https://doi.org/10.1080/1359432X.2020.1806921

Citation:

Handke, L., Costa, P., Klonek, F.E., O'Neil, T., & Parker, S. (in press). Team perceived virtuality: An emergent state perspective. *European Journal of Work and Organizational Psychology*.

[1] A postprint is a digital draft of a research journal article after it has been peer reviewed and accepted for publication, but before it has been typeset and formatted by the journal

Team Perceived Virtuality: An Emergent State Perspective

Lisa Handke[a,d], Patrícia L. Costa[b], Florian E. Klonek[c], Thomas A. O'Neill[a,], and Sharon K. Parker[c]

[a]University of Calgary, Canada

[b]ISCTE-IUL, Lisbon, Portugal

[c]Curtin University, Perth, Australia

[d]Freie Universität Berlin, Germany

Author Note

Lisa Handke, Department of Psychology, University of Calgary, Canada | Division of Social, Organizational and Economic Psychology, Freie Universität Berlin, Germany; Patrícia L. Costa, ISCTE-IUL, Lisbon, Portugal; Florian E. Klonek, Center for Transformative Work Design, Curtin University, Perth, Australia; Thomas A. O'Neill, Department of Psychology, University of Calgary, Canada; Sharon K. Parker, Center for Transformative Work Design, Curtin University, Perth, Australia.

Correspondence concerning this article should be addressed to Lisa Handke, Division of Social, Organizational and Economic Psychology, Freie Universität Berlin, Germany, Habelschwerdter Allee 45, 14195 Berlin, Germany.

Email: lisa.handke@fu-berlin.de

Abstract

The rapid changes of work, the ease of mobility, and ubiquitous use of virtual tools have fundamentally changed the way that teamwork in modern organizations is accomplished. Although these developments have elicited a broad range of studies focusing on the phenomenon of team virtuality, the construct itself is still tied to conceptual ambiguities, opposing theoretical underpinnings, and inconsistent findings. The present paper synthesizes the structural and social-constructivist elements of team virtuality in order to introduce the novel concept of team perceived virtuality (TPV), embedded within a theoretical model of its team-level emergence. We define team perceived virtuality as a cognitive-affective team emergent state which is grounded in collectively experienced feelings of distance and perceptions of information deficits. We further describe how TPV emerges as a function of team members' collectively developed co-constructions and identify antecedents that contribute towards this emergence. By disentangling perceptions from structural properties, the present paper conceptually advances our understanding of team virtuality beyond its structural characteristics. Ultimately, this conceptual work serves as a starting point for future research on team virtuality as a collectively constructed, team-level emergent construct.

Keywords: Team virtuality, emergence, social constructions, conceptual

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The idea of commuting for hours to work 9-5 in a dreary office is fast becoming as about as relevant as a fax machine in the working day

—Mark Dixon, IWG founder and CEO

The above quote shows the pressing relevance of remote work, such as working from home, for many employees. In fact, a recent global survey reported that up to 75% of employees regularly engage in remote work (IWG, 2019). Moreover, the so-called gig economy—based entirely on digital marketplaces in which people can work from anywhere as long as they are online—promises to resolve global unemployment by securing 72,000 full-time positions by 2025, regardless of workers' physical location (Field Nation, 2016; McKinsey Global Institute, 2015). These developments have been fuelled by the Covid-19 pandemic, which has more than doubled the fraction of U.S. respondents indicating that they can perform their work from home (Guyot & Sawhill, 2020). Along with this increased digitization and remote work, it is also well recognized that the scope, complexity, and volatility of work increasingly calls for team-based work arrangements, that is, involving multiple individuals who collectively and interdependently work towards common goals (O'Neill & Salas, 2018). These ongoing changes of work, the increasing ease of mobility, and the ubiquitous use of communication technologies connecting multiple workers creates a type of collective work phenomenon that is often referred to as *team virtuality*. Specifically, team virtuality captures the extent to which interdependent individuals highly rely on communication technologies and sometimes work under conditions of geographic dispersion, to achieve their shared work goals (e.g., Gilson et al., 2015; Raghuram et al., 2019).

However, one of the key challenges to the science of optimizing virtual team functioning lies in aligning the myriad of different research streams in this field (Raghuram et al., 2019). One especially important difference in the literature is that, when explaining the

effects of team virtuality, researchers typically draw either on "cues-filtered-out" theories or social construction theories. Cues-filtered out theories make the key assumption that team virtuality strongly affects collaborative work because the technology *filters out* important *social cues* that make it more difficult to transmit and receive nuances in communication, such as irony or non-verbally expressed sadness (Culnan & Markus, 1987; Walther & Parks, 2002). More specifically, cues-filtered-out theories (e.g., media richness theory, Daft & Lengel, 1986; social presence theory, Short et al., 1976) focus strongly on the *structural properties* of team virtuality. Structural properties are commonly defined as objective features of 1) communication technology (such as the number and type of social cues that a technology can transport) and/or 2) the distance between team members (such as the number of kilometres or time zones between different sites). Such structural properties are vital to understanding difficulties in virtual team functioning (e.g., Ganesh & Gupta, 2010; Ortiz de Guinea et al., 2012). For instance, not being able to convey nonverbal cues (such as laughter) because of the communication technologies means that it can be more difficult to detect irony in conversations, and not being in the same time zone due to a high geographic distance between team members can make it difficult to schedule meetings.

Social construction theories, on the other hand, propose that the social-cognitive construction of a situation is more important for effective teamwork than the structural characteristics under which teams work together (see Walther & Parks, 2002). From this perspective, for example, it is more important for team effectiveness that team members *consider* themselves well synchronized than whether they are *objectively* in the same time zone or use synchronous communication technologies. Thus, social construction theories (e.g., channel expansion theory, Carlson & Zmud, 1999; social information processing theory, Walther, 1992) focus more strongly on social factors (such as the experience of

working together in a team), which influence, and are influenced by, how these structures are utilized and perceived by team members.

By distinguishing social constructions from structural properties, social construction theories have advanced our understanding of phenomena that cues-filter-out theories could not account for. For example, a high degree of relational communication (e.g., messages disclosing personal information; Walther & Burgoon, 1992) can emerge even when using communication technologies, assuming team members are given sufficient time (e.g., Kock, 2005; Walther, 1992; 1996). Findings of this nature are not well accommodated by cues-filtered-out theories because they do not go beyond the structural properties of the medium to consider how different teams with the same communication technologies uniquely appropriate or experience that technology. Accordingly, there is an emerging consensus that social constructions have an incremental value in explaining the effects of team virtuality beyond the structural properties of team virtuality (e.g., Fuller & Dennis, 2009; Yoo & Alavi, 2001).

Altogether, it is clear that the cues-filtered out and the social construction perspectives are both important for understanding team virtuality. However, little has been done to integrate these two theoretical standpoints into one coherent framework. We propose that current theorizing on virtual team functioning could be advanced if the literature not only differentiated between structural properties of team virtuality and the social constructions of team virtuality, but also explained the mechanisms by which these two are linked to each other. In other words: the social construction of "virtuality" within a team may not only be dependent on structural features such as geographic distance (e.g., how many kilometres separate team members from each other?) or communication technology (e.g., does the team communicate just via e-mail or do members schedule frequent video meetings as well?), but also by how the team actually works together (e.g., does the team have flexibility to utilize

various forms of media as needed for satisfying its task and relationship needs?) and members' social-cognitive constructions of this shared experience (e.g., does the team have a common perception about the consequences of using technology?). Accordingly, to understand the role of virtuality in high-performance teamwork, we need to consider how teams construct a shared sense of virtuality.

A second problem with the extant virtuality literature is that it has not provided clarity with respect to the level of analysis (Raghuram et al., 2019). Despite the rich literature focusing on the experiences of individuals working with specific technologies, insufficient attention has been paid to the resulting *collective* phenomena specific to team virtuality that occur when individuals interact with each other using these technologies. The team literature suggests that given repeated patterns of interaction, habits, and routines, team members' perceptions are very likely to converge (Morgeson & Hofmann, 1999; Klein et al., 2001; Kozlowski & Klein, 2000). This is reflected in a growing stream of literature analysing collective phenomena at the team level (e.g., team empowerment, e.g., Kirkman & Rosen, 1999; Maynard, Gilson, & Mathieu, 2012; team trust, e.g., De Jong & Elfring, 2010), often referred to as team emergent states (see also Kozlowski, 2012; Marks et al., 2001; Waller, et al., 2016). However, even though team virtuality perceptions have been described as arising from interactions with other team members (e.g., Carlson & Zmud, 1999; Fuller & Dennis, 2009), thereby potentially qualifying as team emergent states, they have not been explicitly defined and treated as such. Accordingly, we need to advance an understanding of why teams come to differ between each other on these perceptions, and the implications for team effectiveness. Therefore, we propose the need for an emergent state perspective which helps us explain how social constructions of team virtuality collectively emerge, as a function of both team members' interactions and their embedding environment. Specifically, we believe it is time to advance a new construct—*team perceived virtuality*—which acknowledges both

the psychological (as opposed to structural) nature of team virtuality, as well as its team-level emergence.

The purpose of the current research is to offer a framework that synthesizes structural and social-constructivist elements of team virtuality, thereby integrating the two hitherto-distinct perspectives described above. Specifically, we introduce the construct of team perceived virtuality and describe how it emerges as a function of team members' collective co-constructions of their interactions and their work environment (including structural team virtuality). We begin by defining team perceived virtuality (TPV) and its underlying dimensions. We further offer a differentiated description of TPV based on the respective combination of its two dimensions, allowing us to better understand the quality of TPV and its impact on team outcomes. In a next step, we unravel the process of TPV emergence by explaining how team members collectively develop co-constructions that give meaning to their interactions. Finally, we map out the antecedents of TPV in order to identify variables that may contribute towards its emergence. Specifically, we describe how TPV is shaped not only by structural team virtuality, but also by other contextual elements (team familiarity, team design). Ultimately, our contribution is to conceptually advance our thinking about team virtuality by separating structural properties from social constructions, and to consider how these shared perceptions collectively emerge as a function of teams' social interactions. In consequence, the TPV construct seeks to deepen our understanding on *why* virtual teams function the way they do, above and beyond their structural characteristics. Practically, this knowledge enables us to determine factors that may improve team functioning—even under conditions of high structural virtuality—so that teams can fully harness the benefits of modern work arrangements, such as telecommuting or global teamwork.

Team Perceived Virtuality

We define TPV as *a shared affective-cognitive emergent state that is characterized by team members' co-constructed and collectively-experienced 1) distance and 2) information deficits, thereby capturing the unrealized nature of the team as a collective system.* As opposed to the commonly employed structural properties of team virtuality, defining TPV as an emergent state aligns with the Oxford English Dictionary definition of the term *virtuality*, which sees virtuality as something of "essential nature", "unrealized", and "a potentiality". As argued by Deleuze (1966/1988), it is this potentiality that becomes fulfilled in the actual—that is, virtual is not the opposite of "real", it is the opposite of "actual". More specifically, it is not actual because it is in the process of *being actualized*, emphasizing the generative nature of virtuality.

Moreover, TPV is a deficit-oriented state, with higher levels in its two dimensions associated with more negative, and lower levels with more positive consequences for team functioning. This orientation stems from the existing perspective on team virtuality in the literature—for instance, Raghuram et al. (2019) note that "in both telecommuting and virtual teams research, technology dependence tends to take on a negative valence and is considered as a hindrance rather than an asset relative to face-to-face communication" (p. 319) and Wang et al. (2020) conclude that the use of technology can be considered to increase overall job demands. We therefore draw on the existing deficit-oriented perspective on team virtuality but extend its meaning beyond structural properties such as technology use.

As a result, the construct of TPV expands prior conceptualizations of team virtuality in three notable respects. First, it considers team virtuality as having a socially constructed, subjective nature. That is, it acknowledges that distance and information deficits may be related but not equal to structural features such as geographic dispersion and technology use, respectively (i.e., social perceptions are not necessarily defined by structural features, see

technology as context perspective, Larson & DeChurch, 2020). This makes TPV a concept applicable to all teams, as opposed to just those fulfilling the structural aspects of team virtuality. Second, collectively-experienced distance and information deficits are considered to be socially co-constructed through team members' collective experiences. Accordingly, as opposed to structural team virtuality, TPV emerges when team members experience repeated cycles of interaction, and TPV can change over time depending both on joint experiences as well as team members' collective co-construction of these experiences. Third, TPV goes beyond team members' perceptions of structural features (as opposed to studies asking team members whether they consider themselves high in technology use; cf. e.g., Brown et al., 2020; Stark et al., 2014). Instead, TPV focusses on the thoughts and feelings that constitute the shared experience of *being* a team—or more specifically, the *potentiality* of a team (thereby following the dictionary definition, which sees virtuality as something that exists in essence and is always in the process of being actualized)

As evident from the definition given above, TPV is a two-dimensional construct which can be mapped on an affective (feelings of distance) and cognitive (perceived information deficits) dimension. The separation into an affective and a cognitive components aligns with the overall definition of emergent states as team-level concepts reflecting shared affect and cognitions, which—combined with behavioural team processes contributing towards their emergence (Marks et al., 2001)─constitute what are described as the ABCs of teamwork (affective/motivational states, behavioural processes, and cognitive states; Bell et al., 2018). We focus on these two *specific* dimensions (perceived information deficits and feelings of distance) because, as discussed earlier, these dimensions reflect the two most commonly employed theoretical foundations for explaining how virtuality affects team functioning (media richness theory, Daft & Lengel, 1986; social presence theory, Short, et al., 1976; see Raghuram et al., 2019 for an overview). Whilst it might seem plausible to add

additional dimensions, we believe this will then take the construct beyond its current theoretical alliance with the structural perspective on virtuality. In addition, too many dimensions can also restrain our understanding by making the overarching construct too complex and thereby difficult to relate to other constructs in the overall nomological network (see Law et al., 1998). As a result, we chose two dimensions which we considered comprehensive yet unique enough to contribute to both a theoretically meaningful as well as parsimonious construct of TPV. We will outline these two dimensions further in the following section.

Dimensions of TPV

Collectively-Experienced Distance

The affective dimension of TPV is characterized by *team members' collective feelings of being distant from one another*. These feelings stem from team members' mutual awareness of their emotional inaccessibility or unavailability to each other (see Clark & Brennan, 1991; Goffman, 1963). Feeling distant from each other means that team members' relationships will be colder, less friendly, less affectionate, and that team members feel more estranged from each other. The inverse, feeling close to one another, means that team members generally like each other and feel they can confide in each other.

Whereas researchers drawing on cues-filtered-out theories assume a consistent and uniform influence of objective distance, we propose that distance can be understood as a subjective phenomenon rather than solely as an objective property (see also Gibson et al., 2011; Zhao, 2003). For instance, Wilson et al. (2008) refer to perceived proximity as reflecting "one person's perception of how close or how far another person is" (p. 983), and Walther and Bazarova (2008, p. 3) similarly extend Korzenny's (1978) definition of propinquity to the "subjective perception an individual holds that he or she is functionally, if not physically, close to someone else."

We consider collectively-experienced distance as an affective component of TPV because concepts such as closeness and proximity are commonly related to warmth, intimacy, or liking, and are thus reflective of the affective nature of a relationship (Aron et al., 1997; Sedikides et al., 1999; Seibt et al., 2017). Accordingly, we consider collectively-experienced distance to reflect not how team members perceive the physical distance between each other but how distant they *feel* from each other (see Amin & Cohendet, 2004). Accordingly, teams can be physically dispersed but feel close to each other ("far-but-close") just as they can be physically co-located but feel distant from one another ("close-but-far"; Wilson et al., 2008). For example, a team of consultants—who usually work on-site with their customers and rarely have the opportunity to meet up in person with their colleagues—may still write to each other very spontaneously, make jokes, or console each other when someone is having a bad day. Accordingly, team members may still collaborate at a distance but manage to utilize communication technologies for sharing personal information, thereby feeling close to each other, despite the physical distance between them.

Collectively-experienced distance is closely related, yet distinct from other affective team emergent states (e.g., cohesion, trust, team identity). That is, even though feelings of distance possess unique and distinguishing features, they can influence (and be influenced by) other affective states. Feelings of distance describe how detached (or inversely, drawn together) the team members feel from each other as a whole. It thus describes a sentiment of detachment, aloofness, or even estrangement within the team. This, for instance, may shape the team's willingness to stay together as a collective (cohesion, e.g., Casey-Campbell & Martens, 2009; Festinger, 1950; Salas et al., 2015) and to be vulnerable to each other's actions (trust, e.g., Costa, 2003; Mayer et al., 1995). Moreover, although collectively-experienced distance is likely be influenced by team identity (i.e., the team's shared essence of being an entity, see Ashforth et al., 2008; Ashforth et al., 2011; Corley et al., 2006),

feeling close or distant to other team members is purely affective (as opposed to identification, which is also a result of cognitive processes, Ashforth et al., 2008). Considering that feelings of distance are distinctly different from team identity (for example) also means, for instance, that even though a team is able to preserve high levels of team identity because team members see conjointly consider themselves as a collective, they can *feel* distant because they have been interacting more coldly in the last weeks (thereby contributing towards high feelings of distance).

Collectively-Experienced Information Deficits

The cognitive dimension of TPV is characterized by *team members' collective perceptions of poor information exchange*. We consider collectively-experienced information deficits as the collective perception within a team that information exchange *does not* 1) enable timely feedback, 2) meet team members' personal requirements (e.g., by allowing to alter messages to enhance specific team members' understanding), 3) combine a variety of different cues (e.g., by conveying both the content of a message as well as its emotional tone), and 4) use rich and varied language (e.g., by enabling the use of symbol sets close to natural language; see also Carlson & Zmud, 1999).

These collectively-experienced information deficits, in turn, constitute a perceived barrier in the way of conveying information and even more so in the way of converging on meaning (see Dennis & Valacich, 1999; Dennis et al., 2008). For example, a team member may not know how to signal that a comment is meant to be sarcastic and thus just makes the comment without any further adjustments. This, however, is likely to result in communication that has deficits with respect to its intended meaning (because the message does not make sense if it is not clear that it is meant sarcastically). Similarly, if team members do not respond to each other's questions on time they will experience deficits in meaning convergence because they will not be able to tell if they are on the same page.

Finally, team members may wait very long for the others to give them feedback, so that their workflow becomes entirely disrupted, resulting in a deficit in timing. As a result, collectively-experienced information deficits are the result of co-constructions that explain incompleteness, uncertainties or ambiguities in team interaction (i.e., the team's inability to convey complete information and converge on meaning, Daft & Lengel, 1986).

Whereas terms such as information richness have generally been used only in conjunction with technology use (e.g., Carlson & Zmud, 1999; Daft & Lengel, 1986; Kirkman & Mathieu, 2005; McGrath & Hollingshead, 1993), we wish to extend our concept of collectively-experienced information deficits to a broader context. That is, even though the way information is exchanged is most likely impacted by the team's use of technology, collectively-experienced information deficits are also a way to describe the quality of team members' collective experiences. This way, information deficits arise from team interactions, which can be influenced by structural team virtuality properties, such as technology use (cf. Brown et al., 2020), but also by a range of other factors characterizing the team's information exchange. For example, if a team leader gives very generalized face-to-face feedback, without mentioning specific behaviours or events, this may be collectively experienced as poor information exchange. A personal feedback email sent to each team member detailing his/her specific contributions to the team and areas of improvement, in turn, would be collectively experienced as having very little information deficits. Accordingly, collective perceptions of information deficits can also exist independently of high structural team virtuality.

Collectively-experienced information deficits can be distinguished from other cognitive team emergent states (e.g., transactive memory systems, shared mental models). However, analogous to feelings of distance, information deficits and these other emergent states are likely to mutually influence each other, too. Collectively experiencing information

deficits means that the team perceives itself as unable to adequately convey information and converge on meaning. As a result, it is likely that information deficits impede the team's development of shared mental representations of knowledge within the team (i.e., shared mental models, e.g., Cannon-Bowers et al., 1993; Klimoski & Mohammed, 1994) or shared awareness of which team member know what (transactive memory systems, e.g., Barnier et al., 2018; Wegner, 1987)—and vice versa.

Combining the TPV Dimensions

TPV is a formative construct (Edwards, 2011) that consists of two dimensions that are heterogeneous facets. Accordingly, rather than assuming that collectively-experienced distance and information deficits are caused by the underlying construct of TPV (reflective model), we argue that the two dimensions jointly determine scores on the TPV construct (see Jarvis, et al., 2003; Podsakoff et al., 2006). TPV scores are thus *formed* by *both* collectively-experienced information deficits and distance, meaning that TPV exists as an aggregate of these two dimensions (see also Law et al., 1998). However, as collectively-experienced distance and information deficits are heterogeneous facets of TPV, high levels on one dimension do not necessarily have to coincide with high levels on the other (as would be the expectation in a reflective measure). This means that even though TPV is an aggregate multidimensional construct, the two dimensions can exist in different combinations. The nature of these combinations, in turn, can be helpful for understanding the substantive nature of the TPV construct. Accordingly, even if the overall level of TPV remains the same, its quality will be different depending on how the two dimensions of distance and information deficits align with each other.

Although we note that both dimensions are continuous (i.e., teams do not experience distance or information deficits in discrete terms but to a greater or lesser extent), we will explain combinations at higher and lower values of the two dimensions for the purpose of

simplicity. Figure 1 thus depicts a simplified two-by-two matrix, which illustrates the combinations that arise from combining the two TPV dimensions, allowing us to deepen our understanding of the substantive nature of TPV. More specifically, we explain the concept of TPV by virtue of four different quadrants of TPV *states*, which result from the combination of high and low values of collectively-experienced distance and information deficits, respectively. While this matrix does not exhaustively depict all possible combinations (given the continuous nature of the two dimensions), it does allow us to describe certain states that teams may be more or less inclined to gravitate towards depending on the extent to which they experience both distance and information deficits. In the following, we will describe these four quadrants depicted in Figure 1, moving from the upper to lower right-hand side in a counter-clockwise fashion.

Insert Figure 1 about here

Quadrant 1 (upper right-hand side) involves both high distance and high information deficits. We describe states experienced by teams located in this quadrant as "*lost in translation states"* to reflect the confusion and disconnection teams are likely to experience in these states as they feel both very distant from each other and perceive their information exchange as insufficient. Given their affective distance, teams in these states presumably engage in low levels of relational communication (e.g., disclosing personal information, making jokes), which—in consequence—is likely to impair attitudinal outcomes such as team satisfaction. Moreover, we propose that task-related communication is likely to be impaired as well, given the team's perceived inability to effectively exchange information and converge on meaning. This, in turn, also threatens to lower the team's task performance (see Hertel et al., 2005; Martins et al., 2004; Wiesenfeld et al., 2001; Warkentin et al., 1997;

Zheng et al., 2002). An example for teams in these states could be very loosely tied project teams which—due to the Covid-19 pandemic—have been abruptly forced to communicate entirely via technology from one day to the next and experience a lot of technical difficulties in implementing this new form of collaboration.

Quadrant 2 (upper left-hand side) describes states in which teams experience high information deficits but low levels of distance. These are what we call *"night-club states",* to reflect states in which one feels close to others but cannot adequately communicate. Accordingly, teams in these states will perceive their information exchange as insufficient and untimely while feeling affectively close to each other at the same time. As a result of the high degree of warmth and intimacy characterizing shared experiences, we assume that teams experience relatively high levels of satisfaction. At the same time, their inability to provide each other with the necessary information to develop a shared understanding of their taskwork will result in low levels of task performance. An example for a team in one of these states could be a group of friends with different professional and cultural backgrounds who have decided to work on a common project for the first time.

Quadrant 3 (lower left-hand side) is characterized by *"cruising speed states"*, that is, states in which collaboration is working smoothly as teams experience both low distance and low information deficits. In these states, teams feel affectively close to each other and consider their information exchange as effective (thereby also considering themselves as capable of converging on meaning). Simply put, these teams are very unlikely to feel or think of themselves as being virtual. By virtue of their low levels of distance and information deficits, we thus propose that teams in cruising speed states will experience both high levels of team satisfaction as well as task performance. An example for a team in one of these states could be a team which has successfully worked together before on a range of similar projects

and which also gets on well on a personal level (e.g., makes jokes, appreciates each other's help).

Finally, quadrant 4 (lower right-hand side) symbolizes states in which teams experience high feelings of distance but low perceptions of information deficits. These are what we describe as *"machine states"*, as they reflect machine-like efficiency and coldness at the same time. Teams in these states may be excellent at effectively sharing information to gain a shared understanding of the team's goals and the tasks that need to be addressed in order to reach it. However, team members also feel distant from each other, meaning that whereas they are fine with sharing task-related knowledge, they will feel very disconnected from each other emotionally. As a result, we assume that teams in these states will show high levels of task performance but experience low levels of satisfaction. An example for a team in one of these machine states could be an adhoc medical team that has to quickly react to an emergency without the time to respect any personal sensitivities.

By virtue of exemplifying the different nature of possible TPV states, the quadrants described above emphasize the heterogeneous nature of the two TPV dimensions. However, while the quadrants themselves served illustrative purposes by informing us about possible combinations, the key to steering a team toward a particular quadrant or levels of TPV lies in treating the two dimensions distinctly. Specifically, we propose they have different antecedents and outcome relations. With respect to structural team virtuality, many researchers have employed composite measures, which collapse multiple dimensions into one score (e.g., Ganesh & Gupta, 2010; Handke et al., 2018; Hoch & Kozlowski, 2014; Maynard et al., 2019). The underlying assumption is an additive influence of the dimensions that constitute the overall level of team virtuality (e.g., a team that is geographically dispersed but always uses videoconferences to communicate exhibits approximately the same degree of virtuality as a team that is co-located but only communicates via email). However, while TPV

can also be considered as an aggregate construct, we posit that the separation of the two dimensions allows for a more differentiated understanding of the various outcomes previously tied to (structural) team virtuality. Specifically, this differentiation allows to explain prior findings that show that affective and performance-related outcomes can be very different in virtual teams. For instance, many studies have revealed lower levels of affective emergent states such as cohesion or trust as well as attitudinal outcomes such as satisfaction at similar levels of task performance for virtual compared to face-to-face teams (Furomo & Pearson, 2006; Hambley et al., 2007; Simon, 2006; van der Kleij et al., 2009). Accordingly, by addressing the two dimensions as constructs in their own right, we can understand the differential effect that team virtuality has on performance-related (task performance) in comparison to affective (satisfaction) outcomes.

P1a: Teams with high levels of collectively-experienced information deficits will show lower levels of task performance compared to teams with low levels of collectively-experienced information deficits.

P1b: Teams with high levels of collectively-experienced distance will show lower levels of satisfaction compared to teams with low levels of collectively-experienced distance.

The Emergence of TPV

As explained in our earlier concept definition of TPV, virtuality describes the state by which something exists in essence (and not in physical form) and is in the course of being actualized. This definition emphasizes that virtuality cannot be reduced to its structural properties, such as geographic dispersion and technology use. Following the input-mediator-ouput-input framework (IMOI; Ilgen et al., 2005) we thus propose that TPV *emerges* as a collective team property as team members interact with each other and can thus vary dynamically as a function of the team's work context (including but not limited to structural team virtuality, here considered as an input) and team processes (Kozlowski, 2012; Marks et

al., 2001; Waller et al., 2016). Also, we argue that the two TPV dimensions will have a distinct impact on team outcomes (e.g., team satisfaction and team performance), and that these outcomes will influence further processes and interactions.

We furthermore propose that TPV emergence can be explained via a sensemaking process occuring in reaction to essential events in the team's collaboration. Sensemaking occurs when team members identify environmental events which are both relevant to the team as well as somehow novel or unexpected (cf. Maitlis & Christianson, 2014; Morgeson et al., 2010; Weick, 1995). The process by which teams then attempt to give meaning to their collective experiences of these events is referred to as sensemaking (Balogun et al., 2015; Maitlis & Christianson, 2014; Weick, 1995; Weick et al., 2005). Sensemaking occurs via team members' development of a *narrative*. Narratives can be seen both as the co-constructions that help team members understand events and shape others' understanding of events as well as the outcome of this collective co-construction (Balogun et al., 2015; Sonenshein, 2010). That is to say, a narrative is the "story" that team members develop together in order to explain an event and its cause.

Narratives are developed in both a relational and an interpretative context (Balogun et al., 2015). The relational context sees sensemaking as a social process by which team members create collective meanings by virtue of their interactions with each other. In an interpretative context, sensemaking is influenced by collective frames of reference, which arise from a shared environment. With respect to TPV emergence, we propose that team members will make sense of events by taking information from inputs originating both from their interactions (relational) and from their shared context (interpretative). We define a shared context as the conditions that teams have to operate under (and which will thus shape their interactions). This includes structural virtuality, but also how the team's work is structured or how well team members know each other. Accordingly, we assume that team

members will use both team processes (e.g., conflict management, coordination) as well as inputs from their shared context (e.g., structural team virtuality, task interdependence) when trying to make sense of an event they experience (see also Watson-Manheim and colleagues' discontinuity approach, Watson-Manheim et al., 2012; Watson-Manheim et al., 2002).

To give an example, let us imagine a team of academics working on a joint publication. They have agreed on a common goal (writing an article together on a topic which they all consider to advance the current literature) and have also established the initial steps which can take them in the right direction (team member 1 writes a first draft, the rest of the team members read this first draft and give feedback for improvement). However, after the first iteration, the team members realize that their idea may be more difficult to put on paper than they had initially anticipated. Accordingly, they are collectively experiencing a turn of events that is contrary to their initial expectations. In the narrative resulting from the sensemaking of this event, the team members may jointly interpret that this event was caused by vague initial plans and the difficulty to schedule video meetings where all members could be present. To help explain these impairments, in turn, team members will start to consider their work context. For instance, they may attribute problematic planning and coordination to the fact that they are located in different time zones and also do not know each other very well. Accordingly, the team uses both team processes (vague plans, difficulty to coordinate meetings) as well as contextual aspects of its work (working in different time zones, not knowing each other well) as references to co-construct a meaning of their joint experience. What then emerges from these collectively experienced events and the resulting co-constructions are collectively-experienced distance and information deficits, which form the shared state of TPV.

Insert Figure 2 about here

Figure 2 depicts the process of TPV emergence (within the dotted lines). The occurrence of a novel/unexpected event is likely to transpire in changes in team processes (transition, action, and interpersonal processes). It is team processes that elicit members' sensemaking, which in turn lead to the emergence of TPV. Moreover, we believe that all constructs inside the "emergence" box in Figure 2 underly reciprocal relationships. While a change in team processes will elicit a sensemaking process that amounts to the emergence of collectively-experienced information deficits and/or distance, these two dimensions are also likely to further influence team processes (we will explain the cyclical nature of this relationship in more detail in the subsequent section).

Next to the influence of team processes, TPV emergence also depends on the team's context (structural team virtuality, team design, team familiarity), as depicted on the left-hand side of Figure 2. These elements feed into the sensemaking process both directly, as well as indirectly. The direct path influences teams' sensemaking by giving them an interpretative context for their narrative. Specifically, these environmental factors can serve as a reference for the co-construction of TPV by helping the team make sense of changes in team processes (e.g., coordination impairments can be attributed to high levels of structural team virtuality). The indirect path constitutes the impact of environmental factors on sensemaking via team processes. That is, team context will also impact team processes (e.g., structural team virtuality can impede coordination), thereby initiating sensemaking processes.

Whereas this section concentrated on the overall process of TPV emergence (i.e., how and under which circumstances does TPV emerge?), the following section will be devoted to explaining which antecedents influence the actual level of TPV. As TPV is a formative

construct, this level will be determined by its two underlying dimensions. Accordingly, understanding which antecedents influence TPV means understanding which factors influence the level of collectively-experienced distance and information deficits, respectively. More specifically, given the heterogeneous nature of the two TPV dimensions, we will focus on the differential impact of the proposed antecedents on collectively-experienced distance and information deficits, although we acknowledge that some factors may influence both dimensions.

Antecedents of TPV: Team Processes

Team processes are defined as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioural activities directed toward organizing taskwork to achieve collective goals" (Marks et al., 2001, p. 357). Team processes describe *how* teams are working with each other, rather than what that they are working on. Drawing on Marks et al.'s (2001) taxonomy, we differentiate between transition, action, and interpersonal team processes, which are performed during different times over the course of team collaboration. Whereas action processes are carried out during performance episodes (i.e., those collaboration phases where the team is involved in the execution of its primary tasks), transition processes describe actions that take place between performance episodes (i.e., reviewing past performance episodes and preparing for the next). Interpersonal processes, in turn, can be carried out during all phases of team collaboration. Next, we will briefly describe the three process types and their proposed relationship to the TPV dimensions.

Transition Processes

Transition processes occur in between performance episodes and thus fulfil both the function of reflecting prior actions as well as preparing for new ones. Examples of transition processes include goal specification and strategy formulation (Marks et al., 2001). To

effectively engage in transition processes, teams need to develop shared interpretations of their goals and strategies, that is, manage to converge on meaning (Dennis et al., 2008; Kirkman & Mathieu, 2005). This is strongly related to the collectively-experienced information deficits dimension of TPV. That is to say, if a team collectively perceives its information deficits as low, that means it considers itself as capable of converging in meaning—which in turn will both be promoted when teams engage in transition processes as well as enable transition processes to take place (representing the cyclical relationship depicted in Figure 2). Accordingly, as transition processes will be reflected in lower levels of collectively-experienced information deficits, we thereby propose:

P2: Transition processes are negatively related to collectively-experienced information deficits.

Action Processes

These processes describe activities directed towards goal accomplishment, such as coordination and backup behaviours (Marks et al., 2001). Both of these processes require that team members know what the other team members are going to do in order to adapt their behaviour accordingly (e.g., Porter et al., 2003; Rico et al., 2008; Salas et al., 2005). Action processes thus build both on team members' knowledge of one another (e.g., which capabilities does this person have, what action is she or he most likely to engage in next) as well as their willingness to adapt their own actions in such a way that it complements the others' (e.g., by taking over their taskwork because they are overloaded or by continuing to work on a task exactly where the other person has finished off). Accordingly, we consider that engaging in these processes is reflective of low levels of both information deficits (because team members can effectively convey information) and distance (because they feel mutually accessible to each through their awareness of each other's capabilities and intentions). Once again, we assume that this relationship will be cyclical, with action

processes lowering information deficits and distance which will in turn promote future action processes. Accordingly, we propose that action processes will be negatively related to both collectively-experienced information deficits and distance.

P3: Action processes are negatively related to a) collectively-experienced information deficits and b) collectively-experienced distance.

Interpersonal Processes

Interpersonal processes concentrate on the management of interpersonal relationships and encompass activities such as conflict or affect management. Both of these management activies symbolize a low degree of distance as they entail team members disclosing their problems and feelings and also letting these be influenced by the rest of the team. Analogous to the other team processes, we consider this relationship to be cyclical: engaging in processes such as conflict management will make team members feel closer to each other, which will help them engage in more interpersonal processes in the future. Accordingly, we propose that interpersonal processes will be negatively related to collectively-experienced distance.

P4: Interpersonal processes are negatively related to collectively-experienced distance.

Antecedents of TPV: Team Context

We define team context as the conditions that teams operate under. These include structural team virtuality, team familiarity, and team design. As depicted in Figure 2, these contextual factors shape TPV both via their influence on team processes as well as serving as the interpretative context for team members' sensemaking processes. We consider these factors as additive in their influence on TPV dimensions. Accordingly, although some should cause high levels of collectively-experienced information deficits and/or distance to emerge, this can be compensated with yet other factors that can lower them. For instance, if structural

team virtuality is high, this does not have to mean that high levels of collectively-experienced information deficits or distance have to emerge, given a high degree of team familiarity or team autonomy. For instance, teams that had to work remotely from one day to the next following the Covid-19 pandemic may still have levels of autonomy and familiarity high enough to feel close to each other. Conversely, high levels of the TPV dimensions could emergence even under conditions of low team virtuality, given, for instance, high levels of task interdependence at low levels of team familiarity. We will explain the differential impact of these contextual factors in the following sections.

Structural Team Virtuality

Both collectively-experienced information deficits and distance are likely to be influenced by structural team virtuality for two reasons. First, structural virtuality can negatively impact transition, action, and interpersonal processes. As elaborated earlier, transition processes require team members to converge on meaning (Kirkman & Mathieu, 2005). Converging on meaning, in turn, requires that team members can quickly respond to each other to make sure that they are on the same page, which can be difficult under conditions of high structural virtuality, given that this restricts real-time face-to-face communication (Dennis et al., 2008; Kirkman & Mathieu, 2005). Action processes are also likely to be impaired, as anticipating each other's actions and reacting in a timely and suitable manner becomes more difficult if faced with delays (caused by, e.g., time differences or because a question asked via email will not be answered as quickly as in a face-to-face context; see Rico & Cohen, 2005). Interpersonal processes, in turn, require that team members effectively recognize and influence each other's affective states (e.g., Marks et al., 2001; Niven et al., 2009). Given that it is harder to detect emotional responses without nonverbal information (Daft & Lengel, 1986; Kiesler & Sproull, 1986), high degrees of structural team virtuality can impede interpersonal processes (Maruping & Argwal, 2004). At

the same time, structural team virtuality serves as an interpretative context for team members' sensemaking. When team processes are impaired, high levels of structural team virtuality become more salient because they offer an explanation to why this could be happening. Accordingly, becoming aware of being physically dispersed, with little face-to-face interaction, will enforce co-constructions of distance and information deficits. Accordingly, we postulate that there is a positive relationship between structural team virtuality and both TPV dimensions:

> *P5: Structural team virtuality is positively related to a) collectively-experienced information deficits and b) collectively-experienced distance via team transition, action, and interpersonal processes and via sensemaking processes.*

Team Familiarity

Team familiarity can be defined as the knowledge team members have about each other, both in terms of their work-related strengths and weaknesses (professional familiarity) as well as their personal lives (personal familiarity, Maynard et al., 2019). As postulated by channel expansion theory (Carlson & Zmud, 1999), the better team members know each other, the higher the perceived richness of the technology they are using to communicate with (i.e., the higher they perceive the technology's ability to change understanding, Daft & Lengel, 1986). This knowledge increases not only team members' ability to deal with the technology itself but also allows them to acquire a profound understanding of each other, enabling them to adjust their communication behaviour (see Walther, 1992; 1996). By being able to infer what another team member is trying to convey, a higher degree of familiarity enables team members to communicate effectively even under the absence of certain (e.g., nonverbal) cues (Maynard et al., 2019). A higher degree of familiarity facilitates convergence on meaning (Dennis et al., 2008; Walther, 1996), suggesting that team familiarity will promote transition processes. At the same time, knowing each other better means that one can

anticipate what the other team members will do next, thereby also facilitating team action processes. Whereas transition and action processes are likely to be promoted via both professional and personal familiarity, we believe that interpersonal processes will depend particularly on personal familiarity. Being personally familiar with someone means that one is less likely to take offense when communication is harsh (Riordan et al., 2013) and makes it easier to know what the other person means without them having to explicitly verbalize it (O'Neill & Rothbard, 2017). These aspects, in turn, will make it easier to prevent relationship conflicts as and regulate each other's affect. Consequently, team familiarity decreases the level of both collectively-experienced information deficits and distance by improving transition, action, and interpersonal processes. At the same time, team familiarity also serves as an interpretative context for team members' sensemaking. Even if team members are experiencing team process impairments, the fact that they know and understand each other well may decrease the likelihood of them feeling distant from one another or experiencing information deficits. Accordingly, we presume that the higher the degree of team familiarity, the lower both collectively-experienced information deficits and distance.

P6: Team familiarity is negatively related to a) collectively-experienced information deficits and b) collectively-experienced distance via team transition, action, and interpersonal processes and sensemaking processes.

Team Design

Team (work) design refers to the nature and organisation of tasks, activities, and responsibilities applied to the team level (Parker, 2014) and has been shown to directly impact team effectiveness (e.g., Carter et al., 2019; Maynard, Mathieu et al., 2012). Prominent aspects of dimensions that fall under the umbrella term of team design include team autonomy and task interdependence (Campion et al., 2003; Carter et al., 2019).

Team Autonomy

Team autonomy "captures the extent to which the team, as a whole, has the freedom to determine its own tasks and courses of action" (Carter et al., 2019, p.160). The more autonomous a team, the more it can make decisions and plan work activities at its own discretion and thus adapt to changing work conditions (Stewart, 2006). In this sense, teams high in autonomy can decide how they perform their work (e.g., which technology they want to use, how they want to divide their taskwork) and make decisions based on their own judgment (e.g., decide which goals they want to attain or whether these have been reached). We posit that autonomy will be beneficial both for transition as well as action processes. It will be beneficial for transition processes because team members have the freedom, and the motivation, to define goals and plan their attainment based on their own judgment. Autonomy should also promote action processes, as allowing team members to perform work with a variety of different methods means that they can optimally adapt their behaviour to complement each other's actions. Once again, next to the direct influence on team processes, team autonomy will also guide team members' sensemaking processes. That is, if team members experience impaired team processes, low simultaneous levels of team autonomy will render the experience of information deficits and distance all the more likely. For instance because team members are assigned fixed roles that they cannot vary at their discretion, this might slow down their information exchange and their ability to help each other out when necessary. Accordingly, we propose that team autonomy will negatively impact both TPV dimensions.

P7: Team autonomy is negatively related to a) collectively-experienced information deficits and b) collectively-experienced distance via team transition and action processes and via sensemaking processes.

Task Interdependence

Task interdependence can be defined as "the degree to which taskwork is designed so that members depend upon one another for access to critical resources and create workflows that require coordinated action" (Courtright et al., 2015, p. 4). A typical operationalization of task interdependence relies on Thompson's (1967) workflow typology, which ranges from pooled/additive to reciprocal workflows. Pooled/additive workflows suggest that team members can independently work on their subtasks—this equals low levels of task interdependence. Conversely, reciprocal workflows mean that a team member cannot begin or continue performing a task until another team member has completed theirs—corresponding to high levels of task interdependence. Although a high degree of task interdependence does not imply that teams will exhibit better or worse action or transition processes (these may just become more important), interpersonal processes such motivation appear to be fostered by task interdependence (see also Hertel et al., 2004; Ortega et al., 2010). Accordingly, through these interpersonal processes, task interdependence is likely to lower the team's collective feelings of distance. It further serves as the interpretative context for the team's sensemaking processes. For instance, it is more likely that team members will interpret their reliance on each other as being interconnected, which will decrease feelings of distance. Consequently, we propose that task interdependence contributes towards lower levels of collectively-experienced distance.

P8: Task interdependence is negatively related to collectively-experienced distance via team interpersonal processes and via sensemaking processes.

Discussion

Although the topic of team virtuality has gained in importance and interest in both research and practice, it is still tied to conceptual ambiguities and inconsistent findings regarding its effects (e.g., Carter et al., 2019; Gibbs et al., 2017; Ortiz de Guinea et al., 2012).

One explanation are the opposing theoretical perspectives behind the myriad of research in this field (Raghuram et al., 2019). The present paper aimed to integrate existing literature and extend prior research by introducing the concept of TPV within a theoretical model of its team-level emergence. As a result, we have made three important contributions to the literature.

First, the concept of TPV allows us to grasp the socially constructed nature of team virtuality. Accordingly, structural properties such as geographic dispersion or technology may shape TPV, but they do not have to define it. By distinguishing this socially constructed and essentially subjective aspect of team virtuality from structural (i.e., objective) properties, TPV allows us to understand *why* virtual teams function the way they do (and why this can be subject to change, too). Moreover, TPV is a concept that is applicable to *all* teams, regardless of how much technology they use to communicate or how physically distant they are, rendering our understanding of its emergence and antecedent factors important for the entire realm of team research.

Second, we have a contributed a theoretical model that explains how TPV emerges on a team level. Although team virtuality is a team-level construct in theory, we posit that insufficient attention has been paid to the collective phenomena that occur when individuals interact with each other within an environment characterized by certain structural properties. Specifically, we consider TPV as a team emergent state, which evolves and manifests itself as a function of team members' co-constructions based on their collective experiences. Accordingly, although structural properties of team virtuality shape the environment team members interact in, it is team members' perceptions of their collective experiences that shape how virtual they think and feel they are.

Third, we identified several antecedents which we believe to be crucial to TPV emergence. First and foremost, we consider transition, action, and interpersonal team

processes to provoke TPV emergence. If these processes are impaired, team members are likely to collectively co-construct higher levels of TPV dimensions. However, TPV emergence is shaped not only by team processes but also by the team's work context (i.e., the conditions under which these team processes take place). Accordingly, structural virtuality (as well as other contextual factors such as team design) will also determine TPV—both by guiding team members' co-constructions as well as by impacting team processes.

Theoretical Implications and Directions for Future Research

Our discussion of TPV has several implications for researchers interested in the study of virtual teams. First, we suggest that researchers and practitioners need to reach beyond easily quantifiable structural properties such as the number of kilometres between team members' sites or the number of emails they send to each other. In addition, they should consider how virtual the team *perceives i*tself to be, with respect to distance and information deficits, and how this is reflective of the quality of team interactions. Even though this perceptual component is acknowledged by many researchers that draw on the notion of social construction, it has not been consistently qualified and measured as a unique construct. To our knowledge, the present paper has been the first to define team perceived virtuality as a team-level construct and to dissect it into its underlying dimensions, namely distance and information deficits. Accordingly, we urge future researchers to focus their attention on empirical operationalisations of our two-dimensional TPV construct, that is, to move both beyond purely structural, unidimensional measures (cf. e.g., Maynard, Mathieu et al., 2012; Stark et al., 2014) and to empirically validate the role of TPV in (virtual) team functioning.

Second, focussing on how teams perceive themselves above and beyond the structural properties that describe how they work contributes to the ongoing conversation about the defining aspects of collaboration and teamwork. The changes brought about by technology and digitalization, among other factors, influence and shape the very nature of teams and

teamwork, thereby challenging traditional definitions based on clear boundaries and stability (Wageman et al., 2012). Therefore, we argue that addressing the question of "what is a team?" by shifting the focus from more or less structural properties (e.g., clear membership, interdependence, common goal) to the *collective experience of being a team* offers relevant avenues for future research.

Third, our theoretical model of TPV emergence is not exhaustive. That is to say, the antecedents we proposed in this paper have established a nomological network that may well be supplemented by further factors. For instance, higher-level factors such as societal or economic changes (e.g., consequences of the Covid-19 pandemic) can influence factors such as structural virtuality (e.g., a large portion of the workforce is forced to work exclusively from home to reduce the risk of infection). Moreover, the relationships between the constructs in our model may be more complex than depicted. Although some constructs may be less dynamic than others (for instance, team members' geographic location may not change quite as much over time as e.g., intrateam coordination), none of them are entirely static. Moreover, they are likely to change not solely as a function of time or external demands but because of mutual influence processes between them. For example, although high perceptions of information deficits have the potential to impair coordination, growing team familiarity may buffer this relationship by leading to behavioural adjustments, which will in turn improve coordination between team members (e.g., Dennis et al., 2001; Kock, 1998). These improvements, in turn, are likely to not only to decrease the likelihood of being in "lost in translation states" (i.e., by lowering perceptions of information deficits; see also Carlson & Zmud, 1999; Fuller & Dennis, 2009) but can also trigger further behavioural changes and media choices. For instance, by having altered the way one writes an email due to increased experience with the communication partner and respective task, one may develop the perception that even a relatively complex task can be effectively managed using

email. This, in turn, impacts future structural team virtuality (such as technology use), because teams may consider saving the time to meet up face-to-face, if an email has the potential of being just as effective (or even just effective enough to justify not having to schedule a meeting).

Accordingly, we propose that an IMOI-type framework (Ilgen et al., 2005) may be more suited in describing the complexity of TPV emergence, which invokes the notion of cyclical causal feedback. A temporally dynamic perspective on TPV also means acknowledging that both team processes and concurrent TPV emergence may depend on the type of taskwork a team engages in during a given time period. According to Marks et al. (2001), team performance episodes consist not only of phases which directly target goal accomplishment (action phases) but also of phases where teams reflect past performance and plan future actions (transition phases). Moreover, depending on which phase a team is currently in, certain processes become more important than others (i.e., action processes are more important in action phases, transition processes in transition phases, and interpersonal processes are relevant to both). By determining the salience of these respective processes, performance phases can also impact which TPV state a team is more likely to gravitate towards. For instance, if a team were to exhibit very effective transition processes, yet ineffective action processes, this would lead to higher levels of information deficits during an action than a transition phase. In sum, we therefore encourage future research to take a more fine-grained dynamic perspective, looking at changes in TPV, team processes, environmental aspects, and their reciprocal relationships as a function of the team's episodic life cycle.

Finally, although this paper could serve as a basis for developing future TPV measures, aggregation issues would need to be attended to more closely. Team emergent states are typically treated as composition constructs (Coultas et al., 2014; Kozlowski, 2015; Waller et al., 2016). This means that individual characteristics converge into a team-level

property, which is essentially the same as its constituent individual elements (e.g., Cronin et al., 2011; Kozlowski & Chao, 2012; Kozlowski & Klein, 2000). In the case of the TPV dimensions, this would mean that, for example, the distance that individual team members feel towards each other is similar to the collectively experienced distance that their aggregation results in. Methodologically, the emergence of collective constructs is thus operationalized via intra-class correlations or rwg indices, which reflect the sharedness (i.e., convergence) of individual constructs at the team level (e.g., Allen & O'Neill, 2015; Klein & Kozlowski, 2000). The collective construct itself is typically represented by the aggregation of individual-level variables to the collective (i.e., team) level using additive or mean models (given sufficient sharedness as reflected in high rwg and/or ICC indices; Coultas et al., 2014). Accordingly, the collective construct represents the team-level sum or mean of individual ratings. If we consider what this approach would mean for our TPV construct, this implies, for instance, that collectively experienced distance could be operationalised as the mean of all individual team members' feelings of distance, yet only if individual ratings are similar enough.

However, this methodological approach yields conceptual implication that need to be considered. What would be the implication for low levels of sharedness on the TPV dimensions? For instance, one could assume that if the team at least shared their feelings of distance then they could try to influence them, whereas low levels of agreement could be detrimental because the team lacks awareness of potential problems. If we were to approach the TPV dimensions from a compilational perspective (Klein & Kozlowski, 2000), then we would consider that team members' feelings of distance could vary within the team, yet the configuration/pattern of these individual feelings may emerge to characterize the team as a whole. Therefore, differences in a team's collectively experienced distance or information deficits would depend on the configuration of team members' individual feelings and

perceptions. However, although this approach does not require a sharedness of individual ratings, the questions above remain. Would a configuration that consists of very different individual ratings even qualify as something that has been collectively co-constructed? What are the implications of a team where individuals engage in social constructions of team virtuality, but the result of their individual constructions are not the same? To analyse the respective merits of compositional and compilational approaches, we would encourage future research which employs multilevel, longitudinal designs. These would show not only when, how, and if team members' feelings of distance and perceptions of an information deficits coalesce, but also how this relates to the other factors put forward in our theoretical model. Moreover, when applying compilational approaches to emergent phenomena, we would encourage analytic procedures allowing for the study of nonlinear trajectories (cf. Kozlowski & Chao, 2012), such as cusp catastrophe modelling (e.g., Marques-Quinteiro et al., 2019; Ramos-Villagrassa et al., 2018). As opposed to standard linear approaches, these models would be more adequate when capturing the potentially discontinuous nature of TPV emergence, for instance to identify certain thresholds which need to be met in order for team members to experience information deficits.

Managerial Implications

The definition of TPV and the theoretical model embedding it also allows for several practical implications. It implies that teams high in structural virtuality are not doomed per se. In a world characterized by diverse and flexible work arrangements and rapid technological advances, we should no longer be discussing whether structural team virtuality is good or bad but how we can best leverage it to secure high levels of team effectiveness. By virtue of this paper, we have argued that to do so, we need to understand the actual impact that structural team virtuality has on team functioning. There is more than enough empirical evidence to show that the effects of structural virtuality properties are not consistent (e.g., Carter et al.,

2019; Ortiz de Guinea et al., 2012), so evidently, these supposedly objective properties do not affect all teams in the same way.

By looking at a team's perceived virtuality, we are thus able to discuss what happens during team collaboration and how this can be influenced. That is to say, whereas team members and their managers may have relatively little influence over their geographic location, changing elements of their design (e.g., allowing team members more latitude in working methods) or paying more attention to the way they work together (e.g., encouraging team members to engage in backup behaviours) is possible and should thus improve team effectiveness even if team structural virtuality were to stay constant. Moreover, our TPV matrix enables a more differentiated analysis of the quality of team perceived virtuality. That is to say, perceiving oneself as virtual is reflected in a range of qualitatively different states, which would lead to different recommendations on enhancing team effectiveness. Whereas teams in "machine states" may profit more from team-building measures where they can get to know each other on a more personal basis, teams in "night club states" could invest more effort into developing communication norms and joint schedules in order to facilitate their information exchange.

Especially in light of the recent developments following the Covid-19 pandemic, remote work has changed from an option to a necessity for a large number of workers worldwide. Accordingly, the question is not how we can decrease structural virtuality (which may *have to* be high) but how we can best leverage other antecedent factors to TPV in order to keep detrimental consequences at bay. We therefore encourage managers and their teams to regularly reflect their perceptions of team virtuality, rather than assuming that their environment has a predetermined and static effect on their functioning. Moreover, they should take the time to discuss which factors contributed to their current state of TPV and how these can be changed or maintained to enhance team effectiveness. For instance, when

discussing their state of being “lost in translation”, team members may come to realize that this can be attributed to coordination difficulties that resulted from ill-defined goals at the beginning of their collaboration. Reflecting upon this, in turn, can help team members reengage transition processes such as goal specification to guide their further taskwork. Another implication may be that team managers can react to challenges such as those posed by Covid-19 (which involuntarily increases structural virtuality for an indefinite period of time) by adjusting their team’s work design to facilitate team processes, such as by giving team members more autonomy to coordinate themselves under consideration of certain family obligations (e.g., adjusting meeting times to incorporate team members’ childcare schedules).

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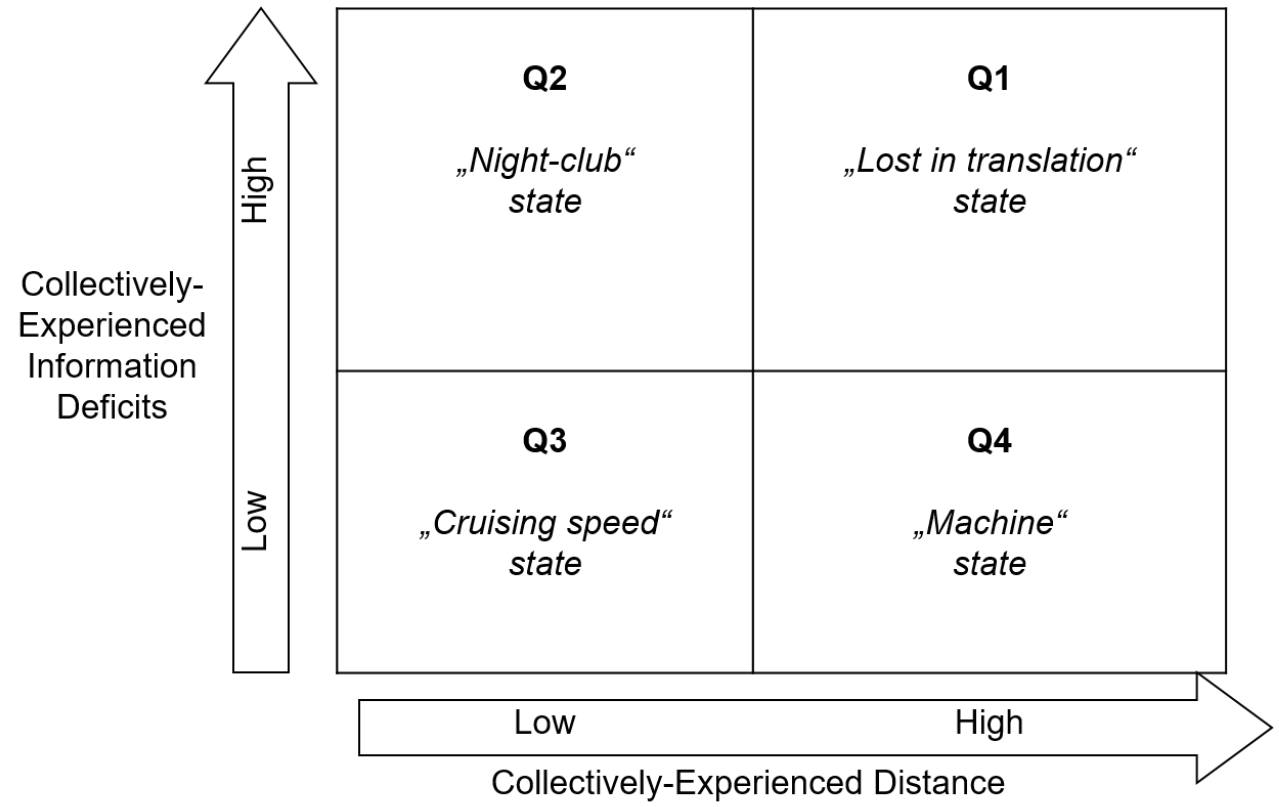
Figure 1

Two-by-Two Matrix Illustrating Possible Combinations of the Two TPV Dimensions



Note. The four quadrants depict possible combinations of low and high levels of collectively-experienced information deficits and distance (and respective states) in teams.

Figure 2

Proposed Theoretical Model