

Towards a unified typology of digital communication technologies in international business: a tool for management and research

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Received 23 January 2023
Revised 28 April 2023
22 June 2023
Accepted 27 June 2023

Abstract

Purpose – Digital communication technologies have become ubiquitous for various firm processes related to international business (IB) and global strategy. However, IB and strategy scholars lack an encompassing and theory-based typology of these technologies that facilitates analysis and discussion of their uses and effects. Likewise, managers have a large choice of technologies at their disposal making it difficult to determine what technology to use in different IB areas. This paper aims to develop a typology of digital communication technologies based on the synchronicity and interactivity of these technologies and capture their fundamental social and temporal dimensions. This results in four ideal types: broadcasting, corresponding, aggregating and collaborating technologies.

Design/methodology/approach – This is a conceptual paper incorporating theoretical perspectives to theorize about four ideal types of digital communication technologies. A subsequent empirical test of this typology has been provided in the appendix.

Findings – The authors discuss how the typology might be applied in IB decisions and some of the contingencies that impact this choice. Building on that, the authors develop directions for future research to increase their understanding of the use of digital communication technologies to help improve IB functions. Overall, the authors suggest future research explores contingencies about where and when different types of digital communication technologies should be used. Finally, the authors provide implication of having a unified typology for both academics and managers.

Originality/value – The authors offer a robust framework for thinking about and capturing different types of digital communication technologies that can be applied by researchers and used by managers when making decisions related to IB. The authors also provide some initial testing of the typology with a three-country study design helping to determine its validity.

Keywords Digitalization, Digital technology, Social and communication technologies, ICT, International business, Typology

Paper type Research paper

1. Introduction

Over the past few decades, a plethora of digital information and communication technologies (ICT) has emerged and transformed various firm processes, from knowledge sharing (Luo and



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Declarations of interest: None.

Multinational Business Review
Vol. 31 No. 4, 2023
pp. 437-458
Emerald Publishing Limited
1525-383X
DOI 10.1108/MBR-01-2023-0011

Bu, 2016) and innovation management (Muninger *et al.*, 2022) to strategizing (Birkinshaw, 2017) and supply chain management (Chen and Kamal, 2016). Recently, the impact of the COVID-19 pandemic has forced businesses to transform their operations and contributed to an increased use of digital ICT for all sorts of business processes (Vargo *et al.*, 2021). Scholars have argued that new digital technologies blur temporal and spatial boundaries and enable firms to open up processes for a wide range of internal and external stakeholders (Birkinshaw, 2017) across hierarchical levels (Hautz *et al.*, 2017) and geographical areas (Gawin and Marcinkowski, 2019). One subset of digital ICT is digital communication technologies that enable users to interact, connect and organize with others (Kiely *et al.*, 2021). These technologies have the potential for inclusive and effective work arrangements that may facilitate international collaboration (Hanelt *et al.*, 2021). As such, they can accommodate faster workflows (Bughin *et al.*, 2017) and therewith also impact the internationalization of businesses (Chabowski and Samiee, 2020; Nell *et al.*, 2021) that often suffer from distance and information costs (van Kranenburg *et al.*, 2014).

Digital communication technologies are a “technological process that reduces the text to something that can be easily fragmented, handled, linked and distributed [...] and allows networking, multimedia, collaborative and interactive communication” (Scolari, 2009, p. 946). These technologies not only allow individuals to communicate with co-workers and those outside the organization but also facilitate increased connectivity and collaboration by enabling an individual to

post, edit, and sort text and files linked to themselves or others; and view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing (Leonardi *et al.*, 2013, p. 2).

In other words, digital communication technologies “enable individuals (and not solely gatekeepers or professional content producers) to consume, produce, and share online information and become cocreators of meaning” (Ariel and Avidar, 2015, p. 21).

Although scholarship on the use and effectiveness of digital communication technologies in international business (IB) is in its nascence, the sheer number of technologies with different features is constantly rising. Applications include external and internal social networks (e.g. Facebook), document sharing (e.g. Google docs), video conferencing (e.g. Zoom), video platforms (e.g. YouTube), team and collaboration platforms (e.g. Slack) and blogs and micro-blogging (e.g. Twitter). This increasing diversity not only challenges firms and users in their adoption (Yee *et al.*, 2021) but also provides scholars with a need to theoretically grasp and conceptualize these technologies. Management scholars have examined smaller ranges of technologies for focused processes, such as knowledge sharing (Razmerita *et al.*, 2014), self-presentation and identity creation (Kaplan and Haenlein, 2010) or online conversations more generally (Mayfield, 2008). In other disciplines, such as communication studies, scholars have identified specific affordances, such as the visibility, editability, interactivity or connectivity of (social) media technologies (Ariel and Avidar, 2015; Treem and Leonardi, 2013). However, to date, there is a lack of an encompassing and theoretically based typology of digital communication technologies that can provide scholars with a framework to study these technologies in IB settings.

This study aims to create a typology of digital communication technologies that is encompassing and meaningful for the study of a variety of current and future technologies applied in IB. A typology draws out connections of causality alongside different dimensions underpinned by theoretical and logical conclusions. They set out how different configurations of a common set of dimensions can each lead to a specific ideal type (Allen *et al.*, 2022). Typologies are important because they can help scholars to be more explicit

about specific phenomena drawing out distinct boundaries around certain conditions or a different combination of factors that lead to a predicted outcome. They, thus, allow scholars to develop a more fine-grained understanding of the relationships between two or more dimensions (Allen *et al.*, 2022).

Internationally, firms face issues with managing subsidiaries, the global value chain and communicating with potential and existing stakeholders. Digital communication technologies can be helpful in many of these areas, but the question arises about which type of technology to use at each point. Looking at individual technologies to find a fit is time-consuming and frustrating, as there exist thousands of different digital communication technologies to sort through. Having a typology can help researchers as they struggle to understand which digital technologies to use in different parts of the firm to support different international activities. A unified typology that embraces the vast array of digital communication technologies can help researchers as they attempt to develop and test theories about the ideal type of technologies that firms should be using to create value and improve performance. Without such a typology, researchers would have to continue to focus on one or two technologies at a time or discuss digital communication technologies in general, reducing any potential benefits the research might produce.

We follow the Weberian understanding in our conceptualization of a typology and propose four ideal types of digital communication technologies (Weber, 2017). Specifically, we draw on media theories that allow us to typify digital communication technologies along two important theoretical dimensions, namely, *synchronicity* and *interactivity*. Synchronicity refers to the technological affordance that allows users to exchange information, communicate and create content *in real-time* (ranging from high synchronicity to low synchronicity or asynchronous), hence, to instantly (or not) coordinate communication, collaboration and other forms of inputs and outputs between parties (Dennis *et al.*, 2008). Interactivity refers to the technological affordance that allows users to interact with each other by using the same technology *to directly exert influence* on each other's communication and content creation (Ariel and Avidar, 2015; Jensen, 1998). Different degrees of interactivity and synchronicity have implications for the kinds of collaboration and information exchange that support and inform IB activities such as global teams and international ventures (Hanelt *et al.*, 2021; Kiely *et al.*, 2021; Westman and Thorgren, 2016). Although these fundamental temporal and social dimensions provide continuums, we propose four ideal types of digital communication technologies that have either higher or lower interactivity and synchronicity, respectively: *corresponding*, *broadcasting*, *aggregating* and *collaborating* technologies. As a final step, we undertook a comparison of our typology with empirical data to determine whether our ideal types match the socially constructed understanding of people that are likely to use these digital communication technologies (Appendix) which helped us underpin our theoretical conceptualization of the ideal types (Allen *et al.*, 2022).

This article contributes to the literature with a typology of digital communication technologies which allows IB researchers to explore their use and effectiveness. Scholars are only beginning to understand how digital communication technologies generally impact IB strategies and processes (Chabowski and Samiee, 2020). Much of the work in this area has focused on developing new or extending existing theories (Brouthers *et al.*, 2022), often exploring how digital platform technologies have expanded the type and variety of business activities that take place internationally (Brouthers *et al.*, 2016). Empirical studies looking at the use of digital communication technologies within IB are limited and typically explore one technology at a time, such as Pogrebnyakov (2017), who looks only at Facebook and the internationalization process. This focus on a single technology or more generally on digital

technologies reduces generalizability and our knowledge of where and when different technologies can be beneficial in IB settings. By developing a typology that encapsulates fundamental dimensions of multiple features and technologies, we advance the abilities of researchers to develop and test theories that capture a wide range of digital communication technologies (current and future), which can be used by managers to understand how firms can use these technologies to improve international performance.

2. Theoretical background

2.1 Digital communication technologies in international business research

Over two decades ago, researchers predicted that digital communication technologies would “revolutionize” the internationalization of business (de La Torre and Moxon, 2001). Soon thereafter, scholars observed that these technologies have “diminished geographic distance and compressed response times for MNEs” (Sambharya *et al.*, 2005, p. 143) and decreased the asymmetries between international partners (Kshetri, 2005). Digital communication technologies have been seen to “facilitate communication among managers across functional and geographical boundaries [that] enhances coordination of multinational activities in the development of strategic opportunity” (Andersen and Foss, 2005, p. 293).

More recently, research has found that, in general, digital communication technologies have positive effects on the internationalization of firms, for example, by benefiting firms’ relationships with partners (Chang *et al.*, 2015; Gabrielsson and Gabrielsson, 2011) and other external stakeholders such as suppliers (Jean *et al.*, 2010) helping to create knowledge or novel combinations of knowledge. These benefits occur partly because digital technologies enhance a firm’s “partnership dynamic capabilities” (Chang *et al.*, 2015, p. 276), lower costs of coordination both internally and externally (Chen and Kamal, 2016) and enhance knowledge sharing and integration (Luo and Bu, 2016).

In the same vein, scholars have looked at the impact of specific types of digital communication technologies, such as Facebook, on the internationalization process (Pogrebnyakov, 2017). Indeed, the use of digital communication technologies has become increasingly intertwined and coupled with internationalization and internalization (Rangan and Sengul, 2009), for example, by facilitating business decisions to reconstruct supply chains across borders (Chen and Kamal, 2016) and by having a positive impact on international sales (Hagsten and Kontnik, 2017). Furthermore, scholars have argued that digital communication technologies facilitate the internationalization process for firms in fast-moving environments, such as high-tech start-ups (Gabrielsson and Gabrielsson, 2004).

Despite this growing interest in the impact of digital communication technologies on the internationalization process, scholars have looked more generally at digital communication technologies without understanding the specific technologies or technology affordances involved (Jean *et al.*, 2010; Chen and Kamal, 2016; Chang *et al.*, 2015; Luo and Bu, 2016) or have focused on one technology at a time (e.g. Pogrebnyakov, 2017; Hagsten and Kontnik, 2017). Yet, firms often use several technologies when making decisions, including internationalization decisions (Colson, 2019). With the large and growing number of digital communication technologies available to firms, it is important to understand which types of technologies are effective in specific situations as adopting and using digital communication technologies represent a significant commitment of resources (Gunasekaran *et al.*, 2017). For example, which type of digital communication technologies should firms use when engaging in the process of choosing an international location or locating and working with local partners? Do certain types of digital communication technologies inhibit the creation of knowledge due to language differences that could occur when people are in different geographical locations? Which

types of technologies are most helpful for managing or reconfiguring global value chains or dealing with foreign subsidiaries? In the next section, we develop a theory-based typology of digital communication technologies that researchers can use to capture the specific types of technologies that firms can use in these international decision processes. We also discuss directions for future research for each type of technology in our typology (Section 2.3) and how specific institutional contingencies might affect their effectiveness.

2.2 Typology of digital communication technologies

To develop our typology, we draw on established media theories that address temporal (i.e. timeliness) and social (i.e. influence) dimensions related to technology use. These dimensions are not only crucial for various decision and collaboration processes but also become relevant in IB as international decisions involve temporal issues like foreign market entry timing or coordinating global value chains as well as social issues like international partner and employee relations and cooperation. As researchers begin to study the impact of digital communication technologies on international decisions, understanding the relationship between each technology and these temporal and social dimensions is important.

2.2.1 Media synchronicity. Synchronicity of digital media concerns the temporal dimension because it affords technology users immediate communication and information exchanges, so information can be instantly transmitted and received, often at the same time this information is produced, such as during a phone call, video conference or video live stream. Hence, with an emphasis on temporality, media synchronicity is often associated with the timeliness of communication and has been shown to contribute to shared understanding (Münzer and Holmer, 2009). Synchronous communication allows technology users to feel connected through the immediate reception and exchange of information, which facilitates the creation of shared meaning (Dennis *et al.*, 2008). Media synchronicity becomes important for decisions about international settings, where mutual understanding, creation of meaning and trust cannot be guaranteed due to language, timing and cultural issues (Kiely *et al.*, 2021). Furthermore, media synchronicity becomes relevant for strategy-making where support and legitimacy vary across international settings (Van Tulder, 2015). Media with higher synchronicity are often perceived as more useful and meaningful because they provide individuals with the opportunity to instantly derive sense and understanding from the information they are presented with (Dennis *et al.*, 2008; Tenzer and Pudelko, 2016).

Media synchronicity can be understood on a dimension from high to low or even absent (asynchronous). Technologies with higher synchronicity allow their users immediate exchange of information, whereas low synchronicity or asynchronous communication denotes information exchanges that are iterative and temporarily serial, as users produce content, such as texts, first before it is disseminated, exchanged, eventually received and responded to, such as through email technology (Tenzer and Pudelko, 2016).

Digital communication technologies allow for the transfer of varying amounts of information between individuals and groups (Dennis *et al.*, 2008), whereas some of these technologies are better suited to transfer more complex information than others. When transferring complex and large amounts of information, technologies with lower synchronicity, such as an email, may be suitable, as recipients have more time to process and analyse the information and to eventually develop an appropriate response or addition to such content (Dennis *et al.*, 2008). In that regards, using digital communication technologies to asynchronously transfer large amounts of information could help internationally active businesses to reduce the cultural distance with their subsidiaries or alliance partners and drive more successful knowledge transfer (Aggarwal and Kapoor, 2019). On the other hand, for transferring less complex and lower amounts of information,

technologies with higher media synchronicity may be better suited and perceived as more efficient, allowing for greater speed in decision-making and synchronization among partners (Tenzer and Pudelko, 2016). Importantly, synchronicity is not limited to the instantaneous changes to the shape, format or content of a medium sent from one individual and then received by another; these changes could also be transmitted simultaneously by more than one technology user, which is captured by the concept of interactivity that we discuss next.

2.2.2 Interactivity. Interactivity is mainly concerned with the social dimension and refers to the technological affordance that allows users of technologies to control the type of interaction they have with each other by engaging in forms of bi-directional or two-way communication processes (Sundar, 2004); this process can occur synchronously or asynchronously. Hence, whereas synchronicity concerns the temporality of communication, interactivity refers rather to a social or control dimension, as it is “a measure of a media’s potential ability to let the user exert an influence on the content and/or form of the mediated communication” (Jensen, 1998, p. 201). Scholars have argued that some digital media such as blogs are typically controlled by one individual and, therefore, exhibit a lower degree of interactivity (Razmerita *et al.*, 2014). In contrast, a wiki, for instance, represents more of a collective format as it is typically edited and expanded by more than one individual. Hence, a wiki possesses lower individuality and higher involvement regarding the level of interactivity.

As such, interactivity refers to the degree a technology allows individuals to change the shape, form or content of a medium. For instance, most electronic written communication such as emails, social media posts or blog entries is usually only written by one person. Undoubtedly, many digital communication technologies, including email, allow the recipient to respond to it. However, the recipient cannot change the shape, format or content of the email that they originally received, which remains under the control of the original sender. In contrast, digital technologies like collaborative document editing are much higher in interactivity as all individuals, who have access and possess control over the document, can change the original format, shape or content. Similarly, in a video conference call, participants can have an active influence on the style, content and manner of the conversation taking place. Therefore, unlike media synchronicity, which has more of a temporal component, interactivity is focused more on the extent of control that an individual can have on the content and communication conveyed through a particular medium. Media interactivity, then, becomes relevant for decision-making in IB settings, where information and knowledge may be distributed across different locations and levels and where the strategy process relies on input and insights from distributed actors rather than from a centrally controlled hub (Garrison *et al.*, 2008; Hautz *et al.*, 2017).

Like synchronicity, media interactivity is a technological affordance that varies across different types of digital communication technologies, depending on their higher or lower interactivity (Ariel and Avidar, 2015; Sundar, 2004). Higher interactivity has often been associated with lower individual control but higher levels of mutual understanding (Etter, 2014), whereas technologies possessing lower levels of interactivity provide higher control to the originator but lower levels of mutual understanding. As such, digital technologies that possess varying degrees of interactivity can allow businesses to develop knowledge and expand their firm network in novel ways, which would have implications for how existing IB theories explain phenomena (Nambisan *et al.*, 2019).

Table 1 summarizes the characteristics of media synchronicity and interactivity including the definitions, analytical dimensions and (dis-)advantages for their use in an IB context. Based on the level of interactivity and synchronicity a technology offers, in

Table 1.
Media synchronicity
and interactivity

	Media synchronicity	Media interactivity
Definition	Technology affordance that enables users to disseminate and exchange information in real time	Technology affordance that enables communication between users as a means to shape content
Analytical dimension	Time: from immediate (high synchronicity) to delayed information exchange (low synchronicity)	Social/influence: from shared (high interactivity) to individual (low interactivity) control
Advantages use case	<i>High synchronicity</i> : creation of shared meaning through instant clarification and lower complexity of information <i>Low synchronicity</i> : also called asynchronous, feasible for exchange of complex and larger amount of information; time to process, respond to and edit content	<i>High interactivity</i> : creation of shared content with shared control over content creation <i>Low interactivity</i> : high individual control over content creation
Disadvantages use case	<i>High synchronicity</i> : not suited for exchange of highly complex and large amounts of information; less time for editing of content <i>Low synchronicity</i> : (asynchronous) loss of immediate connection between users	<i>High interactivity</i> : Loss of individual control over content creation, higher need for orchestration of content creation <i>Low interactivity</i> : lack of input by various users, reliance of single technology user

Source: Table by author

the next sections, we develop a typology of digital communication technologies that can be used in IB.

2.3 Our typology

We propose four ideal types of digital communication technologies in our typology, based on higher and lower levels of synchronicity and interactivity, namely, broadcasting, corresponding, aggregating and collaborating technologies (see [Table 2](#) for an overview). After undertaking some empirical testing and theoretical revision of our typology (see [Appendix](#) for details), we came up with a final version ([Table 3](#)) that we will discuss below ([Allen et al., 2022](#)). We also provide suggestions for future IB research using our typology and how certain institutional contingencies may impact the effectiveness of different technology types for various IB processes.

2.3.1 Broadcasting technologies. Broadcasting technologies are characterized by high synchronicity and low interactivity. This means that content is created and disseminated in real time, yet possibilities for shared influence on communication and content through

Table 2.
Two-dimensional
typology model of
digital
communication
technologies

	Lower synchronicity	Higher synchronicity
Lower interactivity	<i>Corresponding technologies</i> : individual control over content creation and dissemination in sequential manner	<i>Broadcasting technologies</i> : content is created and disseminated in real time with no possibility for shared control over content creation
Higher interactivity	<i>Aggregating technologies</i> : creation and dissemination of content with shared control in a sequential manner	<i>Collaborating technologies</i> : creation and dissemination of content with shared control in real time

Source: Table by author

Table 3.
Final version of the
typology

		Interaction	
		Non-real time	Real time
Control	Individual	Corresponding Technology that allows one person to generate and edit content before dissemination. Examples are email, microblogs, blogs or content pages.	Broadcasting Technology that allows one person to generate content that is disseminated live while being edited or generated. Examples are webinars and live streams.
	Shared	Aggregating Technology that allows multiple people to generate and edit content, but one person at a time. Examples are Wikis, forums, online communities, clouds, or project and team management platforms.	Collaborating Technology that allows multiple people at the same time – with changes being immediately perceivable – to generate and edit content that is disseminated live while being generated or edited. Examples are video conferencing, Office365 or Google Docs.

Source: Figure by author

interactivity are low or non-existent. Hence, content is disseminated and communicated from one individual user to other users, ranging from an individual receiver to larger audiences, whereby these receivers have little to no possibility to influence the communication and content. Examples of such technologies include webinars and video streaming with limited interaction functions.

In IB, such technologies are valuable when users aim to promptly reach many organizational members (or other stakeholders) across various physical locations. For example, managers might use video streaming to communicate headquarter policies and important, time-critical announcements (like the introduction of new products) to subsidiary personnel and other internationally dispersed stakeholders. Besides the timely dissemination of content, broadcasting technologies benefit from the control over content production and dissemination by the individual technology user (e.g. managers). Broadcasting technologies allow for minimal clarification from the receivers of this information, but the receivers do not control the content of the message being sent. One important use of such technologies is communications with foreign subsidiaries. As subsidiaries are often geographically and culturally dispersed, broadcasting technologies provide a means to disseminate a consistent message to all subunits simultaneously.

Future research can explore how and where broadcasting technologies can improve international operations while considering institutional contingencies. For example, differences in language can muddle the message being transmitted. In addition, cultural differences might mean certain proposed policies are more (or less) acceptable in different foreign locations. In cultures where personal relationships are important, broadcasting technologies might be perceived as impersonal and abrasive (Baptista *et al.*, 2017). These technologies might work better for foreign subsidiaries in countries with high power distance as those receiving the message are less disposed to questioning or correcting higher-level managers. Furthermore, issues like the level of technological advancement in

the country (the availability of fast internet connections) or the existence of expatriates might influence the effectiveness of broadcasting technologies. Similarly, these technologies might work well for communicating with internationally dispersed external stakeholders (like customers or product/service users or potential users). In contrast, broadcasting technologies might have limited use when communicating with external value chain partners where developing a shared understanding is important, which can better take place using technology types with a higher level of interactivity (Dennis *et al.*, 2008).

2.3.2 Corresponding technologies. Corresponding technologies are characterized by low synchronicity and low interactivity. Here, individuals are in control of the content and information they create, yet in contrast to broadcasting technologies, the dissemination does not happen in real time but in a serial, iterative manner. A classic example of corresponding technologies is email technology. Even though current hardware and physical infrastructure such as fibre optics and fast internet connections in many parts of the world enable individuals to almost instantly receive emails or messages after they have been sent, these technologies are still not synchronous in the same sense as video conferencing. Through low interactivity, recipients have no control over the content or format before it is sent, as is the case with email but also videos that are uploaded to a database and can be accessed at any time. We do not see emails or videos intended for us while they are composed, edited and drafted as all we see is the result of this process. Similarly, social media posts are also only visible as the end result once the post has been publicized, and we do not see the process of it being typed out or changed (Treem and Leonardi, 2013). Therefore, asynchronous media afford the individual developing the communication more time for editing its content than synchronous media.

In IB, corresponding technologies may be useful when precision in communication is needed, and a considerable amount of complex information is transferred and needs time to process, for example, when negotiating with value chain partners. Corresponding technologies are useful when the influence on the content and communication does not need to be shared, for example, when recruiting foreign market-based agents. One advantage of corresponding technologies in IB is that they lend themselves to translation into various languages, which could improve communications with foreign entities (including subsidiaries, potential agents or other value chain partners) reducing both language and other cultural barriers. These technologies are becoming commonplace and people are used to sending and receiving such communications; thus, they are not perceived as offensive. In addition, country differences in technology infrastructures, which can affect broadcasting technologies, have far less impact on corresponding technologies because these technologies do not require advanced digital support like stable access to the internet. Finally, corresponding technologies give recipients time to digest the information and, if needed, generate a response that is well thought through, improving understanding in complex settings (Dennis *et al.*, 2008).

Future research might explore how corresponding technologies can be used to smooth communications between foreign entities, especially when timeliness is not critical. These technologies might be particularly important when negotiating contracts with potential partners, easing understanding through both translation and the ability to clarify issues over time as they provide a “paper trail” of the previous communication. Corresponding technologies might also be helpful for data gathering either when entering new markets or obtaining financial and operational information from subsidiaries. Differences in culture might influence the effectiveness of corresponding technologies, as in some cultures, questioning instructions or simply asking questions of superiors might not be the norm. In addition, corresponding technologies might work better in individualistic or high-power

distance cultures than in collectivist or low-power distance cultures because the message is not shared (agreed) between parties but directed towards the receiving party.

2.3.3 Aggregating technologies. Aggregating technologies are characterized by low synchronicity and high interactivity. This means that users influence each other's content creation process, but only serially or sequentially. As such, aggregating technologies are often used in the processes of uploading or aligning the additions, redactions and changes made to a document or file opened on a computer, which can be stored on the cloud (Khangagha *et al.*, 2022). As synchronicity is low, changes to the shape, format or content are made sequentially, often by various actors from distant locations over a prolonged period. The low synchronicity can be of advantage, as it allows distant and dispersed parties to work on complex issues or documents at the time of their convenience, whereas high interactivity allows input from various actors through shared control over the process of content creation.

Wikis are a form of aggregating technology that exhibit a high degree of interactivity yet low synchronicity. The core concept behind Wikis is that many individuals can contribute to the entries and shape the overall purpose and knowledge contained in it (Greenstein *et al.*, 2021). Although there could be more complexity regarding access and editability rights, the key argument that remains is that Wikis are typically set up as a collective medium (Greenstein *et al.*, 2021) that facilitates a large number of individuals exercising a right to change the shape, format and content of its interlinked pages in asynchronous ways.

In IB, aggregating technologies may be used for various knowledge-sharing tasks, especially if this takes place over a longer period (Treem and Leonardi, 2013). These technologies are especially important when input from many people who are geographically dispersed is required and time is not of the essence. For example, aggregating technologies might aid in the monitoring of subsidiary activities, especially the implementation of new strategies because they can facilitate access to information from each subsidiary unit over time. Similarly, aggregating technologies might facilitate communication and coordination with global value chain members as they change production and supply schedules. Thus, these technologies can help firms manage daily activities in international operations. In addition, aggregating technologies might be helpful when developing new policies for the organization, allowing participants from outside headquarters to contribute to these, building upon previous responses. This sharing of ideas could also help in the development of new products or services, as foreign entities (subsidiaries and partner organizations) are exposed to different cultures, customer demand and technology and thus might have different ideas or capabilities that can help the firm. The low synchronicity of aggregating technologies provides an opportunity for people to identify development pathways and comprehend the previous stages of the developmental journey more easily.

Future research could explore how cultural differences impact the cooperation required to make aggregating technologies work. Do people from individualistic societies withhold participation, not wanting to share, whereas those from more collectivist cultures overshare? Do those with high uncertainty avoidance or power distance participate less because they do not want to risk looking bad or saying something that others will disagree with? In addition, the research could look at whether younger people are more likely to interact through aggregating technologies than older workers because of their exposure to such technologies from a younger age.

2.3.4 Collaborating technologies. Collaborating technologies are characterized by high interactivity and high synchronicity. As such, collaborating technologies enable multiple users to communicate and mutually create content in real time. This means also that the control over content creation is shared. An example of collaborating technology is video

conferencing. When two or more individuals are connected with a digital communication platform such as Zoom or Microsoft Teams, any changes made on one side of the technology are immediately transmitted and then perceived by the recipients. The moment one communication partner speaks out, the microphone and camera equipment capture the changes to the sound and imagery and transmit them to the output technology, such as a screen and speakers/headphones, at the recipient's end. These changes are, thus, immediately perceivable by somebody other than the individual who initiated the change.

Similarly, multi-user editing technology, which allows several authors to jointly access a file and work on it together at the same time rather than in an iterative manner, can be classified as collaborating technology. High synchronicity allows users to instantly make sense of each other's contributions, changes and additions and react to these promptly. The high interactivity ensures that control over the content creation process is shared and that each user can contribute in a more or less equal way, given that users are participating simultaneously.

For IB, collaborating technologies can often replace face-to-face meetings that would require time and resources to arrange. These technologies enable users to shape outcomes on a real-time basis hence reducing the time needed to agree on critically important issues. They also allow companies to accommodate the increasing demand for work flexibility, giving companies the chance to hire talent despite their geographical location. Collaborating technologies may facilitate and improve headquarters/subsidiary relations allowing subsidiary managers timely and greater input into resource allocation and subsidiary mandate decisions and may be used in global value chains when developing new or improved inputs. Furthermore, collaborating technologies may allow businesses to facilitate easier and more efficient transmission of knowledge from international subsidiaries or alliances that can boost the level of innovation taking place (Aggarwal and Kapoor, 2019). Equally, the seamless communication and exchange of information that collaborating technologies afford can allow businesses to expand their international network, for example, business partners or local consumers, without having to establish physical premises in the country where these networks are located (Brouthers *et al.*, 2022).

Despite the potential benefits of collaborating technologies, future research might look at when and where these benefits come about. For example, as with face-to-face meetings, language issues might hinder effective communication. Unlike corresponding technologies where translation can be incorporated into the communications, because of the immediacy of collaborating technologies, misunderstanding and miscommunications are more likely. Furthermore, in some cultures, disagreeing with others while interacting is unacceptable, and hence, it might appear agreement has been reached only to discover afterwards that there are questions and concerns. To be effective, collaborating technologies require advanced digital infrastructure, which is not available in all countries. Hence, researchers need to consider whether firms can undertake activities through these technologies if the digital infrastructure in the country cannot support the technological needs. Finally, consideration should be given to whether collaborating technologies might be more effective in established relationships than in developing or building new relationships as they offer a more informal method of communication.

3. Discussion, implications and conclusion

Research about the use and effects of digital communication technologies in IB is only in its infancy (Nell *et al.*, 2021), with theoretical frameworks largely missing. The emergence of a large variety of such technologies and their widespread adoption across firms call for a meaningful typology, which helps researchers to study, theorize and discuss their use and

effectiveness beyond the focus on digital technologies in general or a single technology. Furthermore, a typology can be useful for managers as they grapple with decisions about adopting different types of technology for different IB functions. With this article, we developed such a typology based on two dimensions relevant to decision-making in IB: synchronicity and interactivity. The choice for these concepts from media theory was motivated by their fundamental nature related to social and temporal aspects of digital technology use (Dennis *et al.*, 2008) and IB activities where these dimensions become relevant because timeliness and influence are crucial for various IB decisions and related business processes (Tenzer and Pudelko, 2016). The typology we developed in this article has implications for both researchers and managers trying to deal with the digital transformation of IB.

3.1 Future research agenda

For researchers, having a unified typology can help with the development and testing of theories about the use of digital communication technologies in IB without having to look at individual technologies or digital technologies in general. Building on the two dimensions of interactivity and synchronicity, scholars can link these features to different communication situations and theorize how this relates to various phenomena in an IB context. Here, we outline four core research themes that warrant further development.

3.1.1 Theme 1 headquarters and subsidiary relationship. Our typology may guide researchers looking into the complex relationship between headquarters and subsidiaries to understand how different digital communication technologies may resolve or aggravate various tensions and conflicts that are typical for these types of relationships (Schotter and Beamish, 2011). It could be that different technologies (those with greater interactivity) encourage greater subsidiary autonomy but other technologies that require synchronicity restrict a subsidiary's ability to act autonomously. Future research could also build on our current understanding of subsidiary control (Meyer *et al.*, 2020) and explain how the moderating or mediating role of power and influence can be exerted through different types of digital communication technologies.

3.1.2 Theme 2 role of culture in IB. Another area of research for which our typology could be of value is in the context of language and cultural barriers. Managing international teams (especially virtual teams) is difficult because of language, timing and different cultural understandings and perceptions (Kiely *et al.*, 2021). Highly interactive technologies requiring synchronicity could exacerbate these issues making global teams dysfunctional, especially in the post-COVID-19 world in which digital communication technologies have become even more prevalent in business (Brammer *et al.*, 2020). Low or asynchronous technologies might provide a more effective means to encourage participation and cooperation, giving team members time to understand and adjust to cultural and language differences.

3.1.3 Theme 3 international expansion. In addition, research exploring international ventures may benefit from our typology. For instance, building on our understanding of entry mode choice (Brouthers *et al.*, 2022), scholars might explore how the different types of technology vary in their impact on the decision-making process, for example, reducing transaction costs. For those exploring international joint ventures (IJVs) and alliances, incorporating this typology can help us understand how managers can use digital communication technologies to exert control and increase performance across IJVs (Westman and Thorgren, 2016) and may look at these technologies for the management of the complexities associated with internal and external uncertainties in alliances (Aggarwal and Kapoor, 2019; van Kranenburg *et al.*, 2014).

3.1.4 Theme 4 role of artificial intelligence. Artificial intelligence (AI) in the shape of large language models (e.g. ChatGPT or Bing Chat) has emerged as a new technology opportunity/challenge. Scholars might explore how AI can supplement communication technologies, for instance, through simultaneous translation to minimize language barriers as part of broadcasting and collaborating technologies. In addition, AI could be integrated into aggregating technology and could serve functions such as summarizing existing pieces of data or using existing data to generate novel ideas. For corresponding technologies, AI is already being applied in the shape of word or sentence suggestions as well as drafting entire messages (Macaulay, 2020). Hence, researchers might consider both our typology and AI when theorizing about the impact of digital communications.

3.2 Managerial implications

For managers, our typology provides the ground for identifying and selecting the best digital communication technology to use in various IB situations. As we discussed above, each of the ideal-type technologies has certain advantages for specific IB situations – for example, broadcasting technology might be best suited to communicate headquarters policies and important, time-critical announcements (like the introduction of new products) to subsidiary personnel and other internationally dispersed stakeholders. Corresponding technologies, in contrast, might be used for communicating with international partners (current or future) or with subsidiary managers when time is not as critical but where precision of communication is important. Unlike the previous two situations, aggregating and collaborating technologies are useful when managers want to exchange and develop ideas with others inside and outside the organization. Aggregating technologies can be especially important in the development of new products or services, as managers can obtain inputs from foreign entities (subsidiaries and partner organizations) that are exposed to different cultures, customer demand and technology and thus might have different ideas or capabilities that become useful. In contrast, collaborating technologies are most suited when immediate interactions are needed and can replace face-to-face meetings that would require time and resources to arrange.

Using the best-suited digital communication technology when dealing with these IB issues should result in better managerial decision-making. Managing foreign operations (both subsidiary units and partner relationships) can be a daunting task. Communication is key. Clear and accurate communication with foreign partners and employees improves decision outcomes because:

- everyone can understand what the goals and objectives are;
- communications can be translated for better understanding when and where needed;
- greater participation by partners and employees improves buy-in and, thus, commitment; and
- finally, accurate communication allows firms to save time and money.

Our typology, thus, can be used to understand the best ideal type of digital communication technology, in particular, IB situations, based on the level of interactivity and synchronicity needed. This should lead to improved decision-making outcomes.

4. Conclusion

In this article, we have developed a typology for understanding digital communication technologies, hence, developing a platform that IB researchers and managers can use to

investigate how digital communication technologies can improve IB decisions. We encourage researchers to build on this typology by applying it and the related theory to various IB processes and decisions. This framework can provide a starting point for researchers and managers to gain a better understanding of the types of digital communication technologies that firms should use to help make important decisions about foreign location choice, entry mode structures, managing global value chains, headquarters/subsidiary relations and other international activities. As the pace of digital transformation among businesses continues to accelerate and the number of new digital technologies increases, we hope that our typology will enhance the study of the use of digital communication technologies in IB decisions.

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Further reading

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Appendix

We tested our typology to refine it and to determine its validity. To begin, we created a list of 13 generally used digital communication technologies (blog, microblog, email, etc. – see [Table A1](#)) while giving some common brand and platform names as examples (e.g. Twitter, Outlook, WhatsApp, etc.). The authors then came to an agreement as to which cell each technology falls into. We used this list of 13 technologies to test our typology model. Initially, we used several student samples for refining the model but then we tested the module using business professionals in three different countries. We collected our data between late 2019 and 2021. Although there is some controversy about the use of student samples in management research, their use to determine internal validity of new instruments has found strong support ([Graf-Vlachy, 2019](#)) and been used previously in management research ([Kim and Kim, 2020](#)). We asked participants to assign each of the 13 specific digital communication technologies to one of the four cells in our model. We went through multiple cycles of testing the two-by-two typology, first with a small group of academics and then with various student samples ([Table A1](#)). Based on the results of each stage of testing, we made adjustments to the labels (names) and descriptions in the typology. This resulted in the final version of our typology ([Table 3](#)).

To ensure this typology made sense to managers, we tested the external validity of our typology model ([Table 3](#)) with an international sample of business professionals ([Graf-Vlachy, 2019](#)). For this, our chosen methodology was an online survey as this enabled us to gather data from different geographic locations in a time-efficient manner. We produced a simple online questionnaire on Qualtrics in which we listed 14 frequently used digital communication technologies, adding collaborating platforms to our previous list of 13 technologies. As before, we asked participants to categorize each of the specific digital communication technologies into one of the four technology types (cells) in our model. In addition, we asked participants to indicate their age, gender, highest formal degree obtained and area of study.

We gathered data from business professionals in the UK, USA and Germany. These countries were selected because they rank high on digital development ([Cruz-Jesus *et al.*, 2018](#)), so they would be familiar with these digital communication technologies and because of our ability to present the typology in the appropriate language. We used the English version of the questionnaire for our UK and USA samples and translated it into German for our German sample. The typology and questionnaire were translated into German by two of the authors who are German native speakers and then translated back by two different German native speakers who had not seen the English version. For our American and German samples, we posted the link to either the English or German language questionnaire on Amazon Mechanical Turk (MTurk); for our British sample, we posted the link to the questionnaire on Prolific, because there are not many UK-based business professionals on MTurk. Survey platforms such as these have been used in other business research ([Aguinis *et al.*, 2021](#); [Steelman *et al.*, 2014](#)).

For our USA sample of business professionals, we set out qualification criteria that automatically excluded those individuals that do not fit our sampling criteria: these were being located in the USA and possessing at least a bachelor's degree from a US university or college. We received 146 completed responses. From our previous testing sessions of the model, we observed that it requires at least 2 min for participants to read and comprehend our typology model and read the list of technologies. Therefore, we excluded 37 responses because the participants did not spend enough time (120 s or less) on the questionnaire and 15 due to placing all technologies into the same cell. This left us with a final sample of 94 US participants. Of our 94 responses, the mean age of our participant was 37.2 years and our sample's gender split was roughly 45% female and 55% male.

For our German sample of business professionals, we set out the criteria that the participants had to be based in Germany and have completed a university degree. In total, we received 200 responses. Of these, we eliminated 111 because respondents did not pass our screening test (two

Sample	<i>n</i>	Blog	Micro-blog	Cloud	Content page	Email	KM	Instant message	MDE	ISN	PTMP	Video conference	Webinar	Wiki
Academics percent	18	0.83*	0.11	0.22	0.17	0.50	0.06	-0.00*	0.50	0.11	0.17	0.78*	0.33	0.61*
Undergrad students percent	25	0.72*	0.20	0.24	0.12	0.16	0.08	0.08	0.56*	-0.04*	0.24	0.56*	0.12	0.56*
Undergrad students percent	61	0.93*	0.39	0.21	0.18	0.87*	0.21	0.36	0.85*	0.34	0.26	0.57*	0.62*	0.70*
Undergrad students percent	179	0.98*	0.43*	0.26	0.23	0.94*	0.44*	0.41*	0.96*	0.37	0.30*	0.59*	0.78*	0.88*
Post-grad students percent	21	0.62*	0.62*	0.48*	0.33	0.71*	0.33	0.57*	0.90*	0.24	0.48*	0.48*	0.57*	0.57*
Undergrad and post-grad students percent	111	0.53*	0.50*	0.41*	0.26	0.71*	0.35	0.41*	0.66*	0.14	-0.15*	0.36*	0.42*	0.39*

Notes: KM = knowledge management; MDE = multi-user document editing; ISN = internal social network; PTMP = project and team management platform; **p* < 0.05
Source: Table by author

Table A1.
Test of typology
accuracy – UK
student samples

screen questions to be sure participants had read the model), a standard procedure to increase validity of online crowdsourcing (Steelman *et al.*, 2014). A further three responses were excluded because the participant did not spend enough time (120 s or less) on the questionnaire and one due to placing all technologies into the same cell. This gave us 85 usable German responses. Of our 85 usable responses, the mean age of our participants was 31.4 years and our sample's gender split was roughly 16% female and 82% male. One participant indicated their gender as "diverse".

For our UK sample of business professionals, we set out the criteria that the participants had to be based in the UK and are in full-time employment. In total, we received 100 responses. Of these, we eliminated five because the respondents did not fully complete the questionnaire or did not pass our attention checks – another standard procedure to ensure validity of data from online crowdsourcing (Steelman *et al.*, 2014). We used two attention check questions to be sure participants had read the list of technologies to improve the quality of our responses. This gave us 95 usable UK responses. Of our 95 usable responses, the mean age of our participants was 32.6 years and our sample's gender split was roughly 73% female and 26% male. One participant indicated their gender as "other".

Results

Throughout our study, we tested the accuracy of our typology model. To do this, we compared the percentage of correctly classified digital communication technologies against the chance rate of the typology. Because we have four potential categories or cells in which each individual digital communication technology could be classified, we compared the actual typology rate for each technology to the chance rate of 25%. Using two-tailed two-sample *t*-tests, we looked for those digital communication technologies that were classified significantly better than chance by participants. We then looked at how many of the specific digital communication technologies were classified as expected and better than the chance rate. The tables below show the results of this analysis for our development of the model (Table A1) and for the testing of our model with an international sample of business professionals (Table A2).

Table A1 contains the results for our tests for internal validity. For each sample, we noted the group surveyed, the number of usable responses, the average correct typology rate/specific technology and whether the average typology rate was significantly higher (or lower) than the chance rate. As can be seen in the table for the first two samples, only four of the 13 specific digital communication technologies were classified at a rate greater than chance. When we changed our figure, the results improved. The third sample in this table shows that six of the 13 digital communication technologies were classified significantly better than chance. The fourth sample (Table A1) tested another revision to the figure. Here, 11 of the 13 technologies were classified significantly better than chance. Samples five and six (Table A1) tested our final Table 3. Both groups of respondents classified 10 of the 13 technologies better than chance. Hence, providing strong internal validity for our revised typology scheme.

The results for our external validity tests using international business professional samples were mixed (Table A2). In the USA sample, we found that 11 of the 14 digital communication technologies were classified with an agreement better than chance. But for the German sample, only nine of these technologies were classified better than chance, whereas three of the technologies were actually misclassified greater than chance. This discrepancy already points at potential cultural differences that might be explored in future studies. For the UK sample, 13 out of our 14 technologies were classified better than chance which represents the best results of our three-country samples. Overall, these studies tend to provide strong support for our revised typology.

Sample	Blog	Micro-blog	Cloud	Content page	Email	KM	Instant message	MDE	ISN	PTMP	Video confer	Webinar	Wiki	CP
USA percent	0.59*	0.52*	0.56*	0.32	0.60*	0.33	0.41*	0.55*	0.26	0.38*	0.43*	0.54*	0.54*	0.49*
German percent	0.82*	0.62*	0.62*	0.21	0.84*	-0.04*	0.56*	0.89*	0.34	0.52*	-0.05*	0.71*	0.84*	-0.02*
UK percent	0.89*	0.86*	0.73*	0.56*	0.89*	0.49*	0.65*	0.95*	0.25	0.48*	0.56*	0.83*	0.75*	0.69*
Average percent	0.77*	0.67*	0.64*	0.37*	0.77*	0.30	0.54*	0.80*	0.28	0.46*	0.35*	0.69*	0.70*	0.42*

Notes: KM = knowledge management; MDE = multi-user document editing; ISN = internal social network; PTMP = project and team management platform; CP = collaborating platform; * $p < 0.05$

Source: Table by author

Table A2.
Test of typology accuracy – international samples of business professionals

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