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How can the adoption of different digital technologies shape subsidiary disseminative capacity and reverse knowledge transfer in MNCs?

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Abstract

Purpose – The purpose of this paper is to advance the understanding of how different forms of digital technologies (i.e. digital communication technologies [DCTs] and digital in situ technologies [DSTs]) have varying effects on subsidiaries' capacities to engage in reverse knowledge transfer (i.e. the flow of knowledge from subsidiaries to headquarters).

Design/methodology/approach – The increasing accessibility and sophistication of digital technologies has prompted growing interest in their implications for how multinational corporations (MNCs) organize value-adding activities. This conceptual paper argues that existing international business research has tended to treat digitalization as a uniform process. In contrast, the authors distinguish between DCTs and DSTs, each of which introduces distinct organizational dynamics.

Findings – This study develops a theoretical argument suggesting that the type of digital technologies adopted by MNCs configures value-adding activities in ways shaped by opposing forces, namely, centrifugal and centripetal tendencies. These opposing dynamics contribute to variation in subsidiaries' capacity to generate and disseminate knowledge. To explain this heterogeneity, this study proposes a framework and a set of propositions that predict the effects of different digital technologies on the dimensions of disseminative capacity (i.e. ability, willingness and opportunity).

Practical implications – Headquarters' adoption of specific forms of digital technologies can influence subsidiaries' action in disseminating knowledge. The conceptual discussion in this paper can benefit managers by clarifying the consequences of adopting different forms of digital technologies to mobilize and leverage MNCs' globally dispersed knowledge base.

Originality/value – This paper offers a more fine-tuned perspective on digitalization and its effects on knowledge management in multinational firms. By rejecting the treatment of digitalization as a uniform phenomenon, it provides a stronger theoretical foundation for future empirical work on the strategic management of digital transformation in global contexts.

Keywords Digital technology adoption, Digitalization, Disseminative capacity, Knowledge sharing, Reverse knowledge transfer

Paper type Conceptual paper

Introduction

Recent research in international business (IB) has underscored that digitalization presents both new opportunities and operational challenges for multinational corporations (MNCs). The rapid

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development of digital communication technologies (DCTs) has been shown to reduce the cost of coordinating geographically dispersed activities (Mani *et al.*, 2014) and to strengthen MNCs' orchestration capabilities by providing a cost-effective means of sourcing, mobilizing and managing resources across locations and contexts (Awate *et al.*, 2015; Autio *et al.*, 2021). Moreover, digital technologies can support the standardization of routine tasks and enable headquarters to monitor subsidiary activities with greater efficiency (Autio *et al.*, 2021; Menz *et al.*, 2021; Nell *et al.*, 2021). These advances have reshaped firms' internal structures by altering how activities are coordinated across organizational boundaries. They have facilitated more fluid modes of organizing and contributed to the modularization of global value chain activities (Menz *et al.*, 2021; Kano *et al.*, 2022). As a result, the volume and intensity of information exchange within and between MNC units located in different geographies have increased substantially (Bhandari *et al.*, 2023; Zeng *et al.*, 2023).

The onset of the digital age in the 1980s has brought fundamental changes to the control and coordination strategies of MNCs (Cantwell and Shukla, 2025). Some digital technologies have enhanced cross-border connectivity and facilitated instant knowledge transfer, triggering new innovations; others have made global operations automated and data-driven, enabling more central decision-making by headquarters (Cantwell and Shukla, 2025; Meyer *et al.*, 2023). In response to the digital age, large MNCs such as ABB, SKF and Volvo, among others, have embarked on digital transformation with the goals of improving production and maintenance efficiency and integrating their global value chains. Yet, the breadth and depth of digital technology use vary substantially between firms, depending on how well the adopted technologies align with strategic objectives (Björkdahl, 2020). Both empirical research (e.g. a study of 26 MNCs by Björkdahl, 2020) and industrial report (e.g. the McKinsey Report by Sternfels, 2024) reveal that a firm's primary challenge in achieving long-term success with digitalization resides in aligning its strategic objectives with the adopted forms of digital technologies, which directly impact organizational structure and strategies across the global value chain.

Despite these insights, scholarship still tends to treat digitalization as an all-encompassing concept, often using it as an umbrella term without distinguishing between specific forms of digital technologies, their functional roles and their divergent organizational effects. Although studies have examined the impact of individual technologies such as artificial intelligence, blockchain or 3D printing on IB (Ahi *et al.*, 2022), they often overlook how the effects of an individual technology may diverge from those of a combined set of technologies, depending on their application and evolution over time. As a result, the theoretical framing of digitalization becomes central to understanding how MNCs adopt and integrate digital technologies in relation to their global strategies. Recent work by Autio *et al.* (2021) provides an important step in this direction by conceptualizing digitalization as a general-purpose technology and distinguishing between two specific forms: *digital communication technologies* (DCTs) and *digital in situ technologies* (DSTs). DCTs facilitate coordination and integration across geographically dispersed units, whereas DSTs enhance the efficiency of automated processes at specific locations. Embedded in production and operational systems, DSTs can automate and redesign activities within localized operations (Autio *et al.*, 2021; Li and Mudambi, 2025). This distinction is critical because the dominant form of digital technology adopted by an MNC can influence the degree of centralization in strategic decision-making and value-adding activities (Autio *et al.*, 2021). The extent of centralization, as one of the core coordination mechanisms in MNCs (Nohria and Ghoshal, 1994), in turn shapes subsidiaries' capacity to develop and disseminate new knowledge (Zeng *et al.*, 2018).

Based on this reasoning, we pose the following research question (RQ):

RQ1. How does the adoption of distinct digital technologies, specifically digital communication technologies (DCTs) and digital in situ technologies (DSTs), influence subsidiaries' disseminative capacity?

It is widely acknowledged that MNCs derive competitive advantage from their ability to source, recombine and distribute knowledge across geographically dispersed units (Cantwell, 1991; Ghoshal and Nohria, 1989; Andersson *et al.*, 2002, 2007). Reverse knowledge transfer, defined as the flow of knowledge from subsidiaries to headquarters, enables headquarters to benefit from subsidiaries' local experience and competencies. This process contributes to the accumulation of knowledge stocks, strengthens innovation capabilities and enhances overall MNC performance (Mudambi *et al.*, 2014; Najafi-Tavani *et al.*, 2012, 2018). It is therefore both timely and necessary to examine how different forms of digital technologies shape subsidiaries' ability to engage in reverse knowledge transfer. While our primary theoretical predictions emphasize how DCTs and DSTs configure disseminative capacity through shifts in centralization, we also recognize that digitalization may yield secondary outcomes. For example, the automation of routine tasks through DSTs can generate slack resources that subsidiaries might redirect toward experimentation and innovation. We treat this possibility as an alternative interpretation rather than a core prediction and return to it later in the discussion.

Although much of the literature has focused on the absorptive capacity of the knowledge recipient (e.g. Choi and Lee, 1997; Lane *et al.*, 2006), a growing body of research recognizes the critical role of the sender's disseminative capacity (Minbaeva and Michailova, 2004; Minbaeva *et al.*, 2018; Schulze *et al.*, 2014; Szulanski, 2000). Because knowledge transfer involves both a sender and a recipient, its effectiveness depends not only on the recipient's capacity to absorb but also on the sender's ability to articulate, codify and convey knowledge. Building on this insight, we draw on recent work that highlights the heterogeneity of digital technologies (Autio *et al.*, 2021) and integrate it with research on disseminative capacity (Minbaeva and Michailova, 2004; Minbaeva *et al.*, 2018) to better understand the dynamics of reverse knowledge transfer in MNCs. Accordingly, we examine the relationships among the type of digital technology adopted, the degree of centralization and the distinct dimensions of subsidiaries' disseminative capacity, namely, the *ability* to codify and articulate knowledge, the *willingness* to share it and the *opportunity* to engage in its transfer. The focus of this paper is thus on vertical reverse knowledge transfer and how headquarters' digital technology adoption influences subsidiaries' capacity to disseminate knowledge to headquarters.

This paper contributes to ongoing debates on the implications of digital technologies for IB theory and practice in several ways. First, we recognize that different forms of digital technologies can lead to varied transformations in how MNCs organize their geographically dispersed operations. To clarify these variations, we focus on two archetypes of digital technologies and examine how each activates distinct structural forces, specifically centrifugal and centripetal forces. Stated differently, we aim to understand how the adoption of specific digital technologies influences the degree to which MNCs centralize or decentralize their activities, and how this configuration, in turn, affects subsidiaries' disseminative capacity. Although digitalization has received growing attention in IB scholarship, especially with regard to its influence on global strategy, its relationship to specific coordination mechanisms within MNCs remains underexplored (Zeng *et al.*, 2023). In this context, our conceptual study clarifies how different forms of digital technology used

by MNCs can shape coordination practices and, consequently, reconfigure subsidiaries' capacity to engage in reverse knowledge transfer.

This distinction is especially relevant to the broader debate on whether digitalization reshapes coordination structures within MNCs, either by enabling more distributed forms of influence through decentralized access to knowledge and coordination, or by reinforcing hierarchical control through automation and data-driven monitoring. The adoption of DCTs tends to strengthen centrifugal forces, which can support greater subsidiary involvement in organizational decision-making by enhancing their visibility and capacity to contribute knowledge. In contrast, DSTs tend to amplify centripetal forces, which consolidate decision-making authority at headquarters and relegate subsidiaries to roles focused on operational execution rather than knowledge generation. Rather than assuming a uniform effect, our study demonstrates that the configuration of digital technologies adopted by MNCs can either disrupt or entrench hierarchical structures. In particular, we demonstrate that shifts in centralization or decentralization, triggered by digital technology choices, have the potential to redefine the strategic influence and role of subsidiaries within the firm.

Finally, compared to the well-established literature on absorptive capacity, research on disseminative capacity has received considerably less attention, despite its critical importance in enabling effective knowledge transfer (Minbaeva *et al.*, 2018; de Sousa *et al.*, 2023). The existing body of work on disseminative capacity has primarily treated it as an explanatory variable, examining its influence on knowledge transfer across various collaborative and operational contexts. However, it remains unclear how different organizational structures and coordination mechanisms within MNCs facilitate the development of disseminative capacity. To address this gap, we investigate the technological and structural antecedents of disseminative capacity. In doing so, we contribute to the emerging literature by exploring how digitalization affects the distinct dimensions of this capability within MNCs.

Theoretical background

Knowledge transfer in multinational corporations

MNCs are increasingly understood as differentiated networks, in which foreign subsidiaries possess varying capacities to generate knowledge based on their distinct roles and responsibilities (Mudambi *et al.*, 2014). Research on MNC competitiveness consistently highlights knowledge transfer and the ability to recombine knowledge across geographic locations as foundational sources of sustainable competitive advantage (Grant, 1996; Kogut and Zander, 1993). Knowledge transfer refers to the process by which organizational actors (e.g. teams, units or firms) affect one another through the exchange and receipt of experience and expertise (Van Wijk *et al.*, 2008). Early IB research conceptualized knowledge flows primarily from a home-country perspective, emphasizing unidirectional transfer from headquarters to subsidiaries (e.g. Vernon, 1966). More recent work has acknowledged the strategic relevance of reverse knowledge transfer, in which knowledge flows from geographically dispersed subsidiaries to headquarters (e.g. Bartlett and Ghoshal, 1989; Benito *et al.*, 2002; Mudambi *et al.*, 2014; Najafi-Tavani *et al.*, 2014). Through such flows, headquarters can benefit from subsidiaries' localized competencies, thereby improving innovation and overall performance (Najafi-Tavani *et al.*, 2012, 2018). While IB scholars have long emphasized the value of reverse knowledge transfer to the MNC as a whole, they have also explored how this process affects subsidiaries' standing within the corporate network, particularly in terms of the attention they receive from headquarters (e.g. Ambos *et al.*, 2010; Najafi-Tavani *et al.*, 2014).

A central factor in the effectiveness of any knowledge transfer process is the absorptive capacity of the recipient, which refers to "a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990, p. 128). Extensive theoretical and empirical research supports the view that absorptive capacity is a critical driver of successful knowledge transfer (e.g. Lane and Lubatkin, 1998; Lane *et al.*, 2001; Mowery *et al.*, 1996).

It is widely recognized that the recipient's absorptive capacity alone does not fully explain the success of knowledge transfer (Martin and Salomon, 2003; Minbaeva *et al.*, 2018; Minbaeva and Michailova, 2004). Beyond the recipient's learning ability, the effectiveness of knowledge transfer also depends on the sender's capacity to disseminate knowledge (Easterby-Smith *et al.*, 2008; Minbaeva and Michailova, 2004). Because valuable knowledge within MNC networks is often tacit in nature, its transfer imposes additional demands on both parties. Thus, successful transfer of tacit knowledge requires not only the recipient's capacity to absorb but also the sender's capacity to articulate and convey complex knowledge, which is referred to as disseminative capacity. Compared to the extensive body of work on absorptive capacity, scholarly attention to disseminative capacity remains limited. Nonetheless, a growing stream of research highlights its critical role in enabling MNCs to mobilize internal knowledge resources (Burmeister *et al.*, 2018; Minbaeva and Michailova, 2004; Sanchez-Vidal *et al.*, 2018; Szász *et al.*, 2019). Scholars have theorized disseminative capacity in terms of multiple components (e.g. Gupta and Govindarajan, 2000; Martin and Salomon, 2003; Szulanski, 1996) and across different levels of analysis (i.e. organizational and individual) by drawing on diverse literatures in psychology, economics, sociology and pedagogy (Minbaeva *et al.*, 2018).

Despite several definitions of disseminative capacity, there is a consensus that it is a multidimensional construct. For instance, Schulze *et al.* (2014) conceptualize that disseminative capacity consists of five components (i.e. attainment of expert knowledge, assessing receiver's knowledge base, detachment of knowledge, ability to encode and support the application of knowledge) and argue that these components collectively determine the odds of knowledge transfer success. Minbaeva and Michailova (2004) describe disseminative capacity as the behavior of knowledge senders, which is further elaborated as organizational actors' (e.g. expatriate managers) ability and willingness to transfer knowledge when and where it is required within an MNC. It has been further argued that successful knowledge transfer cannot occur without creating any opportunity to share (Argote *et al.*, 2003; Ghoshal and Bartlett, 1988). Therefore, creating opportunities for frequent interaction within the organization is crucial to disseminating knowledge. Minbaeva *et al.* (2018) conceptualize the sender's disseminative capacity based on Argote *et al.* (2003)'s proposed three underlying knowledge transfer mechanisms: *ability*, *willingness* and *opportunity*. Minbaeva *et al.* (2018) have proposed and tested that, to transfer knowledge, the sender needs to have the ability to codify and articulate knowledge, the willingness (i.e. motivation) to share it, and finally, it needs the creation and use of opportunities by adopting a comprehensive set of communication channels. We will adopt this conceptualization of disseminative capacity in this paper.

Effects of digital technology on subsidiary's knowledge transfer

The adoption of digital technologies has introduced wide-ranging changes across multiple aspects of organizational functioning, including internal and external processes related to information technology, cost structures, strategy, business models, products, services, company culture and workforce composition (Swaminathan and Meffert, 2017; Verhoef *et al.*, 2021). The growing use of digital data generated through networked platforms and

connected devices has blurred traditional industry boundaries and posed significant challenges for incumbent firms (Bouncken and Barwinski, 2021; Swaminathan and Meffert, 2017). These challenges manifest as intensified competition and heightened demands for efficiency (Verhoef *et al.*, 2021). A body of research interprets this expansion of digitalization as the evolution of a general-purpose technology that affects various stages of the global value chain, including value creation, delivery and capture (Autio *et al.*, 2021; Sturgeon, 2021; Bouncken and Barwinski, 2021). Advances in digital tools, increased computing power, the proliferation of low-cost sensor technologies and the emergence of novel business models have improved operational agility in MNCs and enhanced efficiency across geographically dispersed units and production facilities in a more economically viable manner (Sturgeon, 2021). The widespread diffusion of digitalization has also reduced the salience of spatial boundaries and enabled stronger alignment among geographically distributed actors (Fitzgerald *et al.*, 2014; Tallman *et al.*, 2018). Moreover, it has facilitated knowledge exchange across entities by supporting digitally mediated forms of communication and collaboration (Bouncken and Barwinski, 2021).

Despite the substantial influence of digital technology adoption on knowledge transfer, empirical research in this area remains relatively limited (Massa *et al.*, 2023). Existing studies have only sporadically examined how specific technologies, such as cloud services or the Internet of Things, facilitate knowledge sharing (Ahi *et al.*, 2022). The adoption of digital technologies by MNCs has affected the organizational structures they use to coordinate globally dispersed knowledge activities, which enables value creation through knowledge recombination (Ghauri *et al.*, 2021; Zeng *et al.*, 2023). It has been argued that increased connectivity driven by digitalization fosters modularization and fragmentation within the global value chain. As a result, MNCs have greater flexibility to disaggregate and reconfigure activities across multiple locations (Kano *et al.*, 2022). The use of digital interfaces supports the mobilization of productive assets, which introduces an additional layer to internationalization beyond the traditional, country-specific physical infrastructure. This development has reshaped how MNCs coordinate activities globally (Autio, 2017).

To better understand how MNCs design global strategies for coordinating geographically dispersed resources and knowledge, Autio *et al.* (2021) offer a framework that classifies digital technologies based on their effects on location and control. They conceptualize digital technology as a general-purpose technology encompassing two distinct forms: *DCTs* and *DSTs*. DCTs support the coordination of decentralized, specialized and non-repetitive activities (e.g. innovation) more efficiently and at lower cost (Autio *et al.*, 2021; Langlois and Robertson, 1992). In contrast, DSTs concentrate on repetitive and routine activities by leveraging technologies such as artificial intelligence, additive manufacturing and big data analytics (Autio *et al.*, 2021; Schmitt *et al.*, 2019). Historically, these two forms were grouped under the broad category of information and communication technologies (ICTs), a classification that overlooked the significance of MNCs' geographical dispersion, or what Yamin and Sinkovics (2007) refer to as their essential "multinationality." During the early 1980s, the introduction of ICT transformed MNCs' organizational structures and strategies, leading to increased global integration of operational activities (Buckley and Ghauri, 2004). While ICT facilitated stronger central control and coordination, it was also perceived as limiting the autonomy and strategic agency of subsidiaries (Yamin and Sinkovics, 2007).

Over time, as with other general-purpose technologies, the rapid advancement of digitalization has differentiated DCTs and DSTs by enabling some value chain activities to be globally dispersed while concentrating others. This paper extends these insights by examining how DCTs and DSTs influence the geographical configuration of MNC activities (Autio *et al.*, 2021; Li and Mudambi, 2025), and how these configurations shape knowledge

dissemination from subsidiaries to headquarters. The next section explores the implications of adopting these technologies for how MNCs coordinate their globally distributed operations.

Digital technologies and (de)centralization of activities

An MNC's global strategy depends on how it balances global and local considerations, particularly with respect to location and control (Autio *et al.*, 2021). These two dimensions are strongly shaped by the influence of centrifugal and centripetal forces, which are activated by different forms of digital technologies (Autio *et al.*, 2021; Giunta *et al.*, 2025). When treated as determinants of global coordination, centrifugal forces refer to the drivers of geographic dispersion, while centripetal forces refer to the drivers of geographic concentration, particularly around the MNC's home base (Benito *et al.*, 2002). Autio *et al.* (2021) further argue that the scalability of digital systems has created a strategic tension for headquarters, which must balance the pull of global centripetal forces and the push of local centrifugal forces when managing and coordinating operations worldwide.

Scholars have argued that digitalization has been emerging under a permanent tension in the global economy between centripetal and centrifugal forces since the 1990s (Moriset and Malecki, 2009). From this perspective, ongoing advances in digital technologies have reshaped both the organizational and spatial structures of global value chains by producing an inherent tension between concentration and dispersion of activities. The trade-off between these opposing spatial tendencies is anchored in the contrasting effects of centripetal and centrifugal forces (Autio *et al.*, 2021; Holgersson *et al.*, 2022; Moriset and Malecki, 2009). According to Holgersson *et al.* (2022), centripetal forces encourage the centralization of economic activities, while centrifugal forces promote the distribution of these activities across markets through globally dispersed subsidiaries and partners. They further suggest that the adoption of new technologies can alter the balance between these forces and, over time, lead to changes in coordination mechanisms.

DCTs can improve both the effectiveness and efficiency with which MNCs leverage and coordinate their globally dispersed and diverse knowledge bases (Autio *et al.*, 2021). These technologies enable new business models by facilitating the distribution of different stages of the innovation process across geographically dispersed units (Dattée *et al.*, 2018; Furlonger and Uzureau, 2019). The combined use of such technologies reinforces centrifugal forces, which arise from factors such as the dispersed nature of knowledge required to build large technological systems, the presence of network effects in creating customer value propositions and the modularity of products (Holgersson *et al.*, 2022). Supporting this view, Moriset and Malecki (2009) discuss aircraft manufacturers such as Boeing, Airbus and Dassault Aviation, all of which have adopted business models that rely on modular design and global sourcing to access a wider pool of specialized partners. The case of Dassault Aviation's Falcon 7X is particularly notable, as it was the first commercial jet to be designed entirely in digital format. Dassault Aviation operates on both physical and virtual platforms, allowing 1,500 design engineers worldwide to contribute simultaneously to a shared database. According to Dassault Aviation (2004), developments in DCTs have made it possible for partners to communicate design changes overnight, replacing the earlier standard timeframe of three weeks.

DSTs, on the other hand, can be understood as a set of technologies primarily applied in production engineering and operations management, with the objective of achieving factory automation (Autio *et al.*, 2021). These tools (e.g. intelligence, big data analytics and additive manufacturing) are used to automate localized processes within firms. DSTs can also be embedded in products and services, such as agricultural equipment, to create new forms of

customer value and experience (Baskerville *et al.*, 2020). By automating routine and less knowledge-intensive tasks within the MNC's global value chain, DST tends to concentrate operational processes and reinforce centripetal forces. Advanced robotics, for instance, can perform increasingly complex tasks in a cost-efficient manner (Ahi *et al.*, 2022). Similarly, 3D printing has transformed global value chain strategies by allowing product design to occur in any location, thereby reducing the need for geographically dispersed development functions (Laplume *et al.*, 2016). We argue that DST-driven automation of standardized and repetitive tasks contributes to the consolidation of certain activities at specific locations, most notably at MNC headquarters. For example, the use of big data analytics to support "Control towers," as in the case of Procter and Gamble, has enabled headquarters to centralize its supply chain monitoring functions (Galbraith, 2014).

Digital technology adoption and subsidiary disseminative capacity

One of the primary competitive advantages of MNCs lies in their capacity to mobilize and apply knowledge generated across global units. Subsidiaries, as unique repositories of knowledge, play a critical role in this process, which is a well-established point in the IB literature (Gupta and Govindarajan, 2000; Najafi-Tavani *et al.*, 2018; Zeng *et al.*, 2018). Within MNC networks, knowledge flows in multiple directions: vertically and forward from headquarters to subsidiaries, vertically and in reverse from subsidiaries to headquarters, and laterally across subsidiaries (Najafi-Tavani *et al.*, 2018). Although these multidirectional flows are widely acknowledged, this paper concentrates on vertical reverse knowledge transfer. We focus on the subsidiary's capacity to generate and disseminate new knowledge, as this capability is central to reinforcing and expanding the core competencies of the MNC. It is important to clarify that subsidiaries are not treated as autonomous or isolated entities. Rather, they operate as integral components of the MNC and are influenced by structural constraints and enabling mechanisms established at the corporate level.

The integration of digital technologies into traditional business operations alters the organizational structures that govern global coordination and decision-making (Autio *et al.*, 2021; Zeng *et al.*, 2023). Giunta *et al.* (2025)'s empirical study on the manufacturing sector in Europe shows the causal effects of types of digital technologies on global value chain regionalization. Drawing on the global connectivity theoretical perspective (e.g. Autio *et al.*, 2021), they have further analyzed how two opposing forces triggered by digital technologies adoptions, that is, centrifugal forces exerted from DCTs reinforce a fragmented product innovation network and centripetal force associated with DSTs incentivize relocation of some stages of the production process in a particular location in Europe. DSTs make firms automate processes, reduce waste and improve productivity, whereas DCTs reduce geographical distances, facilitating knowledge transfer within a firm (Forman and van Zeebroeck, 2019; Giunta *et al.*, 2025). In this context, a notable real-world example is Unilever's digitalized Materials Innovation Factory in UK. By integrating automation and robotics (i.e. DSTs), the factory has automated routine tasks, reduced production costs and accelerated laboratory processes, which in turn has allowed skilled manpower to be redeployed for more knowledge-intensive activities (El Samra *et al.*, 2024). Thus, the type of digital technology adopted by the MNC, through its headquarters, affects both the extent and the nature of subsidiary involvement in reverse knowledge transfer.

Building on our earlier conceptualization of digitalization, we examine the comparative effects of DCTs and DSTs on the three dimensions of disseminative capacity and develop a set of propositions accordingly. The coexistence of these two forms of digital technology presents MNCs with a strategic challenge, namely, how to balance the opposing centrifugal and centripetal forces they generate (Giunta *et al.*, 2025). Because these forces are rooted in

the characteristics of the digital technologies adopted and directly influence the degree of centralization (Autio *et al.*, 2021), our analysis centers on centralization as the primary coordination mechanism. We therefore set aside other mechanisms, such as formalization or socialization (Ghoshal and Nohria, 1989; Lunnan *et al.*, 2019). We assume that, in practice, MNCs are likely to adopt both DCTs and DSTs in parallel, depending on the nature of their knowledge-related activities. These technologies should thus not be treated as mutually exclusive. Guided by this conceptual foundation, the propositions we develop are intended to reflect archetypical configurations (see Figure 1). Our initial focus is on delineating distinct relationships between the two forms of digital technology and subsidiaries' disseminative capacity. This baseline conceptual model will later be extended by introducing contingency factors that may serve as boundary conditions for the proposed effects.

The concept of disseminative capacity was developed to complement the notion of absorptive capacity, which emphasizes the crucial role of the knowledge sender in facilitating effective knowledge transfer. As several scholars have emphasized, the sender's capacity to transfer knowledge is not a uniform or singular capability. Instead, it consists of multiple dimensions (e.g. Minbaeva *et al.*, 2018; Yildiz *et al.*, 2025). This capacity is best understood through three core components: ability, willingness and opportunity. Drawing on the motivation-opportunity-ability (MOA) framework, we follow the conceptualization proposed by Minbaeva *et al.* (2018), which offers a targeted application of this logic by shifting the focus to the sender's role in the knowledge transfer process. This perspective underscores that the success of knowledge outflows depends on the presence of these three conditions at the originating unit. Each of these dimensions is discussed in detail below.

Ability

According to Minbaeva *et al.* (2018), a sender's success in transferring knowledge depends on its ability to evaluate the recipient's existing knowledge and needs, detach the knowledge from its original form and articulate and codify it in a way that aligns with the recipient's characteristics. The existing literature has emphasized the importance of the sender's

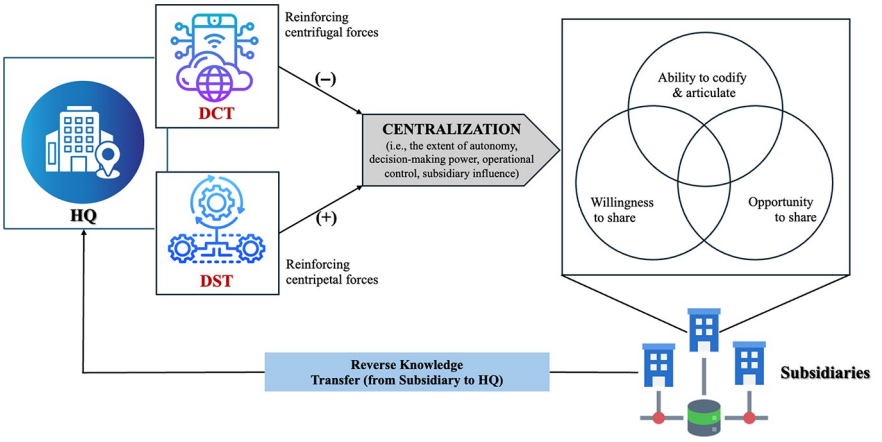

Figure 1. The effect of headquarters' different digital technology adoption on subsidiary disseminative capacity in MNCs
Source: Authors' own work

capacity to assess the recipient's knowledge base, since this enables the sender to determine the relevance of its own knowledge in light of the recipient's needs (Martin and Salomon, 2003; Schulze *et al.*, 2014). Prior research has shown that when a subsidiary's knowledge is not perceived as relevant to the MNC's broader competitive advantage, it is less likely to be transferred (Najafi-Tavani *et al.*, 2014). In addition, when the sender and the recipient share similar prior experiences, the likelihood of transfer increases because the sender is better equipped to encode the knowledge appropriately (Argote *et al.*, 2003). After identifying the relevant knowledge, the sender must extract it from its original organizational context (e.g. people, processes or routines) and reformat it to suit the specific purpose of the transfer (Minbaeva and Michailova, 2004; Park, 2022; Schulze *et al.*, 2014).

Technology-based networks and communication systems facilitate knowledge transfer within organizations by reducing the gap between sender and receiver (Ipe, 2003). When both parties possess similar knowledge bases, prior experience and technological infrastructures, the sender is better equipped to tailor the transfer process to align with the recipient's characteristics. DCTs improve the sender's ability to transmit standardized, codified data, messages and information, although transferring less codified or tacit knowledge remains more difficult (Gupta and Govindarajan, 1991; Rabbiosi, 2011). We argue that the adoption of DCTs can strengthen a subsidiary's ability to engage in reverse knowledge transfer, which may also enhance its legitimacy and perceived value within the broader MNC (Schulz, 2001). During the transfer process, electronic coordination mechanisms can help reduce knowledge heterogeneity between the subsidiary and headquarters. They also support incremental learning by enabling the refinement and reuse of existing knowledge resources (Rabbiosi, 2011). In this way, DCTs can help bridge communication gaps between sender and receiver, contributing to more effective knowledge transfer outcomes.

In addition to narrowing the gap between sender and receiver and improving the subsidiary's ability to transfer codified knowledge, the centrifugal forces associated with DCTs also promote the dispersion of innovation and value-creation activities across the MNC's global network (Dattée *et al.*, 2018; Furlonger and Uzureau, 2019). This dynamic strengthens subsidiary mandates not only in production and sales but also in innovation-related activities (Autio *et al.*, 2021). For instance, Dassault Aviation, an aircraft manufacturer, built its success on modular product architecture and a decentralized knowledge base shaped by centrifugal forces (Moriset and Malecki, 2009). This example illustrates how DCTs facilitate the geographic dispersion of knowledge-intensive functions such as product design and R&D. When a globally dispersed unit (i.e. sender) possesses relevant knowledge aligned with headquarters' manufacturing objectives, DCTs improve its ability to disseminate that knowledge. This creates more opportunities for subsidiaries to participate in specialized knowledge activities and contribute strategically to the MNC's competitive advantage. The strategic role of subsidiaries evolves under decentralized organizational conditions, which support their knowledge transfer capabilities (Pertusa-Ortega *et al.*, 2010; Rabbiosi, 2011). A lower degree of centralization grants greater autonomy to subsidiaries and enables broader involvement of individuals in decision-making processes (Zeng *et al.*, 2018).

In contrast to the decentralization and centrifugal forces triggered by the adoption of DCTs, the centripetal forces associated with DSTs tend to lead MNCs to centralize their less knowledge-intensive or highly routine activities within the global value chain. Prior research characterizes DST as technologies that automate, upgrade and restructure production and operational routines at specific locations (Autio *et al.*, 2021; Bilberg and Malik, 2019; Szalavetz, 2019). The adoption of DSTs enhance the MNC's capacity to monitor and control

operations by automating local processes (Autio *et al.*, 2021). For example, the integration of big data analytics and the Internet of Things (IoT) enable headquarters to access real-time information on supply chain storage and processing, which improves the speed and quality of decision-making (Ahi *et al.*, 2022). These systems increase transparency in global supply processes without relying on subsidiaries to initiate knowledge transfers. Even when headquarters and subsidiaries possess comparable knowledge of DSTs and supply chain systems, the headquarters may have no further need for local knowledge contributions. The centripetal forces associated with DSTs centralize decision-making authority and provide additional control to headquarters over subsidiary operations (Zeng *et al.*, 2018). Smart manufacturing systems that incorporate DSTs provide headquarters with real-time data on components, personnel and processes, thereby improving operational efficiency and planning capabilities (Buer *et al.*, 2021). These systems support centralized, data-driven decision-making and limit the subsidiary's role in acquiring and contributing new knowledge (Nell *et al.*, 2021; Schmitt *et al.*, 2019). Reverse knowledge transfer becomes unlikely under such conditions, as DSTs automate and reorganize local processes according to top-down directives set by headquarters.

Based on the arguments above, we suggest the following propositions:

P1a. The adoption of digital communication technologies, which reinforce centrifugal forces, is positively associated with subsidiaries' ability to transfer knowledge to headquarters because reduced centralization grants subsidiaries greater autonomy to codify, articulate and reformat their knowledge.

P1b. The adoption of digital in situ technologies, which reinforce centripetal forces, is negatively associated with subsidiaries' ability to transfer knowledge to headquarters because increased centralization limits subsidiaries' autonomy and reduces the relevance of their knowledge contributions.

Willingness

Extensive research on reverse knowledge transfer has shown that subsidiaries' willingness is positively associated with effective knowledge sharing toward headquarters (e.g. Gupta and Govindarajan, 2000; Kong *et al.*, 2018; Minbaeva *et al.*, 2018; Najafi-Tavani *et al.*, 2012). While willingness is often discussed as a factor that enables recipients to absorb new knowledge (e.g. Schleimer and Pedersen, 2013), it also plays a central role in shaping the sender's capacity to disseminate knowledge (Minbaeva *et al.*, 2018). Scholars have consistently identified motivational constraints as significant barriers to successful knowledge transfer (Gupta and Govindarajan, 2000; Szulanski, 1996). According to Su *et al.* (2021), subsidiaries with strong motivation are more likely to allocate resources, personnel and time to support knowledge transfer efforts. In line with this view, a meta-analysis by Zeng *et al.* (2018) finds that centralization is an important determinant of subsidiaries' willingness to transfer knowledge. Further evidence suggests that a higher degree of centralization can diminish a subsidiary's willingness to share knowledge, as it limits the unit's autonomy to respond to local demands and conditions (Ciabuschi *et al.*, 2010).

According to Wang *et al.* (2004), a subsidiary's willingness to engage in knowledge transfer is shaped by its perception of the knowledge's value and the quality of the relationship with the recipient. Despite the strategic importance of knowledge sharing, subsidiaries may still be reluctant to transfer their knowledge to headquarters (Mudambi and Navarra, 2004). We propose that a subsidiary's willingness to share knowledge is driven by three interrelated mechanisms. First, the anticipation of gaining *influence* within a

decentralized MNC serves as a primary motivator. When DCTs are adopted, subsidiaries become better equipped to coordinate their specialized activities with other globally dispersed units, which increases their potential to shape organizational decisions. DCTs enhance subsidiaries' capacity to contribute distinctive knowledge to the firm's competitive advantage, particularly in decentralized contexts where influence is more widely distributed. The centrifugal forces stimulated by DCTs direct economic activity and knowledge generation outward across the MNC's global network (Autio *et al.*, 2021), thereby expanding subsidiaries' opportunities to increase their influence. For example, when subsidiaries share locally generated knowledge efficiently through DCTs, they can signal their strategic relevance to headquarters. This, in turn, may strengthen their position within the organizational network and increase their influence in future decision-making processes (Najafi-Tavani *et al.*, 2014).

Second, autonomy in generating and disseminating context-independent knowledge is a critical factor influencing subsidiaries' willingness to share knowledge, and DCTs play an important role in enhancing this *autonomy*. By using DCTs, subsidiaries acquire the capacity to generate knowledge from their local environments and transmit it across the MNC network with greater efficiency. Through the reinforcement of centrifugal forces, DCTs support the decentralization of knowledge-intensive activities and enable subsidiaries to operate more independently in producing and sharing knowledge that is globally relevant. The improved communication and coordination infrastructure enabled by DCTs allow subsidiaries to deliver insights from diverse contexts in a timely manner, facilitating effective knowledge dissemination across borders (Autio *et al.*, 2021). This autonomy enhances their strategic contribution to the MNC, as they are not tightly constrained by local limitations and are instead positioned to create and share knowledge that serves the broader organization.

Third, the *incentives* for subsidiaries to disseminate knowledge may become more pronounced when DCTs are adopted, as these technologies increase the efficiency of knowledge transfer across the MNC. Although subsidiaries may hesitate to share knowledge due to concerns about losing their competitive edge or receiving insufficient recognition, DCTs help mitigate these concerns by facilitating more seamless and timely communication (Forsgren, 1997; Szulanski, 1996). DCTs reduce information asymmetries between headquarters and subsidiaries, which supports stronger collaboration and closer alignment of organizational goals (Kong *et al.*, 2018). As DCTs amplify centrifugal forces, it enables subsidiaries to demonstrate their value contributions in real-time, making it more likely that headquarters will recognize and reward their efforts. For example, in the case of Dassault Aviation, DCTs enabled partners to deliver critical updates overnight, which significantly improved coordination and ensured timely acknowledgment of knowledge contributions. By fostering a more collaborative organizational climate, DCTs help ensure that subsidiaries perceive themselves as valued participants in the knowledge system, with the assurance that their contributions will generate a visible and timely impact on the MNC's broader operations.

In contrast, the adoption of DSTs by headquarters reinforces centripetal forces, which concentrate decision-making authority and operational control at the central level (Autio *et al.*, 2021). These technologies offer real-time, data-driven monitoring and control capabilities, consolidating decision-making processes and enhancing operational efficiency (Chien *et al.*, 2007; Nell *et al.*, 2021). For instance, DSTs have enabled firms such as General Electric (GE) to apply machine learning models that optimize core operational decisions, including delivery scheduling and inventory control, which are the types of functions previously required human input from multiple decentralized units (Barro and Davenport, 2019). By introducing standardization and automation to routine tasks, DSTs reduce the need

for specialized human capital, shift operational activities toward centralized structures and diminish reliance on knowledge contributions from geographically dispersed subsidiaries (Szalavetz, 2019).

This centralization has significant implications for the willingness of subsidiaries to transfer knowledge, particularly reverse knowledge, to headquarters. DSTs reinforce centripetal forces, consolidate decision-making authority and restrict the subsidiary's involvement in knowledge creation and dissemination (Autio *et al.*, 2021). As DSTs centralize strategic processes over time, subsidiaries become increasingly disconnected from knowledge-intensive activities. Research has shown that centralized coordination mechanisms reduce subsidiaries' autonomy and limit their inclination to search for, acquire and share local knowledge (Zeng *et al.*, 2018). Traditionally, headquarters have implemented various monitoring tools (e.g. expatriate assignments and bureaucratic procedures) to control subsidiary behavior and ensure alignment with corporate objectives. These efforts are intended to mitigate potential opportunistic actions that may arise from information asymmetries (e.g. Chatzopoulou *et al.*, 2022). However, such monitoring inherently introduces a level of control that constrains subsidiaries' autonomy, as headquarters aim to enforce compliance with centralized decisions. Prior research confirms that increased monitoring from headquarters is negatively associated with subsidiary autonomy (O'Donnell, 2000). As a result, even when subsidiaries hold valuable localized knowledge, their limited autonomy weakens their incentive to share that knowledge with headquarters (Pertusa-Ortega *et al.*, 2010).

Within this context, the adoption of DSTs reduce subsidiaries' willingness to transfer knowledge back to headquarters. As subsidiaries become increasingly limited to performing standardized and automated tasks, their capacity to contribute locally specialized knowledge becomes less relevant in the broader decision-making process. This reduction in relevance discourages their participation in knowledge-sharing efforts (Nell *et al.*, 2021). It can therefore be argued that DSTs not only restrict subsidiaries' ability to contribute but also diminish their willingness to engage in reverse knowledge flows. The centralization of data-driven decision-making processes weakens the mechanisms that previously supported knowledge exchange and innovation.

In sum, based on these arguments, we suggest the following propositions:

P2a. The adoption of digital communication technologies, which reinforce centrifugal forces, is positively associated with subsidiaries' willingness to transfer knowledge to headquarters because reduced centralization enhances their autonomy to act on local initiatives and increases the likelihood that their contributions will be recognized and rewarded.

P2b. The adoption of digital in situ technologies, which reinforce centripetal forces, is negatively associated with subsidiaries' willingness to transfer knowledge to headquarters because increased centralization confines them to routine tasks and reduces both their autonomy and the recognition of their knowledge contributions.

Opportunity

In addition to the sender's willingness and ability, opportunities must be actively established in order for knowledge to be transferred effectively (Argote *et al.*, 2003). Such opportunities often arise through frequent interaction between sender and receiver (Minbaeva *et al.*, 2018). Opportunity refers to the situational conditions that enable a particular behavioral outcome (Maclnnis *et al.*, 1991). Within an MNC network, these conditions may either support or

constrain the ability of knowledge senders and recipients to learn from one another (Najafi-Tavani *et al.*, 2018). Even when a sender has the ability to codify and articulate knowledge and is willing to share it, the absence of appropriate opportunities renders that knowledge unutilized. Through interaction, senders can better understand the needs of receivers and shape their knowledge contributions accordingly (Minbaeva *et al.*, 2018). Opportunities for knowledge sharing may take both formal and informal forms (Ipe, 2003).

Formal opportunities, referred to as purposive learning channels (Rulke and Zaheer, 2000), include training programs, structured work teams and technology-based systems designed to support knowledge transfer (Bartol and Srivastava, 2002). Informal opportunities, also known as relational learning channels, include personal relationships and social networks that facilitate learning and sharing through trust-based interactions (Nahapiet and Ghoshal, 1998). Electronic platforms and other technology-based systems can enhance purposive learning channels by creating structured environments that engage a broader set of individuals and accelerate the flow of knowledge (Ipe, 2003). However, prior studies suggest that much of knowledge transfer continues to occur in informal contexts, particularly through face-to-face exchanges rooted in trust and personal relationships (e.g. Jones and Jordan, 1998; Pan and Scarbrough, 1999; Truran, 1998; Nahapiet and Ghoshal, 1998). Regardless of whether interactions are formal or informal, effective knowledge transfer between geographically dispersed entities depends on the ability to use diverse communication channels. When senders have access to multiple channels and can select those best suited to recipients' needs, the likelihood of successful knowledge transfer increases (Minbaeva *et al.*, 2018).

As discussed earlier, a higher degree of decentralization, enabled by DCTs, provides subsidiaries with greater autonomy to develop new knowledge and motivates them to pursue appropriate opportunities to share it with headquarters. DCTs can introduce new mechanisms that support interaction within the firm (Verhoef *et al.*, 2021) and allow for novel forms of collaboration across a distributed network of diverse actors. For example, digital technologies such as augmented reality and cloud-based platforms can improve both intra- and inter-firm knowledge transfer (Ahi *et al.*, 2022). These tools help build online communities within the organization that foster collaboration and facilitate knowledge exchange across dispersed units (Schmitt *et al.*, 2019). Prior research demonstrates that electronic coordination mechanisms strengthen communication among organizational units (e.g. Fulk and DeSanctis, 1995; Niederman, 2005) and enhance the flow of knowledge between subsidiaries and headquarters (Rabbiosi, 2011). The centrifugal forces associated with DCTs contribute to the decentralization of specialized activities within MNCs. This decentralization not only grants subsidiaries autonomy to develop local knowledge but also encourages them to identify and pursue opportunities for sharing it, particularly when such initiatives can help them gain visibility and relevance within the MNC. Through these opportunities, subsidiaries contribute to the MNC's competitive advantage by leveraging their local knowledge base (Marino *et al.*, 2020; Schotter *et al.*, 2017). In this context, DCTs play a catalytic role by initiating the interaction process and serving as a coordinating interface between subsidiaries and headquarters.

Through the automation of routine activities, DSTs improve operational excellence (Autio *et al.*, 2021), centralize decision-making authority (Nell *et al.*, 2021) and expand the headquarters' capacity to make data-driven decisions (Leonardi, 2020). This form of digital technology introduces a structural shift within MNCs and broadens headquarters' scope and influence over decision-making at the subsidiary level (Galbraith, 2014; Schmitt *et al.*, 2019). The higher degree of centralization, driven by the centripetal forces associated with DSTs, limits subsidiaries' opportunity to generate knowledge from their local environments

(Lunnan *et al.*, 2019) and restricts the transfer of that knowledge to headquarters (Zeng *et al.*, 2018). In contrast to decentralization, centralization tends to reduce the development of creative solutions, impede communication across departments and constrain the flow of ideas and knowledge (Pertusa-Ortega *et al.*, 2010). DSTs-supported centralization enables headquarters to access real-time data for more efficient decision-making, but it narrows the scope for subsidiaries to engage in knowledge creation and dissemination. While DCTs foster a collaborative environment that encourages frequent interactions between headquarters and subsidiaries, facilitating knowledge dissemination, DSTs primarily focus on upgrading operational efficiency and may not provide as many opportunities for subsidiaries to interact with headquarters for knowledge transfer.

In sum, based on the above discussion and arguments, we suggest the following propositions:

P3a. The adoption of digital communication technologies, which reinforce centrifugal forces, is positively associated with subsidiaries' opportunities to transfer knowledge to headquarters because reduced centralization creates more frequent and diverse interaction channels for knowledge exchange.

P3b. The adoption of digital in situ technologies, which reinforce centripetal forces, is negatively associated with subsidiaries' opportunities to transfer knowledge to headquarters because increased centralization narrows subsidiaries' access to interaction channels and reduces occasions for knowledge sharing.

Discussion and conclusion

In contrast to most studies in the contemporary IB literature that examine the emergence and anticipated effects of digitalization, this paper adopts a different approach by avoiding the treatment of digitalization as a monolithic phenomenon. Following the distinction developed by Autio *et al.* (2021), we argue that different forms of digital technology adoption give rise to distinct structural conditions within MNCs and activate two opposing dynamics: centripetal and centrifugal forces. Before outlining the paper's broader contributions and implications, it is necessary to acknowledge its limitations. This is a conceptual paper grounded in theoretical argumentation and does not incorporate empirical analysis. Future studies may empirically assess the propositions developed here. Moreover, by focusing on archetypical configurations, the paper does not address institutional or legal constraints imposed by host country governments (Kallinikos, 2011), nor does it consider the high location dependence of certain digitally enabled products (Yoo *et al.*, 2010). Our theoretical development also centers exclusively on the sender's disseminative capacity and does not account for the recipient's absorptive capacity in the knowledge transfer process. Subsequent research could explore knowledge transfer as a relational process between subsidiaries and headquarters by integrating both perspectives. In particular, examining how digitalization reshapes the balance of power between these two actors, especially when subsidiaries lead the adoption of digital technologies, could yield meaningful insights. Such inquiry would extend current IB discussions of digital transformation beyond questions of efficiency and coordination and bring greater attention to its organizational consequences within MNCs.

Moreover, this paper has focused on one type of coordination mechanism (i.e. centralization) because it is directly linked to the two forms of digital technology discussed. However, knowledge transfer within MNCs depends on multiple coordination mechanisms, including formalization and socialization, each of which warrants closer examination (Zeng *et al.*, 2018). Centralization refers to the *locus* of decision-making authority, formalization

governs the standardization of processes and routines and socialization involves informal interactions that build trust and facilitate knowledge flows. Future research could investigate how these mechanisms interact with digital technologies to condition subsidiary behaviors related to knowledge dissemination. A deeper understanding of how digitalization impacts all three types of coordination would offer a more thorough explanation of knowledge transfer in globally distributed organizations.

At the same time, an alternative way to interpret the dynamics outlined in this paper would be through the lens of power and resource dependence. From this perspective, the relationship between headquarters and subsidiaries can be viewed as one of mutual dependence, where control over critical resources shapes influence and decision-making authority (Pfeffer and Salancik, 1978). The adoption of a resource dependence interpretation could be seen as strengthening headquarters' control over scarce resources (e.g. data, capital-intensive infrastructure and advanced analytics) by consolidating them in centralized locations, thereby reinforcing asymmetries of dependence. Conversely, DCTs may allow subsidiaries to leverage locally embedded resources and knowledge, thereby reducing dependence on headquarters and creating opportunities to renegotiate influence within the MNC network. While this narrative is theoretically plausible and resonates with existing research on intra-MNC power relations (Jiang *et al.*, 2023), we have not adopted RDT as the guiding framework for our analysis. Our aim has been to conceptualize the structural mechanisms through which digital technologies configure disseminative capacity, focusing specifically on coordination rather than control of resources. Nevertheless, acknowledging this alternative perspective is valuable because it highlights how digitalization may alter not only coordination structures but also the distribution of power within MNCs. Future research could build on our framework by explicitly integrating a resource dependence logic, examining how digital technologies shift relative dependencies between headquarters and subsidiaries across industries and institutional contexts.

Despite these limitations, this paper contributes to the ongoing conversation in the IB literature by offering a finer-grained approach to digitalization. We examine how different types of digital technologies generate centripetal and centrifugal forces that shape the evolving relationship between headquarters and subsidiaries and redefine their strategic roles. Considering that MNCs adopt both DCTs and DSTs in parallel, digitalization is a complex process with inherent trade-offs between these opposing forces and creates variation in the degree of subsidiary autonomy. By focusing on archetypical configurations, we illustrate how the degree of centralization shifts in response to the dominant form of digital technology and how this shift influences subsidiaries' capacity for reverse knowledge transfer. This shift holds particular relevance for understanding whether subsidiaries function merely as recipients of headquarters-driven digital initiatives or actively participate in shaping digital transformation across the MNC. This way, we contribute to the underexplored domain of knowledge flows between subsidiaries and headquarters in the context of digitalization.

Furthermore, although the receiver's absorptive capacity is well recognized (Argote *et al.*, 2003; Andersson *et al.*, 2015; Cohen and Levinthal, 1990; Van Wijk *et al.*, 2008; Zhou *et al.*, 2018), the sender's disseminative capacity (Burmeister *et al.*, 2018; de Sousa *et al.*, 2023; Minbaeva and Michailova, 2004; Sanchez-Vidal *et al.*, 2018; Szász *et al.*, 2019; Yildiz *et al.*, 2025) as a success factor for reverse knowledge transfer is less explored. In that context, we developed a set of propositions that postulate how the level of de(centralization) that emerged from forms of digital technology affects the sender's disseminative capacity. By doing so, we extend discussions on how digitalization reshapes not only the efficiency of knowledge flows but also the decision-making process across MNCs. Our theoretical

predictions suggest that digitalization is not merely a technical shift but also an organizational process, altering the autonomy of subsidiaries and their ability to influence headquarter strategies.

Our theoretical predictions offer MNCs a distinct perspective on digitalization. They clarify how different forms of digital technology may be used to either distribute specific activities across the value chain or to centralize and integrate others. This differentiated view helps MNCs understand how digital technologies influence the balance between centrifugal and centripetal forces, thereby shaping the role of subsidiaries in knowledge transfer. One key implication is that digitalization does not inherently democratize the MNC structure. Rather, its consequences depend on whether the adopted technologies enhance headquarters' control (via DSTs) or expand subsidiaries' strategic influence (via DCTs). Future research could explore this further by examining how digitalization reshapes power asymmetries within MNCs across various industries and institutional environments.

Although the propositions we propose seem straightforward and clear, the reality, as is often the case, is more complex and involves several contingencies. In our paper, we assume that both forms of digital technologies are provided by headquarters, which is knowledgeable about these technologies. However, this might not always be the case for DCTs. If a subsidiary independently adopts these technologies in response to local environmental demands, the headquarters might initially have limited knowledge of it. This could produce different effects across three dimensions (i.e. ability, willingness and opportunity) of the subsidiary's disseminative capacity, rather than the uniformly positive effects outlined in our conceptualization. According to Lane and Lubatkin (1998)'s conceptualization of relative absorptive capacity, the success of knowledge transfer depends on the similarity of the knowledge base between the sending firm (e.g. the subsidiary) and the receiving firm (e.g. headquarters). The subsidiary's success in disseminating knowledge relies on its ability to articulate and codify knowledge based on the recipient's existing knowledge base and needs (Minbaeva *et al.*, 2018). Under these circumstances, since the headquarters is less knowledgeable about the DCTs the subsidiary employs in its value chain activities, the knowledge gap between the two parties might reduce the subsidiary's ability to disseminate knowledge. However, DCTs would likely remain positively associated with the other two elements of the subsidiary's disseminative capacity.

As per their conceptualization, DSTs centralize certain activities through continuous automation of repetitive activities. The subsidiaries adopting these technologies only follow the headquarters' one-way centralized decisions. They are granted less autonomy, which curbs their capacity to seek knowledge from the local environment to engage in knowledge-intensive activities and transfer relevant knowledge. Nevertheless, this may not always be the case. Previous research indicates that subsidiaries undergo a competency development process and evolution over time (e.g. Birkinshaw, 1998; Birkinshaw and Hood, 1998; Cantwell and Mudambi, 2005). This evolution can change their role in an MNC network by gaining a mandate. DSTs, adopted by the subsidiary through the directive from headquarters, can generate slack time for a subsidiary, as routine automated tasks gradually detach the required level of human skills from the automated process over time (Autio *et al.*, 2021). Despite all adverse effects, slack time allows organizations to experiment with new strategies and innovative projects within a resource-constrained environment (Agrawal *et al.*, 2018; Nohria and Gulati, 1996). Previous research shows that financial and managerial slack is associated with subsidiary innovation initiatives (Nohria and Gulati, 1996; Villar *et al.*, 2018). The slack generated from process automation (by DSTs adoption), along with a subsidiary's digital expertise, can allow it to develop its competencies according to the

market demand and can enable it to change its role from an executor to a contributor or innovator (e.g. Ryan *et al.*, 2020, 2022).

This raises an important question:

Q1. Do DSTs always reinforce headquarters control, or can subsidiaries leverage automation-driven slack to pursue new competencies and eventually challenge existing hierarchies?

Future research could examine the conditions under which subsidiaries use DSTs-enabled slack time to enhance their strategic influence. An exemplary case illustrated by Ryan and his colleagues (2022) offers a preliminary answer to this question by showing how a medical equipment manufacturing subsidiary mandated by the headquarters has evolved and become the generator of innovation through continuous upgradation of production facilities and related competencies relying on its slack resources. Thus, a subsidiary can balance between the adoption of DSTs and DCTs. In addition, since a higher level of modularity causes centrifugal forces (Holgersson *et al.*, 2022), a lack of product modularity can impose critical moderating effects on our theoretical framework's tenets by reducing the level of geographical knowledge dispersion (Autio *et al.*, 2021). This can also influence a subsidiary's adoption of DCTs as well as the level of autonomy associated with it.

As noted elsewhere, adopting digitalization in traditional MNCs is now more than integrating some digital technologies in their internal and external operations. It has reshaped and complicated MNCs' organizational structure and global strategies to a considerable extent (Autio *et al.*, 2021; Zeng *et al.*, 2023). Digitalization has also influenced MNCs' pursuit of competitive advantages by accumulating globally dispersed knowledge (Ahi *et al.*, 2022). It is evident from different industry reports that digital technologies have become imperative for MNCs to stay competitive in the digital age (Ghauri *et al.*, 2021). Though some studies (e.g. Autio *et al.*, 2021; Chen and Kamal, 2016; Laplume *et al.*, 2016) highlight the role of digital tools in acquiring and spreading knowledge across the globe to integrate global value chain activities (Feliciano-Cestero *et al.*, 2023), extant literature barely focuses on how the interrelated relationships between knowledge transfer and digital technologies can influence an MNC's emerging new strategies (Massa *et al.*, 2023).

Despite increasing attention to digitalization as a dominant research theme in IB, its implications for subsidiary knowledge dissemination remain underexplored. Effective knowledge transfer is crucial for the survival and performance of MNCs, where subsidiaries play an indispensable role in possessing unique knowledge stocks. In our conceptual model, we have examined how two opposing forces, stimulated by different forms of digital technology, shape subsidiaries' disseminative capacity. Our discussion contributes to a deeper understanding of how digitalization shapes headquarter−subsidiary relationships, raising critical questions about whether digital technologies democratize decision-making or reinforce existing hierarchies. This perspective can help managers move beyond the umbrella term "digitalization" to develop a clearer understanding of the consequences of different digital technologies in their global value chain activities. Future research could build on this foundation by exploring industry-specific variations in digitalization's effects on MNC structures and subsidiary strategic autonomy. The conceptual foundation of this paper is built on considering structural condition of typical MNCs operating in manufacturing industry, embracing digital transformation (e.g. Meyer *et al.*, 2023). Future research within the context of a more specific industry, such as the service industry, or a different firm type, like a "born-digital" would complement our theoretical understanding.

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