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Agentic information systems

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Abstract

Recent advancements in artificial intelligence (AI) have catalyzed the emergence of agentic information systems (IS), which exhibit autonomous behavior and advanced cognitive capabilities. Unlike traditional IS, which functioned primarily as reactive tools supporting humans, agentic IS can make decisions independently, act in unstructured environments, and even delegate tasks to humans. This paradigm shift fundamentally transforms the human-IS relationship, questioning the long-standing assumption of human agentic primacy in IS research and practice. In this article, we provide a conceptual overview of agentic IS, delineating their defining characteristics and situating them within the broader evolution of IS. We introduce key archetypes of agentic IS, explore novel patterns of delegation and interaction between humans and machines, and discuss the socio-technical implications of these developments. Furthermore, we highlight the challenges and risks associated with integrating agentic IS from an individual, organizational, and societal perspective, emphasizing the need for nuanced understanding to harness the potential while addressing emerging complexities.

Keywords Agentic IS · Human-AI collaboration · Delegation · Agency

JEL Classification M21 · O3

Introduction

“The IT department of every company is going to be the HR department of AI agents in the future”

- Jensen Huang, NVIDIA CEO, on AI Agents at CES 2025

As the boundaries between human and technological capabilities continue to blur, traditional perspectives on information systems (IS) are facing unprecedented challenges (Schuetz & Venkatesh, 2020). IS research has

historically examined how humans interact with technological artifacts to complete tasks, while positioning IS as passive tools that support human decision-making and action (Burton-Jones & Straub, 2006; Orlikowski & Iacono, 2001). This perspective establishes human agency as the dominant theoretical assumption in IS research (Baird & Maruping, 2021; Stelmaszak et al., 2024). However, recent advancements in artificial intelligence (AI), such as generative agents (Wang et al., 2024), have rendered this notion of agentic primacy for human agents increasingly insufficient (Alter, 2024; Dattathrani & De', 2023). Modern IS now demonstrate advanced cognitive capabilities, enabling autonomous decision-making and action under uncertainty (Engel et al., 2022; Schuetz & Venkatesh, 2020). This evolution has given rise to *agentic IS*, where technological artifacts possess significant agency themselves (Baird & Maruping, 2021; Demetis & Lee, 2018), thereby fundamentally transforming the traditional understanding of the human-IS artifact relationship (Fügenger et al., 2021a; Guggenberger et al., 2023).

Agentic IS have evolved to dynamic, active entities that are no longer solely dependent on or subordinate to humans (Diebel et al., 2025; Fabri et al., 2023). Their

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agency derives from the ability to make decisions and act autonomously in unstructured environments, without requiring human intervention or initiation (Ågerfalk, 2020; Baird & Maruping, 2021). Self-driving vehicles (Hong et al., 2021), generative AI-based software developers (He et al., 2025), and human-like recommender systems (Zhang et al., 2024) exemplify the growing prevalence of agentic IS in various domains. With the ability to autonomously handle tasks previously reserved for humans, they function as independent entities in socio-technical systems, capable of meaningful collaboration and even supervision within the existing human workforces (Dennis et al., 2023). Furthermore, the transfer of rights and responsibilities concerning task-related decision-making and action is no longer unidirectional; agentic IS artifacts have the capacity to delegate tasks to humans as well (Adam et al., 2024; Stelmaszak et al., 2024). This shift challenges the traditional distinction between IS artifacts and human agents, as both are increasingly regarded as autonomous entities with shared objectives, sophisticated cognitive functions, and a high degree of agency (Schuetz & Venkatesh, 2020). Consequently, these advancements enable novel forms of collaboration between humans and IS, fostering hybrid teams that work together in various configurations to achieve common goals (Hofmann et al., 2024; Seeber et al., 2020).

Despite these potential advantages, effectively integrating agentic IS and actualizing their potential present substantial challenges (e.g., ensuring effective delegation between human and IS as well as managing accountability) (Abedin et al., 2022). Moreover, a comprehensive examination of the key concepts, characteristics, and impacts of agentic IS remains to be conducted, leaving major aspects of this new generation of IS undefined (Baird & Maruping, 2021). It is therefore imperative to develop an understanding of the distinctive characteristics of agentic information systems compared to traditional systems, as well as their socio-technical implications. This knowledge empowers organizations to effectively integrate agentic IS artifacts into their workforce while anticipating challenges. To develop this understanding, we first conceptualize agentic IS by situating it within the evolution of IS toward demonstrating advanced cognitive capabilities and human-like agency. Second, we elaborate on emerging agentic IS archetypes grounded on distinct agency perspectives. Additionally, we identify and conceptualize emerging delegation patterns, thereby presenting novel human-machine interaction mechanisms in the era of agentic IS. Subsequently, potential obstacles and risks associated with changes in the IS landscape and corresponding future research opportunities are addressed. Finally, we present concluding remarks that emphasize the need to recognize the transition toward agentic IS.

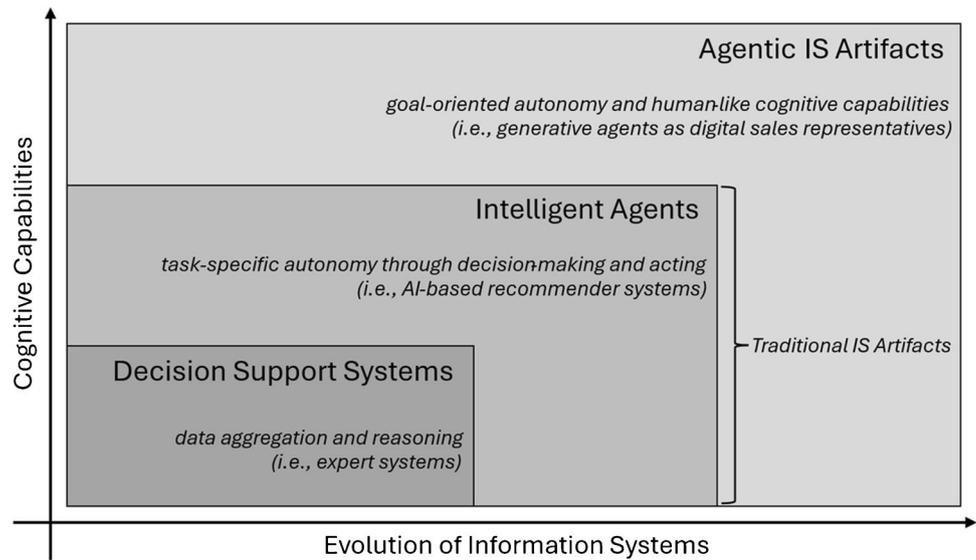
Conceptualization of agentic IS

The conceptualization of IS as socio-technical systems is centered on the premise that humans employ passive IS artifacts to achieve specific objectives (Burton-Jones & Straub, 2006; Orlikowski & Iacono, 2001). This traditional *IS paradigm* is characterized by an unidirectional interaction pattern wherein humans delegate tasks while being responsible for decision-making and acting, thereby assuming primary agency (Alter, 2024; Straub et al., 1995). Within this paradigm, IS artifacts are reactive entities handling well-defined tasks. Although capable of surpassing human abilities in specific areas like large-scale data analysis, they inherently lack human-like features, including autonomy, generalizability across tasks and domains, or learning abilities (Burton-Jones & Straub, 2006; Schuetz & Venkatesh, 2020). However, over the past decades, IS have evolved significantly (see Fig. 1), leading to novel types of IS that aim to match or even surpass human abilities (Berente et al., 2021; Nevo et al., 2009), thus questioning human agency primacy.

Early IS centered on the aggregation of vast amounts of data, serving as *decision support systems* for humans (Lilien et al., 2004; Turban & Watkins, 1986). Nevertheless, the responsibility for deriving meaningful insights remained predominantly with the user. Subsequent generations of IS introduced expert systems and knowledge-based systems possessing reasoning abilities, thereby reducing human effort and enhancing the overall value of the decision support (Arnold et al., 2006; Turban & Watkins, 1986). Despite these advancements, the primary function of them was to facilitate task-specific automation or augmentation for narrowly defined objectives, with limited adaptability to dynamic changes (Arnold et al., 2006; Lilien et al., 2004). Moreover, they relied on structured information and human users to leverage them as tools for improved task completion and goal attainment (Schuetz & Venkatesh, 2020).

The next major evolution of IS capabilities introduced *intelligent agents*, implemented through either symbolic knowledge representation or machine learning models (Jennings et al., 1998; Russell & Norvig, 2021). These intelligent agents (e.g., fraud detection in finance) significantly reduced the need for human intervention by autonomously responding to environmental stimuli and executing suitable actions (Chaudhary et al., 2012; Franklin & Graesser, 1997; Russell & Norvig, 2021). Although capable of (partly) independent decision-making, they were still developed for task-specific automation, with adaptability constrained by narrow perception requirements for specific data structures (Schuetz & Venkatesh, 2020). Consequently, these IS functioned as tools for human users to automate well-defined tasks, thereby leaving the traditional IS paradigm largely unaffected.

Fig. 1 Evolution of cognitive capabilities in IS



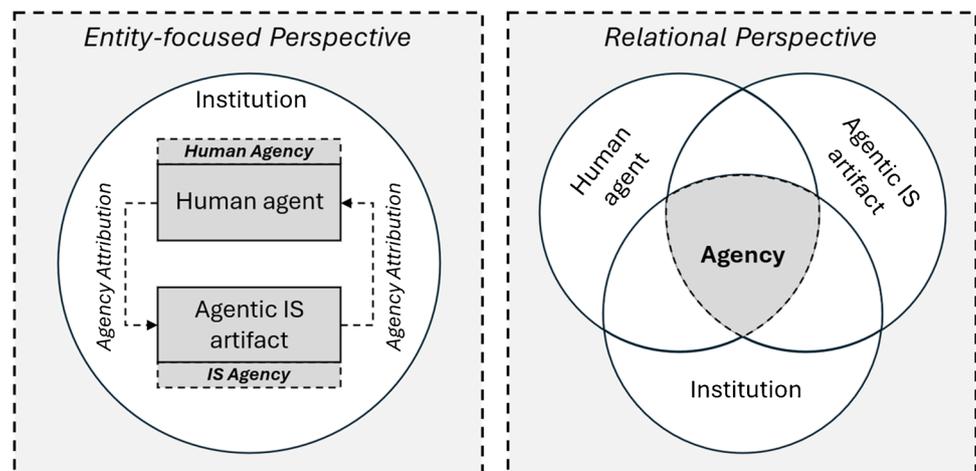
The emergence of *agentic IS* artifacts facilitates the next generation of IS (Baird & Maruping, 2021), powered by advances in AI such as deep learning (Janiesch et al., 2021), generative AI (Banh & Strobel, 2023), and generative agents (Göldi & Rietsche, 2024). These artifacts can establish and pursue long-term objectives, make and act upon independent decisions under uncertainty, and maintain control over their internal states (Berente et al., 2021; Russell & Norvig, 2021). They extend the abilities of previous IS toward human-like features such as multimodal perception, complex reasoning, continuous learning, natural language communication, or sophisticated adaptation in evolving environments (Hughes et al., 2025; Park et al., 2023). These cognitive capabilities enable them to transfer rights and responsibilities for task execution and outcomes from and to human agents (Baird & Maruping, 2021; Demetis & Lee, 2018). Thus, agentic IS artifacts increasingly represent human-like actors in various domains (e.g., software development or

higher education), demonstrating agency comparable to humans (Dattathrani & De', 2023).

Toward a new IS paradigm

The paradigm shift toward agentic IS emerges as artifacts demonstrate human-like agency through advanced cognitive capabilities, challenging the human agency primacy (Schuetz & Venkatesh, 2020). This development disrupts the foundation of the traditional IS paradigm, creating a new balance of agency and novel role distributions between humans and IS artifacts (Alter, 2024; Stelmaszak et al., 2024). The term *agency* is typically associated with an entity’s ability to act intentionally, which requires the presence of a certain cognitive capacity that facilitates the generation and execution of decisions (Berente et al., 2021; Schatzki, 2025). However, within IS research, agency is conceptualized in more distinct ways (see Fig. 2), namely into *entity-focused*

Fig. 2 Comparison of fundamental agency conceptualizations in the agentic IS paradigm



and *relational* perspectives (Dattathrani & De', 2023; Kuss & Meske, 2025).

The *entity-focused* perspective delineates *agency* as a property of a specific entity relating to either inherent characteristics (inherent agency) or specific behavior (behavioral agency) (Gonsalves, 2023; Kuss & Meske, 2025). The concept of inherent agency is centered around an entity's mental state and is attributed to those possessing human-like properties such as consciousness, intentionality, or free will (Murray et al., 2020; Schatzki, 2025). This conception emphasizes human agency while conceptualizing IS agency as a proxy that enacts human intentions (Abdelnour et al., 2017; Bandura, 2001). Behavioral agency refers to an entity's capacity to rationally take actions that influence the environment without requiring inherent mental properties such as consciousness (Ågerfalk, 2020; Dattathrani & De', 2023). Therefore, this agency perspective can be attributed to various entities capable of autonomously making decisions and acting accordingly (Baird & Maruping, 2021). For instance, while an AI-based recommender system lacks inherent agency as it is purposefully designed by humans, its autonomous behavior can be attributed to a degree of behavioral agency (Berente et al., 2021; Lyytinen et al., 2020). In essence, the *entity-focused perspective* facilitates the attribution of distinct agency levels to specific entities within institutions,¹ thereby enabling comparisons between IS artifacts and other entities, such as humans.

On the other hand, the *relational perspective* conceptualizes *agency* as emerging from the sociomaterial entanglement between humans and IS artifacts (Kuss & Meske, 2025; Leonardi, 2013). Instead of treating agency as an entity-specific attribute, it defines agency as a systemic phenomenon shaped by human-IS collaboration (Cecez-Kecmanovic et al., 2014; Leonardi, 2023). Accordingly, agency is materialized through the dynamic interplay between humans, agentic IS artifacts and institutions (Dattathrani & De', 2023; Schultze et al., 2020). Weaker notions still distinguish between social agency (human-related) and material agency (IS-related), while emphasizing their deep interconnection in creating sociomaterial phenomena (Leonardi, 2023; Pignot & Thompson, 2024). Strong relational perspectives are grounded in the ontology of agential realism (Barad, 2007; Kuss & Meske, 2025), thus concentrating on the affordances of the human-IS collaboration without distinguishing between entity-specific agency levels (i.e., non-human and human agency) (Harding et al., 2021; Visser &

Davies, 2021). Moreover, the relational perspective avoids imposing human-like agency criteria (i.e., anthropomorphic assumptions) on artificial entities, thereby facilitating a comprehensive understanding of human-agentic IS dynamics within institutions (Kuss & Meske, 2025; Schultze et al., 2020).

Agentic IS research predominantly employs the *entity-focused perspective* to capture and compare varying levels of agency (e.g., Demetis & Lee, 2018; Stelmaszak et al., 2024), where agency is broadly defined as “the ability to accept rights and responsibilities for ambiguous tasks and outcomes under uncertainty and to decide and act autonomously” (Baird & Maruping, 2021, p. 316). This conceptualization primarily adopts behavioral agency, without specifically distinguishing between human and non-human agency (Baird & Maruping, 2021; Kuss & Meske, 2025). Furthermore, it emphasizes an increase in cognitive capabilities that facilitates independent decision-making and acting for open-ended and intricate tasks (Dattathrani & De', 2023; Stelmaszak et al., 2024). Thus, higher levels of agency enable agentic entities to take on rights and responsibilities for more complex tasks and the corresponding outcomes. To describe these entities, the concept of *agent* is commonly utilized, referring to various entities characterized by some degree of agency (Alter, 2024; Jakob et al., 2024). Within agentic IS, an agent is not necessarily an artificial entity, e.g., an AI agent (Engel et al., 2022; Kühl et al., 2022); rather, it can be also represented by other actors that participate inside institutions, such as human agents (Beck et al., 2022; Hofmann et al., 2024). Both humans and artificial agents are able to transfer rights and responsibilities regarding task-related decision-making and actions toward each other (Fügener et al., 2021a; Strunk et al., 2024). Therefore, instead of the *traditional IS paradigm* of humans leveraging IS artifacts as tools toward task completion, the *agentic IS paradigm* employs a novel perspective on agents with progressively analogous capabilities and degrees of agency operating in diverse constellation (Hofmann et al., 2024; Seeber et al., 2020).

Agentic IS archetypes

Depending on the employed conceptualization of agency, there are various agentic IS archetypes that encompass a spectrum of functions, from assisting humans in ambiguous tasks with enhanced capabilities to automating comprehensive work procedures (see Table 1). From an entity-focused agency perspective, these IS artifacts differ in their individual levels of agency, which enables them to assume novel, more complex tasks without human intervention or initiation. From a relational perspective, the degree of human-agentic IS integration differentiates them with higher relational agency representing more close collaboration.

¹ Grounded in the institutional view of IS, the term “institution” refers to the broader context (e.g., an organization or governmental body) in which agentic entities perceive and act (Chae and Poole, 2005; King et al., 1994). The *institution* influences how agency is distributed among entities (entity-focused) or materialized through their interactions (relational) (Leonardi, 2023).

Table 1 Overview of core agentic IS archetypes

Archetype	Examples	Sources
<p>Assisting Agentic IS refers to artifacts with low levels of agency that assist human agents in simple or ambiguous tasks. Predominantly reactive, they respond to environmental changes and support decision-making under significant human guidance, enhancing productivity without challenging human agency superiority.</p>	<ul style="list-style-type: none"> • Chatbots for customer service • Voice assistants such as Alexa or Siri • AI-based scheduling tools • GenAI-based assistants for generating personalized texts, images or videos (e.g., Google Gemini or ChatGPT) 	(Baird & Maruping, 2021; Barysė & Sarel, 2024)
<p>Autonomous Agentic IS encompasses high-agency artifacts requiring minimal human intervention to proactively manage complex, long-term tasks. They operate independently in dynamic environments and can prescribe actions to humans, potentially reversing traditional agency roles.</p>	<ul style="list-style-type: none"> • AI-driven medical image analysis agents for diagnostics • Self-driving vehicles • Autonomous trading systems in financial markets • AI agents in fraud detection for cybersecurity 	(Demetis & Lee, 2018; Kuru, 2021)
<p>Collaborative Agentic IS represents artifacts that function as collaborative teammates, endowed with human-like capabilities and shared objectives with human partners and other agents. They dynamically adjust their roles according to situational requirements, creating a fluid balance of agency while humans typically retain overall control.</p>	<ul style="list-style-type: none"> • Generative agents in multiple domains (e.g., healthcare, finance, science, marketing, software engineering) • Collaborative robots (e.g., robotic guide-dog, robots in industrial assembly and maintenance) 	(Hopf et al., 2024; Huang et al., 2025)
<p>Hybrid Agentic IS characterizes deep integration of human agents and agentic IS artifacts into a unified system where agency emerges at the collective level rather than being attributed to individual entities. These integrated units enable shared decision-making, goal alignment, and co-evolution without necessitating explicit delegation mechanisms.</p>	<ul style="list-style-type: none"> • Brain-computer interface systems enabling direct communication with AI agents • AI-powered exoskeletons for physical rehabilitation or industrial use • Advanced driving or flight systems that combine human input with AI decision-making 	(Rai et al., 2019; Rajarajan et al., 2024)

Employing the entity-focused or weak relational perspective, humans as well as IS artifacts can possess some degree of agency, resulting in varying novel human-IS constellations and corresponding archetypes. Considering the conventional distribution of agency (i.e., based on the traditional IS paradigm), the *assisting agentic IS archetype* emerges, wherein humans possess the agency primacy, while IS artifacts are positioned on the lower ends of the agency continuum (Burton-Jones & Straub, 2006). Thus, rights and responsibilities regarding decision-making and actions are primarily attributed to humans (Baird & Maruping, 2021; Demetis & Lee, 2018). Within this archetype, IS artifacts primarily function as reactive tools requiring human initiation and intervention, making them suitable for assisting humans during task completion and decision-making (Berente et al., 2021). For instance, generative AI-based applications (e.g., ChatGPT or Claude) can assist users in optimizing text fluency, generating images for social media, or supporting the identification and correction of coding errors (Banh & Strobel, 2023; Feuerriegel et al., 2024). While these artifacts exhibit some degree of agency, such as interpreting user prompts and generating corresponding outputs, their agency remains substantially limited to human-provided tasks and scopes.

However, as agentic IS acquire higher degrees of agency, the *autonomous agentic IS archetype* manifests, which challenges or even reverses the traditional roles by attributing lower levels of agency to humans (Adam et al., 2024; Guggenberger et al., 2023). Within the reversed role, human agents become increasingly dependent on agentic IS artifacts' decision-making capabilities (e.g., autonomous trading agents), as human influence and control over the procedure and overall outcome is significantly reduced (Kar et al., 2024; Rinta-Kahila et al., 2023; Zhang et al., 2021). These artifacts are increasingly capable of autonomously handling ambiguous, long-term task within intricate environments, thereby reducing or even removing the necessity for human initiation and intervention (Demetis & Lee, 2018; Schuetz & Venkatesh, 2020). Moreover, decisions made by agentic IS artifacts can lead to social actions that actively influence the behavioral space of human agents, with some artifacts even prescribing specific actions, potentially resulting in a complete reversal of traditional supervision and subordinate roles (Lanz et al., 2024; Stelmaszak et al., 2024). Thus, agentic IS artifacts can be employed to direct other agents (including humans) by prescribing tasks, tracking and evaluating overall progress and even disciplining them through rewards or replacement (Kellogg et al., 2019; Möhlmann et al., 2021).

The assisting and autonomous archetypes both primarily describe situations in which one entity holds superiority in agency. Nevertheless, within the agentic IS paradigm, the agency of human agents and IS artifacts can converge, with

both entities possessing high degrees of agency, leading to the *collaborative agentic IS archetype* (Braun et al., 2023; Jakob et al., 2024). In these instances, agentic IS can function as teammates or colleagues working in collaboration with human agents in order to achieve shared objectives (Lyytinen et al., 2020; Waardenburg & Huysman, 2022). Thus, both agents can take on rights and responsibilities for tasks and problems in a similar manner while actively communicating with each other (e.g., generative agents in software engineering) (He et al., 2025). This transforms agency primacy into a dynamically shifting property, preventing clear distinction and attribution to specific entities (Fabri et al., 2023; Murray et al., 2020).

These boundaries blur further with advanced human-IS interfaces that facilitate dense integration into human decision-making and acting (e.g., AI-based augmented reality glasses or even futuristic brain-computer interfaces), referring to the *hybrid agentic IS archetype* (Mayer et al., 2024; Rai et al., 2019). Instead of maintaining distinct and separate levels of agency, these heterogeneous teams exhibit conjoined agency, i.e., a shared capacity to act intentionally (Leonardi, 2023; Murray et al., 2020). However, the entity-focused and weak relational perspectives assume both the possibility of attributing agency to specific entities and the suitability of this approach for capturing the effects and implications of the emerging agentic IS paradigm (Dattatharani & De', 2023; Schatzki, 2025). Consequently, these perspectives become increasingly inadequate for understanding the agency dynamics and implications within highly integrated human-agentic IS teams, thereby calling for analysis through the theoretical lens of sociomateriality (Cabrita et al., 2021; Leonardi, 2023).

The strong relational perspective builds on these limitations by focusing on the collaboration between human and IS artifacts (Fabri et al., 2023; Kuss & Meske, 2025) and thus facilitates a more comprehensive perspective on the *collaborative and hybrid agentic IS archetype*. It defines agency by the actions that are afforded or constrained through their relationship (Cecez-Kecmanovic et al., 2014; Leonardi, 2023). This shifts attention to the bilateral interplay between humans and agentic IS artifacts and their shared capacity to act within organizations leading to co-creation, framing agency as a systemic phenomenon rather than an entity-based attribute (Kuss & Meske, 2025; Waardenburg & Huysman, 2022). Therefore, this agency influences which entities are able to perform what actions and how those actions are conducted (Leonardi, 2023; Stelmaszak et al., 2024). Hence, more sophisticated human-IS collaborations (e.g., collaborative risk assessment in courts) influence the sociomaterial entanglement by affording new action potentials. Moreover, the relational perspective becomes increasingly relevant when considering networked businesses in which human agents collaborate with multiple artificial

agents (Hofmann et al., 2024; Tsvetkova et al., 2024). In these environments, multi-agent systems demonstrate high collective agency even when individual entities exhibit low agency, requiring system-level analysis to capture their combined effects (Allmendinger et al., 2026; Stelmaszak et al., 2024; Tsvetkova et al., 2024). However, the strong relational perspective does not provide a framework for differentiating how agency is distributed across individual entities, thereby blurring responsibility boundaries and hindering accountable assignments of control (Kuss & Meske, 2025).

Nascent collaboration patterns

In light of agentic IS assuming novel roles, the traditional *IS paradigm* becomes insufficient for conceptualizing the multifaceted interaction and collaboration patterns between human and IS artifacts (Baird & Maruping, 2021; Stelmaszak et al., 2024). The theoretical framework of delegation has emerged as the prevailing alternative for describing and analyzing the relationships within the *agentic IS paradigm* (Grisold & Schneider, 2023; Guggenberger et al., 2023). Delegation is defined as the transfer of rights and responsibilities for making decisions and performing tasks to another agent (Baird & Maruping, 2021; Braun et al., 2023). The objective is aimed at enhancing productivity and flexibility by recognizing that a single agent may lack the resources, capabilities, or knowledge necessary to achieve complex, multi-step goals independently (Gur & Bjørnskov, 2017). This process requires metaknowledge, i.e., a comprehensive understanding of an individual’s capabilities, those of other agents, and the overarching objectives (Evans & Foster, 2011; Fügener et al., 2021a). While delegation has always been central within the IS paradigm, agentic IS artifacts enable

extended forms of delegation and even reversed patterns toward humans (see Fig. 3). These patterns of delegation build on and extend concepts from related fields like HCI’s *mixed-initiative interaction* by specifically foregrounding the transfer of organizational rights and responsibilities.

User-invoked delegation is the most common form of delegation where human agents transfer rights and responsibilities to IS artifacts or other agents while retaining delegation ownership (Adam et al., 2024; Grisold & Schneider, 2023). The delegation procedure involves temporarily transferring (sub)tasks to agentic IS artifacts with or without direct human supervision (Alter, 2024; Mayr et al., 2024). Thus, humans commonly oversee task progression and maintain accountability for outcomes. Within this paradigm, there exists a spectrum of human supervision levels, thereby providing human agents with varying levels of control. The most restrictive is the “human-in-the-loop” approach, where a human agent manually approves all decisions or at least those of a critical nature made by the agentic IS artifact prior to execution (Grønsund & Aanestad, 2020; Jussupow et al., 2021). This approach significantly limits the agency of the IS artifact and thus restricts the transfer of rights and responsibilities regarding autonomous decision-making (Baird & Maruping, 2021; Stelmaszak et al., 2024). A less restrictive approach is referred to as “human-on-the-loop,” where humans actively monitor decisions and actions made by agentic IS artifacts but intervene only when necessary (Kuru, 2021). Current self-driving vehicles exemplify this pattern: while they operate autonomously, drivers must remain alert to intervene in dangerous situations (Kuru, 2021). The most advanced form of user-invoked delegation entails the complete transfer of rights and responsibilities for a specific task or even long-term objectives to an agentic IS artifact,

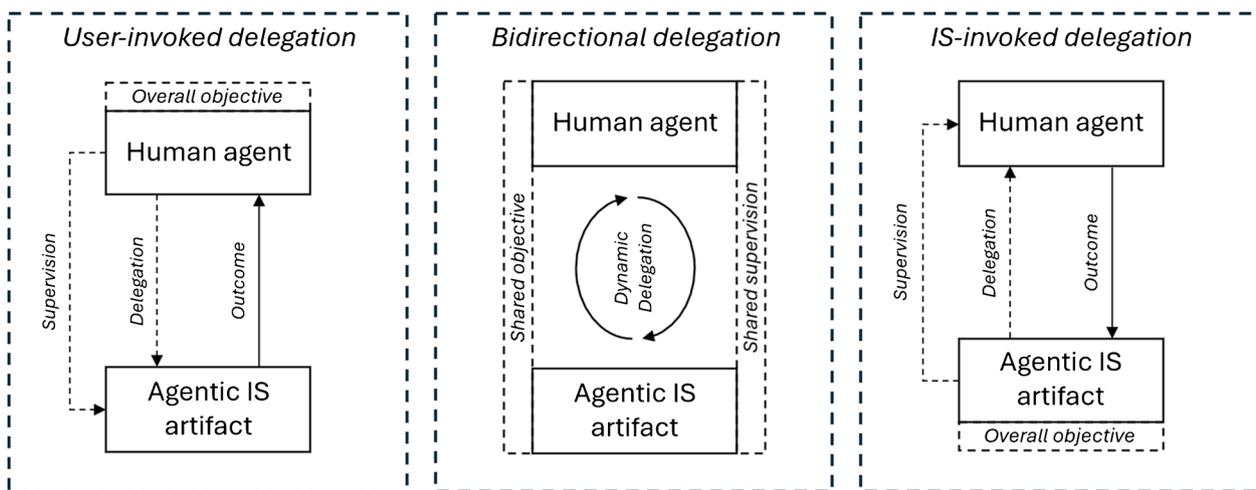


Fig. 3 Agentic IS delegation patterns

without requiring human supervision (Engel et al., 2022; Murray et al., 2020).

The *bidirectional delegation pattern* involves multiple entities, such as human-agentic IS teams, closely working together toward shared objectives (Hofmann et al., 2024; Tarafdar et al., 2023). This collaborative approach incorporates dynamic delegation patterns, where ownership transitions between humans and IS artifacts in accordance with situational demands and comparative advantages (Baird & Maruping, 2021; Jakob et al., 2024). It aims to leverage the complementary strengths of both entities as they work toward common goals that neither could achieve independently (Dennis et al., 2023; Krakowski, 2025). However, this collaboration can be categorized into two forms: *augmentation* and *assemblage*, which represent different degrees of collaborative integration (Braun et al., 2023; Rai et al., 2019). *Augmentation* manifests in human-IS teams function as independent co-workers who support each other by exchanging rights and responsibilities for tasks (Hopf et al., 2024; Ostern et al., 2024). In this form, leadership transitions in a fluid manner, with both parties having the capacity to initiate tasks, delegate responsibilities, and oversee processes (Jakob et al., 2024; Strunk et al., 2024). *Assemblage* represents a more integrated approach to human-IS teams, where humans and agentic IS do not have to explicitly conduct delegation but instead merge into seamless, nearly indistinguishable units (Rai et al., 2019; Waardenburg & Huysman, 2022). Thus, they are contextually and temporally assembled, functioning as integrated entities (e.g., AI-powered robots in medical surgery) that collaborate and interact continuously (Fabri et al., 2023; Rai et al., 2019). This collaborative mode exhibits a reduced reliance on explicit delegation between integrated units, as they inherently share common objectives, tasks, and responsibilities. In scenarios where groups of humans and agentic IS artifacts collaborate, delegation ownership evolves into a collective and distributed attribute (Stelmaszak et al., 2024). It therefore represents a dynamic continuum of changing rights and responsibilities toward task completion rather than a clear transition of authority to any single entity or unit of two (Baird & Maruping, 2021).

IS-invoked delegation emerges as a novel perspective regarding the collaboration between humans and IS (Fügener et al., 2021a; Schuetz & Venkatesh, 2020). This pattern contrasts with exclusive human agency by enabling agentic IS artifacts to anticipate delegation toward IS or to directly delegate to human agents (Adam et al., 2024; Guggenberger et al., 2023). Weak IS-invoked delegation occurs when agentic IS artifacts proactively suggest delegation to human agents or even from humans to artificial entities, such as software engineering agents anticipating that a human developer requires task-support (Diebel et al., 2025; Kraus et al., 2021). Accordingly, while the IS agency

experiences an increase, human agents maintain delegation ownership. In contrast, with strong IS-invoked delegation, both delegation ownership and task leadership transfer to agentic IS artifacts (Baird & Maruping, 2021; Stelmaszak et al., 2024). This type of IS-to-human delegation involves the transfer of responsibility for task and process outcomes to agentic IS artifacts (Demetis & Lee, 2018; Guggenberger et al., 2023), thereby fundamentally challenging the suitability of the predominant IS paradigm (Alter, 2024; Burton-Jones & Straub, 2006). Thus, agentic IS artifacts have the capacity to pursue long-term, multi-objective tasks and to delegate problems that they are unable to solve independently to other agents, including humans. In other scenarios, agentic IS artifacts may function as coordinators, supervising and delegating tasks to other agents without actively participating in problem-solving (e.g., supporting the software development cycle by delegating responsibilities to other entities). While this direction of delegation has the potential to reduce unnecessary cognitive load on humans by allowing them to concentrate on more complex tasks, its success is contingent on the capabilities of the IS artifact and requires a high level of trust from humans to work effectively (Dennis et al., 2023; Sudeeptha et al., 2024).

Challenges

Although agentic IS artifacts pose potential benefits for productivity and efficiency through novel collaboration and automation approaches (e.g., AI teammates or autonomous vehicles), the agentic IS paradigm introduces several new challenges. They range from facilitating effective delegation between humans and agentic artifacts, to managing new distributions of accountability, especially in the case of fully autonomous artifacts.

Metaknowledge

Effective collaboration between humans and agentic IS artifacts depends on sufficient levels of metaknowledge, referring to the ability to accurately assess one's own capabilities and those of collaborative partners (Baird & Maruping, 2021; Evans & Foster, 2011). This awareness enables agents (both humans and artificial entities) to make informed decisions about task allocation and responsibility distribution, including when to collaborate and how to interpret, accept, or challenge one another's outputs (Jussupow et al., 2021). Humans tend to lack the metaknowledge necessary for effective collaboration with agentic IS artifacts, leading to misjudgments of capabilities and task complexity, particularly in uncertain situations (Fügener et al., 2021a; Han & Dunning, 2024). In contrast, IS-initiated delegation tends to achieve better outcomes, as agentic IS artifacts are observed

to delegate tasks more effectively, thereby avoiding some of the metaknowledge limitations seen in humans (Fügenger et al., 2021a). However, this approach creates a fundamental tension: While IS-initiated delegation can optimize collaborative performance by addressing the metaknowledge gap, it reduces human agency and control. This reduction potentially conflicts with accountability requirements and limits applicability in domains where human supervision is mandated due to the limited cognitive capabilities of the artificial entity (Jussupow et al., 2021). Alternative approaches, such as weak IS-initiated delegation where agentic IS artifacts provide suggestions rather than direct task assignments, can partially address the control issue while still addressing the lack of human metaknowledge (Diebel et al., 2025). These intermediate solutions cannot fully capture the collaborative potential of bidirectional delegation patterns found in more sophisticated agentic IS (i.e., collaborative agentic IS or hybrid agentic IS) architectures (Rai et al., 2019). Moreover, they do not resolve humans' difficulty in critically evaluating system outputs when metaknowledge is lacking, increasing the risk of overreliance or unwarranted rejection, which can undermine collaboration (Colville & Ostern, 2024; Han & Dunning, 2024). Consequently, developing new mechanisms to enhance and coordinate metaknowledge in heterogeneous human-agentic IS teams represents a critical challenge for realizing the full potential of agentic IS collaboration (Hofmann et al., 2024; Stelmaszak et al., 2024).

Delegation

To facilitate human-agentic IS collaboration within organizations, effective delegation is imperative (Baird & Maruping, 2021). However, several factors influence humans' willingness to delegate rights and responsibilities to agentic artifacts and their acceptance of IS as a delegating entity, including perceived control, trust, accountability, and cognitive effort (Braun et al., 2023; Strunk et al., 2024). Although these factors are present in traditional IS relationships, they become more prominent as IS artifacts develop increased agency, and human agency diminishes (Fügenger et al., 2021a; Shin, 2021). As agentic IS artifacts serve as team members (collaborative agentic IS) or even supervisors (autonomous agentic IS), they increasingly challenge human control and willingness to collaborate (Adam et al., 2024; Yu et al., 2021). As a result, trust emerges as a pivotal factor in effective delegation performance and human-agent IS collaboration (Dennis et al., 2023). Within the agentic IS paradigm, trust is influenced by various factors including artifact design elements (e.g., transparency and anthropomorphism), human characteristics (e.g., personality and knowledge level), and task features, such as whether outcomes affect oneself or others (Strunk et al., 2024; Vössing et al., 2022). While low levels of trust can hinder effective

delegation between human and agentic IS artifacts, excessive trust, such as unquestioningly accepting IS behavior, can result in irresponsible collaboration (Constantinides et al., 2024; Naiseh et al., 2023). Although user-initiated delegation enhances trust and the sense of control compared to IS-initiated delegation, it can reduce delegation effectiveness (Fügenger et al., 2021a). Thus, effective human-agentic IS collaboration demands novel approaches to balance agency and trust relationships between humans and artificial agents to facilitate effective delegation.

Human centrality

With enhanced cognitive capabilities and human-like agency, agentic IS artifacts are increasingly challenging traditional notions of human-centricity within the workforce (Andriole, 2024; Schuetz & Venkatesh, 2020), thereby suggesting potential disruptions to employment patterns (e.g., fully automated warehouses). However, with humans maintaining exclusive inherent agency (e.g., consciousness or intentionality) and possessing unique capabilities (e.g., empathy, adaptability, unstructured problem-solving, or moral reasoning), a human-centered perspective is necessary (Dattathrani & De', 2023; Schmitt, 2024). This is particularly evident in high-risk contexts, such as clinical or discretionary judgments, where empathetic communication, adaptable reasoning, and value trade-offs are paramount (Jussupow et al., 2021). Moreover, combining the complementary capabilities of humans and agentic IS artifacts has the potential to yield performance beyond what either could achieve alone (Fügenger et al., 2021b; Krakowski, 2025). Therefore, instead of focusing solely on human replacement, the agentic IS paradigm has to concentrate on the development of hybrid workforces that leverage the unique strengths of both agentic IS artifacts and human agents (Fabri et al., 2023; Mayer et al., 2024). This hybrid workforce perspective requires a fundamental theoretical shift away from sole entity-focused agency, which views humans and IS artifacts as separate and potentially converging entities, toward relational agency, which conceptualizes agentic IS as a systemic phenomenon (Leonardi, 2023). This perspective highlights what is afforded through the sociomaterial entanglement of humans and agentic IS artifacts collaborating closely (Kuss & Meske, 2025; Murray et al., 2020). Nevertheless, adopting relational agency as a theoretical lens for human-AI collaboration introduces several challenges (Kuss & Meske, 2025). It requires reconceptualizing constructs such as controllability and accountability at the information system level rather than assigning them to individual entities and developing frameworks to distinguish between varying degrees of relational agency (e.g., assisting agentic IS vs. hybrid agentic IS). Addressing these challenges is essential for the widespread adoption of relational agency as a

productive framework for understanding and optimizing the collaboration between humans and agentic IS artifacts, without solely considering agentic IS as means of automatization and replacement of human agents.

Accountability

With IS artifacts taking on delegation ownership, they concurrently assume responsibility for the outcomes of tasks or processes (Alter, 2024; Baird & Maruping, 2021). This is especially pertinent when agentic IS artifacts autonomously handle tasks rather than delegating them to human agents. However, regulations such as the EU AI Act prohibit the transfer of legal accountability to IS artifacts, mandating human involvement (Benbya et al., 2020; European Union, 2024). Thus, while rights and responsibilities related to decision-making and action are transferred to agentic IS artifacts, legal accountability must remain with human agents as the governing entity (Beck et al., 2022; Kellogg et al., 2019). Current regulatory frameworks address this discrepancy by attributing accountability to external entities, such as developers or providers of agentic IS artifacts (European Novelli et al., 2024; Union, 2024). Alternative approaches necessitate direct human supervision (e.g., human-in-the-loop), which separates legal accountability but potentially reduces the efficiency gained through increased IS agency (Fügener et al., 2021b; Guggenberger et al., 2023). Thus, addressing legal accountability is particularly challenging when supervisory roles are dynamic (e.g., collaborative agentic IS) or reversed (e.g., autonomous agentic IS). Additionally, the increasing delegation of cognitively demanding tasks to agentic IS artifacts creates a paradoxical situation in which human agents remain accountable yet may progressively diminish their capacity to effectively supervise agentic IS, e.g., through skill erosion (Jussupow et al., 2021; Rinta-Kahila et al., 2023). This growing capability gap limits effective human oversight and complicates responsibility allocation within the agentic IS paradigm. Contrary to the entity-based assumptions that accountability can be allocated to specific entities through structural or formal mechanisms, the relational perspective conceptualizes accountability as an emergent property of dynamic attribution processes (Leonardi, 2025). Within this perspective, accountability is not merely a property to be assigned to an entity but rather an ongoing practice that is enacted through the entanglement of algorithms, interfaces, organizational routines, and human actions. Additionally, psychological dynamics further influence accountability. When humans attribute agency to IS artifacts (referring to sense of agency), they experience a

reduced sense of control and responsibility, lowering their perceived accountability despite retained legal accountability (Leonardi, 2025; Vance et al., 2015). This psychological dynamic can undermine human supervision methods, highlighting the need for new mechanisms that manage varying senses of agency and perceived accountability. As a result, novel governance mechanisms are necessary to ensure human legal accountability while still facilitating efficient and effective integration of agentic IS artifacts into hybrid teams (Demetis & Lee, 2018).

With agentic IS artifacts becoming increasingly prevalent in daily life (e.g., artificial sales representatives, AI-based supervisors, autonomous vehicles), addressing these fundamental issues is imperative for effective integration. They impact individuals, organizations and society through changes in collaboration and interaction patterns and by affecting the role of humans within the digital economy. To address these challenges, we provide research questions from an individual, organizational, and societal perspectives as a starting point for future research (see Table 2).

Conclusion

This fundamentals article introduces the emerging paradigm of agentic information systems. By examining the increasingly blurred boundaries between the capabilities of humans and IS artifacts, we conceptualize the agentic IS paradigm and distinguish it from the traditionally employed IS paradigm. Thus, we examine the progression from static and reactive tools to agentic entities that possess advanced cognitive capabilities and agency comparable to humans. Furthermore, we elaborate on the concept of agency as a theoretical foundation for understanding agentic IS. The paradigm shift enables new forms of interaction between humans and IS artifacts, thereby challenging the traditional primacy of human agency. Consequently, the nature of collaboration within IS undergoes a transformation, with the emergence of bidirectional delegation patterns leading to the identification of promising opportunities across various domains. The article also identified four major challenges *coordinating metaknowledge*, *ensuring effective delegation*, *maintaining human-centricity*, and *managing accountability* and derived corresponding research questions to address them at the individual, organizational, and societal level. In order to successfully navigate the transition toward agentic IS, researchers and practitioners must understand these new dynamics and emerging challenges. This knowledge is imperative for the effective management and governance of agentic IS.

Table 2 Future research questions regarding the challenges of agentic IS

	Individual perspective	Organizational perspective	Societal perspective
Metaknowledge	<ul style="list-style-type: none"> How can humans develop accurate self-assessment capabilities to better understand their own limitations when collaborating with agentic IS artifacts? What feedback mechanisms help humans evaluate agentic IS capabilities and task complexity under uncertainty? 	<ul style="list-style-type: none"> What mechanisms ensure effective metaknowledge distribution between humans and agentic IS in organizations? How can organizations design workflows leveraging agentic IS's superior metaknowledge without undermining human agency and control? 	<ul style="list-style-type: none"> To what extent might metaknowledge disparities about agentic IS lead to or exacerbate structural inequality? What risks emerge when a significant gap exists between the operational complexity of agentic systems and the general public's understanding of their capabilities and limitations?
Delegation	<ul style="list-style-type: none"> How do individual differences (personality traits, cognitive styles, prior experiences) influence willingness to delegate tasks to agentic IS artifacts? What critical factors foster trust in human-agentic IS collaboration for high-stake tasks? 	<ul style="list-style-type: none"> How can organizations determine an appropriate balance between human- and IS-initiated delegation? What organizational structures and processes support dynamic delegation patterns where both humans and agentic IS initiate tasks? 	<ul style="list-style-type: none"> What are the long-term societal implications of increased reliance on agentic IS? How might advanced hybrid IS (e.g., human-brain interfaces) reshape human agency and participation in increasingly automated economies?
Human-centricity	<ul style="list-style-type: none"> How must individual skills and competencies evolve to support effective collaboration with increasingly sophisticated agentic IS? How can close sociomaterial entanglement between humans and agentic IS be designed to enhance collaborative performance? 	<ul style="list-style-type: none"> How can relational agency be measured and fostered in diverse human-agent teams operating in complex organizational settings? What are the implications of agentic IS on workforce structure and skill demands, particularly within AI-driven business models? 	<ul style="list-style-type: none"> How will labor markets, particularly within digital economies, transform with the pervasive integration of agentic IS? How can regulations ensure meaningful human control and prevent deskilling as agentic IS proliferate in digital platforms and electronic markets?
Accountability	<ul style="list-style-type: none"> How can individuals maintain oversight as agentic IS increase in complexity and autonomy? How can interventions address diminished perceived accountability resulting from agency attribution to agentic IS? 	<ul style="list-style-type: none"> What governance frameworks can ensure human accountability while leveraging the autonomy of agentic IS? How can organizations manage accountability as an emergent property of ongoing attribution processes among humans, agentic IS, and organizational routines? 	<ul style="list-style-type: none"> How can regulatory frameworks evolve to address the unique challenges of agentic IS without hindering innovation in digital economies? How should societies balance the economic benefits of agentic IS with potential social disruptions?

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