# Media Choice in Multilingual Virtual Teams

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**ABSTRACT**

This study investigates the impact of language barriers on multilingual virtual teams members' choice between different communication media in their inner-team interactions. Through interviewing team leaders and members in both mono- and multilingual virtual teams, we discover discrepancies in media choice and media performance between these two settings and identify foreign language-induced cognitive load as a key reason for these divergences. Our study advances research on communication and knowledge exchange in multilingual virtual collaboration by showing how language barriers alter the process of converging different viewpoints through team interaction, by suggesting language-related modifications to the seminal media synchronicity theory, and by demonstrating the benefits of new media in multilingual settings. It also broadens the disciplinary scope of language research in international business by introducing theories from communication studies and cognitive research. In practical terms, it highlights the benefits of redundant communication, the need for an adequate media infrastructure in multinational corporations and the importance of motivating team members to use new media.

Keywords: Language; Teams and Teamwork; Virtual Collaboration; Media Choice Theory; Qualitative Comparisons

## INTRODUCTION

Being "at the heart of any organization" (Piekkari, Welch & Welch, 2014: 7), effective communication constitutes an essential prerequisite for business success. In multinational corporations (MNCs) consisting of geographically dispersed operations, communication is almost per definition multilingual (Luo & Shenkar, 2006). Although the majority of MNCs uses English as a "transit language" between the various local languages of its subunits, exchanges between non-native speakers of English with different linguistic backgrounds are often significantly more complex (Nickerson, 2005). Acknowledging that "language lies at the heart of international business activities" (Brannen, Piekkari & Tietze, 2014: 495), a fast growing research stream is studying the impact of language barriers on different corporate contexts such as alliance formation (e.g. Joshi & Lahiri, 2014; Cuypers, Ertug & Hennart, 2015), headquarters-subsidiary relations (e.g. Bordia & Bordia, 2014; Reiche, Harzing & Pudelko, 2015) or multinational teamwork (e.g. Hinds, Neeley & Cramton, 2014; Tenzer, Pudelko & Harzing, 2014).

Considering this research activity, it is remarkable that most studies have implicitly assumed communication to happen face-to-face, thus neglecting the particularities of virtual communication. This stands in sharp contrast to the organizational reality of MNCs, where most business communication in a foreign language is not conducted face-to-face, but virtually through electronic media such as email, instant messaging, telephone or video conferencing (Schweitzer & Duxbury, 2010). Hence, it is astonishing that only a few pioneering studies (Klitmøller & Lauring, 2013; Klitmøller, Schneider, & Jonsen, 2015) have explicitly examined virtual communication across language boundaries. Whereas these studies have given first insights into the importance of linguistic diversity for communication through virtual media, they have not systematically compared whether, and if yes, how media choice differs between the monolingual and the multilingual team context and what the reasons for any differences might be. Our study addresses this major gap in the research on language in international business.

To theorize virtual communication in a multilingual context, international business scholars can draw on several established media choice theories, which aim to assist virtual collaborators in choosing the optimal communication media to facilitate mutual understanding. Particularly influential is Dennis, Fuller & Valacich's (2008) media synchronicity theory (MST), which matches specific media with different communication processes and purposes. But are the

normative propositions of MST, which were developed in a monolingual context, still valid in multilingual settings? Despite the fact that "language permeates every facet of international business" (Piekkari et al., 2014: 1), it is remarkable that so far language differences have not been considered as a potential boundary condition for this seminal theory. Addressing this gap, our study explores the impact of language barriers on media choice and examines for one major team function to which extent the seminal MST still holds in the context of multilingual virtual collaboration.

We selected multilingual virtual teams as our specific research setting, as working in global teams "is fast becoming the rule rather than the exception" in contemporary MNCs (Zander, Mockaitis & Butler, 2012: 592). Already a decade ago, 85% of senior managers said they conducted more than half of their work in global teams functioning across boundaries of space and time (Maznevski & Athanassiou, 2006). Considering recent technological advances, the use of global virtual teams, most of which operate across language barriers, is expected to further increase (Zander, Zettinig, & Mäkelä, 2013). Analogous to Earley & Gibson's (2002) definition of multi*national* teams, we define a team as multi*lingual* if it comprises members of two or more different mother tongues.

Our study demonstrated that language barriers reverse established propositions of MST with respect to virtual exchanges which have the specific objective of negotiating meaning and converging different viewpoints among team members. These demanding and complex processes are key to any successful cooperation in MNCs, but as they require particularly intense interaction, they are also highly vulnerable to language barriers. Once we discovered that general normative statements of a seminal media choice theory do not hold for the case of communication to converge meaning among multilingual team members, we took our *initial explorations* to the next level and sought a *context-specific explanation* (Welch, Piekkari, Plakoyiannaki, & Paavilainen-Mäntymäki, 2011) to make sense of this opposition between an authoritative theory and our findings. As we delved deeper into virtual team members' individual motivations for selecting specific media to converge meaning, the phenomenon of foreign language-induced cognitive load (Volk, Köhler, & Pudelko, 2014) emerged as the core mechanism explaining the impact of language on virtual communication.

Bearing in mind that "an organization can be rendered partially deaf, mute and blind because of language effects, ultimately creating the silent organization" (Piekkari et al., 2014: 1-

2), we argue that our study does not only advance media choice theory for the context of multilingual virtual teams, but carries important conceptual and practical implications by contextualizing research on redundant communication to multilingual settings, by exploiting the utility and adoption of new media, and by introducing language-based cognitive load to theories of business communication and knowledge exchange. Our study also encourages more context-sensitive research in these fields and ultimately broadens the disciplinary scope of language research in international business.

## THEORETICAL FRAMEWORK

Our study is built around research on media choice in virtual collaboration. We focus on Dennis et al.'s (2008) media synchronicity theory (MST) as a particularly influential theoretical framework. This theory provides normative recommendations, suggesting which media choices enable the highest performance outcomes for virtual communication in terms of mutual understanding for *two primary information processes*: the *conveyance* of information and the *convergence* of meaning. Whereas conveyance involves the transmission and individual processing of large chunks of information, convergence focuses on the discussion and negotiation of different interpretations. Given that MNCs frequently form virtual teams to facilitate the integration of diverse and distributed knowledge resources (Fang, Kwok, & Schroeder, 2014), convergence processes geared towards the harmonization of divergent viewpoints are not only more complex than relatively straightforward conveyance processes but also essential for their task fulfillment. Consequently, convergence processes will be in the focus of the present contribution.

To define the most suitable *form of media use* for each of these information processes, MST distinguishes between *synchronous* and *asynchronous* communication. For the mere conveyance of information, MST recommends asynchronous media use, which allows participants to process large information volumes at any time and at their own speed. In contrast, for convergence processes asynchronous media use is said to hinder the development of mutual understanding by delaying joint sensemaking. Consequently, for the development of mutual understanding and collective sensemaking, media supporting higher synchronicity, i.e. enabling virtual team members to "move at the same rate and exactly together" are seen as more effective

(Dennis et al., 2008: 581), since they support the "interactive give-and-take required to discuss and converge different interpretations of a situation" (ibid: 582).

Dennis et al. (2008) furthermore distinguish different *media capabilities*, which foster or impede synchronicity. Media characterized by *rehearsability* enable the sender to edit and fine-tune a message before sending it. Those characterized by *reprocessability* give the recipient the opportunity to spend more time decoding messages. If a medium allows many individuals to send signals simultaneously, this so-called *parallelism* distracts the group from a common line of thought. While media characterized by these three capabilities reduce synchronicity, others with high *transmission velocity*, i.e. the immediate or very fast transmission of messages, support it. The same goes for media encoding messages in *natural symbol sets*, i.e. enabling visual cues like gestures along with verbal cues through speaking. Written or digital symbols like typed words, tables and figures are less natural symbols. Table 1 visualizes which media capabilities are represented in synchronous and asynchronous media use and indicates their suitability for the two primary information processes, conveyance and convergence.

[INSERT TABLE 1 HERE]

MST recognizes that using multiple media to convey the same message can in some instances improve communication outcomes (Dennis et al., 2008). Leonardi, Neeley & Gerber (2012) call this practice "redundant media use". If employees choose a specific communication medium at one time and later send the same message through a second medium they engage in *sequential* pairing of communication media. Employees may also engage in *simultaneous* media pairing, i.e. have at least two overlapping conversations with media of different types (Leonardi et al., 2012). Both forms of redundant communication have emerged as a common practice in today's organizations (Stephens & Davis, 2009; Turner & Reinsch, 2007).

Dennis et al. (2008) also acknowledge that extant media choice theories do not have universal explanatory power, since they neglect certain contextual factors. Whereas the authors discuss the impact of team members' familiarity with each other, with the task and with the communication media as contextual variations, we argue that MST still neglects one essential feature of many – if not most – globally dispersed teams: their multilingual nature (Chen, Geluykens & Choi, 2006). Linguistic diversity among virtual team members creates language barriers, i.e. "obstacles to effective communication, which arise if interlocutors speak different mother tongues and lack a shared language in which they all have native proficiency" (Tenzer et

al., 2014: 509). The salience and impact of these barriers vary in strength depending on the interacting team members' proficiency levels and feelings of (dis)comfort in the shared language. While fully acknowledging the relevance of other factors for media choice, we focus on this neglected antecedent, since language is the vehicle for communication. As previously established, we do so specifically for the vital communication objective of convergence. Several recent studies (Klitmøller & Lauring, 2013; Harzing & Pudelko, 2014; Klitmøller et al., 2015) already indicated that language barriers influence employees' media preferences in virtual collaboration. Building on these pioneering works, we formulated our first research question: *how do language barriers influence media choice in convergence processes?*

**EXPLORING THE IMPACT OF LANGUAGE ON MEDIA CHOICE: METHOD**

**Research Design**

To address our first research question, we designed a qualitative study aiming for a "contextually grounded … up-close and personal' … understanding of the language phenomenon" (Brannen et al., 2014: 498). Qualitative approaches are well suited to study complex subject areas and in particular "how" and "why" questions (Suddaby, 2006). More specifically, we conducted semi-structured interviews to investigate virtual team members' subjective perceptions of individual media choices for virtual communication. Focusing on the *individual* as our unit of data collection, the qualitative interviewing method enabled us "to learn about perceptions and reactions known only to those to whom they occurred" (Weiss, 1994: 10) – in our case the individual leaders and members of virtual teams. The interviews provided us with access to informants' "inner events" (Weiss, 1994), including thoughts, beliefs, decisions, emotions and performance evaluations.

However, whereas a study of individual media choices requires an individual level of analysis, we can only fully grasp this phenomenon if we also adopt an interpersonal perspective. After all, communication is an interpersonal exchange, which, in our context, takes place within a multilingual virtual team. We therefore follow traditions of organizational culture studies, assuming that individuals cannot be separated analytically from their environment and that individual choices are not entirely independent, but always socially embedded (Denison, 1996). For our research setting, this means that an individual media choice is based on its expected

performance, i.e. its capacity to foster mutual understanding in bi- or multilateral virtual team communication (Dennis et al., 2008). Individual team members select communication media based on their previous experiences with team interactions through these media and the resulting anticipation for future interactions. To understand the nature of team communication, we compared the individual experiences of several team members in each team. Specifically, we asked informants to report memorable situations from their particular team illustrating the interplay between media choices and mutual understanding between team members. By triangulating the views of different members on such memorable incidents, we gained rich accounts of team interactions and their influence on individual media choices.

**Research Setting**

To separate the role of language in virtual team communication from other influencing factors, we compared media choices between mono- and multilingual virtual teams. Our baseline study comprises 24 interviews in seven monolingual virtual teams from three automotive and three IT corporations. Our main study consists of 30 interviews in six multilingual virtual teams selected from the same six companies. Geographically dispersed teamwork is critical for the success of automakers, as they operate across the world and have to coordinate the development and manufacturing of complex products in a highly competitve industry environment. The IT industry is of equal relevance for our study, as we expect firms and individual employees in this sector to be most open towards new communication tools, allowing us insights into trends probably shaping the future of virtual team communication. Comparisons between interviewees from these two industrial sectors – one mature, one more recent, but both major players in terms of innovativeness and national economies – enabled us to explore possible variations or commonalities in media use across industries (Locke, 2001), thereby probing the robustness of our findings (Miles & Huberman, 1994).

We furthermore sampled teams from several corporations in each industry to capture the influence of language barriers on media choice beyond potential firm idiosyncrasies. For the automotive industry, we collected data from three major automakers headquartered in Germany, which we coded with the pseudonyms CAR1-3 for the purpose of anonymization. The German automotive industry is of particular interest because German car manufacturers have for a long time been highly competitive, suggesting successful coordination of their global operations. For

the IT industry, we selected three leading software firms headquartered in the United States, which we coded as IT1-3. US-American software firms are generally considered at the cutting edge of innovation in their industry. Whereas this design does not allow us to formally separate the effects of industry background and headquarters' country on media choice, we argue that interviewees' detailed accounts of virtual team interactions and their related interpretations demonstrated which contextual variables mattered most for our informants.

For the *monolingual* dataset, we selected one virtual team from each of the three US software corporations, comprising only English native speakers. Furthermore, we chose one virtual team from each of the three German automotive companies, including only German native speakers. This linguistic homogeneity within the teams allowed all team members to conduct team-internal communication in their mother tongue. We complemented our monolingual dataset with a team of German native speakers, employed by one of the American IT corporations, which was located in Germany. Whereas the members of this team used English in external reporting to the US headquarters, they remained in their native German when speaking to team-mates. Our main dataset was geared towards investigating the particularities of the *mutilingual* setting, so we sampled teams with a high degree of language diversity and included only teams comprising at least three different mother tongues. Reflecting the importance of English as the lingua franca of business (Kankaanranta & Planken, 2010), five out of the six multilingual virtual teams used English as their working language. Only team CAR2 communicated predominantly in German. In none of our teams did corporate policies or leaders' directives constrain the media choices of individual members.

For both datasets we selected teams which predominantly interacted remotely through computer-mediated communication. Their distribution implied spatial and temporal dispersion, which we measured using the Spatial Distance and Time Zone Indices proposed by O'Leary & Cummings (2007). These sophisticated measures complement our focus on demographic dispersion in the form of different mother tongues with geographic dispersion, thus capturing the multidimensional nature of team virtuality and overcoming exclusive reliance on self-reported distance estimates. The Spatial Distance Index uses the geodesic ("as the crow flies") distances between the different locations of a virtual team, weighted by the number of members at each site (for the formula see O'Leary & Cummings, 2007: 441). We obtained the mileage separating the sites in each team from the online computational knowledge engine Wolfram Alpha (2015).

The resulting spatial distance indices vary widely in both datasets, ranging from 36 to 2997 in the baseline study and from 1812 to 3917 in the core study. The Time Zone Index is calculated in a similar fashion based on the number of time zones separating virtual team members from different locations (formula: O'Leary & Cummings, 2007: 441). These indices similarly vary, ranging from zero to 3.90 in the monolingual dataset and from 1.93 to 4.54 among multilingual teams. The number of sites per team (different cities) varied between 2 and 7. Some teams included members who were geographically isolated from their colleagues, whereas others had larger clusters.

With the recommendation of theoretical sampling (Glaser & Strauss, 1967) in mind, we furthermore sought out the most interesting teams (Myers, 2008) in terms of knowledge exchange processes. All investigated teams pursued innovation-centered tasks such as R&D, software testing or strategic pricing, which required permanent exchange of ideas and negotiation of competing solutions. To enable meaningful comparisons between mono- and multilingual virtual teams, we held the corporate environment constant between both datasets. The team sizes in our baseline study varied between 6 and 20 people, averaging 12 team members. Our main dataset includes teams of similar sizes, ranging from 8 to 17 people with an average of 13 members. This careful matching between our baseline and main investigation allows us to focus on the distinction between mono- and multilingual virtual teams. Tables 2 and 3 summarize the relevant characteristics of the virtual teams we included in those two datasets.

[INSERT TABLES 2 and 3 HERE]


**Data Collection**

Our monolingual dataset includes 24 semi-structured interviews with all seven team leaders and two to four additional members of each team, whereas the multilingual sample comprises 30 interviews with all six team leaders and four members each. Semi-structured interviews ensure both, a certain degree of consistency in questions to compare the views of different informants and sufficient flexibility to bring up important issues that the researcher did not anticipate (Myers, 2008).

In the first and rather short part of our interviews we gathered background information on the composition and tasks of the teams under study. Our interviews in the multilingual setting

continued with questions about the languages used in spoken and written virtual communication. Informants self-evaluated their own proficiency in English (the headquarters' language in the IT MNCs and the working language of all multilingual teams except CAR2) and, for the German automotive companies, in German (the headquarters' language and the working language of CAR2). They also commented on the general proficiency level in these two languages across their respective team. Interviews in monolingual settings skipped this section and directly continued with questions about interviewees' media preferences. We started by asking which media informants and their colleagues generally used in teamwork, which particular purposes they addressed with each of these choices and why they considered the chosen media most suitable in this respect. We then solicited descriptions of memorable situations, in which specific media choices helped informants achieve their communication goals or impeded them. We wrapped up our interviews in monolingual teams by asking informants whether they also had experiences in multilingual virtual teamwork and if yes, how media choice differed (if at all) in these settings. We concluded our interviews in multilingual teams by asking how (if at all) language barriers influenced the mutual understanding between virtual team members.

Our baseline study of the monolingual context includes 9 US-American native speakers of English and 15 native speakers of German. For the main study in the multilingual virtual teams, we sampled team members speaking German, English, Chinese, Japanese, Hindi, French, Portuguese, Italian and Bulgarian as native languages to obtain a broad variety of perspectives on linguistic constraints to media choice. Moreover, we selected informants with different proficiency levels in English and German, the two most important languages in our teams. We conducted the interviews with German or English native speakers in their mother tongue and interviewed informants speaking other mother tongues in either English or German or in a mix of both languages, depending on which option they preferred.

Given that team leaders have a certain influence on their subordinates' media choices, we included the leaders of all 13 investigated teams in our sample. Embracing a variety of perspectives from different hierarchical levels is also beneficial to mitigate the potential biases of any individual informant (Golden, 1992). This careful and theoretically guided approach to sampling permitted us to achieve data saturation (Locke, 2001), i.e. no new themes emerged well before we completed our interviews. The length of our interviews varied between 20 minutes and one hour. We digitally recorded all interviews and transcribed them in their original language.

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**Data Analysis**

Our qualitative data analysis was aided by the software ATLAS.ti. We initially examined each interview transcript using the "open coding" technique (Locke, 2001). In this process we studied every paragraph of our transcripts to understand what exactly had been said and accordingly assigned one or more thematic code labels to each passage. Many of these initial code labels were "in vivo codes", i.e. codes reflecting interviewees' own word choice (Locke, 2001: 65). For instance, the statement "For Japanese people it is difficult to speak and understand spoken English, but compared to that, writing and reading English is a little bit easier for us" was coded with the labels "communication_spoken" and "communication_written". However, given that we continuously compared our emerging empirical findings to the propositions of MST, we also created code labels indicating how Dennis et al.'s (2008) theoretical concepts were reflected in our data. The statement "The English proficiency of some colleagues isn't very high, so we have more written communication with them, which allows them to write at their own pace and to look up words", for example, generated the code "rehearsability".

Having completed the phase of open coding, we applied the constant comparative method (Glaser & Strauss, 1967; Locke, 2001) to identify recurring themes in our data and probe their robustness. Separately analyzing the transcripts from our monolingual and multilingual teams, we began by juxtaposing different parts of each interview to examine its consistency. We then triangulated different interviews within each team to create a detailed picture of the virtual team interactions, which shaped the media experiences of individual team members and influenced their media choices. Next, we conducted comparisons between teams, juxtaposing teams within one industry, but also contrasting results from the automotive and IT teams under study. In the final and most important step, we compared our findings between monolingual and multilingual virtual teams to tease out the particular influence of language on media choice.

During our iterative process of data collection and analysis, we noticed that certain themes were often raised by our interviewees. For example, all informants emphasized the need to integrate diverging perspectives into a mutual understanding as a core purpose of their virtual collaboration. However, multilingual team members lamented the difficulty to discuss complex issues in phone conferences due to language-related misunderstandings. Comparing these problem descriptions with the literature, we subsequently focused on media choice in

convergence processes as the phenomenon of interest. This gradual shift from broader explorations towards a more focused study guided by repeated iterations between data collection, analysis and the literature is typical for research designs inspired by grounded theory (Glaser & Strauss, 1967). We continued these iterations until we did not introduce any further changes in the coding scheme, suggesting that we reached theoretical saturation (Locke, 2001).

## EXPLORING THE IMPACT OF LANGUAGE ON MEDIA CHOICE: FINDINGS

### Media Choice in Monolingual Virtual Teamwork

To provide a comparative baseline for our investigation of language effects on media choice in *multi*lingual virtual teamwork, we first conducted a study in *mono*lingual virtual teams, whose members share a common native tongue and use this language in daily team interaction. Informants across all those teams emphasized the suitability of asynchronous communication for transmitting a large number of documents. Team sharepoints, for instance, allow many team members to store and access information at the same time:

> When I am travelling and I need a file or presentation, I just go to the web community where I have all the files that have been uploaded recently. I can download the information from there. It is accessible on my desktop and it is also always accessible on my iPod or iPad. We create the information once, store it in the community and can access it from everywhere on our mobile devices. (Mono IT1 leader, American)

Asynchronous media such as e-mails also support information *conveyance* by allowing individuals to carefully rehearse and reprocess messages:

> I always write e-mails if I have to document something. These are well-structured mails, on which I spend quite some time. I draft them very carefully. Then I will be able to say what exactly we communicated weeks, months, or even years later. (Mono CAR3–2, German)

However, given the novelty and innovative nature of their team's tasks, most informants considered the mere conveyance of information secondary. Many of the virtual teams under study, both in our mono- and our multilingual dataset, brought together specialists from different areas to jointly search for new solutions. This interactive sensemaking formed the core of their virtual exchange:

> Writing e-mails does not bring a solution; it just nails down who should do what. You are not jointly working on things; you are just completing a sequence of tasks. Why am I using communication media? Because I do *not* want a sequence, but interaction! (Mono

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CAR 2 leader, German)

Centering on the *negotiation of diverging viewpoints*, the communication in our virtual teams mostly aimed at the *convergence* of information. For this purpose, informants working in monolingual virtual teams considered asynchronous media less helpful:

> There are issues you definitely cannot communicate through e-mails. If we need a quick decision for an ad hoc topic, I rather pick up the phone. (Mono CAR2–2, German)

If the task required interactive give and take, informants found *rehearsability* und *reprocessability* no longer advantageous for reaching mutual understanding. In contrast, these media capabilities turned into liabilities protracting knowledge exchange in highly inefficient ways ("If it is about reaching understanding, an e-mail exchange can take 300 years before you get to the point." Mono IT3b leader, German). The fact that many team members sent *parallel messages* and the dispersed nature of different pieces of information created additional confusion and hindered mutual understanding on complex issues.

Considering these shortcomings of asynchronous exchanges, most interviewees working in monolingual virtual teams preferred synchronous means of communication such as one-to-one calls or telephone conferences to get everyone on the same page:

> With functional tasks, it depends. Do they have a networking component? Are they about mutual coordination? … For discussions, clarifications, for involving others in our topics, we use telephone conferences and share our screens with each other. This is about joint work on our documents and concepts, about discussions where the spoken word is key. (Mono CAR2 leader, German)

Interviewees found the *instant message transmission* through these media highly conducive to collective sensemaking in their teams, particularly with respect to complex and novel issues:

> Paper is patient, e-mails are too. Sometimes I need to find solutions fast. Then I seek personal contact through the phone. You can write many e-mails, but you don't know if you really bring your points across. Through personal exchange, you develop a totally different understanding, a different kind of access to each other. (Mono CAR3 leader, German)

MST categorizes the verbal cues transmitted through phone calls as highly *natural symbol sets*, because they are fast to encode and decode (Dennis et al., 2008). When discussing controversial issues, our informants from monolingual virtual teams clearly appreciated this media capability as conducive to mutual understanding. ("Teleconferences are the ne plus ultra in terms of efficiency." Mono CAR1–2, German). These findings fully support the established propositions

of MST.

Going beyond the bulk of prior studies, which mainly focused on traditional communication media (Gilson et al., 2014), our data also provide evidence of the rising importance of integrated communication technologies. These company-wide systems allow users to verify if colleagues are away from their desk, busy or ready to be contacted. Our interviewees reported to initiate communication frequently through instant chat messages, expecting a prompt answer ("We use messaging instead of e-mail, because it is much more immediate." Mono IT1–1, American). This comparatively new medium constitutes a middle ground between asynchronous e-mail and synchronous phone calls. Particularly our informants from the IT industry sent and received very large numbers of short messages:

> Sometimes I have about five conversation going on at once. … We are so busy because instant messaging is so immediate. Even when grabbing lunch or going to the restroom I actually have to put up that I am busy, so I won't receive any instant messages. (Mono IT3a – leader, American)

Beyond instant messaging, integrated communication systems also allow virtual team members to simultaneously communicate through several channels. Interviewees found this very helpful to reach mutual understanding in their virtual teams:

> I found what was most effective was having some type of virtual meeting room, where everyone can log into a central place. You can share screens and you can have different types of media that can be displayed, whether it is a PowerPoint or a short video clip. That is important. The participants should be able to share any information they have. … You know their minds better after the call. (Mono IT2–1, American)

Whereas some interviewees criticized that their colleagues got distracted from their current meetings by the use of e-mail or chat ("If it's not my call I'm really terrible. I am one of those people that get lost in multitasking." Mono IT2–1, American), these communication media were overall evaluated very helpful for sensemaking purposes.

Comparisons between the individual interviewees and teams across different corporations and industries indicated a variety of factors influencing media choice in our monolingual baseline study. The *number of team sites* was not among them, since many sites can dial into telephone conferences just as easily as a large number of people are copied into emails. Similarly, informants hardly mentioned their team's *geographic dispersion* as evidenced in the Spatial Distance Index (O'Leary & Cummings, 2007), because once spontaneous face-to-face communication was impossible, the velocity of message transmission did not vary between

closer and more distant locations. Reflecting Cummings, Espinosa & Pickering's (2009) findings that temporal boundaries are harder to cross than spatial ones, *time zones* were more relevant in influencing media choice, since they restricted the time available for synchronous team communication. However, the members of our monolingual teams dealt with this hurdle confidently, extending their working hours to reap the above-mentioned benefits of instant exchange or communicating through "linchpins" (O'Leary & Cummings, 2007: 444), i.e. team members located in the geographic middle taking on the role of an information broker ("Time zones are an issue if the Americans have to call the Chinese, so I have taken on the role of sitting in the middle and passing on information." Multi IT1 leader, German). Regarding the *age* of team members, comparisons between virtual team members from different generations show that younger interviewees appropriate sophisticated new communication technologies more willingly and evaluate them more positively than their older colleagues. Moreover, team members' extent of experience with IT issues accounts for some discrepancies in media appropriation, which can be overcome with suitable media training. This factor relates to their *industry* background: given the high overall affinity of IT companies and employees for virtual communication technologies, teams from this industry have a particularly sophisticated media infrastructure at their disposal and use it intensely. However, our data collection over the last two years shows that automotive companies are currently investing heavily in the company-wide implementation of integrated communication technologies. Table 4 illustrates the role of these influences on media choice with typical interview quotes, juxtaposing the situation in monolingual virtual teams.

[INSERT TABLE 4 HERE]

We were particularly interested in the views of those informants who had worked not only in monolingual, but also in multilingual virtual teams. They considered language barriers as a crucial factor, which fundamentally changes the context of virtual teamwork and influences the performance of communication media:

> With American colleagues, it was still quite ok to pick up the phone, but I am also in a Chinese project right now. There we definitely have to write everything. What isn't written isn't understood. … I never call China, this just leads to misunderstandings. And even if we do call once in a while, we need a meticulous protocol afterwards. This is absolutely essential. (Mono CAR1–1, German)

Against the backdrop from our monolingual baseline study, the following section investigates how language barriers influence media choice in virtual convergence processes.

**Media Choice in Multilingual Virtual Teamwork**

Participants of our main study saw language barriers as a central factor influencing their collaboration:

> Language is one of the most important factors. It has the biggest impact on this project, actually. If you are not in the same room or the same area or in the same office then the language becomes a big barrier for communication. (Multi CAR1–3, Japanese)

Language appeared to have little influence on the effectiveness of asynchronous media for the *conveyance* of information, which members of mono- and multilingual virtual teams reported in a similar fashion:

> E-mail is the easiest and most efficient medium for pure info exchange, i.e. when I just need some straightforward piece of information. If I ask for it in an e-mail, I know that I will have the answer on my PC when I get back to the office tomorrow. (Multi CAR1–4, German)

Consequently, with regards to conveyance, we did not observe any contradiction between our findings from the multilingual context on one side and our findings from the monolingual context as well as key propositions of the MST on the other. However, regarding the more important knowledge exchange processes geared towards the *convergence* of different interpretations towards a common meaning, we found salient discrepancies between our findings from the multi- and the monolingual contexts respectively MST. Informants from multilingual teams emphasized that language barriers are highly disruptive to this kind of information processes:

> You have to get to a level of understanding where your minds and your responses are on the same level, get your minds to a state of understanding where they create links to one another. I think the creativity lies in this kind of understanding ... But how do you get that in a meeting where you have language barriers? I start to sweat when I think of language or things like that. (Multi IT3–2, British)

Whereas MST recommends and our interviewees from monolingual virtual teams appreciated synchronous media for these purposes, members of multilingual virtual teams disagreed. While acknowledging the theoretical benefits of synchronicity for negotiation, they countered that language barriers often impede the quick back-and-forth exchanges, which MST praises as the key advantage of synchronous media for convergence processes:

> I have experienced colleagues who are advanced in their careers, but their English is still

an impediment for them. Fact is that the one hour scheduled for a telephone conference passes very quickly and you cannot wait for everybody to find his words. So these people prefer to put their sentences together at rest and send their contribution in written form. (Multi IT1–2, German)

Interviewees from different nationalities and all six multilingual virtual teams highlighted that spoken communication through media such as telephone conferences is fraught by frequent misunderstandings:

It is terrible when the guy on the phone on the other side is telling you something and you don't understand. And then you have to repeat it once, twice. What I found out with Chinese people is that very often the guy just repeats the same sentence. And I'm like: "Ok, but I don't understand what you're saying!" Or: "I don't understand that word because of pronunciation problems. So please use something else. Use another word, use another sentence." But the guy just repeats exactly the same sentence. That is just terrible! (Multi IT3–4, French)

Accordingly, synchronous media with immediate message transmission and speech often failed to produce mutual understanding among team members:

I remember that one guy who newly joined our weekly meeting. When he tried to express his core ideas, the colleagues couldn't understand what he said. After one or two times they understood maybe one third or one half of what he said. Then he would realize that we have to write it down and send an e-mail. (Multi IT1–4, Chinese)

This finding, which informants voiced across all multilingual virtual teams, companies and industries, stands in contrast to the results of our monolingual baseline study. It also contradicts the established propositions of MST, which were meant to be valid across contexts. This discrepancy suggests that language barriers profoundly influence media performance for convergence processes.

But what exactly makes cross-lingual virtual communication through synchronous media inefficient? Our data reveal that listening comprehension presents a considerable stumbling block for mutual understanding. Not only team members with low proficiency in the working language found it hard to process team-mates' speech, also the high-proficiency speakers among our interviewees reported that understanding colleagues' accents in the foreign language could be extremely difficult:

There are those Indian team members whom we don't understand on the phone. They are so hard to understand that we have more misinterpretation than information coming across. We have to ask so many times what they just meant. Phone calls like this produce no outcome at all. (Multi IT2–3, German)

These results are in line with Klitmøller & Lauring's (2013) finding that accents become particularly apparent in phone calls and phone conferences and partly explain why these media are often avoided (Lauring & Klitmøller, 2015).

Besides processing what conversation partners are saying, team members are also expected to answer immediately. As many of our informants struggled with their oral language skills, the need to actively speak their team's working language was seen as a major hurdle to synchronous communication:

> Usually, Japanese persons have problems with speaking in and listening to English, so they hate to call directly. (Multi CAR1–2, Japanese)

When comparing our data with Dennis et al.'s (2008) propositions about the suitability of certain media capabilities for convergence processes, we discover remarkable contrasts between the realities of multilingual virtual teamwork and the established MST. The prevalence of linguistic misunderstandings in speech-based multilingual virtual team communication contradicts MST's proposition that media using *natural symbol sets* like spoken words are highly suitable for converging ideas in a team. Whereas Dennis et al. (2008) suggest that *high transmission velocity* supports the negotiation of different viewpoints, individuals with low proficiency in their team's working language often feel unable to provide much input to the conversation. Our findings thus suggest that the convergence-related propositions from MST are not as universally valid as many scholars might have believed.

Contradicting Dennis et al.'s (2008) propositions, our data demonstrated that asynchronous media support convergence processes across language barriers. In contrast to synchronous and spoken conversations, informants from our multilingual teams perceived written communication to be much more conducive to mutual understanding, as it allows for reflection and careful wording:

> E-mails are better for understanding because they give the guy who received them the chance to actually read, translate, look things up in a dictionary and understand. So you can be much more precise. (Multi IT3–4, French)

The lower informants' proficiency in the working language, the more they highlighted the benefits of asynchronous media. Between-team comparisons demonstrated that particularly those virtual teams with a lower average working language proficiency and those with very high linguistic diversity conducted much knowledge exchange asynchronously. Besides relieving

team members from the pressure to speak a foreign language, written media also eliminated the challenge of heavy accents:

> In the very first teleconference I had with my current team I asked myself if the others were speaking English or another language. This was really extremely difficult for me even though I do speak decent English. But the accent of the Indian, Chinese and Ukrainian colleagues all in one phone conference – this was just insane! (…) In contrast, the e-mails I get are all well written and understandable. I don't know how much time colleagues invest into these e-mails, but their English is quite good there, good enough that we can communicate without any problem. (Multi IT1–2, German)

In addition to language barriers, we also investigated alternative influences on media choice in our multilingual virtual teams (see Table 4). Like in the monolingual baseline study, informants did not raise the number of team sites and their geographic distance as relevant. Team members' ages and industry affiliations did play a role, but followed the same direction as in the monolingual setting: younger team members and those with more IT affinity were more open to new communication technologies. Time differences emerged as the most interesting alternative influence, as they interacted with language barriers. Considering that many time zones separated the multilingual teams in our study, their limited overlap in working hours also fostered the gravitation towards asynchronous media. In contrast to our monolingual teams, in which members made all conceivable efforts to increase the overlap in working hours, time zones provided the less proficient members of multilingual teams with a face-saving excuse to rely on emails. This is understandable, as the strains of bridging time zones and language barriers reinforce each other ("The time zone difference, the accent and the bad phone connection are incredibly painful in conversation." Mono IT1 leader, American).

Our findings are in line with Harzing & Pudelko's (2014) recent observation that language barriers impact asynchronous communication by e-mail less than they impede synchronous communication on the phone. It also supports Klitmøller et al.'s (2015: 280) argument that reflections and corrections of mistakes in e-mail use can reduce language-induced misunderstandings in MVTs and "improve written output level of low proficiency individuals". In terms of the media capabilities outlined by MST, our data suggest that the *rehearsability* and *reprocessability* of asynchronous communication media gain particular relevance in multilingual contexts. Whereas MST describes these capabilities as inadequate for convergence, our data reveal their benefits for mutual understanding in multilingual virtual teams. Contrary to MST's tenets, the preferred communication media of team members struggling with language barriers

are characterized by *low transmission velocity* and encode messages in written and therefore *less natural symbol sets*. Contrasting the suitability of different media capabilities for convergence processes between mono- and multilingual virtual teams, Table 5 visualizes how our empirical findings for the multilingual context contradict the convergence-related proposition of MST. Answering our first research question, we conclude that language barriers lead to a reversal of media choice criteria for convergence processes.

[INSERT TABLE 5 HERE]

Whereas MST was established in a monolingual context, it is implicitly meant to be valid across contexts. However, the surprising contrasts between our empirical findings for multilingual virtual communication and the convergence-related propositions of this general theory suggest that linguistic influences require a "redescription" (Welch et al., 2011) or "recontextualization" (Brannen, 2004) of media choice in multilingual settings. This discovery motivated us to take our initial study to the next level by searching for an *explanation* of language effects in virtual communication. Consequently, we formulated our second research question: *why do language barriers influence media choice in such profound ways?*

**EXPLAINING THE IMPACT OF LANGUAGE ON MEDIA CHOICE: METHOD**

We do not need to add further methodological information regarding the research setting and data collection for the investigation of our second research question, because we are working with the same virtual teams and interviewees. However, additional comments regarding the research design and data analysis might be appropriate.

**Research Design**

Progressing from *exploring* linguistic influences on virtual convergence processes in general to the more focused search for a mechanism *explaining* these language effects, we adopted an innovative research approach, which international business scholars have rarely employed so far: contextualized explanation. Introduced by Welch et al. (2011), this approach addresses cases of mismatch between already established theories and newly obtained empirical observations. Such a mismatch suggests that a previously unrecognized causal mechanism operates in the specific context of investigation, which scholars need to tease out (Welch et al., 2011). To identify this

unrecognized mechanism, contextualized explanation pays close attention to social actors' own accounts of their context-specific experiences and brings existing theories to bear on them. This "back-and-forth thought process between theory and field data" (Yagi & Kleinberg, 2011: 639) helps to view existing theories from new perspectives (Welch et al., 2011; Yagi & Kleinberg, 2011). It follows an interplay between inductive reasoning based on own findings and deductive reasoning embedded in extant theories (see e.g. Denis, Lamothe & Langley, 2001). In our specific case, this approach provided us with a close-up view of why individual team members use different communication media in the multilingual compared to the monolingual virtual team context. Consistent with our focus on individual team leaders and members as the units of data collection in the first, exploratory stage of our study, individuals also constituted the focal units of theorizing for this second stage, our contextualized explanation. Again, as in the first stage of our investigation, the team setting formed the environment in which individual media choices were socially embedded (Denison, 1996).

**Data Analysis**

As recommended by Locke (2001), we already started the analysis of our data parallel to the data collection. This approach helped us to identify discrepancies between our findings and existing theories early on, thus revealing the need for a contextualized explanation and guiding us to focus increasingly on the motivations underlying virtual team members' media choice. Searching for a theoretical explanation of linguistic influences on media choice in virtual teams regarding the convergence of ideas, we delved deeper into the reasons why interviewees selected specific communication media during joint sensemaking in two contexts: mono- and multilingual virtual teams. We compared our findings from both contexts with pioneering perspectives on foreign language processing from cognitive research, producing new codes such as "processing_task_information", "processing_linguistic_information" and "cognitive_load". Through this iterative procedure, we developed a language-sensitive explanation for media choice and performance in multilingual virtual teams.

**EXPLAINING THE IMPACT OF LANGUAGE ON MEDIA CHOICE: FINDINGS**

**Language-induced Cognitive Load**

Examining *why* language barriers influence media choice in such profound ways, we found that the popularity of different communication media among virtual team members was closely linked to the perceived effort of using them. The cognitive strain virtual team members experienced when using specific media strongly varied between mono- and multilingual settings. Interviewees from our monolingual baseline study did not distinguish between efforts of using synchronous and asynchronous media. Speaking and writing messages in their mother tongue was equally easy for them:

> Being an English speaker, it is simple for me. You know, either I'm just going to type it out or I'm just going to talk to somebody. (Mono IT2–1, American)

Reading and listening to oral information also made no difference to them:

> I work in a company where the main language is English and English for me is very comfortable, so I should say, I don't feel inconvenienced at all. (Mono IT2 leader, American)

In contrast, informants from our multilingual virtual teams reported a significantly higher cognitive strain when processing information instantaneously through synchronous and spoken media compared to asynchronous and written means of communication. Their observation resonates with the concept of cognitive load, which refers to the amount of mental activity performed by an individual's working memory at any point in time (Volk et al., 2014). The human working memory stores incoming information and processes it, allowing a person to perform complex cognitive tasks (Chen & Chang, 2009). However, the limited capacity of our working memory restricts the amount of information which can be simultaneously stored and processed (Baddeley, 2003).

Our data demonstrate that these limitations become problematic in foreign language communication. According to Takano & Noda (1993), activities like conversation or negotiation typically consist of both linguistic (communication) and non-linguistic information processing (thinking and deciding). These activities have to be performed in parallel and compete for individuals' limited information processing capacity. Whereas our mono- and multilingual teams needed to process equal amounts of non-linguistic (task-related) information, the former could concentrate on thinking and deciding about the task while relying on the automatic processing of

linguistic (lexical, syntactical and phonetic) information. The latter had to invest conscious effort in processing linguistic cues when having to actively operate in a foreign language. This additional burden substantially strained their cognitive capacity:

> When there are issues to resolve in my area and I am speaking in German I make a lot of mistakes. On the one hand, I have to figure out: "How should I react? What should I answer?" But at the same time I have to formulate this correctly in German. The result of this is that I cannot concentrate 100% on the issue. (Multi CAR3–3, Chinese).

This statement supports the results of neuroimaging studies, which have demonstrated that processing a foreign language significantly increases neural activity in frontal brain regions (Abutalebi, 2008), indicating a more conscious and controlled effort. According to Volk et al. (2014), these strains similarly appear in speaking, reading and writing a foreign language. We found that similar cognitive burdens apply to passive foreign language comprehension:

> I am not a native speaker of English, so I have to make quite a big effort just to understand. In German, even if I just concentrate 80% on the conversation, I still grasp the speaker's point. But in an English meeting, if I think "I will take myself back by 20% and think of something else", then I lose track of the conversation. It is exhausting for me to follow the specific accents and speaking speed. When people speak in German I can still take in the gist of the talk even if I do other stuff in parallel – it just enters my brain automatically in the background. In a meeting with the US colleagues, my brain doesn't recognize the English talk as background information to be processed – it just completely blends it out. (Multi CAR1 leader, German)

This comment reflects insights from applied linguistic research, which demonstrated that second language listeners perceive and process less acoustic information than native language listeners do, as they frequently have to stop listening to think about unfamiliar words and interpret the text segment they just heard. Consequently, they either miss the following information or fail to make sense of the first input, as they are busy processing new inputs from the stream of speech. They also tend to forget quickly what they heard, since their limited short-term working memory is being cleared constantly for new information, while no time remains for fixing information in the long-term memory. This often leaves second language listeners confused about the key ideas of the messages they receive (Goh, 2000).

Taken together, team members with low proficiency in the working language perceived the difficulties of speaking and listening to a foreign language while simultaneously thinking about their tasks as extremely cognitively exacting. These individuals spent almost all their

attention on language processing, which left very few cognitive resources for pondering its content or formulating their own contributions:

> In the call with Geoffrey I was sitting there listening word by word, all my focus was on the communication, what he said. I was listening and thank God I understood everything he said. But, you know, my whole attention was on the words. So while I could actually understand, I did not think of making my point or giving my responses. I was so attentive, but my focus was on processing what Geoffrey said, not on thinking about it or responding. (Multi IT3–3, Indian)

Since virtual team tasks are typically characterized by high cognitive demands, the additional strain language barriers impose on employees' information processing capacity can deplete cognitive resources they could otherwise use for thinking and making decisions about the task at hand (also see McDonald, 2006). Teams members with low proficiency in their team's working language perceived such situations as highly stressful. The resulting anxiety further exacerbated their cognitive load, making it even harder to recall the required vocabulary in the foreign language:

> On the phone, especially if you are feeling insecure and you are getting nervous, you maybe can't think of words which you would know in calmer situations. (Multi CAR2–4, Chinese)

Overall, our data clearly show that synchronous media in foreign language communication require a particularly high cognitive effort, as they are characterized by very high transmission velocity, making them susceptible to mistakes and unsuited to converge ideas on a mutual understanding. In contrast, asynchronous media, characterized by rehearsability and reprocessability, eliminate the pressure to react immediately and allow individuals to take their time formulating and decoding messages. This way asynchronous media substantially reduce language-based cognitive load:

> Not being a native English speaker, I cannot think about our tasks and express myself very well at the same time, so speaking on the phone complicates things. This is one of the reasons why I am using more e-mails than phone calls. (Multi CAR3–4, Italian)

Our interviewees saw the possibility to look up words in online dictionaries, use translation programs and have colleagues proof-read important messages as an important relief:

> You can escape the stress of foreign language conversation on the phone if you put things in writing. Then you have plenty of time to deal with the content and double-check that everything is correct before you send it out. (Multi CAR2–1, German)

They also found it easier to express themselves once unburdened from the time pressure:

> In many cases we do actually have the required active vocabulary. You just cannot spontaneously recall it when it is your turn to speak, in the exact second you would need it. (Multi IT3–1, German)

Consequently, the rehearsability and reprocessability of asynchronous media free up working memory capacity, which team members can reallocate to the communication content, thus reducing miscommunication and supporting mutual understanding.

Kock (2004) already noted that users' perceived cognitive effort varies between different communication media. Going beyond this general indication, our study reveals how the different media capabilities outlined by MST increase or decrease virtual team members' perceived cognitive effort in foreign language processing. The mechanism of language-induced cognitive load thus explains why our findings from the multilingual virtual team setting are in opposition to the convergence-related propositions of MST. We have already established that a convergence process unfolds if team members aim to negotiate controversial issues. Whereas this task-dictated purpose of communication and the associated amount of task-related information are independent of the chosen language, speakers' effort in encoding and decoding its meaning rises substantially when a foreign language is used. Dennis et al. (2008) associate higher synchronicity in convergence processes with reduced cognitive effort to encode and decode messages, as the messages can be broken down into smaller installments. For the specific, but important case of foreign language processing we found that the cognitive strain of foreign language processing depletes the working memory of many virtual team members and even hampers the correct processing of smaller information volumes. Whereas MST posits that *conveyance* processes require time to process information, analyze it and make sense of it, we argue that also *convergence* necessitates processing time with regards to language barriers. Consequently, for the specific context of multilingual virtual teams, we come to a different conclusion than Dennis et al. (2008), who posit that rehearsable and reprocessable media decrease shared focus, slow down exchanges and thus hinder the convergence of ideas in a team. In team settings fraught by language barriers, the benefits of cognitive relief more than outweigh the additional time requirements.

**Tools and Techniques to Secure Mutual Understanding in Multilingual Virtual Teams**

Based on our above presented findings we generally agree with Klitmøller & Lauring's (2013) positive assessment of asynchronous media use in multilingual settings. However, our interviews also brought to light that resorting to asynchronous and written communication is far from being a panacea. Particularly native and highly proficient non-native speakers of their team's working language, who did not suffer from language-induced cognitive load, lamented the limitations of asynchronous media like e-mail for team discussions:

> I think that a written medium sometimes is difficult. Let's say a German colleague takes the time to write something, but his language skills aren't that strong. Then I find myself reading it several times, but I don't understand what he is trying to say, whereas if you are having a conversation you could ask for clarification. That's much easier, more interactive than firing e-mails back and forth. (Multi CAR1–1, American)

These views illustrate the dilemma between the attractiveness of asynchronous media in multilingual settings and their undeniable shortcomings, which are captured by MST. Searching in our data for possible strategies to overcome this dilemma, we found the growing use of integrated communication systems featuring a variety of new communication technologies to be very beneficial.

Both in our monolingual and multilingual virtual teams, many informants reported an increasing use of virtual chatrooms for written conversations. Chat systems had not yet been installed across all departments of automotive MNCs, but respondents from all three IT companies frequently used them. They praised the medium for combining the advantages of asynchronous and written media with the fast feedback of synchronous communication:

> We sometimes use online chat because there is Google translator, an online dictionary to look up some words. If I want to express some meaning and I don't know which English words to use I open a new browser, look up a Chinese word in the online dictionary and paste it to the online chat window. Then if I make some mistakes, if my partner doesn't understand, he immediately responds back: "What do you mean?" If I make a mistake I can get an immediate answer and I can correct. So I can be relaxed in online chat. (Multi IT1–4, Chinese)

As explained above, instant chat messages are characterized by a rather high transmission velocity, yet they do not suffer from "awkward silence" as much as spoken conversations and therefore still allow participants to type messages at their own pace. This way they foster fast exchanges while keeping cognitive load comparatively low.

In addition, multilingual virtual team members often secured understanding through redundant communication, i.e. they repeated their messages through a combination of different media. We also noticed this practice in the monolingual teams under study, but it emerged as particularly salient when communication partners needed to overcome language barriers:

> I sometimes think about an English e-mail for quite a long time until I have formulated it carefully enough to be sure that the other person can understand what I have written. The best way is certainly to write an e-mail and then call the person ten minutes later: "I wrote you an e-mail, is everything in it clear? This is what it's about." Then I notice if the other person understood what I wanted to say. (Multi IT2–3, German)

This sequential pairing of synchronous and asynchronous media unites the fast knowledge exchange of the former with the cognitive relief and better understanding provided by the latter. Particularly the less proficient speakers of the working language reported writing e-mails to either prepare telephone calls or to clarify issues afterwards:

> Japanese usually prefer to use e-mails because they are not so fluent in speaking English, but they are sometimes good at writing and reading. But if it's a really important message we do not only use e-mail. We try to call as well to make sure that what we want to say is understood correctly. (Multi CAR1–3, Japanese)

At first glance, redundant communication might appear counterproductive, as it increases the amount of linguistic cues to be processed. However, if the same content is repeated through a different medium, this additional channel provides a safety net giving virtual team members a second chance to correctly decode the message. After all, whereas the volume of communication and linguistic information to be processed increases, the amount of task-related information remains constant.

Highly proficient speakers also backed up synchronous communication with asynchronous media if they expected misunderstandings and aimed to minimize them. Whereas interviewees unanimously praised sequential media pairing, they disagreed about the usefulness of simultaneous media pairing. In line with the concept of language-based cognitive load, many informants believed that using several communication channels at the same time is an overwhelming task, particularly when facing language barriers:

> If you are in a telephone conference with Chinese, it is hard enough to understand what they are saying. If I was working on my laptop or write e-mails at the same time I would be lost. (…) Just last week we had a call with a Chinese colleague – he spoke a very strange English. We were looking at each other all the time, thinking: "What does he mean?" If I had been texting or e-mailing at the same time, I wouldn't have understood a thing any more. (Multi CAR2–1, German)

However, others did favor simultaneous media pairing as a way to enhance understanding across language barriers. These team members extolled newly established communication systems, which allow multiple communication channels such as telephone conferences, screensharing and online chat to be used simultaneously:

> You watch the presentation slides on your computer while you listen to the speaker. Sometimes you are struggling to actually understand what they are saying, maybe because of the strong accent. Then the written stuff you have in front of you helps you understand it, but you can also send private messages during a meeting to ask your questions. (Multi IT3–2, British)

The industries in which our informants worked or the informants' age emerged as possible predictors for their stance on simultaneous media pairing. Whereas we encountered supporters and opponents of this practice both in IT and automotive corporations, the former socialized their employees more into using new web-based technology, whereas the latter were slower to implement these innovations ("With the media we have at our disposal, communication is really old-school." Multi CAR1–4, German). Being highly familiar with novel communication technologies, interviewees working in IT multinationals were overall more in favor of combining different media. Compared to the younger "digital natives" (Joiner et al., 2013), who rather easily find access to new communication media ("For the 'generation facebook' it is absolutely a matter of course to use these media. ... It has become their second nature." Multi IT1 leader, German), many older employees did not feel equally confident to take advantage of the opportunities new media are offering ("You notice that older people from a certain age onwards are not prepared to make use of the media we offer." Multi IT3 leader, German). Industry and generational effects on media choice thus interact with the impact of language barriers, as the cognitive load in using unfamiliar media exacerbates the strain imposed by foreign language processing and keeps virtual team members from recognizing simultaneous media pairing as a strategy to overcome language barriers.

Multilingual virtual team members' vacilation between synchronous and asynchronous communication and their subsequent combination of both media types illustrates the dilemma they are facing: (a)synchronous communication media facilitate (hinder) immediate interaction, but hinder (facilitate) *rehearsability* and *reprocessability* and thus deplete (free up) cognitive resources. These findings again indicate that MST's proposition regarding *transmission velocity* needs to be modified for the context of multilingual virtual communication. According to Dennis

et al.'s (2008) typology of media capabilities, communication systems pairing several traditional media are furthermore characterized by *parallelism*, since they allow many virtual team members to send messages at the same time. As indicated in Table 5, this media capability is a double-edged sword in multilingual settings: whereas it increases the perceived effort of communication for some team members, it enhances the understanding of others. The latter assessment is remarkable in so far as it contradicts the extant literature on redundant media use, which mostly focuses on the negative impact of parallel media channels on the speed of communication.

## DISCUSSION

**Theoretical Implications**

By exploring how language barriers influence media choice in convergence processes, our study reveals prominent discrepancies between the multilingual context and the propositions of the seminal MST. While this theory was meant to be valid across contexts, we could show that some of its core propositions are, once applied to the multilingual context, reversed. We identified foreign language-induced cognitive load as a powerful antecedent to media choice in virtual teamwork. Revealing this previously understudied explanatory mechanism, our study contributes to reseach on media use in global virtual communication, suggests theoretical extensions to research on international knowledge exchange and advances language-related research in international business.

*Rethinking media synchronicity theory for multilingual virtual teams.* Our study contributes to research on media use in virtual teamwork by highlighting how communication in multilingual virtual teams differs from monolingual settings. Whereas the general propositions of media choice theories are already challenged by an active research stream investigating this phenomenon under different contextual factors (for an overview see Watson-Manheim & Bélanger, 2007), the particularities of communication across language barriers have not been considered in this field. The importance of language barriers in today's MNCs can hardly be overlooked (Harzing & Pudelko, 2013), so their neglect constitutes a substantial shortcoming of classic media choice theories.

Our study demonstrates that media capabilities which MST extolls as highly beneficial for convergence processes in monolingual settings turn into liabilities once language barriers come

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into play and vice versa. For example, Dennis et al. (2008) propose that synchronous media characterized by natural (speech based) symbol sets and high transmission velocity will improve communication processes geared towards joint sensemaking. Our study confirms the validity of these connections for the monolingual context, but also shows that these media capabilities cannot be relied upon in the multilingual context, as they cognitively overwhelm multilingual virtual team members with low proficiency in the working language. If cognitive resources are tied up with language processing, they can no longer be dedicated to the content of communication. As a consequence, synchronous communication processes suffer from incomplete understanding and reduced input by non-native speakers of the working language.

Conversely, Dennis et al. (2008) suggest that asynchronous media allowing team members to rehearse and reprocess messages at their own pace hinder the negotiation of shared meaning due to their slow speed. Again, our data confirm these relations for monolingual settings. In contrast, we found that they foster the convergence of ideas in multilingual settings by easing team members' cognitive effort and freeing up cognitive resources to be used for discussion input. Furthermore, our study shows that the ability of many team members to send messages through a medium at the same time is a double-edged sword: whereas the large amount of foreign language input to a conversation may cognitively overwhelm team members, it also allows them to verify understanding across language barriers with trusted colleagues. Given that MNCs are inherently multilingual (Luo & Shenkar, 2006), we argue that multilingual virtual teams are ultimately more decisive for MNCs than purely monolingual ones. Consequently, our findings can be regarded more relevant for the virtual team context in MNCs than the propositions of MST, which are valid only for monolingual setting. In addition, our major contextual modifications to this theory should also apply beyond teamwork to all virtual communication in international business settings.

*Contextualizing research on redundant communication to multilingual settings.* Our study also demonstrates the limitations of previous research on redundant communication due to their disregard for language effects. With respect to sequential media pairing, for example, Stephens et al. (2008) proposed that managers are likely to use several media sequentially if they aim to persuade others, but are unlikely to do so if their goal is to provide or obtain information. Our findings challenge this view: when language barriers hamper information sharing, managers are also well advised to apply sequential media pairing.

With regards to simultaneous media pairing, scholars have linked this practice to fragmentation of managerial attention (Reinsch, Turner & Tinsley, 2008) and to feelings of heightened stress (Barley, Meyerson & Grodal, 2011). Warnings abound in the literature that the use of several media simultaneously may result in cognitive overload (Dennis et al., 2008), lead to reduced information processing (Schultze & Vandenbosch, 1998) and thereby impair media performance. While part of our interviewees rejected simultaneous media pairing on these grounds, we were surprised to find that an equally large number characterized it as a beneficial technique to enhance understanding across language barriers. Raising these discrepancies, our study advocates judicious redundant communication as a way to enhance cross-lingual understanding and encourages future in-depth research on the conditions for efficient redundant media use in international business settings.

*Exploring the utility and adoption of new media.* Our study follows Gilson et al.'s (2014) recent call for more research on new and emerging technologies of computer-mediated communication. The bulk of current management studies focuses on traditional communication channels, still largely neglecting the integrated meeting tools which are increasingly implemented in corporate practice (Koutsabasis, Vosinakis, Malisova & Paparounas, 2012). Our interviews provide a glimpse of the opportunities these newer technologies offer in the specific context of multilingual virtual communication, thus encouraging more research in this direction. The differences we discovered in the media appropriation of younger and older employees also suggest fruitful avenues for further research. Since the "millennial generation" has grown up with computers and multiple means of communication, Gilson et al. (2014: 12) predict increased comfort and acceptance of technology among these incoming employees. Our findings reflect this trend. It will also be interesting to observe whether the gap in media infrastructures between the IT and automotive industry will close and to which extent differences in appropriation patterns will persist between industries.

*Introducing language-based cognitive load to theories of business communication and knowledge exchange.* We explained our study's central findings with the concept of language-induced cognitive load. Whereas this phenomenon has already been investigated in the fields of foreign language learning and applied linguistics (see e.g. Goh, 2000; Plass, Chun, Mayer & Leutner, 2003; Chen & Chang, 2009), it has so far been largely neglected in research on business communication. Our study illustrates the impact of cognitive load on foreign language

processing in virtual teamwork, a context of paramount important for today's MNCs (Maznevski & Athanassiou, 2006). It provides first empirical support to a recent conceptual study by Volk et al. (2014), which pointed out the importance of working memory constraints for multilingual business communication. Future research could frutifully investigate how this phenomenon shapes the boundaries of other established communication theories.

The language effects we showcased also introduce a cautionary note to some assumptions of established knowledge exchange theories. When Gibson (2001) posits that knowledge processing becomes more and more automatic over a team's lifespan, she mainly refers to team members' increasing familiarity with *task-related information*. Our findings suggest that language barriers may delay this development, as they heighten the cognitive effort of processing *linguistic information* depending on speakers' proficiency in the working language. Whereas the processing of an individual's mother tongue is fully automated through "basic cognitive algorithms [which] are hardwired in humans" (Volk et al., 2014: 865), non-native speakers need to invest conscious and controlled efforts into foreign language processing. These efforts and the amount of working memory resources they tie up only decline at the rate in which virtual team members improve their foreign language proficiency.

We established these findings through data collection in team constellations, as virtual teams are pivotal in creating and acquiring knowledge (Gibson & Gibbs, 2006). However, the effects we identified apply to any virtual communication across language barriers in MNCs, including headquarters-subsidiary exchanges and those between subsidiaries. With the increasing focus of many MNCs on worldwide learning (Hocking, Brown & Harzing, 2007), the multidirectional exchange of knowledge between global units has become a core management challenge, which our contribution informs in an important way.

*Encouraging more context-sensitive research on virtual communication and knowledge exchange.* Having shown the boundaries of MST for multilingual settings, our study reinforces the claim for more context-sensitive research on virtual communication in multinational organizations. To find out which medium best facilitates mutual understanding in a given situation, the individual communication partners and their social context need to be considered. Whereas Dennis et al. (2008) acknowledge the novelty or familiarity of communicative situations as important contextual variations, our study indicates that research needs to consider a broader variety of factors. This is particularly true for virtual communication in multinational and

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multilingual settings, which are subject to the complex and contradictory influences of diversity on cooperation (for an overview see Stahl, Maznevski, Voigt & Jonsen, 2010).

This call for contextual sensitivity also applies to research on knowledge exchange in teamwork. Many virtual teams are established specifically for the purpose of sharing and combining knowledge across national and geographic contexts (Gibson & Gibbs, 2006; Hinds, Liu & Lyon, 2011), but a stream of recent publications has demonstrated that linguistic diversity hampers this global exchange of knowledge (e.g. Welch & Welch, 2008; Klitmøller & Lauring, 2013; Peltokorpi & Vaara, 2014; Reiche et al., 2015). Our study extends this line of work by showing specifically how language barriers hinder knowledge exchange with the purpose to converge different viewpoints on a mutual understanding. This process of collective evaluation, codification and negotiation of meaning (Gibson & Earley, 2007) coincides with the stage of *examination* in Gibson's (2001) model of knowledge exchange. It is of paramount importance for the innovative capabilities of virtual teams, which center around the collective process of making sense of new and diverse information (Dougherty, 2001).

*Broadening the disciplinary scope of language research in international business.* Over the past decade, language-sensitive studies have consolidated into a distinct stream of research in international business (Brannen et al., 2014; Pudelko, Tenzer & Harzing, 2015). We contribute to this fast growing area by presenting "research that explicitly combines ideas from different disciplines" (Cheng, Birkinshaw, Lessard & Thomas, 2014: 643) to capture the inherent complexity of international business phenomena (Cantwell & Brannen, 2011). More specifically, we integrate a key media choice theory from communication studies and information systems research into international business studies and explain the particularities of the multilingual setting with concepts from cognitive research on foreign language processing. Considering the explanatory power of interdisciplinary theorizing in this field, we encourage additional research into the cognitive foundations of language-induced organizational behavior phenomena.

## Managerial Implications

Our findings also have important practical implications for the management of multilingual virtual teams.

*Developing tolerance for asynchronous media use.* Many virtual team leaders and members with high or native proficiency in their team's working language expressed impatience

about their less proficient colleagues' reliance on asynchronous means of communication. Sensitizing these individuals for the cognitive load experienced by low-proficiency speakers of the team language and demonstrating that more careful information processing can ultimately lead to better media performance, our study encourages highly proficient speakers of a virtual team's working language to develop more tolerance for asynchronous media use.

*Using communication media redundantly.* Following the commonplace suggestion that one medium is sufficient to communicate a message if it is strategically matched to the requirements of the task at hand (Donabedian, 2006) and considering that many managers feel overwhelmed by the amount of information they receive (Barley et al., 2011), "saying the same thing twice" through different media is usually considered inefficient and time-consuming (Leonardi et al., 2012). In contrast to this assumption, we found that redundant communication can be highly beneficial once a team faces language barriers. Repeating messages through several communication channels can mitigate the cognitive challenges of synchronous cross-lingual communication, prevent costly misunderstandings (Tenzer & Pudelko, 2012) and consequently improve knowledge sharing across language barriers. This kind of "additional safety net" can also increase multilingual virtual team members' confidence in their abilities, reduce language-based anxiety among low-proficiency team members (Tenzer & Pudelko, 2015) and thereby enhance trust building (Tenzer et al., 2014) in multilingual teamwork. Hence, the leaders of multilingual virtual teams should encourage redundant media use if they observe communication difficulties due to lacking proficiency in the team's working language. In this case not only the less proficient team members, but also fluent colleagues, including native speakers, should communicate redundantly and thereby help their less proficient colleagues understand.

*Providing a sufficient media infrastructure.* Having demonstrated the usefulness of integrated web-based communication systems to mitigate language barriers, the present study encourages MNCs to invest in technologies which provide employees with multiple communication channels. Not surprisingly, we found that multinationals in the IT sector are already on the cutting edge in this respect. By contrast, many automotive MNCs are only now introducing these technologies. Further investments in the communication infrastructure could help to leverage the potential of multilingual virtual teams irrespective of industry and headquarters country.

*Motivating and enabling employees to adopt new media.* Our findings suggest a certain danger that the unwillingness or inability of some team members to use integrated communication systems to their full advantage creates an additional barrier in communication. To prevent this from happening, the concerned employees need more incentives to adopt new information technologies. Competing models have been developed to explain under which conditions employees will do so (Heikkilä & Smale, 2011). Most notably, Venkatesh, Morris, Davis & Davis (2003) differentiate between users' intention to use a technology and their actual usage. The former is influenced by effort expectancy, performance expectancy and social influence, whereas the latter depends, among others, on several facilitating conditions. Our study suggests that MNCs need to address particularly the effort expectancy of older employees and employees from mature industries, i.e. convince them that new media are not too difficult to use. Performance expectancy refers to a user's belief that a given system will improve their work performance (Venkatesh et al., 2003). To address this, MNCs need to demonstrate to their employees the clarifying potential of redundant media use. The intention to use a technology is also determined by social influence, i.e. the degree to which employees believe that their colleagues and superiors want them to use new media (Venkatesh et al., 2003). Leaders may exert this kind of influence by actively championing the use of new media as tools to overcome language barriers. Further facilitating conditions might consist in the provision of training and computer support as well as ensuring that the targeted media fit with existing systems, work tasks, organizational values and the needs and experiences of users (Heikkilä & Smale, 2011; Venkatesh et al., 2003). As these features mostly refer to virtual teams' macro environments, corporate practices need to foster the use of new media in multilingual virtual team settings.

## Limitations and Future Research

Our study also has several limitations that provide the basis for future research. First, we had a disproportionately large number of German respondents both in the baseline and in the main study. One may argue that this specific setting might have moderated our results. However, comparisons between interviewees from different national backgrounds revealed very similar media perceptions and preferences, as long as these informants had similar proficiency levels in their team's working language. Volk et al. (2014: 865) also consider the fundamental working memory processes outlined in our contextualized explanation as "cognitive universals that apply

equally across cultures". To overcome any remaining national idiosyncrasies and further probe our findings, we suggest future studies including additional mother tongues and team member nationalities. Sampling teams from corporations of different national origins within each represented industry could also help to separate industry effects from potential influences of the headquarter location.

Second, one may argue that sampling several virtual teams in each of the represented corporations might have provided further insights into possible firm indiosyncrasies. However, considering that we are dealing with two datasets – mono- and multilingual virtual teams – each spanning six corporations, this would have multiplied our data volume and exceeded the scope of this article. Furthermore, within each dataset, we found pervasive similarities between the media choice patterns of virtual teams from different companies, suggesting that firm effects play a minor role in this respect.

Third, as we focused on explaining how and why language barriers influence media choice in virtual teams, the scope of this journal article did not allow us to gauge the relative importance of linguistic influences compared to other determinants of media choice such as media users' age, industry affiliation or the spatial and temporal dispersion indices proposed by O'Leary & Cummings (2007; also see Cummings et al., 2009). Previous studies have also shown that cultural diversity (Lee, 2002; Shachaf, 2008), institutional conditions like incentives and situational conditions like urgency or task type (Watson-Manheim & Bélanger, 2007) influence virtual team members' media choice. We encourage future quantitative studies measuring and weighing the impact of these manifold antecedents. Our study already indicates a variety of possible interaction effects between these factors. Exploring these interdependencies in depth was clearly beyond the scope of this article, but future research examining which factors reinforce or mitigate linguistic influences on virtual communication could further push the boundaries of both language research and media studies in international business and organizational behavior.

Fourth, our interview study strongly focused on the perceptions and motivations of virtual team leaders and members. We argue that these rationalizations are perfectly suited to elucidate individual experiences of language-induced cognitive load and provide realistic accounts of team interactions through triangulation across informants. However, future studies could produce a more holistic understanding of virtual communication in multilingual collaboration by

complementing the perspectives of individual actors with an independent observer's interpretation and rich description (Kozlowski et al., 2013) of virtual team interactions. The large geographic spread of the 13 virtual teams under study made it impossible to conduct on-site observations in the present study, but future investigations could fruitfully extend our line of research with real-time observations of media choice behaviors and their outcomes, thus adding team-level data to our interview-based individual perceptions. To further develop our explanation through cognitive load, functional magnetic resonance imaging (Cabeza & Nyberg, 2000) could also be used to compare brain activity when communicating in a foreign language through different media.

Fifth, the scope of our study did not allow us to explicitly investigate how the capacity of different communication media to facilitate mutual understanding influences the overall performance of virtual teams. This limitation is very common in language-related international business research, which has rarely explored the impact of language on organization-based performance directly and mostly focused on the processes which link language as an input and performance as an output factor. This focus helps to investigate the complexities of language-induced effects – media choice in our case – in more depth (Brannen et al., 2014). Furthermore, given that multiple studies have already established connections between media choice and virtual team performance (see e.g. Alexander, Pfendler, Thun & Kleiber, 2012; Dennis et al., 2008), we considered the investigation of this relationship less innovative and thus focused on the specific relationships between language barriers and media choice in virtual teams.

Further promising avenues for future research include longitudinal studies, which could trace possible shifts in media preferences over time. Furthermore, the field could benefit from applying multiple methods in future language-related studies. These methods could be drawn from disciplines such as psychology, sociology, and linguistics, but also from cognitive research. Ultimately, we suggest that future research should study the implications of cognitive constraints in language processing on various other areas of international organizational behavior.

## CONCLUSION

Zander et al. (2012: 592) describe globally dispersed virtual teams as "new organizational forms [which] are surfacing more quickly than scholars are able to study them." Martins, Gilson &

Maynard (2004) encourage scholars to study a variety of diversity dimensions in virtual teams. Our study helps to elucidate the effects of a particularly understudied diversity dimension by investigating the impact of language barriers on media choice in virtual teams. We found that many propositions of the seminal MST become reversed once the setting changes from a monolingual to a multilingual one. These results highlight the importance of language diversity for international business: rather than taking well-established communication theories for granted, they need to be carefully reexamined in multilingual environments, underlining in more general terms the relevance of context in international business studies. In our particular setting, we introduce language-induced cognitive load as a previously unrecognized mechanism influencing the behavior of MNC employees.

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**TABLES**

**Table 1:**

**Media capabilities represented in different forms of media use and their suitability for the two information processes outlined in MST**

| Communication media capability | represented in | | suitable for | |
| --- | --- | --- | --- | --- |
| | **Asynchronous media use:** participants do not work together at the same time | **Synchronous media use:** all communication participants are communicating at the same time | **Conveyance processes:** participants transmit large volumes of information and process them individually | **Convergence processes:** participants interactively discuss and negotiate diverging viewpoints |
| **Rehearsability:** a medium allows the sender to fine-tune a message before sending it | ✔ | ✘ | ✔ | ✘ |
| **Reprocessability:** a medium allows the recipient to spend more time decoding messages | ✔ | ✘ | ✔ | ✘ |
| **Parallelism:** a medium allows many individuals to send signals simultaneously | ✔ | ✘ | ✔ | ✘ |
| **Transmission velocity:** a medium transmits messages very fast | ✘ | ✔ | ✘ | ✔ |
| **Natural symbol sets:** a medium transmits physical, visual and/or verbal cues | ✘ | ✔ | ✘ | ✔ |

**Table 2:**

**Key characteristics of the *monolingual* teams and individual informants in our *baseline* study**

| Team | Members' mother tongue and working language | Team task | Number of team members per site | Time zone index | Spatial distance index | Informant | Gender | Mother Tongue |
|---|---|---|---|---|---|---|---|---|
| Mono IT1 (20 members) | English | Change management support for domestic customer companies | US site I: 10 US site II: 5 US site III: 5 | 0.52 | 639 | Mono IT1 – leader | M | English |
| | | | | | | Mono IT1–1 | M | English |
| | | | | | | Mono IT1–2 | M | English |
| Mono IT2 (15 members) | English | Developing marketing/pricing strategies for OEM manufacturers | US site I: 6 US site II: 6 US site III: 2 US site IV: 1 | 0.93 | 740 | Mono IT2 – leader | M | English |
| | | | | | | Mono IT2–1 | F | English |
| | | | | | | Mono IT2–2 | M | English |
| Mono IT3a (12 members) | English | Talent acquisition for enterprise resource planning | US site I: 6 US site II: 3 Canadian site: 2 Mexican site: 1 | 0.53 | 808 | Mono IT3a – leader | F | English |
| | | | | | | Mono IT3a–1 | M | English |
| | | | | | | Mono IT3a–2 | M | English |
| Mono IT3b (6 members) | German | Change management support for domestic customer companies | German site I: 2 German site II: 2 German site III: 1 German site IV: 1 | 0 | 121 | Mono IT3b – leader | F | German |
| | | | | | | Mono IT3b–1 | F | German |
| | | | | | | Mono IT3b–2 | F | German |
| | | | | | | Mono IT3b–3 | M | German |
| | | | | | | Mono IT3b–4 | M | German |
| Mono CAR1 (8 members) | German | Implementing lean management throughout the organization | German site I: 5 German site II: 2 German site III: 1 | 0 | 36 | Mono CAR1 – leader | M | German |
| | | | | | | Mono CAR1–1 | F | German |
| | | | | | | Mono CAR1–2 | M | German |
| Mono CAR2 (13 members) | German | Coordinating advanced technical training | German site I: 4 German site II: 3 Chinese site: 2 Hungarian site: 2 Mexican site: 2 | 3.90 | 2997 | Mono CAR2 – leader | M | German |
| | | | | | | Mono CAR2–1 | M | German |
| | | | | | | Mono CAR2–2 | M | German |
| | | | | | | Mono CAR2–3 | M | German |
| Mono CAR3 (9 members) | German | Strategic pricing for the Indian market | German site: 5 Indian site: 4 | 2.50 | 2539 | Mono CAR3 – leader | F | German |
| | | | | | | Mono CAR3–1 | M | German |
| | | | | | | Mono CAR3–2 | F | German |

**Table 3:**

**Key characteristics of the *multilingual* teams and individual informants in our *main* study**

| Team | Members' mother tongues | Working languange | Team task | Number of team members per site | Time zone index | Spatial distance index | Informant | Gender | Mother Tongue |
|---|---|---|---|---|---|---|---|---|---|
| Multi IT1 (17 members) | German: 8 Mandarin: 7 Hindi: 2 | English | Testing newly developed software | German site: 8 Chinese site: 7 Indian site: 2 | 3.70 | 2728 | Multi IT1 – leader | M | German |
|  |  |  |  |  |  |  | Multi IT1–1 | M | German |
|  |  |  |  |  |  |  | Multi IT1–2 | M | German |
|  |  |  |  |  |  |  | Multi IT1–3 | M | Hindi |
|  |  |  |  |  |  |  | Multi IT1–4 | M | Mandarin |
| Multi IT2 (12 members) | German: 7 English: 2 Bulgarian: 1 Romanian: 1 Polish: 1 | English | Managing international recruitment and employee relations | German site I: 4 German site II: 2 German site III: 1 German site IV: 1 US site: 2 Romanian site: 1 Polish site: 1 | 2.92 | 1812 | Multi IT2 – leader | F | Bulgarian |
|  |  |  |  |  |  |  | Multi IT2–1 | F | English |
|  |  |  |  |  |  |  | Multi IT2–2 | M | German |
|  |  |  |  |  |  |  | Multi IT2–3 | M | German |
|  |  |  |  |  |  |  | Multi IT2–4 | F | German |
| Multi IT3 (8 members) | German: 3 Hindi: 2 French: 2 English: 1 | English | Change management support for international customer companies | German site I: 2 German site II: 2 Indian site: 2 French site: 2 | 1.93 | 1889 | Multi IT3 – leader | F | German |
|  |  |  |  |  |  |  | Multi IT3–1 | F | German |
|  |  |  |  |  |  |  | Multi IT3–2 | M | English |
|  |  |  |  |  |  |  | Multi IT3–3 | F | Hindi |
|  |  |  |  |  |  |  | Multi IT3–4 | M | French |
| Multi CAR1 (15 members) | German: 9 English: 3 Japanese: 3 | English | Developing a standardized product for markets in the triad | German site: 9 US site: 3 Japanese site: 3 | 4.46 | 3144 | Multi CAR1 – leader | M | German |
|  |  |  |  |  |  |  | Multi CAR1–1 | M | English |
|  |  |  |  |  |  |  | Multi CAR1–2 | M | Japanese |
|  |  |  |  |  |  |  | Multi CAR1–3 | M | Japanese |
|  |  |  |  |  |  |  | Multi CAR1–4 | M | German |
| Multi CAR2 (12 members) | German: 5 Mandarin: 5 Hungarian: 1 Spanish: 1 | German | Expatriate and inpatriate management | Chinese site: 5 German site I: 4 German site II: 1 Hungarian site: 1 Spanish site: 1 | 3.71 | 2741 | Multi CAR2 – leader | M | German |
|  |  |  |  |  |  |  | Multi CAR2–1 | M | German |
|  |  |  |  |  |  |  | Multi CAR2–2 | F | Mandarin |
|  |  |  |  |  |  |  | Multi CAR2–3 | F | Mandarin |
|  |  |  |  |  |  |  | Multi CAR2–4 | F | Mandarin |
| Multi CAR3 (13 members) | Mandarin: 6 German: 4 Portuguese: 2 Italian: 1 | English | Developing new solutions for automotive electronics | Chinese site: 6 German site I: 3 German site II: 2 Brazilian site: 1 Austrian site: 1 | 4.54 | 3917 | Multi CAR3 – leader | M | German |
|  |  |  |  |  |  |  | Multi CAR3–1 | M | German |
|  |  |  |  |  |  |  | Multi CAR3–2 | M | Portuguese |
|  |  |  |  |  |  |  | Multi CAR3–3 | F | Mandarin |
|  |  |  |  |  |  |  | Multi CAR3–4 | M | Italian |

**Table 4:**

**Alternative influences on the choice of communication media in mono- and multilingual virtual teams**

| Factors influencing media choice | Relevance in monolingual virtual teams | Relevance in multilingual virtual teams |
|---|---|---|
| **Number of team sites** | not raised as relevant by the interviewees | |
| **Geographic distance** | not raised as relevant by the interviewees | |
| **Time zone distance** | We are 3.5 hours ahead, 4.5 in winter. This means we have to stay in the office longer. If it is absolutely necessary, I log in again from home. … In controlling, we have our end-of-month adjustments, where quick exchanges with headquarters are needed to give them the background. … The moment we send this to Germany there is a rather big need for clarifications. Then they must be able to reach you in the evenings. E-mails are just not enough there. They give a basis, but then you need to explain them. (Mono CAR3–2, German) | When I'm working out of my US office, it's not uncommon for me to have a telephone conference at 2 o'clock in the morning, US time, which is 8 o'clock in the morning in Germany, which is then 3 or 4 o'clock in the afternoon in Japan. So imagine yourself waking up at 1 o'clock in the morning, you grab a cup of coffee, brush your teeth, go down to your office inside your house and dial into an international telephone conference, where you're faced with the complexity of the language barrier and you're faced with the complexity of being awake in the middle of the night. And you are making multimillion dollar decisions! (Multi CAR1–1, American) |
| **Team members' age** | I believe that at some point, we will reach our age limits and we will say: 'Do I really need to have this new thing? I really don't feel like it anymore.' … There are things where younger people automatically have a higher affinity to technology. (Mono IT3b leader, German) | I watch my daughter doing her homework at night. She is seventeen. She is listening to her ipod, she has facebook up on one screen, she is text messaging on her cell phone and she is writing her research paper. Well, it's a different generation! I mean, the younger employees are used to that type of media interface and multitasking. The generation that's coming is used to that constant influence of multimedia. Us old guys need to get used to that. (Multi CAR1–1, American) |
| **Team members' industry background** | I cannot just put the media in front of people who are less involved in IT issues. If I carefully explain to them how they work and make an effort to demonstrate the advantages, they will get a lot of utility out of the media. For them, this is a much higher jump compared to those who already have an affinity to IT. (Mono CAR2–1, German) | I often think we could do more and faster. But when I am working with our customers I see that we are actually very well equipped. The use of many media is a matter of course for us, but not for other firms. (Multi IT3 leader, German) |

**Table 5**

**The suitability of different media capabilities for convergence processes in monolingual and multilingual virtual teams**

| Communication media capability | Suitability for convergence processes (participants interactively discuss and negotiate diverging viewpoints) | |
| --- | --- | --- |
| | in *mono*lingual virtual teams | in *multi*lingual virtual teams |
| **Rehearsability:** a medium allows the sender to fine-tune a message before sending it | ✗<br>Asynchronous message encoding slows interactive exchanges, thus impeding joint sensemaking. | ✓<br>Careful message encoding in a foreign language supports joint sensemaking to an extent outweighing the delay in interactive exchangees. |
| **Reprocessability:** a medium allows the recipient to spend more time decoding messages | ✗<br>Asynchronous message decoding slows interactive exchanges, thus impeding joint sensemaking. | ✓<br>Careful message decoding in a foreign language supports joint sensemaking to an extent outweighing the delay in interactive exchanges. |
| **Parallelism:** a medium allows many individuals to send signals simultaneously | ✗<br>Parallel message transmission from different senders distracts the group from a common line of thought, thus impeding joint sensemaking. | ✗ ✓<br>Parallel message transmission in a foreign language may overwhelm team members, thus impeding joint sensemaking. It may also enable double-checking, thus supporting joint sensemaking. |
| **Transmission velocity:** a medium transmits messages very fast | ✓<br>Fast or immediate message transmission speeds up interactive exchanges, thus supporting joint sensemaking. | ✗<br>Incomplete and faulty message processing in a foreign language impedes joint sensemaking to an extent outweighing faster interactive exchanges. |
| **Natural symbol sets:** a medium transmits visual and/or verbal cues | ✓<br>Message encoding with multiple cues enriches interactive exchanges, thus supporting joint sensemaking | ✗<br>Cognitive overload in listening to and speaking a foreign language impedes joint sensemaking to an extent outweighing richer exchanges. |