2 (as illustrated on the right of Figure 5), the agentic IS artifact moderates a delegation

without receiving a delegation task from the human agent. Instead, one human agent directly delegates a task to the other human agent. Accordingly, at first glance, there is no explicit delegation to the agentic IS artifact. However, in triadic delegation, it is pivotal to enable each agent—including the agentic IS artifact—to continually share relevant information with the other agents in the triad in order to avoid information asymmetries and improve the agents' knowledge. This information-sharing enables the agentic IS artifact to receive information about the delegation (i.e., I_D) without having been originally involved in the delegation. An example from our case study is the intervention in the provision of treatment. Once the agentic IS artifact receives information about the doctor delegating a new target for maximum bladder volume to the patient (e.g., 500 ml instead of 300 ml), it can provide adapted voiding prescriptions and can closely track the compliance of the patient.

At the same time, the agentic IS artifact can inform the human-to-human delegation to improve overall task execution capability. As one doctor stated, the agentic IS artifact can be used to facilitate more objective decision-making:

> *[The agentic IS artifact] tells the doctor how often the patient has performed catheterization, what bladder capacity he has, and how often he has distended the bladder, which is relevant later during a urodynamic examination to determine whether he may have muscle damage to the bladder. These are questions that come up again and again and for which it [the agentic IS artifact] saves a lot of time in everyday life and also provides assistance for more sensible decisions.*

If the human-to-human delegation consists of setting a new target volume for micturitions (e.g., 500 ml instead of 300 ml), the agentic IS artifact can use this information to adapt the distention threshold in order to improve its task execution capability (i.e., provide an objective data analysis of past micturition volumes and bladder distensions).

4.3 Conflicts in Triadic Delegation

With the increasing autonomy of an agentic IS artifact within a triad, various conflicts are emerging from the novel interactions. Certain triadic conflicts revolve around themes previously associated with IS use, such as data sharing, autonomy-related conflicts, and obligation-related disputes pertaining to IS artifacts. Conversely, other conflicts are specific to delegation, encompassing contradictions in delegation outcomes as well as barriers and asymmetries in information. We have also seen the emergence of triad-specific evolutionary conflicts, including aspects of the evolution of dependencies and the evolution of capabilities.

4.3.1 Autonomy Conflict

We observed serious concerns about the potential loss of control that may accompany the increasing autonomy of agentic IS artifacts. Concerning the agentic IS artifact's internal state, which is updated through information from independent task delegations, one patient was concerned about data protection, expressing discomfort with the idea of an IS agent autonomously communicating information to a medical professional:

> *Basically, I would find it problematic at least in terms of data protection if the agent [i.e., the agentic IS artifact] informs the doctor on its own. Well, maybe you can do that. So, on push, so to speak. So, I prefer a button that I can use to send something [i.e., medical information] to the doctor.*

The primary concern is that the agentic IS artifact may be able to autonomously complement classified information from its internal state to maximize its own delegation outcome, which would be out of the delegator's control. A delegation expert summarized the tension between the potential advantages of automation and the imperative of maintaining control as follows:

> *So actually, control is everything. Let's say control is all good and right, actually, we all still have to have control, but basically, I think we have to be aware that we lose control by participating in this technological development and by using this technology at all. And we do lose control because we achieve a certain gain in productivity through the use of technology.*

This expert's insights underline the fundamental conflict between control and efficiency in the use of technology arising from the increasing autonomy of agentic IS artifacts. They emphasize that while people inherently desire control, embracing technological advancements inevitably means relinquishing a certain degree of control to gain productivity.

Closely related to the loss of control is the development of dependencies. Dependencies epitomize the perceptions among patients about their reliance on an agentic IS artifact and vice versa. Our empirical data indicates that prolonged use of an agentic IS artifact may lead to potential conflicts, especially when the artifact begins to supplant tasks that were previously done by human agents exclusively.

> *You probably unlearn. So, I'm a bit ambivalent. Firstly, I think that dependencies arise, whether they're positive or negative, I'm not yet sure, because, on the one hand, you have the chance to learn better, ... so you learn something about your body. On the*

> *other hand, however, you could also unlearn something if you always rely only on it and no longer pay attention to your feelings.* (Patient, interview)

During our research, it became clear that patients often turned to the artifact as a tool to enhance their understanding of and knowledge about the workings of their bodies. However, a point raised by patients is the effect that their dependence on the agentic IS artifact might only become visible when it is not available. For example, some patients affected by neurogenic lower urinary tract dysfunction rely on alternative body reactions to infer the need to void the bladder (e.g., cold sweat or goosebumps). Overreliance on the agentic IS artifact's capabilities can induce patients to lose sight of their bodily reactions. The developed dependence could thus lead to a regression in a patient's skill in scrutinizing the agentic IS artifact's delegations. Another patient remarked that the likelihood of an individual developing these dependencies could be influenced or modulated by the nature and characteristics of the specific disease or condition they were dealing with.

4.3.2 Triadic Information Asymmetry

In the realm of information exchange, the concept of information asymmetry addresses the disparities in knowledge between different agents. In our case, we observed that both patients and doctors tend to lack a comprehensive understanding of the agentic IS artifact's attributes and vice versa. Consequently, the agentic IS artifact may not always have task-relevant information on par with humans. A delegation expert stated:

> *And what was at least a decisive factor for the performance was just how much people know about AI … And I imagine that this is also a factor the other way around, that if the AI [i.e., the agentic IS artifact] delegates to me, and I know more about the AI [i.e., the agentic IS artifact], maybe even more then in the specific now not in general but really the AI [i.e., the agentic IS artifact] that delegates. If I know how it works, then I'm more inclined to maybe accept things the AI [i.e., the agentic IS artifact] gives me and if I know something about the average performance. So, for example, if the doctor knows that the cancer diagnosis tool is ninety-nine percent accurate, he's more inclined to do what it [i.e., the agentic IS artifact] says than if he knows that it has a seventy percent accuracy or doesn't know anything about it. Knowing that it is higher would be more of a quasi-property of the AI [i.e., the agentic IS artifact], but I think simply knowing the partner I'm working with is crucial. It's the same with human-human delegation.*

The expert's statement indicates that the agentic capabilities of the agentic IS artifact widen information gaps between the agents within the triad. While information asymmetry per se is not a new phenomenon in agentic interaction, we show that the agentic capabilities of the agentic IS artifact not only induce information asymmetry between the agentic IS artifact and a human agent but also complicate information asymmetry between the human agents. For example, when an autonomously planned delegation of the agentic IS artifact to the patient conveys information that is relevant to the doctor's capabilities, the lack of mutual data sharing increases the doctor's information gap with the patient. This hampers future human-to-human delegations. Consequently, information-sharing about dyadic delegations with the third agent in the triad may be essential to avoid information asymmetries.

Additionally, we observed that doctors take a more cautious stance on unbridled access to patient data via the agentic IS artifact. One doctor stated:

> *This means, of course, that if the doctor has direct access to the data, he also has more immediate responsibility. Yes, because if I know that they [i.e., the patients] now suddenly have a liter in the bladder, I must act, exactly. I cannot only notice that [without doing something about it]. A doctor, for purely pragmatic reasons, would be very careful with the desire to have direct access to the app [i.e., the agentic IS artifact].*

Thus, clearly, the sheer volume of shared data is not always beneficial. Doctors would be unable to fulfill their responsibility of promptly assisting patients experiencing bladder overfilling if they were aware of every instance of overfilling. It is crucial to consider the motivations and preferences of all parties involved in the delegation process, ensuring a balanced approach to data-sharing, especially through effective communication of the agentic IS artifact.

4.3.3 Role Interference Conflicts

The integration of agentic IS artifacts within the medical domain is reshaping and sometimes blurring the traditional roles of medical professionals and patients. Agentic IS artifacts have the ability to emulate and even surpass specific capabilities traditionally held by both patients and doctors. Thus, this interference in established roles manifests in several dimensions of conflicts.

Central to role interference is the dilemma of obligation ambivalence. This dichotomy emerges from the challenge of discerning the primary beneficiary of an agentic IS artifact's actions. Agentic IS artifacts' foundational programming, which is inherently steered toward optimizing a specific directive (e.g., improving the state of health of a patient), raises a pivotal question: Whose interests does an agentic IS artifact serve? From the

empirical observations, there seems to be a tangible advantage in biasing the agentic IS artifact's operations toward medical professionals. Such a bias seemingly increases patients' trust. As one patient noted: "I guess both, you know [the agentic IS artifact should be optimized for both the doctor and the patient]. If you can win the doctor's trust [in the agentic IS artifact], it would probably be easier for the end user to trust [the agentic IS artifact]."

Delegation outcome contradictions are another facet of role interference. This concept encapsulates the inherent conflicts that arise owing to varying results from the delegation process, especially when both human and agentic IS artifacts are tasked simultaneously. A noteworthy observation is the contrasting nature of outcomes and the subsequent trust dynamics. While some patients may inherently favor decisions taken by their doctors, attributing value to human intuition and empathy, others consider IS-driven outcomes to be more robust, stemming from vast and precise data analytics. One patient highlighted the potential of this dynamic relationship:

> *But it [i.e., the agentic IS artifact] becomes better and better, so now I say that it [i.e., the agentic IS artifact] becomes the relevant cornerstone in this triangular relationship. Where you really say I really have two opinions that I can build up [from the doctor and the agentic IS artifact]. You can really act in different ways there somehow. So that the doctor can really work with the AI [i.e., the agentic IS artifact]. ... This can be helpful.*

As agentic IS artifacts enter the medical world, the traditional patient-doctor roles begin to shift. The resulting problems, whether regarding prioritizing tasks, conflicting delegation outcomes, or dynamic skill shifts, underscore the urgency of carefully structured integration that considers the interplays between human agency and AI autonomy.

5 Theory Development

Our findings shed light on triadic patient-IS-doctor relationships investigated through the lens of delegation. Our study underpins our claim that the agentic IS artifact creates novel phenomena not captured by delegation theory on dyadic human-to-IS delegation structures. However, a triadic delegation relationship is not just a set of three dyadic delegation relationships, and we recognize that triadic delegation creates novel role attributes, interaction patterns, and conflicts. The novel roles and interaction patterns enhance our theoretical understanding of triadic delegation, requiring theoretical embedding. We have elaborated on the relevant phenomena that were prevalent in our case and have unified them in a common theoretical concept, expanding existing delegation theory, as depicted in Figure 6.

Triadic delegations allow for interactions beyond the dyadic interactions of patients and doctors. In the shift from the dyadic patient-doctor relationship to the triadic patient-IS-doctor relationship, the patient-doctor relationship evolves, as the agentic IS artifact provides novel capabilities that both the patient and the doctor can exploit (e.g., monitoring of the bladder filling levels over long time periods). Both doctors and patients thereby an additional alternative for their delegation decisions, which leads to new delegation preferences. Our results support the theoretical view that a doctor's and a patient's preference to delegate a task to an agentic IS artifact significantly depends on their trust in the agentic IS artifact (Leyer & Schneider, 2019; Lorenzini et al., 2023), the risks associated with the delegation (Candrian & Scherer, 2022; Dominguez-Martinez et al., 2014), and the proxy's performance (Castelfranchi & Falcone, 1997, 1998). Beyond that, we recognize a notable influence of situational availability between the two delegation alternatives, resulting in new forms of delegation. For instance, being unable to consult a doctor in a given situation, a patient may prefer to receive a timely delegation outcome from an agentic IS artifact rather than waiting for the doctor to become available. Vice versa, a doctor may also want to delegate specific tasks to a temporarily unavailable patient and thus might prefer delegations to an agentic IS artifact. This phenomenon intensifies when humans delegate tasks that consist of frequent microdelegations (e.g., therapy recalibrations) to an agentic IS artifact rather than to the intended human proxy to overcome agentic unavailability and increase human efficiency. The consequence of having such a ubiquitous delegation alternative in the triad increases the delegation preference toward the agentic IS artifact.

The triadic delegation patterns are particularly relevant for theory since the agentic IS artifact acts neither as a proxy nor as a typical delegator when mediating or moderating delegations. In the first delegation pattern, the agentic IS artifact contributes to the human agent's delegation by coordinating and facilitating the delegation between the original delegator and the intended proxy. In the second pattern, the agentic IS artifact does not receive a delegation but is affected by human-to-human delegations. Accordingly, the triadic delegation patterns differ from existing delegation patterns and mechanisms, such as subdelegation and delegation chains (Burnett & Oren, 2012; Castelfranchi & Falcone, 1998; Yu et al., 2015). While moderation and mediation are existing concepts in IS research (Ågerfalk, 2020), describing how different components or entities shape interactions or outcomes within a sociotechnical system, they introduce novel theoretical perspectives within triadic delegation. In our theoretical model, we introduce the agentic IS artifact's mediation and moderation delegation patterns as a new perspective, which enhances agency within the triadic relationship.

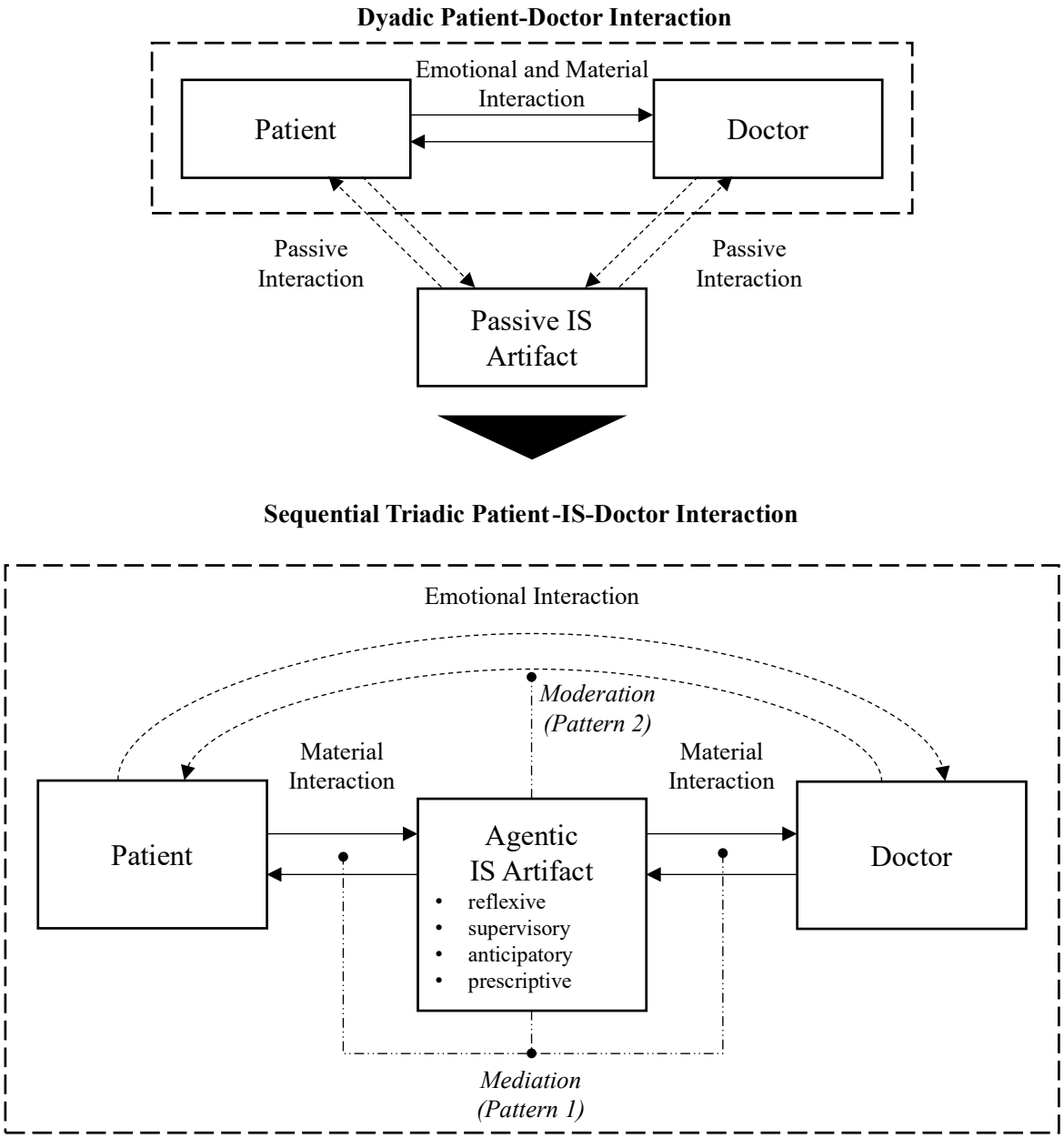

Figure 6. Shift From Dyadic Patient-Doctor Interactions to Sequential Triadic Interactions

Beyond triadic delegation patterns, we also recognize the agentic IS artifact's increasing delegator and proxy role in dyadic delegation. Based on our findings that the agentic IS artifact has significant attribute interferences with both the patient and the doctor and that it can perform increasingly complex tasks, we conclude that the agentic IS artifact has a pivotal role in the patient-IS-doctor relationship. We observed that the agentic IS artifact is capable of performing tasks that possess a high degree of decision-making latitude (i.e., anticipatory and prescriptive). The agentic IS artifact becomes a potential proxy for delegations previously held by humans. Besides tasks requiring a low degree of decision-making latitude (e.g., recording and documenting bladder activity), many of the previous human-to-human delegation tasks require high degrees of decision-making latitude (e.g., prediction of the need to void the bladder). In particular, the increasing autonomous capabilities of the agentic IS artifact enable tasks with higher degrees of decision-making latitudes (Baird & Maruping, 2021). With its various actions, the agentic IS artifact covers a wide range—from reflexive to prescriptive agentic archetypes—of the agency continuum (refer to Appendix D for a detailed overview of the actions of the agentic IS artifact presented in Chapter 4 and their respective agentic archetype). The

agentic IS artifact not only exhibits reflexive (e.g., warning the patient when the sensor is ill-positioned or has no contact with the body) and supervisory (e.g., managing whether the user emptied the bladder) agentic archetypes but also anticipatory (e.g., reminding patients of sufficient liquid intake when bladder filling rate is low) and prescriptive (e.g., prescribing patients to empty their bladder) agentic archetypes. Thus, our results indicate human agents' increasing interaction via the agentic IS artifact that plays the role of a proxy or delegator. In contrast, only limited delegations may remain without the involvement of the agentic IS artifact. Primarily, delegations with empathetic relevance tend to be preferably delegated directly between a patient and a doctor (i.e., emotional interactions) without the involvement of the agentic IS artifact, while material tasks tend to be delegated with the involvement of the agentic IS artifact (i.e., material interactions). This might be explained by the fact that human agents still possess exclusive agentic capabilities in terms of unique emotional intelligence, which agentic IS artifacts do not currently have.

Considering the high degree of decision-making latitude (i.e., anticipatory and prescriptive) of the agentic IS artifact in the patient-IS-doctor relationship, we propose that the agent relationship evolves into a sequence of doctor, agentic IS artifact, and patient rather than taking the shape of an equilateral triangle. Based on increased agency, most of the tasks can be moderated or mediated by the agentic IS artifact (i.e., human-IS-human) or delegated between the agentic IS artifact and one human (i.e., human-IS and IS-human). While this phenomenon supports the view that the agent's attributes are distributed asymmetrically among the human and IS agents (Baird & Maruping, 2021; Ross et al., 1997), it also confirms the theoretical understanding of IS agents achieving an agency level equivalent to that of humans. Consequently, while the hierarchical superiority is neither static nor expressed in all facets of the patient-IS-doctor relationship (e.g., de facto medical decision-making power may remain with the doctor and the patient), the delegation behavior channels through the agentic IS artifact as a central entity. As such, the agentic IS artifact contributes to balancing the asymmetric distribution of agentic attributes while fostering the individual agentic capabilities within the agentic triad.

6 Discussion

6.1 Theoretical Contributions

Our theoretical contribution is twofold, applicable to the domains of healthcare and agentic IS. First, we expand the theoretical understanding of how agentic IS artifacts affect the formerly dyadic patient-doctor relationship. In doing so, we theorize the integration of agentic IS artifacts into healthcare delivery as an emerging health phenomenon. Second, we contribute to IS theory by investigating our healthcare case through the lens of IS delegation. We thereby identify triadic delegations between humans and an agentic IS artifact. Based on our theoretical advancements, we derive a theoretical framework of triadic delegation between patients, doctors, and agentic IS artifacts in healthcare delivery.

In our study, we investigated how the increased agency of the agentic IS artifacts affects the relationship between patients and doctors. Building on the existing concepts of IS agency, we recognize that the new forms of IS agency primarily rely on the IS agent's autonomous capabilities and permeate through the different facets of IS agency. This reliance allows the IS agent to expand its scope of action along with an increasing degree of decision-making latitude (i.e., anticipatory and prescriptive). However, possessing a high degree of decision-making latitude alone does not essentially make the agentic IS artifact more agentic than conventional IS. Instead, the high decision-making latitude must contribute either to the agentic IS agent's advanced task capacity (i.e., expanding the task scope) or its inherent planning capabilities to act independently of direct human inquiry (i.e., expanding the agentic IS artifact's ability to adapt its internal state dynamically) to account for more rights and responsibilities. By obtaining more rights and responsibilities, the IS artifact can be transformed from its passive role to the role of an active agent with increased agency. Besides contributing to the healthcare domain, our theoretical advancements also contribute to IS theory, particularly IS delegation theory. Theorizing the patient-IS-doctor relationship through the theoretical lens of delegation enabled us to expand the theory regarding the agents' attributes and interactions. Our work supports recent theory contributions suggesting that agentic IS artifacts are no longer subordinate to human agents (Ågerfalk, 2020; Baird & Maruping, 2021; Candrian & Scherer, 2022). Beyond that, our theoretical advancements illustrate that the agentic IS artifact's agency may be on an equal footing with human agency in terms of delegation involvement, transforming the agents' equilateral triangle into a sequential triad.

Our research also extends past inquiries in healthcare that theorize relevant effects of IS on patient-doctor interaction and healthcare delivery using IS artifacts (Cresswell et al., 2010; Fichman et al., 2011; Weiner & Biondich, 2006). In line with more recent research that sheds light on the effects of agentic IS artifacts on the patient-doctor relationship by pointing out novel forms of collaboration and agentic hierarchies (Lorenzini et al., 2023; Sauerbrei et al., 2023; Triberti et al., 2020), we recognize the potential of agentic IS artifacts to transform existing dyadic interactions. Lorenzini et al. (2023) highlight the opportunity of achieving shared decision-making within the agentic triad while pointing out the risk that the agentic IS artifact may undermine shared decision-making. Our results corroborate the

potential of agentic IS artifacts to improve shared decision-making by promoting patient autonomy and learning. However, the integration of the agentic IS artifact can still threaten shared decision-making, owing to the delegation involvement of the agentic IS artifact and the risk of information asymmetries.

Moreover, our results extend existing theories about conflicts in triadic patient-IS-doctor interactions. Triberti et al. (2020) proposed three unique conflicts: role ambiguities, decision paralysis, and lack of agentic understanding. According to Triberti et al., agents can suffer from facing multiple or conflicting opinions from several proxies, requiring lengthy evaluation for resolution. Furthermore, a lack of agentic understanding and agentic ambiguities can lead to information misinterpretation and agentic aversion. While our results confirm the third-wheel effects of Triberti et al., we provide further explanations and theoretical grounding for the conflicts in triadic interaction. Furthermore, the conflicts of Triberti et al. predominantly focus on agentic heterogeneities. In contrast, our theoretical contribution not only provides conflicts arising from agentic heterogeneity but also from the attribute interferences of agents (Ågerfalk, 2020; Baird & Maruping, 2021; Candrian & Scherer, 2022).

6.2 Practical Implications

While agentic IS artifacts create many opportunities for improved healthcare outcomes, they also introduce new challenges. We illustrate the most important practical implications for designers of agentic IS artifacts and policymakers derived from our case study.

Designers set the solution space for decisions of agentic IS artifacts prior to their deployment. Accordingly, potential conflicts can be addressed by the designers of agentic IS artifacts. Our findings show that the agentic IS artifact must be informed of relevant interactions in the triad if it is to provide efficient support. Designers should ensure that the implementation of agentic IS artifacts supports the delegation dynamics between human entities, even if the agentic IS artifact is not directly involved. Second, with the emergent sequentialization of the patient-IS-doctor triad, designers must be cautious of role interference. While it is essential for an agentic IS artifact to assume an active or a passive role in delegation processes, it is equally vital to prevent an agentic IS artifact from taking on roles that should be exclusive to either the patient or the doctor (e.g., empathetic roles). Thus, designers should implement the underlying responsibilities, rights, and operational boundaries of agentic IS artifacts prior to their deployment to avoid the development of unintended interferences.

The mediating and moderating behaviors of agentic IS artifacts also have implications for regulators. In our case, the agentic IS artifact actively interacts with both doctors and patients, offering the potential to alleviate symptoms and provide decision support, therapeutics, and diagnostics. Thus, it would be designated as a medical device within the stipulations of the European Medical Device Regulation (MDR) (EUR-Lex, 2017) and the Federal Food, Drug, and Cosmetic Act in the U.S. (FDA, 2018). AI heralds a spectrum of potential applications. However, they are not unequivocally accepted by regulations. A fundamental requirement for the adoption of and trust in agentic IS artifacts is their adherence to national medical device regulations, aimed at circumventing biases and ensuring safety and data protection (Minssen et al., 2020). Our findings present an evolved triadic relationship, with the agentic IS artifact adopting a proactive intermediate role, engaging in both the reception and assignment of delegation. The identified conflicts that result from this dynamic should be regarded as relevant aspects to be considered by regulatory authorities when developing future directives for the integration of agentic IS artifacts in healthcare. Particularly salient are challenges encompassing autonomy and the multifaceted nuances of data-related discord, spanning issues of information barriers, asymmetrical knowledge dissemination, and data transmission protocols. Thus, we advise regulators to consider the nuanced autonomy conflict highlighted in this study when framing guidelines for the autonomy of agentic IS artifacts across the various medical device classifications (Mezrich, 2022). In line with the insights of Price and Cohen (2019), the discourse suggests that while ensuring patient comfort with data provision remains vital, the regulatory frameworks must not inhibit the validation and trust-building processes for agentic AI artifacts that thrive on this very data. Thus, it is imperative to seek balance in endorsing data practices needed for the operation of agentic IS artifacts while safeguarding data privacy.

6.3 Limitations and Future Research

Our study has limitations. The setup of the study featured only one singular agentic IS artifact in conjunction with two human agents. While this may be a common scenario in patient-doctor relationships, alternative setups are also possible, specifically those involving two agentic IS artifacts interacting with one human (e.g., patients maintaining a triadic delegation relationship with one agentic IS artifact for bladder management and another agentic IS artifact for another medical role, such as blood glucose management). Such scenarios could introduce a markedly different dynamic to that revealed in our study (e.g., due to interdependencies). Further, we anchored our research on the premise of an agentic IS artifact in the form of a pre-market research device, which is one of the first AI-enabled health companions that has been developed in the field of urinary bladder monitoring. In hypothetical scenarios, where the agentic IS artifact would remain passive and nondisruptive in its engagement with

established roles, the emergent dynamics may vary significantly from what we observed. Our reliance on a single-case study of an emerging phenomenon, while providing depth, also involves inherent constraints regarding the robustness and generalizability of our derived theory (Eisenhardt & Graebner, 2007; Lee, 1989). Given these constraints, we propose several avenues for future inquiry: Researchers might consider adopting a multi-case study approach to test our findings' generalizability. They could explore the nuanced effects of triadic delegation on both the quality of outcomes and the intricacies of undirected information flows. Furthermore, while we deliberately did not focus on delegation tasks, future research might benefit from investigating the evolution of tasks regarding their content and complexity, and how triadic delegation affects the constitution of tasks.

.

7 Conclusion

The integration of agentic IS artifacts into healthcare IS is reshaping the traditional dyadic relationship between patients and doctors. Our case study revealed that while agentic IS artifacts offer enhanced healthcare delivery and advanced interaction patterns, they also introduce relevant changes in the relationships between the agents as well as novel challenges and conflicts. Employing phenomenon-based theorizing, our research illuminates how the integration of agentic IS artifacts affects the traditional patient-doctor relationship. More specifically, our work shows how the triadic patient-IS-doctor relationship evolves into a sequential triad of patient, agentic IS artifact, and doctor, emphasizing the importance of understanding the evolving dynamics it introduces into the patient-doctor relationship.

References

Agarwal, R., Dugas, M., & Gao, G. (2024). Augmenting physicians with artificial intelligence to transform healthcare: Challenges and opportunities. *Journal of Economics & Management Strategy*, *33*(2), 360-374.

Ågerfalk, P. J. (2020). Artificial intelligence as digital agency. *European Journal of Information Systems*, *29*(1), 1-8.

Baird, A., & Maruping, L. (2021). The next generation of research on IS use: A theoretical framework of delegation to and from agentic IS artifacts. *MIS Quarterly*, *45*(1), 315-341.

Baskerville, R. L., Myers, M. D., & Yoo, Y. (2020). Digital first: The ontological reversal and new challenges for information systems research. *MIS Quarterly*, *44*(2), 509-523.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, *11*(3), 369-386

Berente, N., Gu, B., Recker, J., & Santhanam, R. (2021). Managing Artificial Intelligence. *MIS Quarterly*, *45*(3), 1433-1450.

Berg, M. (2001). Implementing information systems in health care organizations: Myths and challenges. *International Journal of Medical Informatics*, *64*(2-3), 143-156.

Berger, A., Goldstine, J., Hofstad, C., Inglese, G. W., Kirschner-Hermanns, R., MacLachlan, S., Shah, S., Vos-van der Hulst, M., & Weiss, J. (2022). Incidence of urinary tract infection following initiation of intermittent catheterization among patients with recent spinal cord injury in Germany and the Netherlands. *The Journal of Spinal Cord Medicine*, *45*(3), 461-471.

Borch, C. (2022). Machine learning, knowledge risk, and principal-agent problems in automated trading. *Technology in Society*, *68*, Article 101852.

Botrugno, C. (2021). Information technologies in healthcare: Enhancing or dehumanising doctor-patient interaction? *Health*, *25*(4), 475-493.

Burnett, C., & Oren, N. (2012). Sub-delegation and Trust. *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems*.

Burton-Jones, A., Stein, M.-K., & Mishra, A. (2017). *IS use.* MIS Quarterly Research Curations. https://www.misqresearchcurations.org/blog/2017/12/1/is-use

Candrian, C., & Scherer, A. (2022). Rise of the machines: Delegating decisions to autonomous AI. *Computers in Human Behavior*, *134*, Article 107308.

Čartolovni, A., Malešević, A., & Poslon, L. (2023). Critical analysis of the AI impact on the patient-physician relationship: A multi-stakeholder qualitative study. *Digital Health*, *9*. https://doi.org/10.1177/20552076231220833

Castelfranchi, C. (1998). Modelling social action for AI agents. *Artificial Intelligence*, *103*(1-2), 157-182.

Castelfranchi, C., & Falcone, R. (1997). From task delegation to role delegation. *Proceedings of the 5th Congress of the Italian Association for Artificial Intelligence* (pp. 278-289).

Castelfranchi, C., & Falcone, R. (1998). Towards a theory of delegation for agent-based systems. *Robotics and Autonomous Systems*, *24*(3-4), 141-157.

Cecez-Kecmanovic, D., Galliers, R., Henfridsson, O., Newell, S., & Vidgen, R. (2014). The sociomateriality of information systems: current status, future directions. *MIS Quarterly*, *38*(3), 809-830.

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., Morton, S. C., & Shekelle, P. G. (2006). Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care. *Annals of Internal Medicine*, *144*(10), 742-752.

Conte, R., & Castelfranchi, C. (1995). *Cognitive and social action*. UCL Press.

Cresswell, K. M., Worth, A., & Sheikh, A. (2010). Actor-Network Theory and its role in understanding the implementation of information technology developments in healthcare. *BMC Medical Informatics and Decision Making*, *10*(1), Article 67.

Dattathrani, S., & De', R. (2023). The Concept of Agency in the Era of Artificial Intelligence: Dimensions and Degrees. *Information Systems Frontiers*, *25*(1), 29-54.

Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future Healthcare Journal*, *6*(2), 94-98.

Demetis, D., & Lee, A. (2018). When humans using the IT artifact becomes IT using the human artifact. *Journal of the Association for Information Systems*, *19*(10), 929-952.

Dennis, A. R., Lakhiwal, A., & Sachdeva, A. (2023). AI agents as team members: Effects on satisfaction, conflict, trustworthiness, and willingness to work with. *Journal of Management Information Systems*, *40*(2), 307-337.

Dik, P., Klijn, A. J., van Gool, J. D., de Jong-de Vos van Steenwijk, C. C. E., & de Jong, T. P. V. M. (2006). Early start to therapy preserves kidney function in spina bifida patients. *European Urology*, *49*(5), 908-913.

Dominguez-Martinez, S., Sloof, R., & von Siemens, F. A. (2014). Monitored by your friends, not your foes: Strategic ignorance and the delegation of real authority. *Games and Economic Behavior*, *85*, 289-305.

Dorsher, P. T., & McIntosh, P. M. (2012). Neurogenic bladder. *Advances in Urology*, *2012*, Article 816274.

Dubé, L., & Paré, G. (2003). Rigor in information systems positivist case research: Current practices, trends, and recommendations. *MIS Quarterly*, *27*(4), 597-636.

Dung, L. (2024). Understanding artificial agency. *Philosophical Quarterly, 75*(2), 450-472

Dunne, E., Santorelli, A., McGinley, B., Leader, G., O'Halloran, M., & Porter, E. (2018). Image-based classification of bladder state using electrical impedance tomography. *Physiological Measurement*, *39*(12), Article 124001.

Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review*, *14*(4), 532-550.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25-32.

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962-1023.

EUR-Lex. (2017). *Regulation (EU) 2017/745.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0745

Fechner, P., König, F., Kratsch, W., Lockl, J., & Röglinger, M. (2023). Near-infrared spectroscopy for bladder monitoring: A machine learning approach. *ACM Transactions on Management Information Systems*, *14*(2), 1-23.

FDA. (2018). *Federal Food, Drug, and Cosmetic Act (FD&C Act).* https://www.fda.gov/regulatory-information/laws-enforced-fda/federal-food-drug-and-cosmetic-act-fdc-act

Fernández Domingos, E., Terrucha, I., Suchon, R., Grujić, J., Burguillo, J. C., Santos, F. C., & Lenaerts, T. (2022). Delegation to artificial agents fosters prosocial behaviors in the collective risk dilemma. *Scientific Reports*, *12*(1), Article 8492.

Fichman, R. G., Kohli, R., & Krishnan, R. (2011). Editorial overview—The role of information systems in healthcare: Current research and future trends. *Information Systems Research*, *22*(3), 419-428.

Fisher, G., Mayer, K., & Morris, S. (2021). From the editors: Phenomenon-based theorizing. *The Academy of Management Review*, *46*(4), 631-639.

Fuegener, A., Grahl, J., Gupta, A., & Ketter, W. (2022). Cognitive challenges in human-artificial intelligence collaboration: Investigating the path toward productive delegation. *Information Systems Research*, *33*(2), 678-696.

Fuegener, A., Grahl, J., Gupta, A., Ketter, W., & Taudien, A. (2021). Exploring User heterogeneity in human delegation behavior towards AI. *Proceedings of the International Conference on Information Systems*.

Fulk, J., Schmitz, J., & Steinfield, C. (1990). A social influence model of technology use. In *Organizations and Communication Technology* (pp. 117-140). SAGE

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Polity.

Ginsberg, D. A., Boone, T. B., Cameron, A. P., Gousse, A., Kaufman, M. R., Keays, E., Kennelly, M. J., Lemack, G. E., Rovner, E. S., Souter, L. H., Yang, C. C., & Kraus, S. R. (2021). The AUA/SUFU guideline on adult neurogenic lower urinary tract dysfunction: Diagnosis and evaluation. *The Journal of Urology*, *206*(5), 1097-1105.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research. *Organizational Research Methods*, *16*(1), 15-31.

Gray, M., Rayome, R., & Anson, C. (1995). Incontinence and clean intermittent catheterization following spinal cord injury. *Clinical Nursing Research*, *4*(1), 6-18; discussion 19-21.

Gregory, R. W., & Henfridsson, O. (2021). Bridging art and science: Phenomenon-driven theorizing. *Journal of the Association for Information Systems*, *22*(6), 1509-1523.

Grüning, M., Henkenjohann, R., Pinto dos Santos, D., & Trenz, M. (2023). Artificial intelligence, technostress and work outcomes in healthcare: A power perspective on AI characteristics. *Proceedings of the International Conference on Information Systems*.

Guggenberger, T., Lämmermann, L., Urbach, N., Walter, A. M., & Hofmann, P. (2023). Task delegation from AI to humans: A principal-agent perspective. *Proceedings of the International Conference on Information Systems*.

Hansen, R. B., Biering-Sørensen, F., & Kristensen, J. K. (2010). Urinary incontinence in spinal cord injured individuals 10-45 years after injury. *Spinal Cord*, *48*(1), 27-33.

Hanseth, O., Aanestad, M., & Berg, M. (2004). Guest editors' introduction: Actor-network theory and information systems. What's so special? *Information Technology & People*, *17*(2), 116-123.

Haux, R. (2006). Health information systems—past, present, future. *International Journal of Medical Informatics*, *75*(3-4), 268-281.

Hemmer, P., Westphal, M., Schemmer, M., Vetter, S., Vössing, M., & Satzger, G. (2023). Human-AI collaboration: The effect of AI delegation on human task performance and task satisfaction. *Proceedings of the 28th International Conference on Intelligent User Interfaces* (pp. 453-463).

Herath Pathirannehelage, S., Shrestha, Y. R., & von Krogh, G. (2024). Design principles for artificial intelligence-augmented decision making: An action design research study. *European Journal of Information Systems. 34*(2), 207–229.

Hofstetter, S., Zilezinski, M., Wolf, A., Behr, D., Paulicke, D., Stoevesandt, D., Schwarz, K., Schönburg, S., & Jahn, P. (2023). Dfree ultrasonic sensor in supporting quality of life and patient satisfaction with bladder dysfunction. *International Journal of Urological Nursing*, *17*(1), 62-69.

Husairi, M. A., & Rossi, P. (2024). Delegation of purchasing tasks to AI: The role of perceived choice and decision autonomy. *Decision Support Systems*, *179.* Article 114166.

Igawa, Y., Wyndaele, J.-J., & Nishizawa, O. (2008). Catheterization: Possible complications and their prevention and treatment. *International Journal of Urology*, *15*(6), 481-485.

Jendle, J., & Reznik, Y. (2023). Use of insulin pumps and closed-loop systems among people living with diabetes: A narrative review of clinical and cost-effectiveness to enable access to technology and meet the needs of payers. *Diabetes, Obesity & Metabolism*, *25*(Suppl 2), 21-32.

Jennings, N. R., Sycara, K., & Wooldridge, M. (1998). A roadmap of agent research and development. *Autonomous Agents and Multi-Agent Systems*, *1*(1), 7-38.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305-360.

Jeyaraj, A., & Zadeh, A. H. (2020). Evolution of information systems research: Insights from topic modeling. *Information & Management*, *57*(4), Article 103207.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. *Stroke and Vascular Neurology*, *2*(4), 230-243.

Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation mixed-methods study. *JMIR Mhealth Uhealth*, *6*(11), Article e12106.

Jonas, C., Lockl, J., Röglinger, M., & Weidlich, R. (2023). Designing a wearable IoT-based bladder level monitoring system for neurogenic bladder patients. *European Journal of Information Systems*, *33*(6), 993–1015.

Kasperbauer, T. J. (2021). Conflicting roles for humans in learning health systems and AI-enabled healthcare. *Journal of Evaluation in Clinical Practice*, *27*(3), 537-542.

Khumalo, A., & Gharaie, A. (2023). Implications of including the developer in the IS delegation framework. *Selected Papers of the Information Systems Research Seminar in Scandinavia (IRIS).*

Kim, E.-S. (2020). Deep learning and principal-agent problems of algorithmic governance: The new materialism perspective. *Technology in Society*, *63*, Article 101378.

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, *23*(1), 67-93.

Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2021). Digital transformation in healthcare: Analyzing the current state-of-research. *Journal of Business Research*, *123*, 557-567.

Kristiansen, N. K., Djurhuus, J. C., & Nygaard, H. (2004). Design and evaluation of an ultrasound-based bladder volume monitor. *Medical & Biological Engineering & Computing*, *42*(6), 762-769.

von Krogh, G. (2018). Artificial intelligence in organizations: new opportunities for phenomenon-based theorizing. *Academy of Management Discoveries*, *4*(4), 404-409.

Lanza, F., Seidita, V., & Chella, A. (2020). Agents and robots for collaborating and supporting physicians in healthcare scenarios. *Journal of Biomedical Informatics*, *108*, Article 103483.

Lapides, J., Diokno, A. C., Silber, S. J., & Lowe, B. S. (1972). Clean, intermittent self-catheterization in the treatment of urinary tract disease. *The Journal of Urology*, *107*(3), 458-461.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press.

Lee, A. S. (1989). A Scientific Methodology for MIS Case Studies. *MIS Quarterly*, *13*(1), 33-50.

Lee, J. D., & Moray, N. (1994). Trust, self-confidence, and operators' adaptation to automation. *International Journal of Human-Computer Studies*, *40*(40), Article 1, 153-184.

Légaré, F., Stacey, D., Turcotte, S., Cossi, M.-J., Kryworuchko, J., Graham, I. D., Lyddiatt, A., Politi, M. C., Thomson, R., Elwyn, G., & Donner-Banzhoff, N. (2014). Interventions for improving the adoption of shared decision making by healthcare professionals. *The Cochrane Database of Systematic Reviews*, 9, Article CD006732.

Légaré, F., & Thompson-Leduc, P. (2014). Twelve myths about shared decision making. *Patient Education and Counseling*, *96*(3), 281-286.

Leonardi, P. M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, *35*(1), 147-167.

Leonardi, P. M. (2013). Theoretical foundations for the study of sociomateriality. *Information and Organization*, *23*(2), 59-76.

Leyer, M., & Schneider, S. (2019). Me, you or AI? How do we feel about delegation. *Proceedings of the European Conference on Information Systems.*

Lockl, J., Schick, D., Stoetzer, J., & Huff, K. (2022). A model to assess the impact of digital technologies on the health-related quality of life. *International Journal of Technology Assessment in Health Care*, *38*(1), Article e81.

Logg, J. M., Minson, J. A., & Moore, D. A. (2019). Algorithm appreciation: People prefer algorithmic to human judgment. *Organizational Behavior and Human Decision Processes*, *151*, 90-103.

Lorenzini, G., Arbelaez Ossa, L., Shaw, D. M., & Elger, B. S. (2023). Artificial intelligence and the doctor-patient relationship expanding the paradigm of shared decision making. *Bioethics*, *37*(5), 424-429.

Lubars, B., & Tan, C. (2019). Ask not what AI can do, but what AI should do: Towards a framework of task delegability. *Proceedings of the 33rd International Conference on Neural Information Processing Systems.*

Lyytinen, K., Nickerson, J. V., & King, J. L. (2021). Metahuman systems = humans plus machines that learn. *Journal of Information Technology*, *36*(4), 427-445.

Madersbacher, H. (1990). The various types of neurogenic bladder dysfunction: An update of current therapeutic concepts. *Paraplegia*, *28*(4), 217-229.

Maimbo, H., & Pervan, G. (2005). Designing a Case Study Protocol for Application in IS Research. *Proceedings of the Pacific Asia Conference on Information Systems*.

Mezrich, J. L. (2022). Is artificial intelligence (AI) a pipe dream? Ahy legal issues present significant hurdles to AI autonomy. *American Journal of Roentgenology*, *219*(1), 152-156.

Minssen, T., Gerke, S., Aboy, M., Price, N., & Cohen, G. (2020). Regulatory responses to medical machine learning. *Journal of Law and the Biosciences*, *7*(1), Article lsaa002.

Möhlmann, M., Salge, C. A. d. L., & Marabelli, M. (2023). Algorithm sensemaking: How platform workers make sense of algorithmic management. *Journal of the Association for Information Systems*, *24*(1), 35-64.

Mueller, M., Heger, O., Kordyaka, B., & Niehaves, B. (2019). Investigating the influence of information incongruity on trust-relations within trilateral healthcare settings. *Wirtschaftsinformatik Proceedings*.

Murray, A., Rhymer, J., & Sirmon, D. G. (2021). Humans and technology: Forms of conjoined agency in organizations. *Academy of Management Review*, *46*(3), 552-571.

Oh, S.-J., Shin, H.-I., Paik, N.-J., Yoo, T., & Ku, J. H. (2006). Depressive symptoms of patients using clean intermittent catheterization for neurogenic bladder secondary to spinal cord injury. *Spinal Cord*, *44*(12), 757-762.

Orlikowski, W. J. (2005). Material works: Exploring the situated entanglement of technological performativity and human agency. *Scandinavian Journal of Information System*, *17*(1), 183-186.

Orlikowski, W. J., & Iacono, C. S. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research*, *12*(2), 121-134.

Pinski, M., Adam, M., & Benlian, A. (2023). AI knowledge: Improving AI delegation through human enablement. *Proceedings of the CHI Conference on Human Factors in Computing Systems.*

Ploug, T., & Holm, S. (2020). The four dimensions of contestable AI diagnostics: A patient-centric approach to explainable AI. *Artificial Intelligence in Medicine*, *107*, Article 101901.

Price, W. N., & Cohen, I. G. (2019). Privacy in the age of medical big data. *Nature Medicine*, *25*(1), 37-43.

Reichmuth, M., Schurle, S., & Magno, M. (2020). A Non-invasive wearable bioimpedance system to wirelessly monitor bladder filling. *Proceedings of the Design, Automation & Test in Europe Conference & Exhibition.*

Ross, W. T., Anderson, E., & Weitz, B. (1997). Performance in principal-agent dyads: The causes and consequences of perceived asymmetry of commitment to the relationship. *Management Science*, *43*(5), 680-704.

Rozensky, R. H., Tovian, S. M., Gartley, C. B., Nichols, T. R., & Layton, M. (2013). A quality of life survey of individuals with urinary incontinence who visit a self-help website: Implications for those seeking healthcare information. *Journal of Clinical Psychology in Medical Settings*, *20*(3), 275-283.

Sauerbrei, A., Kerasidou, A., Lucivero, F., & Hallowell, N. (2023). The impact of artificial intelligence on the person-centred, doctor-patient relationship: Some problems and solutions. *BMC Medical Informatics and Decision Making*, *23*, Article 73.

Schlosser, M. (2015). Agency. *Stanford Encyclopia of Philsophy* https://plato.stanford.edu/entries/agency/?trk=public_post_comment-text

Schmitt, A., Zierau, N., Janson, A., & Leimeister, J. M. (2023). The Role of AI-Based Artifacts' Voice Capabilities for Agency Attribution. *Journal of the Association for Information Systems*, *24*(4), 980-1004.

Schuetz, S., & Venkatesh, V. (2020). The rise of human machines: How cognitive computing systems challenge assumptions of user-system interaction. *Journal of the Association for Information Systems, 21*(2), 460-482.

Schurch, B., Schmid, D. M., & Stöhrer, M. (2000). Treatment of neurogenic incontinence with botulinum toxin A. *The New England Journal of Medicine*, *342*(9), Article 665.

Scott, D., & Purves, I. N. (1996). Triadic relationship between doctor, computer and patient. *Interacting with Computers*, *8*(4), 347-363.

Sechrest, R. C. (2010). The internet and the physician-patient relationship. *Clinical Orthopaedics and Related Research*, *468*(10), 2566-2571.

Shademan, A., Decker, R. S., Opfermann, J. D., Leonard, S., Krieger, A., & Kim, P. C. W. (2016). Supervised autonomous robotic soft tissue surgery. *Science Translational Medicine*, *8*(337), Article 337ra64.

Shapiro, S. P. (2005). Agency Theory. *Annual Review of Sociology*, *31*(1), 263-284.

Shepherd, D. A., & Sutcliffe, K. M. (2011). Inductive top-down theorizing: A source of new theories of organization. *Academy of Management Review*, *36*(2), 361-380.

Sichman, J. S., Conte, R., Demazeau, Y., & Castelfranchi, C. (1997). A social reasoning mechanism based on dependence networks. In M. N. Huhns & M. P. Singh (Eds.), *Readings in agents* (pp. 416-420). Morgan Kaufmann.

Spruit, M., & Lytras, M. (2018). Applied data science in patient-centric healthcare: Adaptive analytic systems for empowering physicians and patients. *Telematics and Informatics*, *35*(4), 643-653.

Stelmaszak, M., Möhlmann, M., & Sørensen, C. (2024). When algorithms delegate to humans: Exploring human-algorithm interaction at Uber. *MIS Quarterly*, *49*(1), 305–330.

Tanaka, M., Matsumura, S., & Bito, S. (2023). Roles and competencies of doctors in artificial intelligence implementation: Qualitative analysis through physician interviews. *JMIR Formative Research*, *7*, Article e46020.

Taudien, A., Fuegener, A., Gupta, A., & Ketter, W. (2022). Calibrating users' mental models for delegation to AI. *Proceedings of the International Conference on Information Systems*.

Tian, S., Yang, W., Le Grange, J. M., Wang, P., Huang, W., & Ye, Z. (2019). Smart healthcare: making medical care more intelligent. *Global Health Journal*, *3*(3), 62-65.

Triberti, S., Durosini, I., & Pravettoni, G. (2020). A "Third Wheel" Effect in Health Decision Making Involving Artificial Entities: A Psychological Perspective. *Frontiers in Public Health*, *8*, Article 117.

Tudor, K. I., Sakakibara, R., & Panicker, J. N. (2016). Neurogenic lower urinary tract dysfunction: Evaluation and management. *Journal of Neurology*, *263*(12), 2555-2564.

van der Linden, S., Sevastjanova, R., Funk, M., & El-Assady, M. (2023). MediCoSpace: Visual decision-support for doctor-patient consultations using medical concept spaces from EHRs. *ACM Transactions on Management Information Systems*, *14*(2), 1-20.

van Leuteren, P. G., Nieuwhof-Leppink, A. J., & Dik, P. (2019). Sens-U: Clinical evaluation of a full-bladder notification—A pilot study. *Journal of Pediatric Urology*, *15*(4), 381.e1-381.e5. https://doi.org/10.1016/j.jpurol.2019.04.006

Verpoorten, C., & Buyse, G. M. (2008). The neurogenic bladder: Medical treatment. *Pediatric Nephrology*, *23*(5), 717-725.

Vettoretti, M., Cappon, G., Facchinetti, A., & Sparacino, G. (2020). Advanced diabetes management using artificial intelligence and continuous glucose monitoring sensors. *Sensors*, *20*(14), Article 3870.

Wager, K. A., Lee, F. W., & Glaser, J. P. (2022). *Health care information systems: A practical approach for health care management* (5th ed.). Jossey-Bass.

Walsham, G. (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, *4*(2), 74-81.

Weiner, M., & Biondich, P. (2006). The influence of information technology on patient-physician relationships. *Journal of General Internal Medicine*, *21*(Suppl 1), 35-39.

Wooldridge, M. J. (2009). *An introduction to multiagent systems* (2nd ed.). Wiley.

Wu, S. A., Wang, R. E., Evans, J. A., Tenenbaum, J. B., Parkes, D. C., & Kleiman-Weiner, M. (2021). Too many cooks: Bayesian inference for coordinating multi-agent collaboration. *Topics in Cognitive Science*, *13*(2), 414-432.

Wyndaele, J.-J., Brauner, A., Geerlings, S. E., Bela, K., Peter, T., & Bjerklund-Johanson, T. E. (2012). Clean intermittent catheterization and urinary tract infection: Review and guide for future research. *BJU International*, *110*(11C), E910-E917.

Yeow, A., & Goh, K. H. (2015). Work harder or work smarter? Information technology and resource allocation in healthcare processes. *MIS Quarterly*, *39*(4), 763-786.

Yu, H., Miao, C., Shen, Z., Leung, C., Chen, Y., & Yang, Q. (2015). Efficient task sub-delegation for crowdsourcing. *Proceedings of the AAAI Conference on Artificial Intelligence*.

Zhang, Z., Yoo, Y., Lyytinen, K., & Lindberg, A. (2021). The unknowability of autonomous tools and the liminal experience of their use. *Information Systems Research*, *32*(4), 1192-1213.

Appendix A: Rigor Criteria

Table A1. Overview of Rigor Criteria Applied During Our Research (adapted from Dubé & Paré, 2003)

Area 1: Research design		
Clear research question	X	We asked: *How do agentic IS artifacts affect the dyadic patient-doctor relationship in patient-centric healthcare delivery?*
A priori specification of constructs	X	We relied on the theoretical constructs provided by our theoretical lens (Baird & Maruping, 2021).
Clean theoretical slate	X	We relied on delegation theory, agency theory, and dedicated domain consideration through patient-doctor-computer theory.
Multiple-case design		N/A.
Nature of single-case design	X	We leveraged unique research access to an AI-enabled bladder monitoring tool.
Unit of analysis	X	Our unit of analysis is an AI-enabled bladder monitoring tool for patients affected by neurogenic lower urinary tract dysfunction.
Pilot case	X	We conducted a pilot study at the start of our research.
Context of case study	X	We provided a comprehensive description of the agentic IS artifact being studied and its context in triadic delegation in healthcare.
Team-based research	X	We held discussion rounds for all data collection steps prior to data collection. All the authors were involved in the data analysis.
Different roles for multiple investigators	X	We assigned different roles to each author. Exemplary roles included conducting interviews (Authors 1 and 2), coding (Authors 1, 2, and 3), and reviewing and discussing findings (Authors 4, 5, and 6).
Area 2: Data collection		
Elucidation of the data collection process	X	We provided a detailed description of our data collection procedure.
Multiple data collection methods	X	We used interviews, meeting notes, observations, and document analysis for our data collection.
Mix qualitative and quantitative data		N/A.
Data triangulation	X	We conducted data source triangulation of interviews, observations, notes, and documents.
Case study protocol	X	We followed a case study protocol that we adapted from Maimbo and Pervan (2005).
Case study database	X	A summary of our data appears in Figure 1.
Area 3: Data analysis		
Elucidation of the data analysis process	X	We provided a detailed description of our data analysis procedure.
Field notes	X	We took extensive notes during our observations.
Coding and reliability checks	X	The coding was done by different investigators. It was discussed in several iterations.
Data displays	X	We provided quotes throughout Section 4.
A flexible and opportunistic process	X	We made several adjustments during our data collection procedure.
Logical chain of evidence	X	We provided a detailed description of our research procedure.
Explanation-building	X	We developed our theory based on the results, followed by a discussion of the implications.
Searching for cross-case patterns		N/A.
Quotes (evidence)	X	We provided quotes for each major result statement.
Project reviews	X	We held frequent discussions among all authors with different foci.
Comparison to the literature	X	We compared our findings to the literature on delegation in healthcare.

Appendix B: Interview Guide

Chapter 1: Introduction

Activity: Overview of research project

Activity: Establishment of a shared understanding of the research concepts: artificial intelligence, autonomy, agency, agentic IS artifacts, agentic relationships

1.1 What is your age?
1.2 What is your personal, educational, and professional background?
1.3 What are your current professional activities?
1.4 What are your touchpoints to digital health applications and agentic IS artifacts?

Patient:
1.5 Do you have any restrictions that limit your bladder control?
1.6 How long have you been living with this restriction?

Chapter 2: General Statements on Agentic IS Artifacts in Healthcare
2.1 How would you describe your interactions with an agentic IS artifact as part of the patient-doctor relationship? How do such agentic IS artifacts differ from regular digital health applications?
2.2 How do you assess agentic IS artifacts' role in healthcare concerning the dyadic interaction between doctors and patients? How does each role evolve in the context of a triadic interaction between doctors, patients, and an agentic IS artifact?
2.3 How would the agentic IS artifact influence communication with the patient and with the doctor?
2.4 Do you think there are certain tasks and responsibilities that an agentic IS artifact could do better than a doctor or human? If so, what are they?
2.5 What tasks and responsibilities are subject to being owned and controlled by agentic IS artifacts?
2.6 How do you assess the delegation capabilities of tasks or responsibilities of agentic IS artifacts in the medical care process?
2.7 Who is the agentic IS artifact obligated to? Why?

Chapter 2: Role-Specific Questions
3.1 How do you assess your role within a triadic delegation?
3.2 How would you assess your degree of control in the context of a triadic relationship with respect to the agentic IS artifact?
3.3 How do you assess agentic IS artifacts' effects on the degree of personalization of your medical care?
3.4 Can you imagine being dependent on the artifact in the future?

Chapter 3: Construct-Specific Questions
Trust, resistance, attitude, and willingness:
4.1 How do you generally feel about interacting with an agentic IS artifact as a healthcare companion?
4.2 How does interaction with an agentic IS artifact affect your capacity to achieve your medical goals in patient-doctor interactions?
4.3 How does the agentic IS artifact affect collaboration between patients and doctors?
4.4 How do you assess your communication and willingness to share information with an agentic IS artifact compared to sharing it with a human doctor / patient / IS artifact designer? Why?

Uncertainties and conflicts:
4.5 What uncertainties and concerns have arisen concerning the artifact's delegation and task ownership? What approaches have been or are being pursued to address them?
4.6 Have you ever encountered any conflicts between an agentic IS artifact and a doctor / patient / IS artifact provider? If yes, what are they?

Decision models and information flows:
4.7 What factors would you consider when deciding whether to delegate a task to an agentic IS artifact or a patient?

4.8 How do your criteria and parameters for delegation decision-making evolve within a triadic relationship?
4.8 How does the information flow change with respect to agentic IS artifacts in the triadic relationship?
4.9 How would you assess the need for the agentic IS artifact to receive information that would normally only be shared between doctor and patient / user?

Chapter 5: Validation of the Results (validation of the interview study only)

Activity: Presentation of preliminary theoretical understanding and discussion

5.1 Do you understand the core concepts and mechanisms of the theoretical model?
5.2 How do you assess the model's core concepts?
5.3 Would you like to add or remove any elements from the model?
5.4 Does the model adequately describe the phenomena being studied?
5.5 Can you identify objects and relationships that may play predominant roles?

Chapter 6: Closure

Activity: Synthesis and summary of the statements discussed

6.1 Are there any additional insights or ideas that you recognize as particularly significant but have not had an opportunity to discuss?

Activity: Information regarding the next steps in the research project

Activity: Feedback on the interview

Appendix C: Literature Review

Table C1. Targeted Keyword Search Across Broad Sources

Query	Literature stream	Search string	Exclusion criteria
A-1	IS Agency	TI=(agenc* OR agentic) **AND** TS=("information system" OR "information technology" OR "artificial intelligence" OR "machine learning") **AND** PY=(2017-2024)	- Exclusion of viewpoints and opinion papers - Exclusion if no dedicated focus on the conceptualization of AI-enhanced IS agency
A-2	IS Delegation	TS= (delegate*) **AND** TS= (agent* OR human*) **AND** TS= ("information system" OR "information technology" OR "artificial intelligence" OR "machine learning") **AND** PY=(2017-2024)	- Exclusion of viewpoints and opinion papers - Exclusion if no consideration of delegation between humans and IS
A-3	Patient-Doctor-IS Relationship	(delegation OR relationship OR cooperation OR interaction[TOPIC]) **AND** (patient[TOPIC]) **AND** (physician OR doctor OR clinician[TOPIC]) **AND** ("information system" OR "information technology" OR "artificial intelligence" OR "machine learning"[TOPIC]) **AND** TIME=2017-2024	- Exclusion of viewpoints and opinion papers - Exclusion if the paper only focuses on a dyadic relationship - Exclusion if the relationship is studied within a narrow medical procedure or context

Table C2. Broad Keyword Search Across Top-Tier IS Journals

Query	Topical focus	Search string	Exclusion criteria
B	Agents, Agency, Delegation	TS=(agen* OR delegat*) **AND** PY=(2022-2025) **AND** IS=("0167-9236" OR "0960-085X" OR "0378-7206" OR "1471-7727" OR "1350-1917" OR "1047-7047" OR "1536-9323" OR "0268-3962" OR "0742-1222" OR "0963-8687" OR "0276-7783")	- Exclusion if no dedicated focus on agentic concepts or delegation relationships

Table C3. Review Procedures of the Literature Review

Query	Database	Initial set	Title screening	Abstract screening	Full-text screening	Duplicates removed	Forward/ backward	Final set
A-1	Web of Science	216	-202	-4	/	-2	+2	**11**
	AISeL	76	-68	-3	-2			
A-2	Web of Science	82	-72	/	-4	-1	+11	**21**
	AISeL	16	-9	-1	-1			
A-3	Pubmed	889	-864	-12	-5	/	+2	**12**
	AISeL	12	-9	/	-1			
B	AIS Senior Scholars' List of Premier Journals	86	-76	-3	/	/	+1	**8**

Appendix D: Evaluation of the Actions of the Agentic IS Artifact Regarding the Agentic Archetype

Table D1. Evaluation of the Actions of the Agentic IS Artifact Regarding the Agentic Archetype

Action of the agentic IS artifact	Explanation (derived from technical documentation and interviews)	Agentic archetype (following Baird & Maruping, 2021)
Ensuring appropriate placement on the body	The agentic IS artifact can warn the patient when the sensor is ill-positioned or has no contact with the body to ensure appropriate placement.	Reflexive
Recording of data	After the sensor module is attached to the body, the agentic IS artifact begins recording the filling and voiding cycles of the patient in a log (together with additional data on voided volumes and incontinence episodes). As the sensor module is detached from the body, the agentic IS artifact stops recording.	Reflexive
Evaluation of the present need to void the bladder	The agentic IS artifact can assess the current need for bladder emptying when prompted by the user.	Reflexive
Update the internal state for the prescription of voiding times	The agentic IS artifact can leverage user feedback on erroneous prescriptions to adapt future prescriptions of voiding times.	Reflexive
Supervision of performed micturitions	As the agentic IS artifact can continuously monitor the bladder filling level of the user, it can supervise whether prescribed bladder voidings have been performed by the user (or whether the user performed bladder voidings that were not prescribed).	Supervisory
Detection of inability to perform a delegated task	By using internal control measures, the agentic IS artifact can detect that it is not capable of (further) performing a delegated task (e.g., prediction confidence falls below a predefined threshold).	Supervisory
Analysis of data	By leveraging the recorded data, the agentic IS artifact can conduct a first-level medical evaluation of the bladder's medical condition (e.g., indication for urinary tract infections) or oversee treatment progress (e.g., the effectiveness of bladder soothing medication).	Anticipatory
Assessment of long-term bladder voiding behavior	Based on the time between two consecutive voidings and the voided volume, the agentic IS artifact can detect changes in long-term bladder voiding behavior that could indicate the need for a change in therapy (e.g., dose adaptation of bladder soothing medication) or complications (e.g., urinary tract infections).	Anticipatory
Leverage outcome of human-to-human delegation	The agentic IS artifact is capable of utilizing data regarding delegations that it is not directly involved in (e.g., adapting voiding prescriptions after a new target volume has been delegated to the patient by the doctor).	Anticipatory
Act as a transient proxy	Once the agentic IS artifact has detected an inability to (further) perform a delegated task, it could delegate the task to either the doctor or the patient, depending on the circumstances.	Prescriptive
Prescription of voiding times	By continuously monitoring the bladder of the patient, the agentic IS artifact can prescribe the optimal time for the patients' bladder voiding.	Prescriptive

About the Authors

Pascal Fechner is a doctoral candidate in information systems engineering at the University of Bayreuth. He holds a master's degree in mechanical engineering. His research focuses on the development of autonomous AI agents and the technical integration of advanced machine learning algorithms and sensor technologies in the context of the Internet of Things.

Luis Lämmermann is a post-doctoral researcher at the University of Bayreuth, where he also received his PhD in information systems engineering. Previously, he was an AI researcher at the Frankfurt University of Applied Sciences and the Fraunhofer Institute for Applied Information Technology FIT. His research interests include human-AI collaboration, AI management, and autonomous AI agents.

Jannik Lockl is a research associate of University College London. He received his PhD in information systems engineering from the University of Bayreuth. His research interests include digital innovation and technology-driven change through emerging technologies like artificial intelligence and blockchain, among others.

Maximilian Röglinger is a professor of information systems at the University of Bayreuth and adjunct professor in the School of Management of Queensland University of Technology. Maximilian also serves as managing director of the FIM Research Center and as deputy director of the Fraunhofer Institute for Applied Information Technology FIT. His areas of interest include digital disruption, innovation, transformation, and business process management.

Nils Urbach is a professor of information systems and digital business and a director of the Research Lab for Digital Innovation & Transformation (ditlab) at the Frankfurt University of Applied Sciences. He is also a director at the FIM Research Center and the Branch Business & Information Systems Engineering of Fraunhofer FIT. His research interests relate to digital innovation and transformation, managing artificial intelligence, and blockchain.