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A CONSTRUAL-LEVEL APPROACH TO UNDERSTANDING INDIVIDUAL-LEVEL CONTRIBUTIONS TO DISTRIBUTED TEAMWORK

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DECLARATION

This is to certify that

i) the thesis comprises only my original work toward the degree of Doctor of Philosophy except where indicated in the Preface,

ii) due acknowledgement has been made in the text to all other material used,

iii) the thesis is fewer than 100,000 words in length, exclusive of tables, maps, references and appendices.

ABSTRACT

This study addresses the limited understanding of distributed team (DT) members' individual-level contributions to teamwork. In DTs, team members work together from geographically separate locations. DTs offer many benefits, but teamwork in these teams is challenging to the point where high-profile organisations have previously banned their use. However, abandoning DTs is premature because we can address their challenges by clarifying how their fundamental attributes – i.e., the spatial distance between team members and how they communicate – influence individual team members' teamwork contributions (i.e., cooperation, coordination, and conflict). Our understanding of how these attributes influence teamwork contributions is limited because their mediating mechanisms are under-theorised. This literature indicates two theoretical perspectives for developing a model of individual team member processes in DTs: construal-level theory (CLT), which has been recently introduced to DTs to theorise around psychological distance in DTs, and social identity theory (SIT). Identifying how these mediating mechanisms work together at the individual level in DTs has been theoretically and empirically challenging. I aim to clarify these mechanisms by integrating core tenets of CLT and SIT to address challenges for distributed teamwork. I address two questions to examine these challenges: i) How do the socio-cognitive processes of psychological distance and social identification work together to influence individual team members' contributions to distributed teamwork?; and, ii) How can communication and associated technologies be used to improve the socio-cognitive processes that determine perceptions of other team members and subsequent teamwork in DTs? To answer the first research question, I propose that spatial distance matters because it can generate psychological distance, which then reduces the degree to which individuals identify themselves and others as members of their DT. This psychological distance and weaker social identification, in turn, leads individuals to dehumanise others in their DT. I frame this process of dehumanisation as an example of construal of others – a concept central to CLT and the effects of psychological distance in DTs. To answer the second research question, I develop an additional model predicting the direct effects of communication frequency and particular media (i.e., face-to-face, video CMC, phone and text-based computer-mediated communication), on psychological distance and social identification,

and their moderating effects on the influence of spatial distance. I test the hypotheses with path analyses and multiple regression analyses using two waves of survey data obtained from employees currently working in DTs located in Australia. These analyses indicate overall support for the primary theoretical model. This evidence demonstrates that psychological distance and DT identification are more critical than spatial distance for contributions to distributed teamwork. The study supports the role of dehumanisation as an instance of construal of other people, which operates as a shared mechanism for the effects of psychological distance and social identification. It also demonstrates that social identification and dehumanisation are dual mechanisms for psychological distance's effects in DTs. However, the data also demonstrate mixed support for the second theoretical model regarding the influence of communication media. Overall, we must consider DT members' perceptions in addition to their physical separation to better understand and address challenges for individual-level contributions to teamwork.

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1 CHAPTER 1: INTRODUCTION

1.1 The context of individual-level teamwork in distributed teams

Distributed teams (DTs; aka 'virtual' teams; Gilson, Maynard, & Young, 2015), in which team members work together from spatially separate locations, are increasingly utilised in organisations, but they are often unsuccessful and not well understood. DTs represent an approach to organising the way employees work together in modern organisations. They allow organisations to connect and organise experts across geographic locations without requiring those experts to relocate to a central office. This enables flexibility, raises capability and reduces the environmental impact and time commitment imposed by commuting to central offices (Hoch & Kozlowski, 2014; Tietze & Musson, 2005). Technological advancement, affordability, and user-friendliness of computer-mediated communication (CMC; e.g., email, instant messaging, and video conferencing) have enabled the increasingly widespread use of DTs, particularly among knowledge workers (Bosch-Sijtsema, Ruohomaki & Vartiainen, 2009). Although DTs are widely implemented, they often fail. According to a survey of 379 human resource (HR) professionals conducted by the Society for Human Resource Management (Minton-Eversole, 2012), 46% reported that their organisation utilised DTs; Of those organisations, 49% used DTs to increase collaboration. Alarmingly, over half of the respondents who reported using DTs stated that building collaborative relationships within DTs is often unsuccessful. They also reported that coordination and distribution of work are amongst the biggest challenges facing DTs.

Teamwork in DTs is more challenging than in co-located teams, to the point where some high-profile organisations previously banned their use. For example, Yahoo banned remote work throughout their organisation in 2013 (Goudreau, 2013). While effective teamwork in DTs is undoubtedly challenging, abandoning DTs is premature as they offer many benefits, and they can be highly successful despite their challenges; they can even outperform co-located teams (Jarvenpaa & Keating, 2011; Krumm, Terwiel, & Hertel, 2013; Schmidt, Montoya-Weiss, & Massey, 2001; Staples & Zhao, 2006).

Individual members of DTs must demonstrate attitudes and behaviours that contribute to teamwork, such as effective cooperation, coordination, and conflict management. However,

spatial distance separating individuals from other team members may make enacting - and engendering a willingness to enact - these contributions more challenging (Alnuaimi, Robert, & Maruping, 2010; Cramton, 2001; Hinds & Mortensen, 2005; Howard & Magee, 2013). These challenges may arise because DT members are typically less visible to each other than in teams where all members work in the same physical location (i.e., co-located teams), which reduces awareness of other team members' contexts, interdependent needs, ways of working, and expertise (Bjorn & Ngwenyama, 2009; Kurland & Bailey, 1999). It is also typically more challenging to meet other DT members face-to-face, and DTs often must rely on CMC to co-ordinate and collaborate their efforts. CMCs can limit the bandwidth for information transmission and social cues between team members.

Consequently, DTs have potentially limited opportunities for individuals to develop shared experiences and certainty about what they require of each team member (Bjorn & Ngwenyama, 2009; Kurland & Bailey, 1999). These aspects can make teamwork more difficult for distributed co-workers (Siebdrat, Hoegl, & Ernst, 2013; Wilson, Crisp, & Mortensen, 2013). These challenges are, unfortunately, difficult to address because we do not adequately understand how and when the core characteristics of DTs – primarily how spatial distance between team members, and secondarily their reliance on computer-mediated communication (CMC) - influence how individuals work together in DTs.

Despite their unique challenges, outcomes in DTs in general, in addition to outcomes of spatial distance and CMC in DTs, are mixed and not well understood. Studies have demonstrated weaker teamwork-related outcomes in DTs, including collaboration, cohesion, and achievement of team goals (Aubert & Kelsey, 2003; Cramton, Orvis, & Wilson, 2007; Polzer, Crisp, Jarvenpaa, & Kim, 2006). Research also shows that distance from colleagues can reduce individuals' work effort (Caillier, 2014). In contrast, studies have revealed similar, if not superior, teamwork and subsequent performance in DTs compared to co-located teams (e.g., Jarvenpaa & Keating, 2011; Krumm et al., 2013; Schmidt et al., 2001; Staples & Zhao, 2006). Therefore, arranging employees into DTs does not necessarily lead to poorer outcomes. Moreover, spatial distance does not always lead to poorer outcomes, particularly when more proximal psychological processes are considered (O'Leary, Wilson, & Metiu, 2014; Siebdrat et

al., 2013). Conflicting empirical studies also show that CMC's effects are inconsistent, with contradictory findings that CMC can worsen, improve, or have no effect on DT outcomes (e.g., Han, Hiltz, Fjermestad, & Wang, 2011; Ho & McLeod, 2008; Schweitzer & Duxbury, 2010).

Rather than avoiding DTs and forfeiting their many advantages, I argue that we must address the challenges in DTs in a way that overcomes potential problems and enables organisations and employees to benefit from them. This requires a better understanding of how and when spatial distance and CMC lead to particular outcomes for individuals in DTs. To achieve that, we need to understand the mechanisms that either underlie and mediate their effects or are more critical for DT functioning.

1.2 Key developments and related issues in distributed team research

The conditions that foster effective distributed teamwork remain elusive because we do not sufficiently understand the processes that lead to individual members' distributed teamwork contributions (De Guinea, Webster, & Staples, 2012; Minton-Eversole, 2012; Webster & Staples, 2006). The unique features of DTs lead to difficulties directly comparing – conceptually or empirically – the processes that explain how team members contribute to teamwork in DTs and co-located teams. In the context of greater spatial distance from other team members, and with drastically less or no face-to-face communication, DT members must 'read' team members communications in the absence of the usual social cues. In short, they need to construe many different things they cannot 'see' or form perceptions around the other team members' characteristics, their intentions and expectations, and the consequences of cooperating or non-cooperating with others who are working elsewhere. Methodological issues have exacerbated this problem and have led to inconsistent findings.

Theoretical gaps and methodological issues need to be addressed to advance this literature. For instance, findings across studies report inconsistent relationships between spatial distance and CMC and DT outcomes, reflecting a general failure to adequately consider mediating mechanisms that help explain the causal nature of this relationship, or moderators that capture important aspects of context that are likely to influence the strength (and direction) of the relationship between these variables (De Guinea et al., 2012; Foster et al., 2015; Wilson et al.,

2013). Indeed, a major theoretical challenge in this literature is to predict and explore the mediating mechanisms for the effects of fundamental DT attributes at the individual-level – namely the spatial distance from other team members and the frequency and media through which communication occurs – on individual-level contributions to teamwork.

A promising line of inquiry has emerged, which focuses on socio-cognitive mechanisms through which spatial distance and communication influence behaviours in DTs. This literature indicates two critical theoretical perspectives for developing a model of individual-level team member processes in a DT context which consider perceptions of other team members: construal-level theory (CLT) (e.g., Trope & Liberman, 2010; Wilson et al., 2013), and social identity theory (SIT: e.g., Ashforth & Mael, 1989; Gibson, Huang, Kirkman, & Shapiro, 2014; Haslam, 2006; Spears & Postmes, 2015; Siebdrat, Hoegl, & Ernst, 2013; Tajfel & Turner, 1979; Wilson, O'Leary, Metiu, & Jett, 2008). However, these perspectives have not yet been well integrated. Most papers in this area have drawn from one or the other of these theories (e.g., O'Leary et al., 2013), or they have been presented as competing perspectives with surface level connections (e.g., Wilson et al., 2013). A key contribution of this paper is to look at how they might share antecedents and work in parallel to influence outcomes in DTs, potentially through shared and separate mechanisms.

This work indicates that intervening perceptual processes are more important than spatial distance to understand individual-level contributions to distributed teamwork, but this approach requires further development. Compared to spatial distance, the perceptions of spatial distance from other people - known as *psychological distance* – appears to be a better predictor of outcomes (O'Leary, et al. 2014; Siebrat et al., 2013). Psychological distance is also more malleable than spatial distance because geographic dispersion is often unavoidable. Therefore, psychological distance offers a point of intervention to address teamwork challenges in DTs (O'Leary & Cummings, 2007; Wilson et al. 2008; Wilson et al., 2013). Researchers also propose that feeling a sense of belonging to the DT and categorising oneself and others as DT members (i.e., social identification with the DT) has implications for psychological distance, perceptions of other team members, and DT outcomes (e.g., Bjorn & Ngwenyama, 2009; Ellemers, Glider & Haslam, 2004; O'Leary et al., 2014; Postmes, Spears, & Lea, 1998; Tyler &

Blader, 2003; Wilson et al., 2008; Wilson et al., 2013). However, how psychological distance impacts DT member outcomes is not well understood, theoretically or empirically, because studies in this area are fractured and inconsistent in how they view spatial distance, psychological distance, and social identification working together (Dixon & Panteli, 2010; Wilson et al., 2013). Moreover, prior studies have not adequately integrated psychological distance and social identification in models of individuals' contributions in DTs, in part because they have not strongly theorised or tested the direction of their association (O'Leary et al., 2014; Siebdrat et al., 2013; Wilson et al., 2008; Wilson et al., 2013).

CLT represents an important theoretical link between psychological distance and its outcomes in DTs, and it can be better integrated with SIT. CLT in conjunction with SIT can clarify how psychological distance from others in a DT works together with social identification with the DT to influence individuals' teamwork contributions. CLT suggests that perceptions of target events, objects or people become more abstract as psychological distance increases (Trope & Liberman, 2010; Wilson et al., 2013). In DTs, these perceptions in relation to other team members are most relevant. Research demonstrates that psychological distance and construal-level, in a general sense, are positively related (Soderberg et al., 2015). However, this relationship – and therefore CLT - is less well established in the specific context of DTs, in part because construal of other people needs to be operationalised in a more specific and less 'abstract' way. Exploring construal of others as a shared mediating mechanism for the effects of psychological distance and social identification in DTs may clarify the role of each construct for team member contributions in DTs, and facilitate the integration of CLT and SIT in this domain.

Developing a theoretical model that clarifies how psychological distance and social identification influence teamwork contributions in DTs means that we can better specify how and when communication, and the media through which it occurs (e.g., face-to-face, video CMC, phone, and text-based CMC), shapes DT outcomes. Outcomes of CMC in DTs are mixed (e.g., Han et al., 2011; Ho & McLeod, 2008; Schweitzer & Duxbury, 2010; Kayworth & Leidner, 2000; van der Kleij, Schraagen, Werkhoven, & Dreu, 2009), potentially because more proximal processes and interactions with other variables are not considered enough (Marlow et al., 2017). Examining a model of individual-level contributions to DT based on CLT and SIT provides

a theoretically grounded way to determine how to improve DT functioning by using communication media intentionally.

1.3 Aims, research questions, scope and significance of this study

The aim of this study is to contribute to theoretical and empirical knowledge towards addressing challenges for individual-level contributions to distributed teamwork. A problem identified from the literature motivates it: working with others in DTs can be successful, yet this mode of work often fails; the conditions associated with this success or failure are unclear due to insufficient integration and understanding of the construal and social identification processes leading to DT members' individual-level contributions to teamwork,. That is, we do not yet know how and when fundamental characteristics of DTs from an individual's perspective– the degree of geographic separation from other team members, and secondarily the frequency and media through which communication with other DT members occurs – influences individuals' contributions to distributed teamwork.

This work investigates the mediating cognitive processes that occur within individuals as a result of the core characteristics of their distributed team. It does not examine multiple levels beyond the individual (e.g., team and organisational) for largely theoretical reasons. For instance, several constructs of interest (e.g., construal and psychological distance) are typically examined at the individual level rather than other or multiple levels, with theoretical development largely bound to this level of inquiry. My interest and the focus of this work were on how individuals' work-related behaviours and attitudes are shaped by the distributed context. I was interested in the cognitive processes within individuals and how those processes influence individuals. This work can serve as a basis for investigating how additional aspects of the distributed team context may influence individuals. A secondary concern was a more practical consideration. The data I originally planned to collect was difficult to 'nest' in terms of obtaining a large enough sample of distributed teams across one organisation.

This study extends our understanding of individuals in DTs and provides theoretical contributions to the literature by integrating CLT and SIT by addressing two research questions: i) How do the socio-cognitive processes of psychological distance and social identification work

together to influence individual team members' contributions to distributed teamwork?; and, building on the first question, ii) How can communication and associated technologies be used to improve the socio-cognitive processes that determine perceptions of other team members and subsequent teamwork in DTs?

In this research, I contribute to theory by integrating CLT and SIT to clarify how spatial distance and three interrelated individual-level constructs that deal with perceptions of others are vital to individuals' contributions to distributed teamwork. These constructs are psychological distance, social identification with the DT (referred to as *DT identification* from here onwards), and dehumanisation. I propose how these constructs work together to influence teamwork at the individual level, and I address a significant conceptual gap for CLT research by introducing dehumanisation as a domain-specific form of construal of other people. Building on an initial theoretical model, I also clarify how communication with other DT members, and the media through which it occurs, influences psychological distance and DT identification.

A primary contribution of this thesis is in how I integrate CLT and SIT to build a primary theoretical model of individual-level contributions to teamwork, with testable hypotheses. In brief, I will propose that spatial distance matters because, first and foremost, it may simultaneously generate psychological distance – in this case, a perception that other team members are more physically distant from the self - and reduce a sense in which individuals socially identify themselves and others as members of their DT. I propose that these processes in turn increase the extent to which individuals think about others in their team as mechanised objects rather than people possessing human characteristics. I frame this process of dehumanisation as an example of construal of other team members – a concept that I assert is central to CLT – in addition to the effects of psychological distance (central to CLT) and DT identification (central to SIT) in distributed contexts. By building this theoretical model, I offer a novel approach to integrating CLT and SIT in this context. Moreover, I will propose that more frequent communication with other team members reduces psychological distance from them and strengthen DT identification. I will draw from media richness theory (Daft & Lengel, 1986), SIT and CLT to propose that face-to-face communication and more advanced media (e.g., video

CMC) more effectively reduces psychological distance, whereas less advanced CMC such as text-based CMC more effectively strengthens DT identification.

1.4 Thesis structure

This document consists of four additional chapters. In the next chapter (Chapter 2: Literature review and theory development), I review the literature to identify and address what I see as the core theoretical shortcomings; namely, exploring the processes and mechanisms through which spatial distance, and secondarily communication, are likely to influence DT member dynamics. Here, I also address the question of context – and offer a theoretical model that looks at core factors that moderate the causal chain linking spatial distance with DT members' contributions to teamwork via psychological distance, DT identification, and dehumanisation of other team members. In Chapter 3 (Methods), I describe the research methods used to conduct my study, including the philosophy underlying its design, the study design itself, and the measures used to obtain data to test hypotheses. In that chapter, I also demonstrate that the data are robust, containing valid measures and reliable data with which to test the theoretical models. I conclude Chapter 3 with an overview of the final dataset used in analyses (i.e., descriptive statistics and bivariate correlations). In Chapter 4 (Results), I present the quantitative analyses of the study, including tests of hypotheses included in Models One and Two and robustness checks of these results. In Chapter 5 (Discussion), I discuss the results from Chapter 4 concerning relevant literature from Chapter 2. I further interpret the results and their implications for theory, past studies, and practice. I also discuss empirical limitations of this study and avenues for further empirical work.

2 CHAPTER 2: LITERATURE REVIEW AND THEORY DEVELOPMENT

In this chapter, I review prior research pertinent to addressing my research questions. I use this review as a foundation on which to build two theoretical models that include hypotheses to be tested in a field study. I organise this chapter into six sections. In section 2.1, I review the general DT research, focusing on issues in the literature that mean we are yet to fully understand the effects of spatial distance on individuals' contributions to distributed teamwork. In section 2.2, I shift focus from spatial distance towards two perceptual processes in DTs —psychological distance and DT identification —and propose that they are more important than, and explain the effects of, spatial distance in DTs. In section 2.3, I introduce and discuss how the effects of these two processes in DTs may be mediated by how abstractly individuals think of other team members concerning CLT and SIT. In section 2.4, I propose to solve a central issue for CLT and research in DTs by conceptualising construal of others in a manner specific to the DT domain with the concept of dehumanisation. In section 2.5, I draw from my literature review to propose a theoretical model with hypotheses connecting spatial distance to individual-level contributions to teamwork via psychological distance, DT identification, and dehumanisation in DTs. In section 2.6, I review the literature around communication in DTs and its effects on psychological distance and DT identification. I hypothesise the direct and moderating effects of communication media and their frequencies on these cognitive processes and the influence of spatial distance on these processes.

2.1 Distributed teams and the context of spatial separation and distance between team members

2.1.1 Defining distributed teams

DTs are distinct from co-located teams. All teams consist of "two or more individuals with specified roles interacting adaptively, interdependently, and dynamically towards a common valued goal" (Salas, Sims, & Burke, 2005, p. 562). This definition includes types of 'co-located' teams in which team members located physically in the same workplaces, and DTs in which individuals work together while physically separated to varying degrees in different workplace

locations. I will argue that spatial distance in DTs should be considered to understand the antecedents of DT member contributions to teamwork.

In addition to spatial distance, researchers have identified other forms of objective distance – including temporal and social distances (Klitmøller, Schneider, & Jonsen, 2015; O'Leary & Cummings, 2007) – but these forms are beyond the scope of this initial study. I examine spatial distance as it is the most salient objective distance for DTs, to the exclusion of other forms that are typically highly correlated with spatial distance or are not unique to DTs (Wilson et al., 2013). For example, temporal distance is dependent on spatial distance (e.g., time zone differences) or shift work (beyond the scope of this research), and co-located and DTs tend to possess similar cultural diversity (Hinds & Bailey, 2003). Additionally, in my approach to fieldwork, I limit cases to employees in DTs in which all members are located within the same country (Australia), to maintain a manageable scope of this initial study. Before exploring foundational research for understanding why and how spatial distance may or may not be vital to individuals' attitudes and behaviours in DTs, it is useful to consider why DTs have emerged in contemporary work settings.

DTs emerged with the proliferation of CMC technologies[1]. The central role of CMC is reflected in the widely used term, 'virtual teams' – virtual in the sense that team members are not co-located, may never or infrequently meet face-to-face, and rely to varying degrees on CMC to collaborate and coordinate their activities (e.g., Hinds & Bailey, 2003; Webster & Staples, 2006). Understanding how DTs work therefore requires an explicit consideration of how CMC alter team dynamics (e.g., Gibson et al., 2011; Hinds & Bailey, 2003; Wilson et al., 2013).

The use of CMC is not unique to DTs, but it is more central to understand them. Co-located team members also rely on CMC, in conjunction with face-to-face communications. The use of CMC can also impact co-located team dynamics (Mortensen & Hinds, 2001). However, the use of CMC in co-located team settings is typically supplementary to face-to-face communication,

[1] CMC covers various communication media including, but not limited to, video CMC or video conferencing, voice calls (e.g., telephone, voice-over-IP [VOIP]), email, texting, and real-time text-based chat.

and the extent of its use is a matter of choice. For DTs, however, the opposite is generally the case: team members are dependent on CMC as their primary means of communication, often with limited opportunity to meet face-to-face (De Guinea et al., 2012). Unsurprisingly, DTs typically (but not always; e.g., O'Leary et al. 2014) utilise CMC substantially more than co-located teams (Schiller & Mandviwalla, 2007). Consequently, they interact with others relying on fewer social cues or incidental contact and are typically less visible to each other.

Considering this issue of spatial distance, alongside social contact, is vital for addressing challenges in DTs related to the central constructs in this study. The frequency of communication and the unique qualities of each CMC medium may also influence how individuals perceive other team members (Gibson & Gibbs, 2006; O'Leary et al., 2014; Wilson et al., 2008). Later, in Section 2.6, I return to communication after I establish the core theoretical model of my study.

2.1.2 A broad review of distributed teams and spatial distance research

Co-located team research identifies contextual predictors of team dynamics and outcomes. The more limited DT research, based on these co-located team studies, demonstrates similar contextual factors predicting various outcomes, including but not limited to:

(i) effective leadership (Bass, Avolio, Jung, & Berson, 2003; Joshi & Roh, 2009; Liao, 2017; Yoo & Alavi, 2004),

(ii) team members' knowledge, skills, and abilities (KSAs) that support teamwork behaviours (e.g., Klein & Kozlowski, 2000; Krumm, Kanthak, Hartmann, & Hertel, 2016; Mathieu, Tennenbaum, Donsbach, & Alliger, 2014),

(iii) trust in other team members (e.g., Bijlsma-Frankema, de Jong, & de Bunt, 2008; Jarvenpaa, Knoll, & Leidner, 1998; Wilson, Straus, & McEvily, 2006),

(iv) task design (e.g., meaningfulness, autonomy and interdependence; Chi, Chang, & Tsou, 2012; Stewart, 2006),

(v) group diversity (e.g., Daniel, Agarwal, & Stewart, 2013; Harrison, Price, Gaven, & Florey, 2002; Jarvenpaa & Keating, 2011; Martins & Shalley, 2011), and

(vi) group size (e.g., Bradner, Mark & Hertel, 2005; Wheelan, 2009).

However, by focusing on contextual constructs to gain similar benefits for co-located and DTs alike means less central consideration of how, when and why – or through which processes – fundamental characteristics of DTs (i.e., spatial distance separating team members and greater reliance on CMC) influence individuals in DTs. I recognise that the effects of the above-listed contextual factors can differ between co-located and DTs. For example, large teams can be more effective if distributed rather than co-located (Bradner et al., 2005), and leadership and analysis skills can be more critical for DT outcomes (Krumm et al., 2016). Nonetheless, the influence of fundamental DT characteristics on how individual members conduct teamwork remains unclear, particularly regarding mediating mechanisms for these effects (Wilson et al., 2013). This gap is problematic because answers to critical questions — most importantly, the research questions driving this study — remain unknown. Furthermore, theory and evidence indicate other constructs which are more relevant to DTs compared to co-located teams, determine outcomes in DTs (e.g., O'Leary et al., 2014; Siebdrat et al., 2013; Wilson et al., 2008; Wilson et al., 2013).

Understanding how DT members contribute to teamwork requires significant revisions to the standard approach to explaining team processes and outcomes. Contributing to teamwork is more difficult for DT members because spatial distance reduces the visibility of other team members (Howard & Magee, 2013), the salience of the team (Hertel, Konradt, & Orlikowski, 2004), and individuals' awareness and understanding of their team including interdependent tasks, needs, knowledge and experience (Cramton, 2001; Kotlarsky & Orshri, 2005; Peters & Manz, 2007). However, like broader comparisons between co-located teams and DTs, outcomes of spatial distance are mixed. While research demonstrates adverse outcomes of spatial distance, such as more significant interpersonal conflict (e.g., Hinds & Mortensen, 2005), and poorer cooperation and coordination (e.g., Cramton & Webber, 2005; Hoegl & Proserpio, 2004; Hoegl, Ernst, & Proserpio, 2007), research also demonstrates non-significant associations between spatial distance and similar outcomes (e.g., O'Leary et al., 2014; Siebdrat et al., 2013).

To progress in this area, we must address the theoretical and methodological issues that have at least in part driven inconsistencies across studies and made it difficult to conclude precisely how spatial distance influences individuals in DTs (De Guinea et al., 2012). The

theoretical concerns predominately stem from under-theorisation of socio-cognitive processes through which spatial distance may influence individuals' teamwork contributions. The methodological issues include:

(i) the problems associated with comparing DTs and co-located teams, rather than investigating unique characteristics that specifically predict outcomes (De Guinea et al., 2012; Wilson et al., 2013),

(ii) the problems associated with operationalising spatial distance (De Guinea et al., 2012; Hoegl et al., 2007) and

(iii) a lack of ecological validity due to an over-reliance on lab studies or student samples (Gilson et al., 2015).

The first of the three methodological issues – the tendency to compare DTs to co-located teams – implies that many studies have not focused on factors that differentiate between DTs (e.g., Cramton & Hinds, 2001; Cramton & Webber, 2005; Furumo, 2009; Hinds & Bailey, 2003; Hinds & Mortensen, 2005; Mortensen & Hinds, 2001; Robert, 2016). This focus is problematic because it means we do not know precisely which characteristics of DTs determine their dynamics and outcomes, and how and why they exert their effects.

The second methodological issue concerns the weak or inconsistent ways that studies operationalise spatial distance. Most studies use what might be described as 'dirty measures' of 'geographic distance', in that they conflate different dimensions of spatial distance, virtuality, or both, rather than disentangling their constituent parts (De Guinea et al., 2012; Hoegl et al., 2007; Kirkman & Mathieu, 2005). For instance, geographic distance measures have operationalised spatial distance in terms of 'virtuality' by combining spatial distance between team members with measures of communication. Arguably, combining these variables obscures the actual effects of multiple constructs (De Guinea et al., 2012; Foster et al., 2015). Moreover, when studies have untangled geographic distance from other variables, it is inconsistently operationalised across studies, in ways including but not limited to:

(i) the miles between co-worker's closest cities in dyads (O'Leary et al., 2014),

(ii) a team-level aggregate of miles between team members' office locations (Hoch & Kozlowski, 2012; Siebdrat et al., 2013),

(iii) the degree to which all team members were co-located for a project's duration (Hoegl & Proserpio, 2004; Hoegl et al., 2007),

(iv) the degree of physical isolation (i.e., individuals' percentage of time spent working away from central offices, without co-located organisational members) (Bartel, Wrzesniewski, & Wiesenfeld, 2012), and

(v) a team-level aggregate of a one-item question asking individuals whether they are co-located or not co-located with each team member (Suh & Shin, 2010),

(vi) the percentage of members not co-located with other team members (Muethel, Gehrlein, & Hoegl, 2012).

Inconsistently operationalising spatial distance makes it difficult to confidently draw conclusions across studies (De Guinea et al., 2012).

The third and final methodological concern relates to ecological validity given few prior DT studies were conducted in the field with observations drawn from individuals working in real DTs. Laboratory studies have several strengths. First, they enable tighter controls of factors that may otherwise impact outcomes, allowing researchers to empirically isolate causal relationships between constructs (Dennis, Nunamaker Jr, & Vogel, 1991). Laboratory studies are also usually easier to replicate than field studies (Dennis et al., 1991). However, their shortcomings are salient to understanding individuals in DT. Most importantly, they typically involve participants completing simple tasks rather than ongoing work involving complex projects or the completion of multiple interdependent work tasks over more extended periods. Therefore, lab settings may not depict how DT members function in the real world. Additionally, many of these laboratory studies can be problematic because most rely on student samples, often involving participants with limited or no work experience (Gibbs et al., 2017). As a result, researchers have stated that field studies more accurately demonstrate processes underlying how individuals act in DTs (Gilson et al., 2015; Purvanova, 2014). Researchers recognising these problems have called for more empirical research on DTs in real-world settings (De Guinea et al., 2012; Gilson et al., 2015).

So, in recognising these methodological shortcomings in past research, which may have led to inconsistencies across papers, I will examine my model with a series of best practices derived

from this review. To gather the most robust observations and make the most accurate conclusions about the constructs of interest, I will conduct my research in the field, with individuals in DTs (and excluding individuals in colocated teams), and operationalise spatial distance in a way that does not conflate the construct with others.

In addition to methodological issues, researchers have not adequately theorised the processes and mechanisms through which spatial distance influences individuals in DTs. Some progress has, however, been made. For example, studies have sought to theorise the distance between team members in a more coherent manner, and to more explicitly theorise factors that mediate and moderate the degree to which spatial distance influences individuals' attitudes and behaviours in DTs (e.g., O'Leary et al., 2014; Polzer et al., 2006; Ruiller, Van Der Heijen, Chedotel, & Dumas, 2019; Siebdrat et al., 2013; Wilson et al., 2008; Wilson et al., 2013). To address the theoretical shortcomings, I delve into this research and further explore the socio-cognitive mechanisms that may determine DT member dynamics and outcomes (in sections 2.2—2.5). I also address the question of context – and offer a theoretical model that looks at core factors that moderate the causal chain linking spatial distance with those processes (in section 2.6).

2.2 Psychological distance and distributed team identification

A promising line of enquiry into individuals' contributions in DTs centres around *perceptions* of other people. DT research rarely examines cognitions at this individual level, yet it is where cognitions affect attitudes and behaviours (Markarius & Larson, 2017). Two approaches – based on CLT (e.g., Trope & Liberman, 2010; Wilson et al., 2013) and SIT (e.g., Ashforth & Mael, 1989; Haslam, 2006; O'Leary et al., 2014) – are central to explain the role of perceptions of other DT members. I evaluate how these approaches have been deployed in the DT literature.

This critique forms the basis for a new theoretical model in two ways. One, it links spatial distance to DT member outcomes through two separate but related mechanisms via individuals' perceptions – or construal – of their distributed colleagues: psychological distance and DT identification. Two, it facilitates the means to meaningfully operationalise and test CLT applied to perceptions of others in DTs using the concept of dehumanisation. This work has

remained too vague and fails to conceptualise construal in a precise, practical or domain-specific manner in this context. Dehumanisation enables the application of CLT to theorise how distancing and de-identification generates a tendency towards more abstract construal of other people and subsequently reduced teamwork contributions via a shared mechanism.

2.2.1 Psychological distance in distributed teams

Psychological distance, as a concept, is central to CLT. CLT posits that psychological distance leads to abstract perceptions of a target (Trope & Liberman, 2010). Psychological distance is an asymmetric, "subjective experience that something is close or far away from the self, here and now" (Trope & Liberman, 2010, p. 440). Psychological distance in relation to spatial distance has been examined using various terms, such as relational proximity (e.g., Amin & Cohendet, 2005), and perceived or subjective proximity (e.g., Cha, Park, & Lee, 2014; Ruiller et al., 2019). I recognise other dimensions of psychological distance (e.g., temporal psychological distance and hypothetically; Trope et al., 2010). These dimensions correlate highly and may contribute to each other (Bar-anan, Liberman, Trope, & Algom, 2007; Trope & Liberman, 2010). However, psychological distance in terms of spatial distance from teammates is most relevant and central to DTs and therefore this study. Future studies can explore additional dimensions concerning my theoretical model.

Perceptions are more proximal to attitudes and behaviours than objective reality, and therefore psychological distance should be more critical than spatial distance to understand DTs. For instance, two team members working together from separate buildings are separated already. Increasing spatial distance between those buildings may not change how they organise their work. It may, however, change how they work together by influencing how they think about each other. Examining psychological distance informs our understanding of how and when the effects of spatial distance are transmitted to distributed teamwork and shifts our focus towards perceptual processes to better address challenges associated with distance in DTs.

Psychological distance was introduced to the DT literature about a decade ago (see Wilson et al., 2008). However, few DT studies have since developed the concept or deployed it

empirically (see Appendix A for an overview of four central papers in this area, including: O'Leary et al., 2014; Siebdrat et al., 2013; Wilson et al., 2008; and Wilson et al., 2013). The initial proposition relating spatial distance to psychological distance in a distributed work context is found in a theoretical paper regarding distributed dyads. In that paper, Wilson et al. (2008) proposed that psychological distance is more central than spatial distance to interpersonal processes and outcomes in distributed contexts.

Citing "conventional wisdom", Wilson et al. (2008) proposed that spatial distance should typically generate psychological distance, but added that it might not under particular conditions. To support this claim, they cited evidence where co-located team members felt psychologically distant from each other. They further proposed that shared social identification and communication mediate between spatial distance and psychological distance (I return to communication in Section 2.6). However, they did not specify theoretical reasons for these general or specific effects. This approach has been adopted in subsequent papers (O'Leary et al., 2013; Ruiller et al., 2019).

Later, Wilson et al. (2013) drew from CLT to further theorise the roles of spatial distance and psychological distance for interpersonal cognitions in distributed contexts. They proposed that spatial distance generates psychological distance, which then leads to abstract perceptions of other team members and subsequent cognitions and behaviours. Their focus was to use CLT to explain the influence of psychological distance in distributed work contexts; their model becomes more relevant in subsequent sections, where I will discuss it in greater detail.

Siebdrat et al. (2013) built upon Wilson et al.'s (2008) model to further theorise how spatial distance may reduce collaboration via psychological distance. They reasoned that spatial distance generates psychological distance by reducing face-to-face communication and increasing reliance on CMC, which in turn reduces the team's salience and visibility. However, they proposed and tested a direct relationship rather than implicitly including and testing the role of communication.

Overall, researchers have not yet developed strong theoretical reasoning for direct outcomes of psychological distance in distributed work contexts. For example, O'Leary et al. (2014) proposed that psychological distance reduces relationship quality in dyads. However,

they did not specify a reason for expecting this relationship. Moreover, Siebdrat et al.'s (2013) proposed chain of effects are plausible but indicate mediation of the effects of psychological distance via social identification, rather than the direct effects suggested by their reasoning.

Nascent evidence from at least five empirical papers indicates negative associations between psychological distance and individuals' teamwork-related outcomes. These outcomes include coordination, cooperation, task effort, and relationship quality (i.e., Bradner & Mark, 2002; Cha et al., 2014; O'Leary et al., 2014; Ruiller et al., 2019; Siebdrat et al., 2013). Within this evidence, the effects of spatial distance weaken or disappear when accounting for psychological distance (e.g., O'Leary et al., 2014; Siebdrat et al., 2013). This indicates that psychological distance is more critical to understanding DTs.

As I have noted, it makes intuitive sense that spatial distance would generate psychological distance, in part by reducing visibility and awareness of other DT members. However, two quantitative studies do not support this intuition. In one study, spatial distance and psychological distance were not associated in a study of co-located and dispersed dyads, (O'Leary et al., 2014). In the other study, they were positively correlated at the team level (Siebdrat et al., 2013). However, this association was reduced after accounting for other variables in regression analyses, which indicates the possibility of moderators or mediators.

There are three primary explanations for a nonsignificant association between spatial distance and psychological distance found in those studies:

(i) spatial distance and psychological distance are unrelated;

(ii) additional variables determine psychological distance more strongly than spatial distance, and they obscure or moderate these weaker effects;

(iii) other methodological issues obscured the relationship between the two constructs.

First, despite being counterintuitive, spatial distance may not generate psychological distance in practice. The reasoning for this association was guided by intuition rather than strong theoretical reasoning (e.g., O'Leary et al., 2014; Wilson et al., 2008), or entangled with the consequences of spatial distance for communication (e.g., Siebdrat et al., 2013). Nevertheless, a positive effect, even if small, makes sense.

Second, spatial distance may generate psychological distance when all else is equal. However, all else is not typically equal in real-life DTs. Theory and empirical evidence indicate that communication influences psychological distance – in terms of main effects, and potential moderating rather than mediating effects regarding spatial distance (e.g., O'Leary et al., 2014; Walther & Bazarova, 2008; Wilson et al., 2013). Frequent communication may render the effect of spatial distance non-significant. However, this moderating effect has not been tested. I return to the direct and moderating effects of communication in Section 2.6.

Third, the team and dyadic levels of investigation may not be ideal for exploring the association between spatial distance and psychological distance. Siebdrat et al. argued that psychological distance across a team is more critical than in dyads because distributed work occurs in teams. I counter-propose that the foundations of teamwork are built upon individuals' contributions to teamwork, and individual-level cognition, including psychological distance, determine these contributions. Therefore, the individual level is the most appropriate to investigate these associations.

Moreover, Siebdrat et al.'s (2013) measure of psychological distance does not appear to be face-valid, so their findings may not accurately represent its relationships with other variables. Rather than capturing the perception of distance, their measure captures two other phenomena: the effort required to meet with DT members face-to-face, and virtuality of communication in the DT (e.g., percentage of communication via CMC)

In sum, I address two main gaps in this literature. One, I re-evaluate and test the association between spatial distance and psychological distance by more directly operationalising them at the individual level. Wilson and colleagues suggested that, intuitively, spatial distance generates psychological distance, yet this association is not firmly grounded in theory and has not played out empirically. However, empirical tests of this association did not account for communication in the same quantitative analysis, despite reasons to predict that it may obscure the effects of spatial distance (O'Leary et al., 2014; Siebdrat et al., 2013). In section 2.6, I continue to review relevant literature on communication in DTs and revisit the association between spatial distance and psychological distance. Two, the direct effects of psychological distance on DT outcomes are poorly theorised in part because these relationships are likely mediated. Though,

few studies beyond Wilson and colleagues' theoretical papers draw from theory to predict such mediators in DTs. I will further develop this work to investigate the mediated effects of psychological distance in DTs.

2.2.2 Social identity theory and social categorisation processes in distributed teams

Perceptions of other DT members likely form in part through psychological distance, but DT identification may also influence these perceptions (Ashforth & Mael, 1989; Tajfel & Turner, 1979). These socio-cognitive processes are usually examined in isolation from each other, yet they may act in parallel to influence perceptions of other team members and subsequent teamwork contributions. Work has begun integrating them in models of DT member dynamics and outcomes, but a critical issue remains; how researchers see these constructs working together is inconsistent (e.g., O'Leary et al., 2014; Ruiller et al., 2019; Wilson et al., 2008; Wilson et al., 2013).

As Tajfel (1978, p. 63) described, social identification "is that part of an individual's self-concept which derives from [his/her] knowledge of [his/her] membership of a social group together with the value and emotional significance attached to that membership". According to SIT, social identification emerges from individuals' motivation to classify themselves and others into social categories. From this process, belongingness and identification with the "in-group" develop**,** which allows individuals to classify, define, evaluate and compare oneself and others based on group membership (Hogg & Hornsey, 2006). Individuals identify with groups to improve their self-concept or to gain certainty and meaning around expectations (Hogg & Terry, 2000), balanced with distinctiveness from others (Vignoles et al., 2006). Social identification entails three distinct mechanisms: (i) perceiving oneself as similar to those in the in-group and dissimilar to those outside the group; (ii) reducing uncertainty; and (iii) attributing more positive traits to those in the in-group (Brewer, 1979; Hinds & Mortensen, 2005; Turner & Haslam, 2001).

Applying the tenets of SIT, researchers suggest that stronger team identification improves individuals' behaviours and attitudes towards their team by: increasing perceived shared similarity with the team, reducing uncertainty about expectations and needs of other team

members, and leading to more favourable biases or perceptions of in-group members which engender a willingness to help them (Bjorn & Ngwenyama, 2009; Hornsey & Hogg, 2000). Identifying with a team also orients individuals to adopt and pursue team goals over individual goals (Hogg & Terry, 2001; Postmes et al., 1998). Consequently, they should be motivated to work well with other team members and to maintain and improve their team's performance. I further apply these tenants of SIT to hypothesise more specific teamwork contributions in DTs in section 2.5.

Studies have empirically demonstrated benefits of social identification with co-located teams. These benefits include cooperative attitudes towards teammates (Ellemers et al., 2004; Tyler & Blader, 2003), commitment to team goals over personal goals (Van der Vegt & Bunderson, 2005; Van der Vegt, Van de Vliert, & Oosterhof, 2003), and cooperative behaviours (Blader & Tyler, 2009; Brewer & Kramer, 1986; Riketta, 2005; Tyler & Blader, 2000; 2003).

Similar benefits are expected in DTs but are less well empirically established. Studies reveal improved processes in DTs from stronger DT identification by strengthening cohesion when face-to-face communication is scarce or unavailable (Fiol & O'Connor, 2005). Moreover, greater DT identification reduces task and relationship conflict (Han & Harms, 2010; Hinds & Mortensen, 2005), and improves individual-level coordination and cooperation (Bos et al., 2010; Cramton & Hinds, 2005; Kane, 2010; O'Leary & Mortensen, 2010). Less clear is how and why spatial distance, considered separately to communication, influences DT identification development. Being physically separated or communicating primarily online with DT members should not preclude DT identification, though it may introduce difficulties developing it.

Studies that applied SIT to theorise the development of DT identification fit mostly into three streams:

(i) the application of SIT, and the social identity deindividuating model (the SIDE model) with the SIT framework, to predict and explain how reliance on CMC influences DT identification (e.g., Lea, Spears, & de Groot, 2001; Postmes & Spears, 1998; 2000; 2005; Postmes & Tanis, 2001);

(ii) fault-lines that fracture groups into subgroups, which weaken DT identification and may lead to poorer outcomes such as inter-subgroup conflict (e.g., Bos et al., 2010;

Chiu & Staples, 2013; Cramton, 2001; Cramton & Hinds, 2005; Harush, Lisak, & Glikson, 2018; O'Leary & Mortensen, 2010; Polzer et al., 2006; Prasad, DeRosa, & Beyerlein, 2017; Privman, Hiltz, & Wang, 2013; Webster & Wong, 2008; Yilmaz & Pena, 2014); and,

(iii) the effects of spatial distance – or other aspects of geographic distance between employees – on DT identification development (e.g., Bartel et al., 2012; Bradner, & Mark, 2002; Hakonen & Lipponen, 2008; Hinds & Mortensen, 2005; Mortensen & Hinds, 2001; O'Leary et al., 2014; Wilson et al., 2008).

The first group of studies concern communication rather than, or in addition to, spatial distance. These studies become pertinent when I return to the topic of communication in section 2.6. The second group of studies examines subgroup social identification and its implications for DT identification. These studies are beyond the scope of this study, but this stream will continue yielding valuable insights, and researchers may later add configurational distance and subgroup social identification to my theoretical model.

The third group of studies is relevant to answering the first research question. However, these studies have not determined how spatial distance from other team members influences individuals' DT identification. In the preceding section, I noted Wilson et al. (2008) and O'Leary et al. (2014) suggested that shared identity mediates this relationship. However, they did not provide theoretical reasons for expecting these pathways. Researchers have also conflated the theoretical effects of spatial distance and communication on DT identification. For instance, researchers have predicted that spatial distance reduces DT identification by reducing informal, spontaneous interaction, but these aspects represent communication rather than a direct effect of spatial distance (e.g., Mortensen & Hinds, 2001).

The most promising and straightforward reason to expect that spatial distance weakens DT identification is by reducing the DT's salience and attractiveness. A team's salience represents its relevance to an individual (Ashforth & Mael, 1989). Individuals in spatially distant teams might be 'out of sight, out of mind' and less salient because they are not as visible or accessible, with less apparent cues to their existence and relevance (Bartel et al., 2012; Fiol & Connor, 2005). However, considering only salience, spatial distance may not weaken DT identification;

once physically separated from others, increasing spatial distance may not further reduce their salience or visibility, aside from making face-to-face meetings more challenging to arrange (Fiol & Connor, 2005). Foster et al. (2015) drew from SIT to address this criticism by suggesting that spatial distance reduces social attraction. Considering social attraction with salience means that spatial distance may still reduce DT identification, whereby distant teams are considered less attractive targets with which to identify.

Indirect evidence for the relationship between spatial distance and DT identification is inconclusive due to methodological issues. For instance, an experimental study indicates that spatial distance weakens the mechanisms through which social identification develops (i.e., similarity and social attraction; Fujita, Trope, Liberman, & Levin-Sagi, 2006). However, 'distance' was manipulated ambiguously - representing either spatial distance or psychological distance – so it is unclear which 'distance' is responsible for this observed effect. Another experimental study manipulated distance using a similar method; Bradner and Mark (2002) found that 'distant' individuals were less likely to be categorised into the in-group, as indicated by the expected effects of social categorisation (i.e., positive attributions bestowed upon them). Those in the 'close' condition demonstrated greater cooperative behaviours towards the target, consistent with stronger social identification and categorisation of targets into the in-group. Their measure of identification was unrelated to the distance manipulation, but this was also poorly operationalised, with a single item reflecting interpersonal similarity rather than group identification (i.e., "I felt that I had a lot in common with the [target]"; Bradner & Mark, 2002).

Two additional studies come close to examining the relationship between spatial distance and DT identification, in real-world contexts, but their findings are mixed, inconclusive and even less direct. One study investigated perceived similarity in distributed dyads (O'Leary et al., 2014), and another explored other organisational foci of social identification among teleworkers (Bartel et al., 2012). O'Leary et al. (2014) concluded that spatial distance and shared social identification are unrelated, yet they did not examine team identification – they instead measured perceived similarity in terms of demographics, values and work commitment. Therefore, conclusions drawn from this result may be inaccurate. Moreover, Bartel et al. found that teleworkers identified less strongly with their organisation if they spent less time in their

central office. Narrative evidence from their study also indicates that psychological distance, rather than spatial distance, is responsible for reducing social identification with an organisational group (i.e., respondents reported that working remotely creates feelings of distance and separation from the organisation). However, they did not examine 'distance' variables directly.

In sum, research has established how and why DT identification can directly improve DT outcomes. However, work has not established or directly tested whether spatial distance influences DT identification. Considering SIT, spatial distance should reduce DT identification by reducing social attraction and salience of the DT. Moreover, psychological distance may be more critical to DT identification and its drivers and may mediate the effect of spatial distance. Investigating this mediation may resolve gaps in understanding how social identity influences individual DT members in parallel with other processes – in this case, psychological distance. Moreover, the pattern of previous findings and theoretical arguments indicate that communication via CMC and face-to-face may play direct and moderating roles for DT identification development. As I have noted, section 2.6 returns to these effects.

2.2.3 The association between psychological distance and distributed team identification

Prior studies have not adequately integrated psychological distance and DT identification, in part because they have not strongly theorised or tested their causal relationship. In fact, two sets of relationships have been proposed but have not been supported strongly:

(i) spatial distance precedes psychological distance, which in turn predicts social DT (de)identification (Siebdrat et al., 2013; Wilson et al., 2013); and

(ii) spatial distance precedes social identification, which in turn predicts psychological distance (O'Leary et al., 2014; Ruiller et al., 2019; Wilson et al., 2008).

A third set of relationships is plausible considering this review so far, but has not been directly proposed, whereby:

(iii) spatial distance precedes psychological distance and DT identification, which are in turn negatively associated in some way.

For these sets of relationships, researchers have not suggested convincing arguments grounded in SIT. Regarding the first set, Wilson et al. (2013) suggested that spatial distance generates psychological distance which then provides "the basis for identifying in-groups and outgroups" (p. 640). However, they did not implicitly include social identity in their model. Wilson et al. proposed these relationships to contrast SIT-based explanations against CLT-based explanations of the effects of psychological distance. They acknowledged that social identity and construal processes co-occur but did not detail how or why psychological distance should reduce social identification. Siebdrat et al. (2013) adopted similar reasoning.

Regarding the second set of relationships, Wilson et al. (2008) asserted that spatial distance reduces shared identity, which in turn increases psychological distance. However, as I have noted, they did not provide a reason for this effect. O'Leary et al. (2014) later reasoned that shared identity should reduce psychological distance because ingroup members should seem similar to the self, thereby instilling a 'psychological tie' which should make them feel more proximate. While this tie should strengthen relationships with ingroup members, its causal influence on psychological distance does not necessarily follow. For example, can someone not still feel far away from a sibling despite many years of shared experiences and common ground?

Considering the previous literature reviewed so far, the third set of relationships is possible. Whereby, spatial distance generates psychological distance and reduces DT identification, and psychological distance and DT identification are negatively related. However, this pattern has not been proposed or explored.

Empirical evidence is incomplete and inconclusive for determining which of the three sets of relationships is most accurate. Empirical studies indicate that psychological distance and social identification are negatively associated, but their methodology leaves their causality, and therefore each construct's place in a model of individual DT members' behaviours and attitudes, yet to be determined. These studies were cross-sectional (e.g., Ruiller et al., 2019; O'Leary et al. 2014) or conducted in lab settings in which ''spatial distance" was ambiguously manipulated (Fujita et al., 2006). Moreover, this association may be bi-directional, so

researchers can argue for either direction of causality unless they test the relative strength of both directions.

In sum, the causality between psychological distance and DT identification, and thus their relative place in models of individual-level attitudes and behaviours in DTs, has not yet been grounded in theory or empirically determined. We must start with a stronger argument grounded in SIT to predict how these constructs relate to each other, and then test this causal effect.

2.3 Construal of others as a mediator for the effects of psychological distance and distributed team identification

Precisely how DT identification and psychological distance work together to influence individual-level cognition and subsequent teamwork-related attitudes and behaviours is not well understood. Researchers have speculated on mechanisms explaining links between psychological distance and its outcomes in DTs, but they typically have not offered strong support for these speculations. Moreover, calls to investigate mechanisms for the effects of social identification in organisational contexts have yet to be fully answered, particularly in DTs (Ashforth, Harrison & Corley, 2008).

CLT (Trope & Liberman, 2010) offers the most promising line of inquiry to better integrate these processes in DTs. CLT is the dominant way of thinking about the general outcomes of psychological distance. Wilson et al. (2013) introduced CLT to the DT literature, applying it theoretically as a framework for understanding the role of spatial distance and psychological distance for individual-level cognitions concerning other team members. While their model provides an anchor on which to develop our knowledge of DTs, empirical support and further theory development is needed to better integrate psychological distance and social identification processes into this framework.

2.3.1 Construal-level theory and research

CLT was conceived to explain how psychological distance, as a general concept, influences how individuals cognitively represent events, objects and people across distances (Fujita et al.,

2006; Trope & Liberman, 2010). CLT proposes that individuals cannot directly experience events, objects or people that are not in the same physical place or time as themselves, so they must rely on cognitions to 'construe' them. CLT posits that we construe things or people who are physically distant and thus psychologically distant more abstractly or with more general characteristics (Trope & Liberman, 2010). Conversely, we construe things or people perceived to be closer more concretely with fewer characteristics. Liberman and Trope (1998) introduced the link between psychological distance and abstract construal, refining their arguments in subsequent papers (e.g., Trope & Liberman, 2003; 2010; Trope, Liberman, & Wakslak, 2007).

Construal as a construct is continuous rather than dichotomous. As our perceptions of a target become more abstract, we consider fewer contextual features, and the target becomes less detailed and specific. Abstract construals capture the general idea of the target and involve more global processing. Conversely, less abstract or concrete construals include more contextual, specific and observable information about the target. For example, abstraction of an object, such as an armchair, may range from an abstract construal of "furniture" (more abstract, less concrete), to "seat" (somewhat abstract), to "leather armchair" (less abstract, more concrete), and so on as psychological distance decreases (Liberman, Trope & Stephan, 2007).

A growing number of studies support CLT by establishing a positive association between psychological distance and abstract construal in general terms. This association is best demonstrated in a meta-analysis by Soderberg et al. (2015), of findings across more than 100 empirical papers. Their meta-analysis demonstrates a consistent positive effect of psychological distance on abstraction and its consequences, which is stable "across time, researchers, and settings" (p. 525).

CLT has been invoked to explain interpersonal processes and outcomes in management, including but not limited to procrastination (McCrea, Liberman, Trope & Sherman, 2008), stereotyping job applicants (McCrea, Wieber, & Myers, 2012), motivation and self-regulation (Fujita et al., 2006), conformity and norms (Ledgerwood & Callahan, 2012), and role integration (Reyt & Wiesenfeld, 2015). Researchers have regarded CLT as: "a promising new direction that could be useful to understand how [DT] members make sense of their teammates and the team

as a whole… [and may] advance our understanding of [DTs]" (Martins & Schilpzand, 2011, p. 62). However, domain-specific applications of CLT to explain outcomes of psychological distance from other people, such distributed teamwork, remain under-explored. How construal-level may explain at least partially the effects of DT identification, in parallel with psychological distance, also has not been addressed.

In a general sense, preliminary empirical evidence supports a positive association between psychological distance and abstract construal of other *people*, but more robust support is needed. For instance, in a seminal study of construal of activities of others, Fujita et al. (2006) manipulated 'spatial distance' by telling participants that, for example, people in a video recording were studying in a near location (same state) or a distant location (overseas). Participants provided written descriptions of activities in the video. The researchers examined these descriptions for abstractness using the linguistic categorisation model (Semin & Fiedler, 1988; I describe this approach in section 3.4.2). Compared to the near condition, the far condition led to more abstract descriptions. As I already noted, their manipulation of spatial distance might instead represent psychological distance. Consequently, their results may support a relationship between psychological distance, rather than spatial distance, and construal of others' *actions*, rather than the people themselves.

2.3.2 Construal-level applied to understand distributed team dynamics

Research has begun applying construal-level to DTs, and its relation to psychological distance and social identification, but it has proved challenging theoretically and empirically. I have in part noted that Wilson et al. (2008), O'Leary et al. (2014), Siebdrat et al. (2013), and Wilson et al. (2013) proposed the most similar models to the one I will develop (in section 2.5). These attempts to integrate key socio-cognitive constructs are inconsistent in how they view these constructs working together. Section 2.2 addressed some of these inconsistencies (i.e., the relationships among spatial distance, psychological distance, and social identification, and their relative places in a model of individual-level outcomes in DTs). I develop a theoretical model in part to address these and other inconsistencies. My model builds on previously proposed models with similar concepts and includes fundamental differences and contributions

regarding the relationships between these constructs and their individual-level outcomes in DTs.

The most promising approach to construal-level in DTs was outlined by Wilson et al. (2013). Recall from section 2.2.1, Wilson et al. (2008) developed a model of psychological distance – which included shared social identification - in distributed work contexts, that was adopted in subsequent papers (i.e., O'Leary et al., 2013; Ruiller et al., 2014; Siebdrat et al., 2013). However, work had not incorporated construal as the mechanism for the effects of psychological distance in DTs. To resolve this gap, Wilson et al. (2013) drew from CLT to explain the effects of spatial distance and psychological distance on general outcomes in DTs - i.e., mental representations of others - mediated by construal of other people. They also proposed how construal and social identification may influence similar outcomes in DTs. Wilson et al.'s (2013) model serves as a starting point for applying CLT to understand better the associations between spatial distance, psychological distance, DT identification, and construal of others, to predict individual-level attitudes and behaviours in DTs.

However, Wilson et al.'s (2013) model has not been tested. Researchers have tested isolated pathways contained in this model, but this work has proved problematic for reasons already outlined in this chapter. Theoretical and empirical challenges must be addressed to further develop and test Wilson et al.'s (2013) model in the field. I recognise three challenges: (i) psychological distance and DT identification have not been well integrated in a model of DT member contributions with construal of others as a construct—I began addressing this point in section 2.2; (ii) a lack of specificity regarding practical individual-level outcomes of construal in DTs; and most importantly, (iii) construal of other people is vaguely defined and not well operationalised. These issues mean that construal's role for distributed teamwork, and as a mechanism for the parallel effects of psychological distance and DT identification, has not been well established, theoretically or empirically.

First, papers that considered construal and social identification - or similar constructs - have not effectively integrated SIT and CLT or detailed how these constructs work together. In their review, Wiesenfeld et al. (2017) recognised this issue and posed questions for future research to answer, including whether organisational identification is associated with construal.

Integrating CLT and SIT in DTs means that perceptions of distance and social categorisation processes should both somehow influence construal of others. As I covered in section 2.2, we know that social identification and psychological distance influence similar outcomes, and that they are negatively related, despite uncertainty around their causality. Moreover, theoretical and empirical work has established that social identification with a group influences perceptions of other group members, which then have similar effects to those expected by CLT (e.g., Gibson et al., 2014; Haslam, 2006; O'Leary et al., 2014; Spears & Postmes, 2015; Trope & Liberman, 2010; Wilson et al., 2008; Wilson et al., 2013). Considering theory and evidence together indicates that DT identification may improve individuals' teamwork contributions at least partially via their construal of other team members.

Counter to Wilson et al.'s (2013) account - whereby social identification and construal processes influence similar outcomes in parallel through distinct mechanisms - I propose that DT identification directly reduces abstract construal of other DT members. They cited two studies to support their argument: Liviatan, Trope and Liberman (2008) and Fujita et al. (2006). Wilson et al. made assumptions based on their reading of these studies, yet these assumptions may be flawed and leave open the possibility for a relationship between DT identification and construal of others in DTs.

First, Liviatan et al. (2008) treated psychological distance as a mediator between social categorisation effects (i.e., perceived similarity conceptualised as low social distance) and construal of another person. Their participants expressed more interest in receiving information about secondary, subordinate features (e.g., the dress code) of a socially close target and not information about primary, superordinate features (e.g., salary), which Wilson et al. argued is counter to what would be expected by SIT. Concrete construals should include subordinate and secondary or specific features, whereas abstract construals should include primary or general features. Even after adjusting for liking, the effect of 'social proximity' on the interest in concrete information remained significant (Liviatan et al. 2008). In their arguments for explaining these effects with CLT rather than SIT, Wilson et al. assumed that dress code represented a secondary feature and not a primary feature regarding the categorisation process. However, this may not be true of these features, leaving open the possibility that

social identification influences construal of others. One may explain those findings by imagining that construal partially mediates the effects of similarity. That is, participants who felt similar to the target may have identified them as part of their in-group and therefore saw them in similarly concrete ways as the self, rather than as an outgroup member who is different and more abstract.

Second, Wilson et al. referenced Fujita et al.'s (2006) paper, which I previously outlined in this chapter, to demonstrate that social identification and construal are unrelated, but limitations of their paper mean their conclusion is premature. Participants who were told that actors in a video were in a near rather than a distant site rated them as more similar than themselves, in line with SIT and the expected attraction effects of distance. More importantly, the ratings of similarity were not correlated with abstraction of their actions. At first glance, this finding seems to indicate that social identity and construal are unrelated. However, it may instead represent issues with their operationalisation of construal of actions rather than of people, yet perceived similarity concerns construal of people rather than their actions. Therefore, we cannot conclude that these constructs are not associated; the participants who felt more like the "spatially closer" actors may still have construed them in more concrete ways. Further, it is unclear whether Liviatan et al. (2008) and Fujita et al. (2006) support Wilson et al.'s (2013) assertions, because neither study directly examined individuals' construal of other people or their social identification with a team. Furthermore, researchers have not directly tested whether social identification influences construal. More broadly, psychological distance and construal-level are rarely discussed alongside other processes explaining similar outcomes.

Wilson et al.'s (2013) full model has not yet been applied to address challenges in DTs, in part because it lacks specificity regarding individual-level behavioural or attitudinal outcomes. Wilson et al. briefly mentioned that abstract construal might worsen individuals' coordination with others. From CLT, they reasoned that people abstractly construe psychologically distant others and consequently focus on 'the forest rather than the trees' when perceiving them (Reyt & Wiesenfeld, 2015). Thus, they would be less aware of distant others' concrete details and their contexts, reducing their capacity to coordinate with them. Beyond the proposed effects on general cognitions, Wilson et al. did not explore other specific behavioural or attitudinal

outcomes of construal in DT. Moreover, beyond 'direct' adverse effects of psychological distance on relationship quality and teamwork (e.g., Cha et al., 2014; O'Leary et al., 2014; Ruiller et al., 2019; Siebdrat et al., 2014), more specific individual-level outcomes of construal have not been tested in DTs.

The most fundamental issue for construal-level research, particularly regarding DTs, is that construal is vaguely defined and not well operationalised (if at all). Construal of other people, in particular, has yet to be directly measured in an empirical study. Instead, construal of other people is assumed from observed effects (e.g., Liviatan et al., 2008; Wilson, 2014), or indirectly measured with construal of the target's *actions* (e.g., Fujita et al., 2006; Reyt & Wiesenfeld, 2015; Vallacher & Wegner, 1989; Wiesenfeld et al., 2017). Additionally, experimental studies manipulate construal-level *mindset* rather than operationalising construal directly and as a continuous construct (e.g., Ledgerwood & Callahan, 2012). This means empirical studies have yet to demonstrate the actual antecedents and consequences of construal of other people in DTs (Wilson et al., 2013).

Because of how DT studies have – or have not – operationalised construal of other people, discussions of its antecedents and outcomes are typically vague and not well tested empirically. For example, in a follow-up experimental study, Wilson (2014) found support for part of the Wilson et al. (2013) model in terms of their proposed cognitive outcomes of distance, yet their study included the aforementioned conceptual issues. Wilson (2014) examined spatial distance and construal-level-related attributions. After manipulating spatial distance by assigning participants into 'co-located' or 'distributed' groups, Wilson found the theorised effects of construal-level (i.e., higher perceived within-person variance in co-located groups). From this finding, Wilson inferred that construal-level mediates the relationship between distance and trait-based attributions. However, I treat these results as preliminary, because the researchers inferred, rather than directly measured, psychological distance and construal-level from their predicted effects—and similar effects are commonly explained with social identity processes directly, rather than with construal-level. This issue is in addition to, and further compounded by, supposed manipulation of spatial distance which may or may not represent psychological distance instead, as discussed in sections 2.2.1 and 2.3.1. To solve this issue, Reyt & Wiesenfeld

(2015) suggested that researchers could, in the future, operationalise construal-level in domain-specific ways.

2.3.3 Summary of psychological distance, social identification, and construal-level in distributed teams

In sum, we know that spatial distance from colleagues does not always worsen DT member outcomes (O'Leary et al., 2014; Siebdrat et al., 2013). Theoretical and empirical studies indicate that the socio-cognitive processes of psychological distance and DT identification are more critical than spatial distance, and at least theoretically may mediate its effects (O'Leary et al., 2014; Wilson et al., 2008; Wilson et al., 2013). We also know from these works that DT outcomes are improved by reducing psychological distance and strengthening DT identification (Bos et al., 2010; Bradner & Mark, 2002; Bjorn & Ngwenyama, 2009; Cha et al., 2014; Cramton & Hinds, 2005; Han & Harms, 2010; Hinds & Mortensen, 2005; Kane, 2010; O'Leary et al., 2014; Siebdrat et al., 2013). Furthermore, theory suggests that abstract construal of other people in DTs may worsen teamwork contributions because it involves less awareness and attention towards others, and their context and needs, in addition to attributions of others' negative behaviours or outcomes to character flaws rather than situational constraints (e.g., Cramton, 2001; Ledgerwood et al., 2010; Wilson et al., 2013).

However, significant knowledge gaps remain in this area. For instance, we do not know why spatial distance does not always lead to adverse DT outcomes, in part because methodological issues remain unresolved (e.g., focusing on comparing DTs and co-located teams, inconsistent operationalisation of spatial distance, and over-reliance on lab studies and student samples). Perhaps more important to address is the under-theorisation of the socio-cognitive processes through which spatial distance influences teamwork contributions, and how these processes work together to influence DT outcomes. Intuitively, spatial distance should generate psychological distance, but this does not always play out (e.g., O'Leary et al., 2014; Siebdrat et al., 2013), and theoretical reasoning for this association has been weak so far. We also do not yet know whether spatial distance reduces DT identification. Compared to spatial distance, psychological distance may be a better predictor of DT identification (e.g., Ruiller et al., 2019; Siebdrat et al., 2013; Wilson et al., 2013), but we do not know precisely how psychological

distance and DT identification influence each other. We know they are negatively related (e.g., Fujita et al., 2006; O'Leary et al., 2014; Ruiller et al., 2019) but we do not know the dominant causal direction of this relationship and how these constructs fit together in a model of individual team members' teamwork contributions.

Considering CLT should address this knowledge gap at least in part. CLT indicates that construal of other people in DTs should mediate the effects of psychological distance on individual-level attitudes and behaviours in DTs (Fujita et al., 2006; Wilson et al., 2008; Wilson et al., 2013) – but we do not know this empirically. Considering SIT and CLT together also indicates that construal of others at least partially mediates the effects of DT identification, and by extension represents a shared mechanism for the effects of psychological distance and DT identification – but we also do not know this empirically.

To better understand the socio-cognitive processes influencing individuals in DTs, I build and test a theoretical model that extends the model proposed by Wilson et al. (2013). In building this model, I address the relevant limitations discussed in this review. This model will contrast with previous theoretical models of psychological distance and construal-level in DTs, and supporting empirical works, by:

(i) Further integrating social identification with psychological distance and construal-level, by proposing that construal-level mediates the parallel effects of psychological distance *and* DT identification in DTs;

(ii) Specifying individual-level behavioural and attitudinal outcomes and how they may be predicted by construal-level and more distally psychological distance and DT identification in the same model;

(iii) In the field study, measuring individuals' spatial distance, psychological distance, and DT identification, rather than inferring, indirectly measuring, or manipulating these variables; and

(iv) Conceptualising and testing a negative causal effect of psychological distance on DT identification.

Before developing the model, I must address the most problematic challenge to construal-level research applied to DTs: the vague definition and operationalisation of construal of other

people. To overcome this issue, I employ the construct of dehumanisation as a form of construal of other people that applies to DTs. In the next section, I draw from theory and existent evidence to make a case for conceptualising and operationalising construal in this way.

2.4 Conceptualising dehumanisation as a domain-specific form of construal of others in distributed teams

2.4.1 Conceptualising abstract construal of other people with the concept of dehumanisation of others

Addressing the operationalisation of construal of other people requires an understanding of its meaning in practical terms. We know that construal of objects can be represented by abstract descriptions focusing on the superordinate characteristics (e.g., seat) or more concrete descriptions focusing on the sub-ordinate characteristics (e.g., Eames lounge chair in black leather and walnut wood). However, the literature contains no 'concrete' examples or specific meanings of the degrees of abstraction of other people. As I have mentioned, researchers have instead represented construal of other people with descriptions of the activities of others (e.g., Fujita et al., 2006). However, this representation does not capture construal of people themselves.

A critical way in which individuals construe others is with the extent to which they perceive characteristics underlying what it means to be human and 'real'. Dehumanisation signifies an individual's perception that another person or group lacks characteristics underlying what it is to be human (Haslam, 2006). An abstract construal of an object means it is perceived with ill-defined or fewer characteristics with less attention to its context. Similarly, perceiving less humanness in a person means that that they seem less well-defined, and are attributed less specific or fewer human characteristics, with lesser acknowledgement of their context. These perceptions of the humanness of others are best described and explained within the framework of dehumanisation.

A significant contribution of this study is that it addresses the problem of operationalising construal of other individuals in distributed contexts, by using the construct of dehumanisation of others[2]. Used in this way, dehumanisation represents a specific and measurable form of construal of other people, which is conceptually the same phenomenon with the same antecedents and consequences. It parsimoniously ties the separate research streams together, including the areas of psychological distance and construal-level, social identification, dehumanisation, and DTs. I will now expand on these ideas to further build the conceptual model with construal of others as the focal point, represented by the dehumanisation of others in the DT.

2.4.2 Dehumanisation of other people

Dehumanisation signifies an individual's perception that another person or group lacks human characteristics (Haslam, 2006). There are two main approaches to conceptualising dehumanisation: infrahumanisation (e.g., Leyens et al., 2001; Leyens et al., 2003; Leyens, Demoulin, Vaes, Gaunt, & Paladino, 2007) and the dual model of dehumanisation (e.g., Haslam & Bain, 2007; Haslam & Loughnan, 2014; Haslam et al., 2005). Infrahumanisation concerns comparing out-groups to the in-group, rather than intragroup dehumanisation (Leyens et al., 2007). However, evidence demonstrates that dehumanisation also occurs interpersonally (Haslam, 2006). More recently, Haslam proposed two forms of dehumanisation: animalistic and mechanistic. Animalistic dehumanisation occurs when people view others as lacking characteristics that distinguish humans from animals such as cognitive capacity, civility and refinement (Haslam & Loughnan, 2014). Mechanistic dehumanisation occurs when people view others as "object- or automaton-like", based on perceived low emotionality, vitality and warmth (Haslam & Loughnan, 2014, p. 405). Mechanistically dehumanised others are viewed as

[2] Originally, I attempted to directly operationalise construal-level by devising and testing new measures. However, testing these measures in pilot studies demonstrated poor validity and reliability. These pilot studies, including the newly created measures, are described in Chapter 3. After reviewing these measures, I decided they were not adequate to use in further field studies. Subsequently, I abandoned them and searched the literature for a construct that embodies construal of other people. It became clear that dehumanisation represents abstract construal of others in a manner that is compatible with my conceptual model, with robust measures available, that also provides a literature and framework with additional evidence for my model.

lacking human nature and seen as automatons or objects rather than 'real' people with human minds.

In this study, I focus on mechanistic dehumanisation as abstract construal of other people in a practical sense, acting as the common cognitive outcome of psychological distance and DT identification. I focus on the mechanistic form of dehumanisation rather than the animalistic form, because mechanistic specifically entails perceiving others in a decontextualized and more abstract, less real manner. A connection between construal, and by extension psychological distance, and mechanistic dehumanisation as a 'colder' and more shallow perception of others has been noted as possible but not explored in any depth (Haslam, 2006). Mechanistic dehumanisation represents construal of people in the sense that it represents the cognitive construal of people in a less concrete, detailed or 'real' sense. I propose that mechanistic dehumanisation represents an abstract construal and thus mechanistic (rather than a humanistic or animalistic) mental representation of another or a group of others. Therefore, other people who are increasingly psychologically distant should be increasingly abstractly construed as ill-defined objects or automatons that lack emotionality, warmth, depth, individuality, and 'real' minds.

2.4.3 Evidence supporting dehumanisation as the domain-specific representation of construal of other people

Conceptualising construal of other people with dehumanisation is indirectly but strongly empirically supported. For instance, in a study of mechanistic dehumanisation, dehumanisation reduced when individuals considered the preferences of 'others' and the minds of others (Fiske, 2009). Though the researcher did not explain their findings with CLT, considering dehumanisation as abstract construal of other people provides a parsimonious explanation for their results. Considering the preferences and the other person as 'real' entity in their context should lead to more concrete perceptions of the other. Lower mechanistic dehumanisation represents these concrete perceptions.

Additional evidence is less direct but supports conceptualising construal of others with dehumanisation, motivated by psychological distance. Empirically, the self is considered to

possess greater humanness than other people, yet this phenomenon is not tied to self-enhancement, self-esteem or culture (Loughnan et al., 2010). Loughnan et al. did not conceptualise dehumanisation as construal of people, yet their finding is an example of construing other people—who are by definition always more distant than the self—more abstractly and less human than the self. This phenomenon alone may not establish that dehumanisation is abstract construal. For instance, individuals directly experience the self, whereas they cannot directly experience others' minds and feelings. Therefore, individuals see themselves as more human than others. However, in conjunction with other evidence, dehumanisation should represent construal of other people.

Its associations with psychological distance in three studies outside the DT context provides further evidence that dehumanisation represents abstract construal of people. First, psychological distance (temporal) from a 'future' self leads to dehumanisation of that future self (Haslam and Bain, 2007). Second, individuals dehumanise themselves when they experience psychological distance from themselves after they played violent video games and experienced cognitive dissonance (Bastian et al., 2012). Third, doctors tend to dehumanise spatially distant patients (Haque & Waytz, 2012). With this last finding, Haque and Waytz suggested addressing dehumanisation by decreasing psychological distance between doctors and their patients. They did not elaborate on this issue, nor did they mention construal-level as a mechanism for this association. Instead, they discussed the reduction of empathy, and a lack of physical contact or direct perception of patients, as the mechanism between distance and dehumanisation. I propose that psychological distance and CLT provide a more parsimonious and logical explanation of their findings. Moreover, using dehumanisation as a form of abstract construal of others in DTs further explains the potential adverse outcomes from greater psychological distance. Wilson et al. (2013), for example, explained these effects in terms of greater homogeneity of distant others, yet dehumanisation as construal can explain potential effects further while bridging these effects to another substantial area of literature.

Applying dehumanisation to construal-level among members of DTs extends dehumanisation research further into the organisational domain. Though studies have examined it in organisational contexts (e.g., among doctors and patients in hospitals; Haque &

Watz, 2012; Lammers et al., 2012; Vaes & Muratore, 2013), or with prosocial or antisocial behaviour in formalised teams among students (e.g., Alnuaimi et al., 2010), there remains a dearth of research applying dehumanisation to issues of management in real-world organisational contexts. Therefore, looking at construal-level with dehumanisation allows us to demonstrate better how spatial distance, psychological distance and DT identification together influence individuals' contributions in DTs.

Representing construal of others with dehumanisation addresses criticisms that cognitive and social explanations of dehumanisation are underexplored. Researchers typically suggest that reduced empathy explains adverse acts towards dehumanised others (Haslam, 2006). However, CLT can be invoked to explain these effects more fully. CLT can explain dehumanisation and associated decreased empathy towards others in DTs as an outcome of psychological distance and social identification, with subsequent effects on attitudes and behaviours. Drawing from CLT, I propose that perceiving someone more abstractly (and as less-than-human) means less clarity around their potential suffering and reduced cognisance of their actual or potential experience. Similar to how current acts may not be linked as concretely to contributing to future events because they are viewed more abstractly than the present, so too might an individual fail to link current acts (or inaction) to abstract others. Recall that viewing someone more abstractly means they seem less similar to the self and more abstract, and they are afforded less empathy. Consistent with CLT, dehumanisation is associated with difficulties perceiving similarities between self and dehumanised others (Alnuaimi et al., 2010). Therefore, the needs of others who are seen more abstractly, and thus dehumanised, can more easily be ignored. So, dehumanisation of others in DTs should reduce pro-social attitudes and behaviours towards them.

In the next section, I will build the primary theoretical model with hypotheses that will guide the field study. This model will be used to investigate the chain of relationships between spatial distance, psychological distance experienced from the DT, DT identification, dehumanisation of others in the DT, and attitudes and behaviours that support teamwork, at the individual level.

2.5 Model One: Individual-level distributed teamwork contributions based on perceptual processes

2.5.1 Individual-level contributions to distributed teamwork: Cooperation, coordination, and conflict

The success of all teams, whether co-located or distributed, requires that individual team members complete their tasks and facilitate effective and efficient teamwork towards accomplishing team goals (Bedwell et al., 2012; Salas et al., 2005). In DTs, spatial distance from other team members likely shapes individual-level contributions to teamwork through individual-level cognitive mechanisms. These mechanisms necessitate an individual-level perspective using individual-level constructs. Ultimately, I am interested in how construal of others, DT identification and psychological distance drive specific attitudes and behaviours towards others in DTs.

CLT, SIT, and research identifying attitudes and behaviours supporting task collaboration and team maintenance (Rousseau, Aube, & Savoie, 2006), indicate that cooperation, coordination, and conflict represent essential contributions that facilitate teamwork in DTs. Focusing on these 'teamwork contributions' addresses the lack of specificity regarding outcomes of construal, a problem in the literature identified in section 2.3. Strong associations between social identification with teams and these outcomes, or similar, are well documented in co-located teams (e.g., Blader & Tyler, 2009; Ellemers et al., 2004; Riketta, 2005; Tyler & Blader, 2003; Van der Vegt & Bunderson, 2005; Van der Vegt et al., 2003) and to a lesser but still substantial degree in DTs (e.g., Cramton & Hinds, 2005; Fiol & O'Connor, 2005; Hans & Harms, 2010; Hinds & Mortensen, 2005; Kane, 2010; O'Leary & Mortensen, 2010). Recall from Section 2.3.3, specific outcomes of construal-level for DT members are not well documented directly, but theory indicates that these links are likely.

Teamwork is based on cooperation (Penarroja, Orengo, Zornoza, & Hernandez, 2013), which consists of cooperative behaviours and attitudes (Bedwell et al., 2012). I define individual-level cooperative behaviours in DTs as "a set of behaviours directed towards joint effort with other individuals in a team" (Koster, Stockman, Hodson, & Sanders, 2007). In this context, cooperation includes engaging with other team members with an underlying orientation to

accomplishing team goals (Robert, 2016). Thus, I also examine cooperative attitudes, which are an individual's concern for their team's overall goals and a desire to work with other individuals in their team to achieve their team goals.

Coordination facilitates efficient teamwork (Bedwell et al., 2012; Penarroja et al., 2009). The broad definition of coordination used in this study, adapted from Bedwell et al. (2012; p. 135), is "the planning and scheduling of ones' interdependent tasks with consideration of the requirements and interdependencies of others to efficiently accomplish work tasks". As with all other variables in this study, I operationalise coordination at the individual level. Coordination is typically conceptualised at the team level, representing how well interdependent tasks (and sometimes knowledge and expertise) are sequenced and organised across the team (e.g., Brandon & Hollingshead, 2004; Entin & Serfaty, 1999). However, coordination is not necessarily a team-level or interactive process; the mechanisms of coordination can be conceptualised at the individual level. Individuals are responsible for planning and executing their behaviours and anticipating the actions and timing of others' interdependent tasks (Knoblich & Jordan, 2003).

Examining conflict provides insight into cognitive processes that contribute to individuals' experience of disagreements with their team. Scholars have conceptualised conflict into three distinct forms: relationship, task, and process conflict (Jehn, 1994; Jehn, Northcraft, & Neale, 1999). Task conflict refers to disagreements regarding work content. Relationship conflict refers to interpersonal, emotional and non-work specific disagreements, including personality clashes and incompatible values. Process conflict refers to disagreements over how tasks are done and issues such as dividing responsibilities. Other conceptualisations exist (e.g., Amason, 1996; Barasade, Ward, Turner, & Sonnenfeld, 2000; Cheung & Chuah, 2000). However, the role of conflict here is to examine antecedents of distributed teamwork contributions, rather than to solve conceptual issues of the construct, and my hypotheses reflect conflict more generally. Though I am primarily interested in predicting conflict in a general sense, I conceptualise conflict into the three forms suggested by Jehn and colleagues because it is the dominant approach and because it may yield nuanced findings into why particular mechanisms lead to particular types of disagreements.

The contributions that individuals make to their team – including cooperating and coordinating with others, and avoiding high levels of conflict - are vital to team effectiveness. Despite mostly focusing on the team level, empirical evidence demonstrates that these contributions lead to DT performance (Hoegl et al., 2007; Kaiser, Tullar, & McKowen, 2000; Martinez-Moreno, Gonzalez-Navarro, Zornoza & Ripoll, 2009; Montoya-Weiss, Massey, & Song, 2001; Mortensen & Hinds, 2001). For instance, cooperative attitudes have been associated with DT performance (Kaiser et al., 2000). Moreover, conflict has been negatively associated with general DT effectiveness (Martinez-Moreno et al., 2009; Montoya-Weiss, Massey, & Song, 2001). Behavioural contributions to teamwork, including better group task work, coordination, and reduced conflict, are more critical for performance in DTs than in co-located teams (Hoegl et al., 2007; Mortensen & Hinds, 2001).

2.5.2 Individual-level contributions to distributed teamwork in the context of spatial distance

In this study, spatial distance refers to the physical distance (i.e., kilometres) between the locations where team members are (usually) located and conduct their work tasks. As I outlined regarding more general outcomes in Section 2.1.2, an individuals' greater spatial distance from other DT members should weaken their cooperative attitudes, reduce their cooperative behaviours and coordination with others, and increase their experience of conflict, because it entails less visibility, salience, and contextual information available, and more uncertainty (Bradner & Mark, 2002; Hogg & Terry, 2001). When further removed from a person or group, they should be less 'top of mind' than they would otherwise, which should weaken cooperative attitudes towards them. Spatial distance should also reduce the ability to cooperate by entailing lesser visibility of the team and those within it and may restrict knowledge of the team and its goals (Alnuaimi et al., 2010; Hertel et al., 2004). Moreover, greater spatial distance may heighten conflict by obscuring contextual information, making it harder to develop a mutual understanding of other DT members' tasks, concerns, needs, and processes (Hinds & Bailey, 2003). A shared physical context helps to avoid and manage conflict; without it, solving

problems and developing a mutual understanding are more difficult, increasing the risk of conflict (Cramton & Hinds, 2001; Cramton et al., 2007; Hinds & Bailey, 2003).

Previous studies have demonstrated lower cooperation and coordination, and greater conflict, in DTs compared to co-located teams (e.g., Cramton & Hinds, 2001; Cramton & Webber, 2005; Furumo, 2009; Hinds & Bailey, 2003; Polzer et al., 2006; Robert, 2016). However, the reasons for these differences are unclear because distributed-ness, or spatial distance, has not been examined consistently in these studies (De Guinea et al., 2012). Moreover, recall from section 2.1.2 that studies have demonstrated non-significant associations between spatial distance from others, and relationship quality in dyads and collaboration in teams (O'Leary et al., 2014; Siebdrat et al., 2013). As I previously intimated, intervening processes—including perceptions—have not been considered enough (O'Leary et al., 2014). All else being equal, and considering the existing evidence, increasing spatial distance from others in DTs should lead to weaker individual-level contributions and greater conflict with others. However, 'all else' is not equal; the effects of spatial distance are probably indirect via the perceptual processes of psychological distance, social identification, and dehumanisation of others. Furthermore, other factors — such as communication — may moderate its effects. Therefore, I do not hypothesise direct effects of spatial distance on individuals' contributions to distributed teamwork.

2.5.3 Pathways from spatial distance to psychological distance and distributed team identification

Following from section 2.2.1, spatial distance may still generate psychological distance overall, despite opposing conclusions and initial evidence (e.g., O'Leary et al., 2014; Siebdrat et al., 2013). I expect that spatial distance generates *some* psychological distance directly; intuitively, being physically farther from someone should translate to feeling farther away, even if this does not always occur. I expect that this effect is diminished by moderators (e.g., communication) or is at least partially mediated by other variables, as will be discussed. However, I begin with a baseline hypothesis that spatial distance generates psychological distance:

Hypothesis 1: Spatial distance is positively associated with psychological distance in DTs.

Recall from section 2.2.2 that greater spatial distance from other DT members should weaken individuals' DT identification by reducing the team's social attraction (Bradner & Mark, 2002) and salience (Siebdrat et al., 2013). Also, from section 2.2.2, empirical tests of this relationship are inconclusive, potentially because those studies have poorly operationalised the constructs. Alternatively, though visibility may strengthen DT identification under circumstances which are not apparent when focusing on the direct effects of spatial distance, visibility, and thus DT identification, may depend on moderators (Hogg & Terry, 2001; Radner & Mark, 2002; Siebdrat et al., 2013). I propose that spatial distance reduces DT identification in general, though I later discuss how this relationship may change when considering psychological distance and moderating variables in section 2.6. I test the following hypothesis:

Hypothesis 2: Spatial distance is negatively associated with DT identification.

2.5.4 Psychological distance and individual-level contributions in distributed teams

As I have noted, psychological distance is likely more relevant and proximal than spatial distance to distributed teamwork contributions, and it may be responsible for transmitting at least part of the influence of spatial distance onto these contributions (O'Leary et al., 2014; Siebdrat et al., 2013; Wilson et al., 2008; Wilson et al., 2013). Empirical evidence cited in section 2.2.1 demonstrates negative associations between psychological distance and teamwork-supporting outcomes in DTs (Bradner & Mark, 2002; Cha et al., 2014; O'Leary et al., 2014; Ruiller et al., 2019; Siebdrat et al., 2013). These papers did not examine or refer to mediating mechanisms, despite indications from CLT that the effects of psychological distance are mediated by construal of other DT members (Trope & Liberman, 2010; Wilson et al., 2013). Therefore, I do not hypothesise direct effects of psychological distance onto individual-level

contributions. Instead, in section 2.5.7, I build hypotheses predicting that dehumanisation mediates the effects of psychological distance onto the outcome variables.

2.5.5 Pathways from distributed team identification and individual-level contributions in distributed teams

According to SIT, stronger DT identification should directly improve individual-level contributions to teamwork. These effects should occur for at least four reasons:

(i) By providing a sense of shared meaning that is essential for teamwork, helping individuals to interpret and act on others' behaviours, especially in uncertain contexts (Bjorn & Ngwenyama, 2009);
(ii) By orienting individuals towards team goals rather than personal goals, which motivates them to cooperate and coordinate with other team members (Brewer, 1999; Postmes, Spears & Lea, 1998)
(iii) By tying individuals' sense of self to their team-related esteem, motivating them to coordinate and cooperate to achieve team goals (Hogg & Terry, 2001).
(iv) By biasing individuals to overestimate the positive characteristics and contributions of in-group members – and underestimate out-groups (Hornsey & Hogg, 2000).

Regarding the fourth point, these biases should predispose team members to think and behave favourably towards other team members, and consequently demonstrate cooperative attitudes and behaviours. Conversely, if an individual does not identify strongly with their DT and the team is not seen as a relevant in-group, they may behave less favourably towards other team members and experience more conflict with their team.

Per the review in section 2.2.2, considering the empirically demonstrated effects of social identification on teamwork-related outcomes in co-located teams, the relevant theory and preliminary studies of similar outcomes in DTs, I expect to find the following direct associations:

Hypothesis 3: DT identification is associated with:

a) Greater cooperative attitudes;
b) Greater cooperative behaviours;
c) Greater coordination; and
d) Lower conflict.

Considering the associations hypothesised so far, DT identification should mediate the relationships between spatial distance and individual-level contributions to distributed teamwork. A similar mediating relationship between spatial distance and team outcomes has been suggested more generally (Foster et al., 2015). The current study furthers Foster et al.'s account of mediation by testing social identification's effects on specific contributions to teamwork. I hypothesise and test the following:

Hypothesis 4: DT identification mediates the relationship between spatial distance and:

a) Cooperative attitudes;
b) Cooperative behaviours;
c) Coordination; and
d) Conflict.

2.5.6 The pathway from psychological distance to distributed team identification

In this study, I build on the review of theory and empirical studies in Section 2.2.3 to propose that lower psychological distance is critical for stronger DT identification and that this causal direction of effects is stronger than the reverse. I acknowledge this association could be bi-directional, but I contend that the reasons for this direction are more strongly founded in theory. Specifically, SIT and social categorisation processes indicate that greater psychological distance should reduce DT identification by reducing the fundamental drivers of social identification, including the DT's social attractiveness, similarity to self, and salience (Bradner &

Mark, 2002; Hogg & Terry, 2001; Siebdrat et al., 2013; Wang, Walther, & Hancock, 2009; Wilson et al., 2013). In Chapter 4 (Results), I will test these directional effects to determine their causality. In the field study, I test the following hypothesis:

Hypothesis 5: Psychological distance reduces DT identification.

2.5.7 Pathways from psychological distance and distributed team identification to dehumanisation

The dominant conceptualisations and explanations for the occurrence of dehumanisation are derived from SIT, indicating social identification as a critical antecedent. However, considering dehumanisation as construal of other people means that greater psychological distance should increase dehumanisation. Researchers briefly mentioned that this effect might occur, yet they have not tested it in DTs (Haslam, 2006; Haslam & Bain, 2007). Considering theoretical reasons for a positive association between psychological distance and construal of others, and the theoretical and empirical support for conceptualising mechanistic dehumanisation as this construal, I expect greater psychological distance to strongly increase abstract construal of other DT members, represented by greater dehumanisation. In the field study, I test the following hypothesis:

Hypothesis 6: Psychological distance is positively associated with dehumanisation of others in DTs.

The proposed chain of relationships so far does not represent the whole picture. Questions arise such as: 'What role does social identification play in perceptions of others conceptualised as the construal of others?' and 'What role does construal of others play in explaining at least part of social identification's effects on individual-level contributions, in parallel with psychological distance?' As I proposed in section 2.4, dehumanisation of others represents construal of others and is usually explained with social identification and SIT. Regarding the chain of processes between spatial distance and contributions to distributed teamwork, DT

identification should be more proximal to dehumanisation than to cooperation, coordination and conflict. Moreover, it may be a critical mediator – in parallel with psychological distance – between spatial distance and dehumanisation (Haslam, 2006). So, I build hypotheses which propose that dehumanisation at least partially mediates the effects of DT identification and psychological distance in DTs.

Considering CLT and SIT together, I put forward that stronger DT identification reduces dehumanisation of other team members in DTs. Leyens and colleagues (e.g., Leyens et al. 2001; 2003; Vaes et al. 2003) theorised that dehumanisation involves seeing out-groups as less human than in-groups. By extension, individuals that identify with the group attribute more human characteristics to in-group members than they would otherwise. These effects should occur for two reasons: one, by developing perceptions of similarity with others in the team, thereby perceiving team members as similarly human and less abstract; and two, by focusing attention away from others as individuals and instead towards considering them in terms of the in-group, and by extension perceiving them as more human. Stronger DT identification should reduce dehumanisation because it should entail perceptions of greater similarity to other team members, so they should be seen to possess similarly 'concrete' and 'human' characteristics. As Alnuaimi et al. (2010, p. 212) stated: "perceived dissimilarity with others is the core mechanism [of] dehumanisation". Perceptions of 'shared humanity' with others decrease when they seem to possess different values (Schwartz & Struch, 1989). Viewed in terms of CLT, those perceived as similar to the self (i.e., the team) should be viewed in more human terms, because they should view the self as less abstract and more human. Moreover, Haslam (2006) indicated that social identification enables dehumanisation of out-group members through perceptions of those people as lacking individuality and qualities that make them 'human'. When DT identification is low, team members should seem dissimilar to the self, less concrete and thus less human, and seen in terms of dehumanised mechanistic stereotypes.

Empirical studies indirectly support a negative influence of social identification (or its core aspects) on dehumanisation of others. Research has demonstrated that the degree of similarity with a target's group, rather than the status of the out-group, negatively determined the degree of dehumanisation (Rodriguez-Perez et al., 2011). Indeed, perceived similarity, as an

indirect indication of social identification, has been associated with concrete construal of others' actions (Leviatan et al., 2008). Further supporting these effects, studies demonstrate a positive association between social identification with a group and humanisation of in-group members when the group is meaningful (Demoulin et al., 2009; Paladino et al., 2002). DTs, rather than a randomly assigned group or one based on arbitrary distinctions, constitute meaningful groups.

Studies of power further illustrate the utility in considering SIT and CLT together. Power differentials between individuals or groups have been associated with greater dehumanisation, but only towards those with less power (Gwinn, Judd, & Park, 2012). CLT alone suggests that dehumanisation would occur upwards and downwards, but Gwinn et al.'s result indicates social identity-induced perceptions of similarity and self-enhancement needs can reduce dehumanisation, alongside psychological distance which increases dehumanisation.

Based on the theoretical arguments and empirical support, I test the following hypothesis:

> Hypothesis 7: DT identification negatively associated with dehumanisation of others in DTs.

2.5.8 Pathways from dehumanisation to individual-level contributions to teamwork in distributed teams

Simply put, when an individual dehumanises others, they by definition fail to see their human characteristics, which should reduce cooperative behaviours and attitudes towards them. According to CLT, when an individual perceives their teammates more abstractly, their human characteristics, including task-relevant qualities (e.g., unique skills and abilities), and work (e.g., assigned tasks, interdependencies, and schedules) and emotional needs, should be less well understood and attended to (Opotow, 1990; Trope & Liberman, 2010; Wilson et al., 2013). Consequently, their unique qualities should be more challenging to utilise and their needs more challenging to meet. Thus, dehumanisation should make cooperating with others more challenging. Correspondingly, dehumanisation should mean targets seem more homogenous and less individualised, accompanied by less empathy towards them, reducing the

perceived requirement to cooperate; in the extreme, people would not think to cooperate or coordinate with a non-human entity or a computer. Therefore, dehumanisation should reduce cooperative behaviours and cooperative attitudes towards others in DTs.

Previous findings from more general contexts indirectly indicate that dehumanisation reduces cooperative behaviours and attitudes in general. Empirical studies demonstrate reduced prosocial attitudes and behaviours towards dehumanised others (Alnuaimi et al., 2010; Andrighetto, Baldissarri, Lattanzio, Loughnan, & Volpati, 2014; Bastian & Haslam, 2011; Cuddy, Rock, & Nortin, 2007), and less intention to aid dehumanised groups (Andrighetto et al., 2014; Cuddy et al., 2007). However, researchers have not examined the latter effect in the DT context.

The study of dehumanisation most directly relevant to cooperation in a distributed work context was conducted by Alnuaimi, Robert and Maruping (2010). Their lab study demonstrated a positive association between dehumanisation of others and social loafing in DTs. As Alnuaimi et al. (2010) describe, social loafing is the tendency to withhold contributions in a team. This description represents the inverse of how I define cooperation in this study. Therefore, social loafing as a result of dehumanisation indicates a negative relationship between dehumanisation and cooperative behaviours and attitudes (e.g., a lack of concern for the team's goals and desire to work with others to achieve them). In a field study I will test the following hypothesis:

> Hypothesis 8: In DTs, greater dehumanisation of other team members is associated with a) lower cooperative attitudes and b) lower cooperative behaviours.

The construal-level mechanisms represented by dehumanisation should also reduce coordination with others in DTs. Effective individual-level coordination requires that individuals are aware of, clear about, and have knowledge of other team members' needs, assigned tasks, schedules, expertise, contexts and ways of working (Cramton, 2001). However, as I have suggested previously, dehumanisation of teammates should reduce awareness of these aspects (Wilson et al., 2013). Dehumanisation should also mean viewing targets as more homogenous

or interchangeable (Wilson et al., 2013). Coordinating with others who are seen in this way is difficult because it reduces awareness or facilitates denial of their uniqueness in terms of their schedules, tasks and requirements. Individuals who dehumanise their DT may not understand them, and consequently, they would be less inclined and able to coordinate with them. As an extreme example, other team members who seem to be machines designed to complete tasks should be available to work at the behest of other team members. Therefore, dehumanisation of other DT members should reduce individual-level coordination.

The effect of dehumanisation on coordination is yet to be tested directly. Instead, support for this effect comes from studies demonstrating reduced attention and effort expended towards dehumanised others. An empirically demonstrated a positive relationship between dehumanisation and ignoring or ostracising targets supports a similar relationship with coordination (Bastian & Haslam, 2011). That is, if a dehumanised target is ignored, then coordination with, and awareness of, that target would naturally reduce or cease. Moreover, the relationship between dehumanisation and social loafing in DTs demonstrated by Alnuaimi et al. (2010) indirectly indicates a similar effect on coordination; social loafing entails less effort towards group tasks, and these efforts are in part represented by coordination.

Therefore, I will test the following hypothesis:

> Hypothesis 8c: In DTs, greater dehumanisation of other team members is associated with lower coordination.

Dehumanisation of other DT members should also increase conflict with them. Conflict represents interpersonal and work incompatibilities, and I expect that these incompatibilities can arise through construal processes. Dehumanisation presents incompatibilities with target others because a core tenet of the construct is to perceive them as dissimilar to the self. Due to this perceived dissimilarly, dehumanised others should be less well understood, and their needs and 'human' experience may be more easily disregarded or at least considered less important than one's own needs. Therefore, one reflects less on how one's behaviours (or lack of behaviours) towards targets can lead to conflict. Targets' unique situations may reduce their

ability to complete tasks. For instance, other aspects of their lives may compromise their emotional wellbeing or make them less able to complete work tasks. However, individuals can disregard others' situations when dehumanising them. Considering another extreme example, if someone's computer does not operate as expected, they may typically blame the computer rather than themselves; the computer is being uncooperative because it is malfunctioning. Mechanistically dehumanised people are not computers, and therefore relationship conflict can arise in these situations. Taken together, dehumanisation of other team members should increase conflict experienced with others in DTs.

Studies support a positive association between dehumanisation and conflict. In a healthcare context, dehumanisation of co-workers is shown to increase interpersonal conflict (Kim et al., 2016). Moreover, conflict can arise from dehumanisation. For instance, in an extreme example of intergroup dehumanisation between Jewish-Israeli and Palestinian participants, those who mechanistically dehumanised the other group were more supportive of aggressive acts and violence and less supportive of conflict resolution (Leidner, Castano, & Ginges, 2013). Though this is an extreme example outside an organisational context, it demonstrates a tendency to escalate or maintain conflict when dehumanising the other party. More generally, dehumanised targets are not as readily forgiven for particular acts, making conflict more difficult to address (Wohl, Hornsey, & Bennett, 2012). However, much of the dehumanisation literature has focused on relationship conflict between groups or interpersonally, rather than conflict in general or other types of conflict within a group or team.

So, I will test the following hypothesis:

> Hypothesis 8d: In DTs, dehumanisation of other team members is associated with greater conflict with the team.

2.5.9 Dehumanisation as a mediator between psychological distance and individual-level contributions to teamwork

Combining CLT and evidence of associations between psychological distance, dehumanisation, and teamwork contributions, it follows that dehumanisation mediates the effects of psychological distance in DTs. In this chain of processes, individuals with greater

psychological distance from their DT should perceive other team members in more abstract ways, with fewer human characteristics. These dehumanised perceptions should reduce understanding and awareness of other DT members' needs, characteristics, and contexts. As outlined in section 2.4.3, dehumanisation represents ill-defined perceptions of targets' behaviours and affect, and targets should seem less similar, relevant and salient, to the self. Dehumanised team members, then, should be less well understood, and their actions attributed to personality traits rather than their contexts. Therefore, dehumanisation should mediate the negative effects of psychological distance by making it more challenging and less motivating to cooperate and coordinate, and to manage and avoid conflict, with others in DTs.

These mediated chains of effects are supported by jointly considering studies linking individual pathways between psychological distance, dehumanisation or construal, and teamwork contributions, discussed previously in this review. Additional evidence, though scarce and preliminary, provides more direct support for these mediation effects. Recall from sections 2.5.5 and 2.5.6, Alnuaimi et al. (2010) empirically demonstrated that dehumanisation fully mediates the positive association between team dispersion and social loafing.

However, Alnuaimi et al.'s findings are preliminary for three main reasons, and more robust evidence is needed to support the mediating role of dehumanisation in the current study. First, Alnuaimi et al. did not separate the effects of dispersion and communication, yet they likely play different but interconnected roles for dehumanisation, potentially indirectly, in teams (to be discussed further in Section 2.6). Second, we can conceptualise social loafing as unethical behaviour or a lack of contributions to teamwork, but it does not directly represent the degree to which employees cooperate, coordinate or experience conflict. Third, and most importantly, Alnuaimi et al. examined physical dispersion but did not examine psychological distance.

Additional research that is less direct further supports the mediating role of dehumanisation. Recall Siebdrat et al.'s (2013) study, in which psychological distance mediated the negative association between spatio-temporal distance and team collaboration. It is highly likely that dehumanisation further mediates the effects of psychological distance in this chain of processes. As I discussed previously, DTs experience more conflict compared to co-located teams because others' context is less visible, so DT members can misattribute others' actions or

failures to personal aspects rather than contextual factors (e.g., Cramton & Hinds, 2001). In support of those effects, scholars suggest that construal mediates between psychological distance and trait-based attributions (Wilson et al., 2013; Wilson, 2014), and a study empirically demonstrates greater trait-related attributions in distributed, rather than co-located, work contexts (Wilson, 2014). Dehumanisation represents construal of other people in this context, and it should lead to these same misattributions. Therefore, dehumanisation should mediate the effects of psychological distance in DTs.

Ultimately, considering the theory and empirical studies presented so far, I propose that CLT provides a more parsimonious and convincing explanation for Alnuaimi et al.'s results, beyond reduced similarity and empathy alone. It suggests and explains prosocial behaviour beyond reduced barriers to acting antisocially towards team members. CLT indicates that dehumanisation draws attention and awareness away from individualised details, making others and their needs harder to understand, and subsequently reducing their capacity and motivation to contribute to teamwork and manage conflict. I extend the previous reasoning by considering CLT to explain reduced cooperation and coordination, and increased conflict, from greater psychological distance with dehumanisation. Accordingly, I will test the following hypothesis in the field study:

> Hypothesis 9: Dehumanisation mediates the relationship between psychological distance and;
>
> a) Cooperative attitudes;
> b) Cooperative behaviours;
> c) Coordination, and;
> d) Conflict.

2.5.10 Dehumanisation as a mediator between distributed team identification and individual-level contributions to teamwork

I propose that dehumanisation at least partially mediates the effects of DT identification on individual-level contributions in DTs. This proposition comes jointly from considering CLT and SIT, studies associating social identification processes with dehumanisation of others

(presented in section 2.5.7), and studies associating dehumanisation with various outcomes (presented in section 2.5.8). As I outlined earlier in this section, when an individual strongly identifies with their team, others in the team (representing the in-group) should seem more similar to the self and thought of in terms of the team. Consequently, the individual should attribute human characteristics to their teammates and then demonstrate greater cooperation and coordination, and reduced conflict, with their DT.

Considering these relationships and underlying processes together, stronger DT identification should improve individual-level teamwork contributions at least partially through its negative effects on abstract construal of the team. Recall from Section 2.2.2, DT identification may improve individual-level contributions in DTs through various underlying processes (i.e., perceived shared similarity and meaning, reducing uncertainty, deindividuation effects, in-group biases, and self-enhancement needs; Bjorn & Ngwenyama, 2009; Hogg & Terry, 2001; Hornsey & Hogg, 2000; Postmes et al., 1998). The effects of construal—including mental representation, categorisation, interpretation of actions, and explanations of behaviour—overlap with those processes explaining the effects of social identification (e.g., Wilson et al., 2013; refer to previous sections for an overview). Further, perceived (dis)similarity is a core aspect of social identification with a group, and it is a core mechanism of dehumanisation and construal of others (e.g., Alnuaimi et al. 2010; Trope & Liberman, 2010). Moreover, as I previously indicated, individuals who identify with their DT may concretely construe other team members (Liviatan et al., 2008), and may attribute more human characteristics to them than they otherwise would. Therefore, dehumanisation likely transmits the effects of social identification onto individuals' attitudes and behaviours in DTs.

The mediating role of construal is further supported, albeit indirectly, by empirical studies of antisocial attitudes and behaviours towards out-groups. Intergroup violence can emerge from the dehumanisation of out-groups, and dehumanisation may arise from social identification and categorisation processes (Cuddy et al., 2007; Opotow, 1990). Individuals who mechanistically dehumanise an out-group tend to support antisocial acts towards them and are less supportive of conflict resolution (Leidner et al., 2013; Nagar & Maoz, 2017). The intensity of dehumanisation also reduces helping behaviours towards the out-group (Cuddy et al., 2007).

The most promising empirical support for the effect of social identification on individual-level contributions being mediated by dehumanisation within DTs comes from the study by Alnuaimi et al. (2010; previously discussed in sections 2.5.8 and 2.5.9). Relevant is their finding of a negative association between dehumanisation—entailing perceived dissimilarities with the target(s)—and prosocial behaviour (operationalised in the negative as social loafing). Researchers often express social identification in terms of perceived similarity with others in a group (e.g., Demoulin et al., 2009; Leviatan et al., 2008; O'Leary et al., 2014; Paladino et al., 2002). Though it does not represent social identity directly, I take Alnuaimi's findings as further evidence that DT identification may lead to greater prosocial behaviours and attitudes (e.g., cooperation and coordination) towards other team members via humanisation of them.

However, methodological and theoretical issues mean that this evidence is preliminary. First, the studies assume or infer social identification with an in-group and the categorisation of a pre-selected out-group, rather than measure the strength of social identification with the group. Second, the studies tend to focus on attitudes and behaviours derived from extreme examples of in-group/out-group divides, and dehumanisation of out-groups, rather than construal-level or dehumanisation of those within a group as a function of social identification with the group. Third, apart from Alnuaimi et al. (2010), the studies do not focus on work contexts, specifically. Consequently, empirical studies have not assessed the association between DT identification and dehumanisation. The current study addresses these concerns by measuring each variable and their associations in real-world DTs.

I note that dehumanisation may only partially, rather than fully, mediate the effects of social identification in DTs. Strongly identifying with a team means that individuals internalise and work towards team goals over their own goals (Brewer, 1999). This process, as an outcome of social identification, should occur independently to construal-level processes. Therefore, DT identification should directly influence individual-level contributions, in addition to mediated effects via dehumanisation.

In sum, dehumanisation should at least partially mediate the effects of DT identification on cooperation, coordination, and conflict. I test these effects in my field study with the following hypothesis:

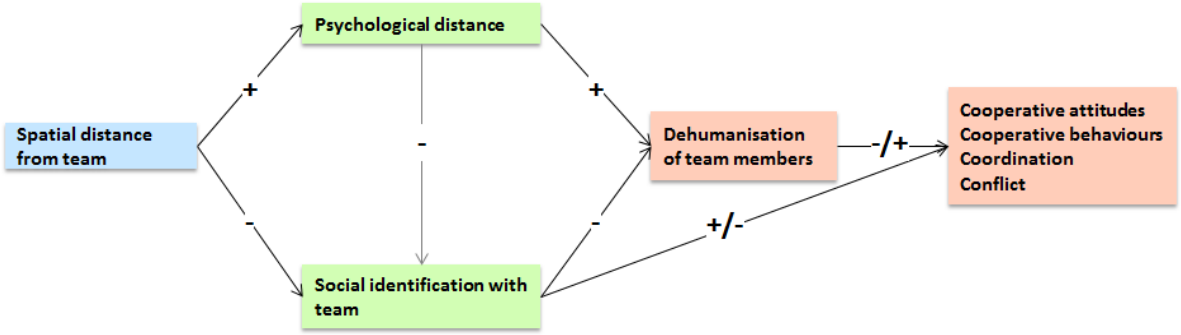
Hypothesis 10: Dehumanisation partially mediates the relationship between DT identification and;

a) Cooperative attitudes;
b) Cooperative behaviours;
c) Coordination; and
d) Conflict.

2.5.11 Summary of Model One

Model One and its hypothesised pathways are illustrated in Figure 2.1:

Figure 2.1. The hypothesised relationships between variables in Model One.



As shown by the pathways illustrated in Figure 2.1, Model One proposes a series of mediation effects whereby spatial distance increases psychological distance from the DT and weakens DT identification. Further, the model proposes that these two processes influence dehumanisation—representing a domain-specific form of construal of others—and mediate the effects of spatial distance on dehumanisation. Dehumanisation, then, reduces cooperative attitudes, cooperative behaviours, and coordination and increase conflict, mediating the effects of psychological distance and DT identification on these variables. The model also proposes that DT identification improves outcome variables directly and psychological distance weakens DT identification. The hypotheses associated with each pathway in Model One are collated and presented in Table 2.1.

Table 2.1. Summary of hypothesised relationships in Model One.

Hyp.	Hypothesised Relationship
1	Spatial distance is positively associated with psychological distance.
2	Spatial distance is negatively associated with DT identification.
3	Greater DT identification is associated with:
	a) Greater cooperative attitudes;
	b) Greater cooperative behaviours;
	c) Greater coordination; and
	d) Lower conflict.
4	DT identification mediates the relationship between spatial distance and:
	a) Cooperative attitudes;
	b) Cooperative behaviours;
	c) Coordination; and
	d) Conflict.
5	Psychological distance reduces DT identification.
6	Psychological distance is positively associated with dehumanisation of others in DTs.
7	DT identification is negatively associated with dehumanisation of others in DTs.
8	Greater dehumanisation of other team members is associated with;
	a) Lower cooperative attitudes;
	b) Lower cooperative behaviours;
	c) Lower coordination; and
	d) Greater conflict.
9	Dehumanisation mediates the relationship between psychological distance and;
	a) Cooperative attitudes;
	b) Cooperative behaviours;
	c) Coordination, and;
	d) Conflict.
10	Dehumanisation partially mediates the relationship between DT identification and;
	a) Cooperative attitudes;
	b) Cooperative behaviours;
	c) Coordination; and
	d) Conflict.

Model One integrates core tenets of CLT and SIT to clarify past literature in terms of how spatial distance, psychological distance, and social identification, and construal-level are considered to work together to influence individual-level outcomes in DTs. It advances applied CLT research in DTs by utilising dehumanisation as a domain-specific operationalisation of construal of other people. It highlights that psychological distance and social identification are critical, parallel processes in DTs which can alter individuals' perceptions of others and subsequent attitudes and behaviours towards them via a shared mechanism; precisely, how individuals construe or dehumanise others in their DT.

Treating dehumanisation as a *mechanism* for their effects, psychological distance from other DT members and DT identification represent points of intervention to improve individual-level contributions to DT work. Considering where to go from here, questions arise such as "how do we intervene to reduce psychological distance and increase the strength of DT identification, especially when spatial distance is unavoidably high?" Recall from Section 2.1 the frequency of communication with other DT members, and the media through which this communication occurs (i.e., face-to-face and various CMC media), are characteristics of all teams, but they are more central to the challenges in DTs. Considering communication may also explain the inconsistent effects of spatial distance onto DT outcomes - outlined in section 2.1.2 - by weakening the effects of high spatial distance on these two processes. The influence of communication on psychological distance and DT identification is, therefore, the focus of the next section of this chapter.

2.5.12 Controlling for task interdependence in Model One

There are theoretical reasons to include task interdependence as a control variable in Model One. Task independence is "the degree to which team members rely on one another and must interact in order for the group to accomplish its work" (Staples & Webster, 2008, p. 621). Logically, when DT members' tasks are interdependent, the DT is likely to be a more salient target for social identification due to the importance of the team to one's own tasks. Previous findings demonstrate that task interdependence strengthens team identification in DTs (Hakonen & Lipponen, 2007). Moreover, empirical work has demonstrated that individuals feel psychologically closer to others when they are in an interdependent mindset (Gunia, Sivanathan, & Galinsky, 2009; Gino & Galinsky, 2012). Task interdependence may instil an interdependent mind-set and reduce psychological distance in DTs. Logically, task interdependence may also influence the individual-level contributions to teamwork; if tasks are more interdependent, they naturally should cooperate with others, coordinate their actions with others, and may experience greater task conflict. So, task interdependence is important to investigate as a control variable in model one to ensure that the effects of psychological distance and DT identification on the end outcomes are not merely due to task interdependence in DTs.

2.6 Direct and moderating effects of communication frequencies on psychological distance and social identification in DTs

2.6.1 Moving from spatial distance to communication in DTs

Model One specifies psychological distance and social identification as mechanisms for DT member teamwork contributions. However, as noted in section 2.1, contextual factors likely moderate these effects, though they have not been well accounted for. Identifying moderators has theoretical and practical implications, including refinement and extension of existing models and management practices. Naturally, practical questions arise around how to help DT members *feel* closer to one another and identify with the team. Indeed, communication methods may facilitate this, allowing them to view and treat each other as real humans and more readily contribute to teamwork.

Individuals may feel closer to, or identify more strongly with, their DT if other team members are more salient and predictable, and if the team is more socially attractive. Frequent communication may improve these aspects. Recall from Section 2.1, spatial distance from other team members is fundamental to DTs, whereas communication - including the tendency to rely on CMC with infrequent or no face-to-face communication - is an essential secondary and independent characteristic. I noted that most studies examine the dichotomy between co-located teams versus DTs, rather than separating the effects of spatial distance and communication channels (i.e., face-to-face and the various CMC media), missing potential critical nuances. Some scholars have exclusively examined CMC dependence in teams or dispersion as an antecedent of CMC use, but CMC use does not necessarily directly depend on spatial distance (Gibson et al., 2014). For instance, both DTs and fully co-located teams can heavily rely on CMC (Webster & Staples, 2006), and empirical findings indicate no difference in CMC frequency between co-located and distributed communication partners (O'Leary et al., 2014). Co-located teams often rely on CMC by choice, and some DTs can rely exclusively on face-to-face meetings, although co-located teams that do not supplement face-to-face contact with CMC are likely rare. Furthermore, studies that separate distance and communication tend to explore only one of these characteristics in isolation, or they examine communication in general rather than specific media. Consequently, they would have missed potential parallel

and combined effects of distance and communication, limiting our understanding of how to best use communication to address distance-related challenges in DTs.

Communicating frequently with DT members may reduce individuals' psychological distance from their team and strengthen their DT identification, despite high spatial distance. However, the choice of media may determine these effects. Simply hearing others' voices or seeing their faces while communicating may make them feel closer, more salient and feel more 'real'. Other questions become relevant such as 'how does the frequency and choice of communication media moderate the positive effects of spatial distance on perceived distance and its negative effects on affinity with DTs?'.

To further address the second research question presented in Chapter 1— "how can communication and associated technologies be used to improve the socio-cognitive processes that determine perceptions of other team members and subsequent teamwork in DTs"—I develop hypotheses for the influence of communication on psychological distance and social identification in DTs. I draw from CLT and SIT to develop these hypotheses. I also consider the unique characteristics of communication media and associated theoretical perspectives regarding their direct and moderating effects concerning spatial distance. Here, I focus on the frequency of communication and the media that individuals use to communicate with their team. I use these boundary conditions for two main reasons. One, they are the most fundamental aspects of communication in DTs, and papers seminal to this thesis and its central theories (e.g., O'Leary et al., 2014; Wilson et al., 2013) have focused on these characteristics. Two, they are the most appropriate and sufficient characteristics to examine the effects of communication on psychological distance and DT identification, considering two key theories: media richness theory (Daft & Lengel, 1986) and the SIDE model (Postmes, Spears & Lea, 1998; Spears & Lea, 1994).

2.6.2 General outcomes of face-to-face and computer-mediated communication in DTs

In DTs, face-to-face communication is beneficial, whereas outcomes of CMC are mixed. Even relying on moderately frequent face-to-face communication, rather than solely on CMC, improves individuals' contributions to DTs by facilitating teamwork, increasing trust and familiarity, and building common ground and clarity (e.g., Karis, Wildman, & Mane, 2016; Newell, David, & Chand, 2007). In contrast, CMC outcomes are inconsistent, with evidence that CMC worsens (e.g., Schweitzer & Duxbury, 2010; van der Kleij et al., 2009), improves (e.g., Ho & McLeod, 2008; Kayworth & Leidner, 2000), or does not influence DT outcomes (e.g., Han et al., 2011). Delving deeper, DT members who must rely on CMC can feel isolated, and infrequent spontaneous communication is associated with conflict (Hinds & Mortensen, 2005), and reduced understanding (Cramton, 2001). Users of CMC also typically consider it less effective than face-to-face communication (Potter & Balthazard, 2002; Stanko & Gibson, 2009). Conversely, studies demonstrate positive processes from CMC use. In work-related examples, CMC can improve flexibility, access to expertise, and group processes including voice and decision making under conditions of psychological safety and flatter status (Gibson et al., 2014; Ho & McLeod, 2008; Schmidt et al., 2001). CMC can also be more spontaneous than face-to-face, with little or no need for scheduling interactions via text-based CMC.

Foremost among reasons for mixed outcomes of CMC is less than adequate consideration of proximal processes underlying their effects and inconsistent operationalisation of communication. The first reason identifies a theoretical and methodological gap, whereby many studies have not accounted for mediators or interactions between communication and other variables that may obscure CMC's effects. Therefore, studies have not determined precisely how or when CMC leads to particular outcomes in DTs (Marlow et al., 2017). This gap may also explain the inconsistent outcomes of spatial distance in DTs, per section 2.1. The second reason indicates that mixed CMC outcomes at least partially stem from the inconsistent and indirect ways studies operationalise communication, where they overlook separate critical aspects of distance and communication (Gibson et al., 2011; Penarroja et al., 2013). Consequently, these studies may have missed the unique effects of distance and communication.

The theoretical model developed in section 2.5 provides a framework to specify more precisely how and when the frequency of communication and the media through which it occurs, alongside spatial distance, may reduce psychological distance and strengthen DT identification. I investigate these effects by focusing on three critical dimensions of 'virtuality' relevant in research and practice: (i) spatial distance (covered in previous sections); (ii) separate communication media (e.g., face-to-face and separate CMC media), and; (iii) frequency of each communication medium (Gibson et al., 2011). These dimensions vary independently in DTs (Gibson et al., 2014; O'Leary et al., 2014).

2.6.3 Review of the relationships between communication frequency and media and psychological distance in distributed work contexts

Researchers have theorised the effects of communication on psychological distance in DTs in only a small number of papers. Wilson et al. (2008), Wilson et al. (2013), and O'Leary et al. (2014) each proposed that more frequent communication reduces psychological distance. However, each paper focused on different aspects of these effects. Recall from section 2.2, Wilson et al. (2008) proposed that frequent communication reduces psychological distance by improving the salience, certainty, and mental picture of the other person and their context. They explained that communication with others reminds us of their existence and brings them top of mind to counteract the 'out of sight, out of mind' problem inherent in DTs (Hinds & Bailey, 2003). They also suggested that frequent communication affords clearer mental pictures of others' contexts (e.g., workspaces, tasks, and behaviours) which may make them seem closer. Subsequent papers adopted these propositions and their reasoning (e.g., O'Leary et al., 2014; Ruiller et al., 2019).

More recently, Wilson et al. (2013) proposed that communication moderates the association between spatial distance and psychological distance and this effect depends on the communication medium and its characteristics. Before I explain this point and its broader implications, I note that each CMC medium possesses unique characteristics or affordances, which may determine their effects on psychological distance and DT identification.

To predict the effects of CMC media on psychological distance, Wilson et al. (2013) drew from media richness theory (Daft & Lengel, 1986). Media richness theory is one of the primary theories with which to examine the effects of CMC media (Daft & Lengel, 1986). This theory supposes that each CMC medium's effects depend on the social cue or information transmission it affords (e.g., text, audio, or visual cues). Generally, excluding face-to-face, video CMC affords the highest media richness, because it can transmit visual and auditory cues. In contrast, text-based CMC (e.g., email, instant messaging, and real-time chat) is leaner because it does not typically allow communicators to convey voice tone, facial expressions or gesturing (emojis and attachments notwithstanding).

Wilson et al. (2013) anticipated that, compared to learn media, rich media reduces psychological distance more strongly by affording greater salience, certainty, and a clearer mental picture of others. They also proposed that media choice - choosing lean CMC when richer CMC is available - moderates or enhances the effect of spatial distance on psychological distance, by drawing attention to spatial distance. They based these propositions on findings from Walther and Bazarova (2008), which I evaluate shortly.

In contrast to Wilson et al. (2008; 2013), O'Leary et al. (2014) (and more recently, Ruiller et al., 2019) proposed a less technologically deterministic approach. Like Wilson et al., O'Leary et al. proposed that frequent communication reduces psychological distance. However, O'Leary et al. concluded that the meaning individuals attach to media is more important than the media itself. That is, they proposed that individuals attach symbolic meaning to lean media to signal various characteristics, and this meaning reduces psychological distance between two people.

Empirical studies support a negative association between the overall frequency of communication and psychological distance. O'Leary et al. (2014) demonstrated a negative correlation between communication frequency (i.e., the sum of face-to-face and CMC media frequencies) and psychological distance. Their qualitative analysis further supported this finding, illustrated by the following quotes: "[CMC has] helped in making [me] feel that the distance does not matter"; and "technology helps me in getting [closer] to [distant co-worker]" (O'Leary et al., 2014, p. 1232).

Preliminary evidence from two papers indicates that the association between communication and psychological distance depends on the media used. First, the lab experiment by Walther and Bazarova (2008) demonstrated that using leaner CMC may reduce propinquity - the feeling of nearness of other people - if richer media are available. They assigned participants into groups that were allowed to communicate using one medium (i.e., face-to-face, video CMC, audio, or text-based CMC) or were given a choice between two media. Individuals in groups that could choose a medium experienced lower propinquity if they chose the leaner medium. However, lean media did not demonstrate this effect in groups that had no choice of media. Second, O'Leary et al. (2014) presented correlations between separate CMC media (omitting face-to-face communication) and psychological distance in dyads[3]. Psychological distance negatively correlated with the frequencies of each CMC medium; it correlated most strongly with the frequency of phone, followed by text-based CMC and video conferencing. This pattern of correlations appear to contradict the predictions of Wilson et al. (2013), Walther and Bazarova (2008), and media richness, whereby we would expect psychological distance to most strongly correlate with the richest CMC (i.e., video CMC frequency). However, methodological limitations mean O'Leary et al.'s correlations may not represent the actual effects of these media. I discuss these limitations shortly.

Aside from Walther and Bazarova (2008), researchers have not directly addressed the effect of face-to-face communication on psychological distance. Some DTs can sometimes meet and communicate face-to-face despite the typical separation of team members. Face-to-face communication, by definition, must take place in physical proximity to the other communicator(s) in a shared physical context. It is also direct and unmediated and richer than any CMC medium. As I have noted, even moderately frequent face-to-face communication offers many benefits for teamwork (e.g., Karis et al., 2016; Newell et al., 2007). However, we do not know whether it reduces psychological distance in DTs because research has not directly tested this effect.

[3] I discuss the inversed direction of O'Leary et al.'s (2014) bivariate correlations in relation to psychological distance because they measured perceived proximity which is the inverse of psychological distance.

Theoretically, the paradox of being physically close yet feeling distant and vice-versa (e.g., Wilson et al., 2001; 2008) indicates that face-to-face communication may not reduce psychological distance. However, we can explain this paradox in a way that is consistent with a significant effect. Empirical evidence demonstrates that face-to-face communication occurs at similar frequencies in DTs and co-located teams, and CMC can be used more frequently than face-to-face in both types of teams (O'Leary et al., 2014). Therefore, the paradox might occur as a result of whether team members communicate while in a face-to-face situation and whether distant others meet to communicate face-to-face, rather than as a direct result of spatial separation or co-location. Therefore, frequent face-to-face communication may still reduce psychological distance in DTs.

As I have noted, Wilson et al. (2013) briefly theorised that using lean media when richer media is available moderates (i.e., enhances) the effects of spatial distance on psychological distance by drawing attention to spatial distance. This moderating effect has not been adequately examined empirically, though preliminary evidence indicates it may occur. For instance, Fujita et al. (2006) demonstrated that their manipulation of 'spatial distance' increased abstract perceptions of actions when information about a target was constant. Coupled with studies finding no significant relationship between spatial distance and psychological distance (O'Leary et al., 2014; Siebdrat et al., 2013), this finding may mean that more frequent communication in real-world DTs weakens the direct effects of spatial distance. Indeed, studies demonstrate that communication weakens the influence of 'geographic dispersion' on conflict (Hinds & Mortensen, 2005) and performance in DTs (Prasad et al., 2017). Moreover, using a similar experimental procedure, Oh et al. (2008) demonstrated that using email (compared to 'no communication') weakens the association between distance (represented by near versus far conditions) and what they called psychological distance. However, critical methodological limitations mean Oh et al.'s findings may not be robust.

Initial support for the direct and moderating effects of specific media on psychological distance, as suggested by Wilson et al., (2008; 2013), is found in studies by Walther and Bazarova (2008) and Oh et al. (2008). However, further empirical enquiry and theoretical development are needed to address their methodological limitations to conclude these effects

definitively. First, both studies were lab-based with student participants, and may not be ecologically valid for ongoing real-world DTs (recall my critique of relying on lab studies in section 2.1). This issue is present in the broader research area, where most studies are theoretical or lab-based to discern the impact of CMC media in isolation (e.g., Croes et al., 2016; Haines & Mann, 2011; Postmes et al., 1998; Walther & Bazarova, 2008). In this case, Oh et al. and Walther and Bazarova examined communication with experimental conditions, restricting the choice or use of CMC to one or two media. However, real-world DT members are typically free to choose from many communication options and often use more than two media in parallel. That is, phones, text-based CMC, and even video CMC should be available to most individuals in DTs; most laptops and mobile phones manufactured in the last decade possess integrated webcams for this purpose - though I concede slow internet speeds or unreliable connections may make video CMC less viable.

A second and related issue is that the two studies did not directly measure psychological distance. Oh et al. (2008) examined construal of a fictional target person's actions, rather than the perceived distance from them. Also, Walther and Bazarova's outcome of interest (propinquity) is similar yet distinct from psychological distance, and their measure of propinquity does not look 'clean' because it conflates spatial distance with perceptions of closeness and communication[4]. Last, Oh et al.'s findings may not generalise to the broader population because their sample was small for their study design, with only 20 cases per condition to support their findings.

Furthermore, O'Leary et al.'s (2014) findings support a negative effect of communication frequency on psychological distance in distributed dyads, but their correlations between separate CMC media and psychological distance are inconclusive. Their correlations do not represent the unique effects of each medium and may be confounded by unaccounted for variables. For example, phone frequency positively correlated with 'years known', email

[4]The measure of propinquity used by Walther and Bazarova (2008) consisted of semantic differentials which were at once judgements of distance and reflections of objective distance; example items include distant-nearby, together-proximal, and disconnected-connected. The 'disconnected-connected' item in the measure also conceptually overlaps with communication.

positively correlated with 'years worked with', and psychological distance correlated with each of these variables. These correlations indicate that other variables may partially account for correlations between CMC media and psychological distance.

Further gaps in our knowledge of the relationship between communication and psychological distance remain, including:

(i) Empirical work is yet to quantitatively examine the direct effect of face-to-face communication on psychological distance, though theory, intuition, and preliminary evidence a negative effect (Walther & Bazarova, 2008).

(ii) The effects of individual CMC media are not well tested; no study has quantitatively examined the simultaneous effects of each CMC medium (i.e., video CMC, phone, and text-based CMC) on psychological distance.

(iii) More robust evidence is needed to support the moderating effects of CMC media in DTs based on media richness.

(iv) The effects of communication media on psychological distance have not been examined with multivariate analysis while controlling for potential confounding variables (e.g., team tenure or task interdependence; Koster et al., 2007; Staples & Webster, 2008).

In sum, researchers propose compelling reasons and demonstrate preliminary evidence to suggest that more frequent communication, particularly communication conducted face-to-face or via richer CMC media, should reduce psychological distance in DTs. However, the available evidence is inadequate to determine these effects conclusively. Moreover, researchers have suggested but have not directly examined the moderating effects of communication on the relationship between spatial distance and psychological distance. Therefore, more robust evidence is required to fully support the direct and moderating effect of face-to-face and separate CMC media and their frequencies on psychological distance and the association between spatial distance and psychological distance.

2.6.4 Review of the relationships between communication frequency and media and social identification in distributed work contexts

Recall from section 2.2 that team identification can develop differently in DTs compared to co-located teams because physical characteristics are less visible (Fiol & O'Connor, 2005; Howard, & Magee, 2013), so DT identification may develop from how individuals communicate with other team members and how often. In section 2.2.2, I identified a research stream focused on DT identification development and CMC media. Drawing from SIT, researchers in that stream suggest that more frequent communication strengthens DT identification by making the team more salient and socially attractive, through greater exposure to the team (Fiol & O'Connor, 2005). According to SIT, social identification is strengthened primarily by the group's salience and attractiveness to the individual (Foster et al., 2015; Tanis & Postmes, 2005). Social attractiveness relies on information about the target, including social (Walther, 1992). More frequent exposure to a person or group makes more information about them available, so the more salient and socially attractive they should seem (Bornstein & D'Agostino, 1992). Therefore, more frequent communication should strengthen DT identification by more frequently exposing individuals to the team (Bradner & Mark, 2002; Hogg & Terry, 2001; Siebdrat et al., 2013).

Researchers have empirically established a positive association between overall communication frequency and DT identification. Specifically, studies demonstrate a positive association between the extent of CMC use and team identification at the individual level (Robert & You, 2018), and stronger group norms – indicating stronger social identification - from communicating via CMC (e.g., email) (Postmes, Spears, & Lea, 2000). Communication with others in a group (in this case, managers) also makes those groups (in this case, organisations) more salient as targets of social identification (Postmes, Tanis, & DeWit, 2001). Less well established are the nuanced effects of specific CMC media and face-to-face on DT identification.

Drawing from SIT and the social identity deindividuation (SIDE) model, researchers propose that lean media rather than rich media facilitate stronger DT identification (Postmes, Spears & Lea, 1998; Spears & Lea, 1994). The SIDE model was introduced to explain how anonymity

strengthens social identification and categorisation when a relevant group is salient (Postmes et al., 1998). According to this model, when an individual identifies with a group, they de-individuate themselves and others. Consequently, they see themselves and others in terms of group membership rather than as individuals (Hogg, Terry, & White, 1995; Saunders & Ahuja, 2006; Turner et al., 1987). Applications of the SIDE model to DTs specify that communication via richer CMC disrupts social identification by affording detailed social cues which draw attention to individual differences and away from the group. This process is thought to weaken the deindividuation process that underlies social identification. Though it may appear counterintuitive, this means lean CMC should strengthen DT identification more effectively than rich CMC by affording anonymity (visual or auditory), limiting the availability of individuating information (Haines & Mann, 2011; Postmes et al., 1998).

Moreover, SIT and the SIDE model indicate that social attraction—attraction to a group—strengthens social identification with a group, whereas interpersonal attraction—attraction to individuals—weakens it (Spears & Postmes, 2015; Wang et al., 2009). To a degree, all CMC media facilitate team salience. However, greater anonymity and lower visibility afforded by lean CMC should increase salience and social attraction while maintaining individuals' team-focus (Lea & Spears, 1992; Postmes et al., 1998). Researchers propose that pseudo-anonymity afforded by lean CMC should strengthen DT identification, in part because complete anonymity is not practical in a DT context (Spears & Postmes, 2015). A reliance on lean CMC should amplify a social identity that already exists and is relevant to the self, and in DTs the team's existence is enough to facilitate this process.

Empirical studies support the SIDE model and its predicted effects of CMC media and face-to-face communication on team identification with a salient group (e.g., Chan, 2010; Croes et al., 2016; Hains & Mann, 2011; Lea, Spears & DeGroot, 2001; Postmes & Spears, 2000; Postmes, Spears, Lee, & Novak, 2005; Postmes et al., 1998; Tanis & Postmes, 2003; 2005). As I soon discuss, however, several methodological issues should be addressed to more robustly support the application of the SIDE model in DTs.

For example, lab studies have demonstrated that text-based CMC may strengthen the underlying processes of social identification with a group (e.g., attraction, deindividuation of

self and others, self-categorisation into a group) to a greater degree than richer CMC (i.e, video CMC) or face-to-face because it affords pseudo-anonymity and less individuating cues (Lea et al., 2001; Postmes et al., 1998). Moreover, empirical research specifically demonstrates stronger social identification with a group in the absence of individuating cues from other group members and vice versa (Lee, 2007). Studies have also demonstrated that social cues that reveal team members' characteristics improve interpersonal evaluations, but they may also reduce solidarity or 'realness' of a group, and in turn, reduce social identity–related processes such as in-group biases (Tanis & Postmes, 2003; 2005).

In addition, Haines and Mann (2011) found that pseudo-anonymity more effectively strengthens social identity-related processes compared to full anonymity. Specifically, they found that a greater awareness of others, rather than complete anonymity, is associated with greater deindividuation. Though they did not examine social identification as an outcome of CMC, their study indicates that more frequent communication via lean CMC should strengthen social identification in teams, because it affords pseudo-anonymity and should therefore foster deindividuation of others and the self.

A study has also demonstrated that co-presence — and the visibility it involves — may reduce attraction in cross-gender dyads (Croes et al., 2016). In the same study, Croes et al. found that physical co-location increased interpersonal attraction. However, they examined individuals in dyads rather than individuals in teams. So, whether co-location in DTs (e.g., face-to-face meetings) strengthens interpersonal or social attraction in DTs, and subsequently whether it weakens or strengthens DT identification, is yet to be determined.

A recent empirical study seemingly contradicts predictions of the SIDE model (Klitmoller et al., 2015). However, as the authors noted, the limitations of the study design mean the results may not generalise to other contexts, so their implications should be cautiously considered.

In addition to direct effects, communication and spatial distance may interact to influence DT identification. Robert and You (2018) proposed that CMC – as opposed to face-to-face communication - strengthens DT identification to a greater degree when spatial distance is higher. They reasoned that teams rely on CMC when members face greater spatial distance. In turn, team members become more adept at using CMC to develop a team identity and

belongingness to the team. However, the authors did not thoroughly consider the SIDE model or multiple CMC media to build their proposition or reasoning.

Two empirical studies support interaction effects between communication and distance that are expected from the SIDE model, but they do not support Robert and You's (2018) reasoning for these effects. First, Wiesenfeld, Raghuram and Garud (1999) tested the direct and interaction effects of face-to-face and CMC (text-based CMC and phone) and employees' 'virtual status'. They found that for more virtual workers (i.e., those that spend two days or fewer per week in the central office), more frequent communication via text-based CMC strengthened organisational identification, yet more frequent communication via phone weakened it. Though the researchers did not invoke the SIDE model, these findings broadly support its approach to interaction effects, albeit for organisational identification rather than DT identification, and 'virtual status' rather than spatial distance. Second, Robert and You (2018) tested their proposition and found a similar interaction, whereby the use of CMC strengthened team identification to a greater degree when dispersion was higher. However, they did not test whether these interactions depend on the media used. Robert and You's (2018) reasoning is also not supported by Wiesenfeld et al.'s findings; if distance or time away from the central office makes team members more effective users of CMC, then both phone and text-based CMC should weaken the adverse effects of spatial distance onto psychological distance. In other words, they should demonstrate even lower psychological distance when spatial distance is high. However, this pattern of results did not play out.

Research seeking more robust support for the SIDE model in DTs must address methodological issues; most critically, the reliance on lab-based studies and student samples of convenience (e.g., Croes et al., 2016; Lea et al., 2001; Postmes et al., 1998; Tanis & Postmes, 2003; Haines & Mann, 2011). Like studies of CMC and psychological distance, this means the existing evidence may not represent how real-life DTs operate in practice. Also, most studies isolate the effects of one CMC medium (often text-based CMC in fully anonymous assembled teams) to the exclusion of other media, rather than examine unique effects of multiple media. This issue is problematic because individuals in real-world DTs use multiple media over time, are typically pseudo-anonymous rather than fully anonymous, and may have interacted with

each other previously (Scott, 2007). Spears and Postmes (2015) acknowledged this criticism, stating that the SIDE model assumes leaner CMC is pseudo-anonymous in real-world DTs because individuating information (e.g., names, genders, roles, and professions) is typically available. Additionally, many studies that support the SIDE model in distributed contexts did not directly examine social identification. Instead, they examined processes expected to predict social identification (e.g., deindividuation or social attraction; Haines & Mann, 2011; Lea et al., 2001) or outcomes that may indicate its underlying processes have occurred (e.g., group influence or antisocial behaviours; Chan, 2010; Postmes et al., 1998; Tanis & Postmes, 2003; 2005). Therefore, to robustly support the SIDE model in DTs, research needs to concurrently investigate the influence of various CMC media and face-to-face communication on social identification, specifically in real-world DTs.

2.6.5 Summary of communication, psychological distance and social identification

In sum, researchers have begun theorising that more frequent communication reduces individuals' psychological distance from their DT by increasing the salience, certainty and mental pictures of the DT and other team members (O'Leary et al., 2014; Wilson et al., 2008; Wilson et al., 2013). Drawing on SIT, researchers agree that frequent communication strengthens DT identification by making the team more salient and attractive (e.g., Fiol & O'Connor, 2005; Foster et al., 2015; Siebdrat et al., 2013). These effects of communication are generally supported (Lim et al., 2013; O'Leary et al., 2014; Postmes et al., 2000; Postmes et al., 2001; Robert & You, 2018). However, critical to answering the second research question is whether and how specific CMC media and face-to-face influence these processes in real-life DTs. We know that their effects probably differ across media, but we cannot definitively conclude these effects because critical gaps remain.

The media richness approach indicates that rich CMC may more effectively reduce psychological distance compared to lean CMC, and lean CMC may enhance the negative effect of spatial distance on psychological distance when richer media are available (Wilson et al., 2008; Wilson et al., 2013). Research has demonstrated findings contrary to this approach, but

their limitations mean they may not accurately represent the actual effects of communication (O'Leary et al., 2014). Moreover, empirical findings indicate that the media richness approach to psychological distance is still a valuable avenue of enquiry (Walther & Bazarova, 2008), yet this empirical work is limited; we must address gaps to confirm how communication media and their affordance of media richness influences psychological distance in DTs.

In contrast to the effects of CMC media on psychological distance, studies drawing from SIT and the SIDE model indicate that lean media, rather than rich media, facilitate DT identification. They suggest that all communication makes the team salient, but lean media better facilitates a team-focus rather than an individual-focus by affording fewer individuating cues. Multiple studies support this SIDE model approach, but methodological issues must be addressed to establish these effects in DTs. Chiefly, evidence from real-world DTs is needed to support the SIDE model more robustly. Furthermore, studies must examine the strength of DT identification directly (rather than 'shared similarity', expected effects of DT identification, or its precursors) as a function of separate CMC media simultaneously (rather than investigating just one or two media) and face-to-face communication in real-world pseudo-anonymous DTs (rather than fully anonymous lab-based groups). Additionally, though researchers have suggested moderation effects between spatial distance and communication on DT identification, these effects are not well developed theoretically, and research has not adequately tested the nuanced effects of separate media (Robert & You, 2018; Wilson et al., 1999).

2.6.6 Model Two: Communication, psychological distance and social identification

The current study addresses inconsistencies and critical gaps in the 'CMC in DTs literature' by drawing on SIT and the SIDE model, the psychological distance literature, and media richness theory. I propose that more frequent communication, particularly through rich CMC (e.g., video CMC) and face-to-face communication, reduces psychological distance. I also propose that lean CMC (e.g., text-based CMC) strengthens DT identification, yet rich CMC and face-to-face may weaken it. I also propose interaction effects between communication media and spatial

distance on these processes. I contribute to the literature by investigating the following critical and unique characteristics of virtuality in real-life DTs:

(i) the unique effects of spatial distance (see section 2.1; I will re-test these effects in Model Two alongside communication);
(ii) the unique effects of communication media (including face-to-face, text-based CMC, phone, and video CMC);
(iii) the effects of each communication medium on proximal processes important to construal of others (i.e., psychological distance and DT identification); and
(iv) interactions between separate communication media and spatial distance.

Considering previous propositions and preliminary findings, I expect that all communication reduces psychological distance in DTs, but richer communication media better facilitate this effect. Per Wilson et al.'s (2008) paper, greater salience, predictability, and clearer context are essential to reduce psychological distance. Media richness theory indicates that media affording richer social cue transmission should provide these critical aspects. Therefore, I expect the most significant reduction in psychological distance from more frequent communication via video CMC, followed by phone, and then text-based CMC. Counter to Walther and Bazarova (2008), I propose that lean media reduces psychological distance despite the availability of other choices because multiple media are available in real-life DTs.

Following from Wilson et al.'s (2008) argumentation, face-to-face communication should more strongly reduce psychological distance compared to CMC. Face-to-face communication is qualitatively different from CMC because it necessitates physical presence in the same space, and allows for direct eye contact and touch. As I have noted, the paradox of being close yet feeling distant can occur, which means that face-to-face contact may not reduce psychological distance (e.g., Wilson et al., 2001; 2008). This paradox, however, represents being co-located and feeling distant rather than communicating while being co-located. Logically, communication via face-to-face should facilitate the most direct and clear perception of a person or group, so it should most effectively improve salience, predictability and clarity in DTs.

Consequently, more frequent communication via face-to-face should demonstrate the strongest reduction in psychological distance. I test the following hypothesis in the field study:

> Hypothesis 11: The frequency of communication reduces psychological distance in DTs, whereby the frequency of face-to-face communication demonstrates the strongest effect, followed by video CMC, phone, and text-based CMC.

Building on the moderating effects suggested by Wilson et al. (2013), I propose that frequent communication weakens the positive effect of spatial distance on psychological distance. Recall that Wilson et al. (2013) suggested that rich CMC weakens this relationship by drawing attention away from spatial distance and reducing the barriers to salience and understanding others. Based on Walther and Bazarova (2008), Wilson et al. also suggested that lean CMC strengthens this relationship when rich media are not available. As I have noted, Walther and Bazarova based their propositions and findings on a forced-choice that does not represent DTs in practice. Moreover, despite its limitations, O'Leary et al.'s (2014) study demonstrated negative correlations between various CMC media (lean and rich) and psychological distance. Therefore, I propose that frequent communication, regardless of medium, weakens the effect of spatial distance on psychological distance. I propose that these effects are stronger for face-to-face communication and richer media compared to lean CMC:

> Hypothesis 12a: The relationship between spatial distance and psychological distance is moderated by the frequency of communication, whereby the effect of high spatial distance is weaker when communication is more frequent.
> Hypothesis 12b: The moderating effect of communication frequency is strongest from face-to-face communication, followed by video CMC, phone, and text-based CMC.

I draw from the SIDE model and media richness to predict that frequent communication via lean CMC (i.e., text-based CMC) strengthens social identification, because it promotes salience,

social attraction, and deindividuation of self and others. Conversely, I predict that rich CMC and face-to-face communication do not strengthen DT identification, because they facilitate more individuating information and promote interpersonal (un)attraction and weaken social (group) attraction, despite promoting team salience (Postmes et al., 1998). Accordingly, I will test the following hypothesis:

> Hypothesis 13: The frequency of text-based communication strengthens DT identification, whereas the frequency of face-to-face, phone, and video CMC do not strengthen DT identification.

I draw from the SIDE model to further develop the interaction effects between communication and spatial distance on work-related social identification that were previously proposed by Wiesenfeld et al. (1999) and Robert and You (2018). I propose that text-based CMC reduces the negative effect of spatial distance on DT identification because it counteracts its expected mechanisms of effects (i.e., reduced salience and social attraction) without reducing deindividuation through increased individual (un)attraction:

> Hypothesis 14: The frequency of text-based communication weakens the relationship between spatial distance and DT identification.

2.6.7 Summary of Model Two

Model Two proposes that the frequency of communication influences psychological distance and DT identification and these effects differ depending on the communication medium. Table 2.2 presents the hypotheses included in Model Two:

Table 2.2. Summary of hypothesised relationships in Model Two.

Hyp.	Hypothesised Relationship
1	*Spatial distance is positively associated with psychological distance. [re-test]*
2	*Spatial distance is negatively associated with DT identification. [re-test]*
11	The frequency of text-based communication strengthens DT identification, whereas the frequency of face-to-face, phone, and video CMC do not strengthen DT identification.
12a	The relationship between spatial distance and psychological distance is moderated by the frequency of communication, such that the relationship is weaker when communication is more frequent.
12b	The moderating effect of communication frequency is stronger from face-to-face communication, followed by video CMC, phone, and text-based CMC.
13a	The frequency of text-based communication strengthens DT identification.
13b	The frequency of face-to-face, phone, and video CMC do not strengthen DT identification.
14	The frequency of text-based communication weakens the relationship between spatial distance and DT identification.

Model Two begins to answer the second research question. It provides a framework to explore how to use communication technologies strategically to improve psychological distance and DT identification. This model builds on foundational work considering SIT, the SIDE model, psychological distance, and media richness theory. Model Two and subsequent empirical enquiry differs from prior works in its specificity, whereby I postulate effects of communication via text-based CMC, phone CMC, video CMC, and face-to-face, and interactions between these media and spatial distance. I will investigate these separate communication channels in the same analyses, facilitating insight into the unique effects of spatial distance and communication media and new insights into whether communication moderates – and therefore obscures – the effects of spatial distance onto psychological distance and DT identification.

2.6.8 Control variables in Model Two

Researchers should justify their selection and use of control variables, theoretically or empirically (Bernerth & Aguinis, 2016). In my analyses of hypotheses in Model Two, I include three control variables to rule out or account for alternate explanations of the effects of communication on psychological distance and social identification. I selected three control variables that are theoretically likely to confound the influences of spatial distance and

communication variables on DT identification and psychological distance. These control variables were task interdependence, individuals' tenure in the DT (DT tenure), and whether the respondent is a supervisor/manager of the DT. These variables were chosen based on theoretical links to communication and either or both of the two dependent variables, or by previous findings demonstrating such linkages.

First, I needed to determine whether communication influences the dependent variables due to the communication itself or by representing greater task interdependence in the DT. Following on from reasons for investigating task interdependence as a control in Model One, I will also control for it in Model Two. Logically, when DT members' tasks are interdependent, they are more likely to need more frequent communication to manage their completion. As I have previously indicated, greater task interdependence may also increase DT identification and reduce psychological distance in DT. So, not only is task interdependence important to control for when analysing Model Two, it may also be an important variable in its own right.

Second, I chose to control for whether each respondent is a supervisor/manager of their DT. Individuals who hold a managerial or supervisor role in a DT may be more likely to identify with the team because they would have higher power and prestige, which can drive social identification with a group (Hogg & Terry, 20023). These individuals are also more likely to communicate frequently with their DT because they must coordinate and manage the interpersonal aspects of their team and their assigned tasks. They may also be psychologically closer to their team because they must be more aware of the individuals and their activities within the team, and thus the team should be more salient, predictable, and be clearer in their mind's eye (Wilson et al., 2008). So, managers or supervisors of DTs may demonstrate reduced psychological distance and greater DT identification simply because they communicate more frequently, or because they hold a more prestigious and integral role in the team.

Third, I controlled for DT tenure because in previous studies tenure has been shown to strengthen social identification in organisations and its effects (Hameed, Roques, & Ali Arain, 2013; Mael & Ashforth, 1992). Tenure may also reduce psychological distance while also increasing communication. Familiarity may reduce psychological distance by making knowledge and awareness of those in the team more specific and a greater likelihood of more direct

experience with those other team members (Trope & Liberman, 2010). Longer tenure in a team would give individuals more time to become more aware and knowledgeable about their teammates, and may increase likelihood of higher salience of others in the team. It may also represent a survivor bias whereby those who feel closer to others in their team, more strongly identify with their team, and communicate more frequently in their team are more likely to remain in their team.

2.6.9 Reflection on Models One and Two

Initially, I considered the two models as one integrated whole. However, after considering several theoretical, empirical and practical issues with this approach, I decided to keep these models distinct and explore them in this way. I have two main reasons for my decision not to integrate the two models.

First, I designed each model and their respective theorising and analyses so that they each answered a discrete research question. In doing so, I planned to develop each 'model' into self-contained papers for submission to journals; one paper that will be based on model 1 to address the relationships between psychological distance, social identity and construal, and to introduce dehumanisation as a context-specific version of construal, and; one paper based on model 2 to explore how specific communication media could be used to reduce psychological distance and strengthen social identification in DTs.

Second, I did not expect to obtain a large enough sample size to test an integrated model with all the mediators and moderators included – especially not with a multi-wave matched dataset. Each model corresponds to how I planned to test the relationships within them with the data I had reasonably expected to collect with the resources available to me. Third, considering an integrated model would have necessarily expanded the thesis to an unmanageable length and complexity. I would have needed to consider flow-on effects of direct effects, mediations, and interactions of specific forms of communication. Focusing on an integrated model raises questions about how CMC's effects on psychological distance and social identification flow on to more distal outcomes, yet I had not developed strong theoretical reason to hypothesise these effects, nor adequate resources to test them in full.

2.6.10 Conclusion

To better understand individuals' contributions to teamwork in the context of spatial distance in DTs, I argue that we must better integrate and understand the socio-cognitive mechanisms that determine them – including psychological distance from other team members, the strength of social identification with the DT, and dehumanisation of others in the team. I also argue that, given the ways these processes should work together, the frequency of communication and the media through which it occurs (i.e., face-to-face, video CMC, phone, and text-based CMC) likely represents a core practice through which we may improve these processes. I have developed an approach to individuals' DT contributions that is represented in two theoretical models. This approach is based firmly on various theories (i.e., CLT, SIT, the SIDE model, media richness) to integrate better the socio-cognitive mechanisms and theoretical arguments, and builds upon previous models in several important ways to contribute to theory and the practical improvement of DTs. In the following chapter, I present the research methods and study design for my field studies to test my hypotheses included in Models One and Two, before delving into the results of my study and discussing the implications of these results in subsequent chapters.

3 CHAPTER 3: RESEARCH METHODS AND STUDY DESIGN

3.1 Introduction

In Chapter 1 (introduction), I outlined the challenges for DT member functioning, leading to a general problem statement and two research questions serving as the foci of this thesis. In Chapter 2 (literature review and theory development), I developed two theoretical models. Model One indicates hypotheses around the roles of spatial distance and socio-cognitive processes—psychological distance, social identification and dehumanisation—for cooperation, coordination and conflict in DTs. Model Two indicates hypotheses around the role of communication for psychological distance and social identification in DTs—including the frequencies of various communication media (i.e., face-to-face, video CMC, phone, and text-based CMC) considering their unique characteristics (i.e., media richness theory; Daft & Lengel, 1986). Each hypothesis was developed through a review of the literature in relevant domains.

In this chapter, I describe the study design, data collection process, and analytical approach used to test my hypotheses. I organise this chapter into twelve further sections. In section 3.2, I begin with an outline of the epistemological stance taken in thinking about my research question and associated empirical inquiry. In section 3.3, I discuss the broader context of this research project, provide my reasons for constructing a theoretical model at the individual level, and justify the constructs of interest. In section 3.4, I describe the data collection procedures and delve into practical and methodological concerns regarding data samples, including the nature of the obtained sample. I describe the critical features of the data, providing an overview of respondents in the final dataset. In section 3.5, I report the measurement instruments included in three fieldwork surveys. In section 3.6, I outline the data analysis strategy, including path analyses and multiple regressions for hypothesis testing. In sections 3.7 through 3.11, I demonstrate the validity of my data and the appropriateness of my planned analyses for these data with various statistical tests, including assessment of missing values, factor analyses and reliabilities, outliers, and violations of multivariate analyses assumptions. I conclude this chapter in section 3.12, with the descriptive statistics of my data - including means and standard deviations of variables and bivariate correlations - and I discuss their implications for the next chapter (Chapter 4: Results).

3.2 The ontological and epistemological stance

An ontological and an epistemological stance guide each scientific research project. Each stance involves assumptions with implications for how research is approached, including the methods used to address the research question(s). These assumptions are based on the nature of reality and how we develop knowledge of that reality. Ontology is the nature of reality, and ontologies generally fall into one of two categories: relativist (subjective) or realist (objective) (O'Gorman & MacIntosh, 2015). A relativist stance assumes that reality, or the natural and social world, does not exist independently from our perceptions and interpretations of it. Conversely, a realist stance assumes that reality exists independently from our actions and observations; to take a realist stance means to suppose reality can be objectively measured by controlling for personal biases and account for error (O'Gorman & MacIntosh, 2015).

In this thesis, I adopt a realist ontology. The assumption underlying this approach, and informing all aspects of this thesis, is that reality exists beyond individual interpretations or consciousness of reality (O'Gorman & MacIntosh, 2015). In this thesis, I consider the reality or existence of the constructs similarly to how I would consider a tree in a forest; the tree exists independently of anyone's awareness or interpretation of it (Crotty, 1998).

Epistemology refers to how we come to develop our knowledge and understand reality (Crotty, 1998). Within realist ontology, our understanding of reality, including universal laws driving cognitions and associated constructs in this thesis, can be developed through a realist epistemology, with associated tools designed to limit error and personal biases (Ramey & Grubb, 2009). In this thesis, I adopt a realist epistemology. The assumptions of this epistemology align with my choice of ontology. Although the cognitive constructs of interest (i.e., psychological distance, DT identification, and dehumanisation of others) exist in people's minds, the existence of each construct is part of objective reality and can be measured objectively rather than based on how we perceive the existence of these constructs (Brown, 1996). That is, we can gain knowledge of these constructs using quantitative measurement tools.

Taking a realist stance means I must pay attention to, and address, two main limitations: First, I must pay careful attention to potential errors and biases in my study; and second,

though I expect that the findings will be replicable, I must acknowledge that future studies may not be able to replicate them in particular situations or with specific samples that differ from those in my study. Although I trust that my model should apply to all cases of individuals in DT contexts, I acknowledge that further studies and critical discussions will be required to further determine the generalisability of my hypotheses and findings, and under which situations my hypotheses hold and how underlying theory will require adjustment across situations. Our understanding of reality through realism is limited by the biases, errors, and imprecision of the methods used, which often cannot measure the constructs of interest directly (O'Gorman & MacIntosh, 2015). This limitation applies to my thesis and the constructs I measure. Understanding of phenomena is built across studies with different methods, and it becomes clearer with each study, critical analysis, and discussion.

A realist epistemology is appropriate to guide research in my area. Adopting this stance means that objective and independent observations of reality are suitable. In this thesis, I access the constructs of interest via measures in quantitative surveys, provided by external respondents. Quantitative methodology is most appropriate for my study, as the constructs of interest can be measured using validated and reliable scales, and other items, appropriate to my hypotheses. Deductive data analyses, including correlations, factor analyses, regression analyses, and path analyses, are appropriate to test my hypotheses within the context of DTs regarding spatial distance, psychological distance, DT identification, dehumanisation of the team, individual-level contributions to teamwork and frequencies of communication media use.

3.3 Research context

3.3.1 Data collection overview

Data collection for this study proved more challenging than first anticipated. Challenges arose for many reasons that I will discuss in Section 3.4. For now, I note that these challenges necessitated three stages of data collection, including:

(i) An initial field study using what I had anticipated would be adequate measures of the constructs of interest (including a measure of construal-level adapted from an existing measure);

(ii) A pilot study of a revised survey including new domain-specific measures of the constructs of interest (i.e., two new measures of construal-level that I created for this study); and

(iii) A final survey which formed the main source of data used to test my hypotheses.

In the first stage of data collection, I sourced data from one medium-sized financial organisation that implemented DTs across multiple cities within Australia. In the second and third stages of data collection, I sourced respondents using an online panel of individuals drawn from a database owned by a commercial survey firm (ResearchNow). For the final stage of data collection, survey data were collected from the same online panel in two waves. I also collected data from a third party—initial respondents' co-workers—to assess variables concerning the initial respondents. Prior to the final survey, I adjusted my theoretical model after analysing the measures of construal-level with data from stage two; the new measures lacked sufficient validity and were consequently abandoned. I briefly discuss the initial study and subsequent pilot study in Section 3.4.

3.3.2 The individual level of measurement

As I discussed in Chapter 2, I propose that individual-level processes mediate between spatial distance and individual-level contributions in DTs. The individual-level aligns with the central theories and concepts of this thesis: contributions to teamwork (i.e., individuals' cooperation, coordination, and conflict with their team), and the intrapersonal, rather than interpersonal, psychological antecedents of these contributions to the team (i.e., individuals' psychological distance from the other members of their DT, their DT identification, and the extent to which they dehumanise the other team members). These antecedents involve how the individual perceives and interprets the DT and context. For example, psychological distance must be measured at the individual level as it represents individuals' perceptions of the distance between themselves and others in their team. These individual-level perceptions of spatial distance are considered to impact the respondents' cognitions—in this case, DT

identification and dehumanisation of others—and their attitudes and behaviours (e.g., cooperation and coordination with other team members). Measuring constructs at the individual level is also less problematic than measuring at the team level and for matching data across waves; matching datasets is especially difficult considering the difficulties involved with obtaining a specific sample of employees currently working in DTs within Australia.

3.3.3 Obtaining an adequately large and generalisable sample

To answer my research question, I required a large sample with particular characteristics (i.e., individuals currently working in a DT located within Australia). Online panels were the best avenue for collecting a sample with these characteristics because they provide a broader scope to access respondents in DTs.

Online panels, typically maintained by commercial research firms, have become more widely accepted as a valid source of data by academic researchers conducting large scale quantitative surveys (Kees, Berry, Burton, & Sheehan, 2017). This acceptance stems from the advantages of online panels, such as their ease and scope, allowing access to populations that would otherwise be difficult, impossible, and time-consuming to access, faster data collection (particularly useful for multi-wave data collection), and higher response rates from respondent pools that are generally more receptive to responding to surveys (Kees et al., 2017). Online panels also provide access to samples with greater diversity in terms of respondents' organisational setting and the roles they inhabit. Most theories in industrial-organisational psychology and management are devised to apply to diverse types of organisations and jobs, which are arguably better tested with more diverse samples, such as those typically obtained with online panels (Landers & Behrend, 2015). I used online panels for stages two and three of my data collection, due to their potential advantages in providing adequately sized samples of DT members located within Australia.

There are three main criticisms regarding validity and reliability of online panel data, focused around the representativeness of the general population, the honesty of respondents, and the degree of care respondents take in answering these surveys. Researchers have argued

that online panels represent convenience samples that are not strictly randomly selected from the population they are assumed to represent, and so they may not be as representative of the general population as samples collected other ways (Landers & Behrend, 2015). Moreover, researchers have voiced concerns that many respondents in online panels may not respond truthfully or may not read or answer questions with enough care to provide valid or reliable data (Ford, 2017). These respondents are referred to as 'cheaters' and 'speeders', respectively (Smith et al., 2016). The critiques of online panel data are not a major concern for the present research for two reasons. First, evidence demonstrates that online panel data are typically representative of the populations of interest, if not more representative than other popular sources of data (i.e., student or college samples, organisational samples). Second, evidence demonstrates that cheaters and speeders may not be as prevalent as some researchers suggest, and there are easily implemented methods to recognise and deal with these cases as they arise.

Overall, samples taken from online panel sources are not less representative than samples from other sources. Although evidence shows that respondents of one popular online panel (Amazon MTurk) can be more likely to suffer from anxiety or be unemployed than the general population, panel samples are generally more demographically diverse and representative of the general population than student and community samples (Chandler & Shapiro, 2016). For instance, compared to student samples, online panels are typically more representative of the general population regarding age and education; online panels are not as skewed towards younger and more highly educated respondents (Kees et al., 2017). Moreover, although online panel samples may tend to represent higher unemployment than other samples, this tendency is not problematic for my thesis because I filtered for, and selected only, those respondents who were currently employed and working in DTs. Additionally, I focus on examining relationships between variables among virtual team members, rather than estimating aspects of the population in general. Recall from Section 3.2 that I take a realist epistemological stance, which means I do not assume my results will apply across all samples; I assume that further work is required to support the universality of my conclusions.

Regarding cheaters, researchers have voiced concern that some respondents of online panels are motivated by monetary reward for participation in online surveys to answer questions dishonestly to avoid disqualification from participation (Smith et al., 2016). For example, many studies require data from particular populations. Questionnaires in these studies include 'filter' questions at the start of the data collection process. Filter questions ask respondents to declare whether they belong to the population of interest to ensure that the sample includes only those respondents fitting the criteria set by the researcher(s). If an individual declares that they do not belong in the sample of interest (e.g., DTs), then they are ineligible to continue responding to the survey and will not be included in the 'final' sample. In this thesis, I begin the surveys by asking respondents to declare whether they currently work in a DT within Australia. This filter question as it appeared in the field surveys is presented in Appendix C.

Speeders, by contrast, may fall within the defined population of interest but pose a problem because they do not pay adequate attention when reading and interpreting questions. Like cheaters, they are similarly motivated solely by the monetary reward but seek to spend the least effort and time required to attain it (Smith et al., 2016). This problem is associated with a more widely-held concern among some scholars that online panel surveys are likely to involve greater risks associated with the collection of reliable or valid of responses (Chandler & Shapiro, 2016).

As I have noted, cheating and speeding may occur among respondents recruited from online panels, reflecting the relative novelty of online panels as an alternative to more traditional recruiting methods. While cheating and speeding are possible in all approaches to recruiting and administering surveys in social science research, there may be reasons to believe that the opportunity for both cheating and speeding are greater in online panels. Providing the opportunity to be paid for each survey completion, in a system that frequently provides new opportunities to complete surveys for monetary reward, may encourage individuals to maximise rewards by maximising the number of surveys within the minimum time. In such a system, cheating and speeding may be more problematic than typical recruitment methods.

However, the available empirical evidence indicates that cheating and speeding occur in other, more traditional approaches to recruiting respondents, and these issues are no more likely or more prevalent in online panels. Whilst Feitosa, Joseph and Newman (2015) claim that around 5-10% of respondents in Amazon's MTurk panel lie about their location—for example indicating they are domiciled in the United States, yet they live elsewhere—Ford (2017) suggests that this claim is based on anecdotal evidence rather than any robust process of estimation. The few studies comparing the propensity of respondents to cheat or speed in online panels versus other recruiting methods indicate that this problem is not any more widespread in online panels. Behrend et al., (2011), for example, found that respondents to online panels are generally honest and do not differ considerably from undergraduate student samples. Moreover, online panel datasets have been shown to demonstrate the same statistical relationships between variables as datasets sourced directly from student or professional samples. This equivalence is demonstrated in a recent meta-analysis of 54 studies which sourced data from online panels, such as MTurk or Qualtrics, that indicated online panels are as reliable as student and professional samples, if not more reliable, and issues for online panels apply to all sources of survey data (Kees et al., 2017).

As these comparisons between online panels and more traditional methods suggest, all approaches to recruiting respondents and collecting data pose a risk of speeding and cheating (Kees et al., 2017; Landers & Behrend, 2015). More importantly, the evidence demonstrates that these issues are no greater in online panels versus other data sources. Regardless of the form of sampling, researchers such as Landers and Behrend (2011) recommend that these problems are considered for all survey studies in the social sciences, including industrial-organisational psychology and management, irrespective of the data collection method.

To address these potential issues, I included checks in the data collection that were intended to filter out and exclude cheaters and speeders. These checks included:

(i) 'Trap questions', designed to reveal untruthful respondents;

(ii) Checks of the time respondents took to complete the survey and the exclusion of responses deemed to be inappropriately fast; and

(iii) Manual checks for nonsense answers to text-based questions, or answers indicative of a co-located (i.e., not distributed) team.

I discuss each check in more detail in Section 3.5, where I describe the measures and items that were included in the surveys.

Using an online panel to recruit my respondents and administer my survey was suitable and efficient. I chose to collect data using online panels from a specific group that would otherwise be difficult to obtain for the desired sample size. A large pool of respondents from an online panel provided a greater assurance that enough cases can be collected across multiple waves promptly. I did everything a researcher could do to minimise the occurrence and impact of potential cheating and speeding. The data for the main study proved reliable and valid, as demonstrated by the standard tests presented in subsequent sections.

3.4 Sample and procedures

For data collection stages two and three, after choosing to use an online panel to recruit respondents and collect data, I commissioned a Melbourne-based research firm, ResearchNow, to assist in generating a sample of potential respondents and to assist in the distribution of an online survey. ResearchNow assisted in identifying an appropriate sample from their larger panel of potential subjects. These potential respondents received an email with a link to an online survey. This link led respondents to a survey hosted on the Qualtrics platform. Respondents were paid in reward points, equivalent to $2 AUD, for their completion of the survey. I administered surveys for stage one of the data collection (consisting of two waves) and stage two (representing a subsequent pilot study) in September 2016, December 2016, and February 2017, respectively. For stage one, this represents a time lag of three months between waves. The final stage of data collection involved the administration of separate surveys in June 2017 (wave one) and September 2017 (wave two), respectively, representing a time lag of three months. These time lags were motivated by practical reasons, specifically to evaluate the first wave of data collection and to devise and implement adjustments to the second wave of data collection instruments.

For all three stages of data collection, respondents self-selected into the study based on a single filter question, which asked whether they currently worked in a DT within Australia, according to a definition of DTs provided to them (see Appendix C). I restricted respondents to only those in DTs within Australia to focus on the psychological distance concerning spatial distance, and to limit other forms of distance (e.g., cultural, language and large temporal distances). Additionally, to improve data quality and limit the inclusion of 'speeders', trap questions were included to test respondents' attention. For example, respondents were asked to "select strongly disagree if you are paying attention". If respondents failed any trap questions, they were automatically directed away from the survey and were unable to complete it. Only respondents who completed the survey and passed the trap questions were included in the final dataset for each wave. For more detail see Appendix C.

For the third stage of data collection, the necessary sample size was calculated based on the desired statistical power and the number of parameters in each analysis. Kline (2005) recommends a 'rule of thumb' of at least five cases for each parameter to be estimated for path analysis or SEM. My model contains 37 parameters to be estimated. Accordingly, I required 185 cases in my final dataset.

3.4.1 Administration of stage one of data collection survey

The aim of stage one of the data collection was to test my initial model. This initial model was like the final model (presented in Chapter 2) with one crucial difference; in stage one, construal of others was conceptualised more generally and in line with prior work as abstract versus concrete, rather than as dehumanisation. I attempted to measure construal-level directly with a measure for the DT context. Because such a measure had not yet been developed, my secondary aim was to adapt an existing measure to assess construal of others in DTs.

To operationalise this domain-specific construal-level, I adapted an original scale developed by Reyt and Wiesenfeld (2015), which was based on the behavioural identification form (BIF; Vallacher & Wegner, 1989). Reyt and Wiesenfeld's measure assesses individuals' construal-level

of activities conducted in the domain of work, and it is currently the only available work-related scale of construal-level. Reyt and Wiesenfeld's measure lists work-related activities, typically conducted on a day-to-day basis, and asks respondents to choose a descriptor that best describes each activity. For each activity, respondents must choose between a 'concrete' descriptor and an 'abstract' descriptor. In contrast to the list of activities in BIF, such as "making a list" or "cleaning the house", Reyt and Wiesenfeld's measure lists work-specific actions, such as "preparing a report" or "obtaining information from others in your team". Some researchers have used modified versions of the BIF to measure how respondents think about others' *behaviours* (Burgoon, Henderson, & Markman, 2013; Leviatan et al., 2008), though none have used a similar measure to assess construal of others themselves.

To attempt to measure construal of others in a DT, I used the work-related activities listed in Reyt and Wiesenfeld's (2015) scale and asked respondents to think about each activity conducted by members of their DT. Respondents were asked to choose the option that best describes those team members undertaking each action. To ensure clarity of interpretation and face validity, I pre-tested the survey among experts, including management academics at The University of Melbourne, fellow PhD students, and external IT professionals. The final version of the survey instruments and instructions, including the adapted scale, is included in Appendix B. The 15-minute survey was administered across two waves within a medium-sized financial firm located in Australia, with DTs across several states. 78 eligible employees responded to the first wave of the study, and 32 employees responded to the second wave.

In this initial field study, I had anticipated that the adapted measure would be an adequate measure of construal of others. However, this study and the measure of construal of others were inadequate for two reasons. First, I obtained a smaller sample size than I desired—restricting the data's utility for testing the conceptual model—and second, my measure of construal-level demonstrated questionable validity. The measure demonstrated adequate reliability with a Cronbach's α of .73 (Hair et al., 2014). However, an exploratory factor analysis (EFA) revealed seven distinct factors. Additional examination of the rotated factor matrix with Varimax rotation did not reveal a discernible pattern of factor loadings that made theoretical sense. To test the validity of the scale further, I made a composite score and examined the

correlation of that score with psychological distance and DT identification, yet these correlations were not significant. I concluded that the validity of the scale was questionable for this context and the scale requires revision and further testing to determine its usefulness.

3.4.2 Administration of stage two of data collection survey

After the first stage of fieldwork, I designed two additional stages of data collection. The second stage was a pilot study to demonstrate the reliability and validity of two domain-specific construal-level measures that I created for my study. One of these measures was a revised version of the scale from my initial study. The other measure was newly created using a more open-ended approach[5]. For the initial scale, I was concerned that respondents may have considered only those colleagues who typically worked in close physical proximity. I revised the scale to instruct respondents to specifically consider *all* members of their DT, including those located elsewhere (see Appendix B for the revised measure).

The new open-ended measure of construal-level was based on work by researchers who have measured construal-level by coding written words with the Linguistic Coding Method (LCM; Coenen, Hedebouw & Semin, 2006). The LCM supposes that categories of verbs and adjectives differ in their level of abstraction and this abstraction provides insight into cognitive and social processes (Coenen et al., 2006; Semin & Fiedler, 1988). The LCM has been used in construal-level research (e.g., Fujita et al., 2006; Reyt, Wiesenfeld, & Trope, 2016; Stephan, Liberman, & Trope, 2010). For instance, Fujita et al. (2006) asked participants to "describe what they saw in writing" after watching a video of two people interacting. Fujita et al. coded the responses into categories with associated abstractness according to the LCM and created

[5]Some studies take another approach to measuring construal-level by focusing on explanations for behaviour as a reflection of construal-level of an individual (e.g., Henderson et al., 2006; Nussbaum et al., 2003). These studies examine whether an individual is construed more abstractly or concretely by examining whether they attribute behaviours or outcomes to the disposition of the target individual(s) or their situation. The underlying assumption of this method is that psychologically closer objects are viewed more concretely, and thus situational information is more likely to be considered when developing attributions. However, this approach confounds attributions and construal-level, whereas measuring construal of others based on the abstractness with which they are described is more direct and thus less likely to be confounded by other factors.

'abstractness' scores. Similarly, I created an open-ended question asking respondents to describe up to nine colleagues in their DT (see Appendix B). I coded each word in each response according to their associated level of concreteness, based on concreteness scores in a list of 40,000 English words assembled by Brysbaert, Warriner, and Kuperman (2014). The average of these scores was used to represent the construal of others in the DT for each respondent, with higher scores indicating higher concrete construal.

As outlined in Section 3.4, an online panel (ResearchNow) was used to obtain a sample of 102 respondents for the second stage of data collection. Using this sample, the construal-level scale demonstrated poor reliability with a Cronbach's α of .53. After removing poorer performing items, the most reliable form of the scale contained only the reverse-coded items, with a Cronbach's α of .78. However, examination using EFAs revealed six factors when including all items, and two factors when including only the reverse-coded items. Problems with the open-ended measure of construal-level were also apparent; many cases were missing data for this measure, some respondents provided only one single-word description for each teammate, and some respondents with four or more teammates described only three of them.

I also used the correlations between the new measures and the behavioural identification form (BIF: Vallacher & Wagner, 1989) to assess divergent validity of these measures. To be thorough, I created two versions of the composite variable for the construal-level scale (all items and reverse-coded items), which are presented in the correlation matrix in Table 3.1.

Table 3.1. Correlations and reliabilities of measures in the pilot study.

	1	2	3	4	5
1 Construal-level scale (all items)	(.53)				
2 Construal-level scale (negative items)	.73**	(.78)			
3 Construal-level open-ended	.09	.14	-		
4 Behavioural identification form	.35**	.30**	.10	(.69)	
5 Psychological distance	-.19	-.18	-.23*	-.14	(.85)
6 DT identification	.15	.16	-.15	.07	-.08

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note: The reliability of each scale is included on the diagonal. DT identification demonstrated a Cronbach's α of .87.

Both newly created measures of construal-level demonstrated poor validity. The construal-level scale may possess adequate convergent validity, indicated by its moderate correlations with the BIF. Yet this scale demonstrated poor criterion validity, indicated by its non-significant correlations with psychological distance and DT identification. Also, the open-ended construal-level measure may not measure what it was designed to measure; it correlated significantly with psychological distance, but in the opposite direction than expected. The open-ended measure also failed to correlate significantly with the BIF. This pattern of results indicates questionable validity for both measures. So, further investigation and development of these measures are required before they are useful. Additional limitations and future directions for measuring construal-level in this domain are explored in the discussion chapter (Chapter 5).

Considering these results, I revised my model by conceptualising and operationalising construal-level in a domain-specific manner. To this end, I considered how construal-level manifests itself in my domain of interest, which led me to explore the literature on the objectification of others and studies of dehumanisation. As discussed in the literature review, I made links between dehumanisation and construal-level research, and more broadly psychological distance and social identification, which led me to the final version of the model and the third and final stage of data collection.

3.4.3 Administration of stage three of data collection survey

For stage three of data collection, representing the main study, I aimed to collect at least 300-400 responses with data matched across two waves. I therefore set an initial target of 700 completed surveys in wave one to account for expected attrition at wave two and a smaller response for co-worker surveys. Based on estimates from the online survey company's prior experience, I expected 60-75% wave one respondents to complete wave two, and 60-75% of wave two respondents to opt into the co-worker nomination question. I anticipated that those opting in would refer at least two co-workers on average and expected that 25-50% of these co-workers may complete the co-worker survey. After removing respondents who failed the trap questions, 731 and 292 completed surveys for waves one and two were included in the initial datasets, respectively.

Cases were removed from the dataset if they reported:

(i) A duration of under five minutes to finish the long survey (estimated at 18-20 minutes), indicating 'speeding';

(ii) 'Zero' spatial distance from others (explained below), indicating possible 'cheating';

(iii) Over a quarter of their reported team members primarily residing outside of Australia, indicating that the team was not entirely located within Australia and could bias the results; or

(iv) Team size over 40 (explained below).

A report of zero (average) spatial distance (in kilometres) indicates one of several possibilities: a) the team is not distributed; b) the team is sometimes distributed and is co-located at other times, or; c) the respondent only reported their co-located colleagues. Though teams that are sometimes distributed are relevant to future research, these possibilities are likely to be problematic for the interpretation of the results (e.g., including respondents who may be in non-DTs), so these cases were excluded from the dataset. Outlier analysis of team size revealed that cases reporting more than 40 members in their DT constitute a large univariate outlier (for both waves). Various team studies in well-regarded journals indicate that a team size beyond 30-40 members is unusually large. Examples of team size in such studies are 8-46 members (Magjuka & Baldwin, 1991), 6-30 members (Campion et al., 1993), 5-12 members (Vinokur-Kaplan, 1995), and 3-35 members (Wheelan, 2009). An examination of standardised scores for team size and further iterations of outlier analysis revealed that cases with a team size of 41 demonstrated standardised scores of four and upwards. According to standard procedures outlined in Hair et al. (2014), these cases are problematic outliers. Most, if not all, of the respondents that indicated a team size of 41+ employees are likely to have considered an organisational group that was not a team, such as a department. If some respondents had more than 40 employees in their DT, they would represent extreme cases. Thus, I excluded cases that reported a team size greater than 40.

For wave one, 190 of 731 complete surveys were unusable according to the criteria, leaving a total sample of 541 cases. For wave two, 23 of 292 complete surveys were unusable, leaving a total of 269 cases.

I tested for sampling bias by comparing the respondents who completed only wave 1 with those who completed both waves. I tested for significant differences in demographic characteristics using independent samples t-tests to compare the age and hours worked means, and chi-square analyses to test differences in the proportion of temporary versus ongoing DTs, genders, supervisors/managers, and mode of work (i.e., full-time, part-time, and casual). Compared to the participants who responded only to wave 1, participants who completed both waves demonstrated a greater proportion of temporary DTs (9%, compared to 11.4%; $X^2(1, N = 541) = .41$, $p > .05$), a greater proportion of males (48.6%, compared to 46.9%; $X^2(1, N = 540) = .16$, $p > .05$), a lesser proportion of supervisors/managers (31.8%, compared to 35.5%; $X^2(1, N = 541) = .79$, $p > .05$), and a lesser proportion of full-time (75.5%, compared to 78.5%) and casual workers (2.3%, compared to 4%; $X^2(3, N = 541) = 4.51$, $p > .05$). The two samples demonstrated similar work hours per week ($t(539) = 1.262$, $p > .05$) and age ($t(538) = -1.86$, $p > .05$). Specifically, there was no significant difference between participants who responded only to wave 1 in terms of hours worked per week (M = 37.91, SD = 10.89) and age (M = 43.48.07, SD = 11.78) compared to those who responded to both waves (hours per week: M = 36.71, SD = 10.70, age: M = 45.40, SD = 11.90). It is unclear whether these sample differences would significantly bias the responses of the final sample. It is possible that these differences may slightly bias the results, but I am unsure whether they would have significantly influenced responses and the relationships between variables. Although significant differences were found, the differences do not appear to be large.

To further determine whether attrition between waves 1 and 2 may have biased the analyses, I followed the suggestions by Goodman and Blum (1996) to test whether non-random sampling has occurred using a logistic regression. In this regression, I entered the central variables of interest from wave 1 – psychological distance, DT identification, and dehumanisation – as predictors of attrition (i.e., whether respondents responded to both waves). The results of the binary logistic regression indicated that none of the predictors were significantly associated with attrition (X^2 (3) = 3.38, $p > .05$).

After merging these waves, 220 matched cases remained in the final dataset. The sample demographic characteristics, as reported in wave one, are presented in Tables 3.2 and 3.3:

Table 3.2. Sample demographic characteristics of categorical variables.

Variable	Frequency	Percent (%)
Gender		
Male	107	48.6
Female	113	51.4
Location		
New South Wales	77	35.0
Victoria	58	26.4
Queensland	35	15.9
South Australia	21	9.5
Western Australia	20	9.1
Northern Territory	1	0.5
Tasmania	7	3.2
Australian Capital Territory	1	0.5
Work status		
Full-time	166	75.5
Part-time	48	21.8
Casual	5	2.3
Other	1	0.5
DT status		
Temporary	25	11.4
Ongoing	195	88.6
Supervisor of team		
Yes	70	31.8
No	150	68.2

Note: n = 220. Sample demographic characteristics reported in wave one.

Table 3.3. Sample demographic characteristics of continuous variables (n = 220),

Variable	*M*	*SD*
Age	44.40	11.90
Hours worked per week	36.71	10.70
Hours worked for the DT per week	21.02	13.99
Team tenure (years)	3.34	3.51
Organisational tenure (years)	8.05	7.53
Team size (excluding respondent)	8.10	6.83

Note: n = 220. Sample demographic characteristics reported in wave one.

As Tables 3.2 and 3.3 above show, males and females were almost equally represented in the final sample, with females representing a little over half of the respondents. Approximately

a third of the respondents were supervisors in their DTs. Most respondents were from NSW, Victoria or Queensland, and most were working full-time for their organisation. Most respondents were in ongoing rather than temporary teams, and on average, over half of the total hours worked were for their DT. Additionally, respondents' average team tenure was less than half their average organisational tenure.

At the end of the wave two surveys, respondents were invited to nominate up to four of their co-workers who were currently working in the same DT to complete an additional survey. This co-worker survey was designed to obtain alternative indicators of constructs from additional sources, including cooperation, coordination, and conflict, concerning the initial respondents. These alternative indicators were sought to address potential concerns around the validity of self-reported behavioural outcomes. Measures from both waves of the surveys were used in the co-worker survey, and some of these measures were adapted to the perspective of the co-worker reporting on the initial respondent and their experience with the initial respondent. Unexpected constraints enforced by the online panel data company prevented me from offering any incentives for referring co-workers and for co-workers to respond to the survey. This lack of incentive to respond meant that I did not receive adequate responses—only ten people responded to the co-worker survey—and therefore the data were unusable for the planned analyses.

3.5 Measures

All measures used a five-point Likert scale from one (strongly disagree) to five (strongly agree), unless otherwise specified. The full survey for the main study, including all items and scales, are included in Appendix C. Reliabilities found in the current study for each scale are included in Table 3.6 in Section 3.8.3.

Spatial distance was measured similarly to the measure used by O'Leary et al. (2014), by asking respondents where they typically worked, and the location of up to nine of their teammates relative to themselves (i.e., same office or floor in the same building, different floor in the same building, different building in the same city [if so, number of kilometres away], or different city [if so, which city]). From this question, the average spatial distance from other

team members for each case was calculated. If a respondent indicated that a team member primarily worked in the same office or a different floor in the same building, their response for that member was treated as zero kilometres. If they indicated the team member typically worked in a different building in the same city or town, the 'kilometres between buildings' response was used. Finally, if the respondent indicated that their team members primarily worked in another city, they entered postcodes into the survey or indicated their primary location by stating their city or suburb (e.g., 'Melbourne' or 'Fitzroy'); for these responses, I manually entered the corresponding postcodes into the data. The distance from the respondents' postcodes and their team members' postcodes were calculated in a straight line, in kilometres, using an online tool ("Free Map Tools: Distance between Australian postcodes", 2017). The average distance in kilometres was calculated from each respondent's distance from their fellow team members.

Erroneous and incomplete responses to the spatial distance questions were identified and addressed. If the respondent indicated the state in which a person who reportedly worked 'in a different city or town', yet they did not indicate the town or city, then the default was to use the postcode of the central business district for that state. For example, if Victoria was indicated but no town or city was provided, then the Melbourne central business district postcode, '3000', was used. If less information was provided, or if the respondent indicated that a team member was overseas, then these responses were marked as problematic. If the respondent indicated 'different building in the same town/city' yet they did not indicate kilometres between buildings, the median was inserted into the data. Using the median, rather than the mean, was deemed to be more accurate. After comparing means and medians and exploring the distributions of this variable, it was clear that using the mean distance led to an inflated spatial distance score; inserting the individual's mean score for these instances often presented a much higher distance than would be reasonably expected for two buildings within the same town or city. Thus, this variable was represented by the mean spatial distance from each respondent from the other members of their DT.

Psychological distance was measured with a four-item subscale that was included in a larger 16-item scale by Kimmons, Harrison, and Martins (2016). Respondents were presented

with the item stem “When I think about my teammates in the virtual team” and asked to indicate the extent to which they agree with each item. An example item is “I have a feeling that they are remote from me”. The reliabilities for this scale were very high, with a Cronbach’s α of .90 in wave one and .92 in wave two.

Social identification with the team was measured using a four-item scale developed by Doosje, Ellemers, & Spears, 1995). The items cover the cognitive, evaluative and affective aspects of social identification with the team. Items include “I identify with other members of the team”, “I see myself as a member of the team”, “I am glad to be a member of the team”, and “I feel strong ties with other members of the team”. The scale demonstrated high reliability, as indicated by a Cronbach’s α of .86 in wave one and .87 in wave two.

Dehumanisation was measured with a four-item scale from Alnuaimi et al. (2010). The original measure—created as part of a post-experiment online survey—asked individuals to rate the items referring to their group after completing a laboratory task. Items were reviewed by multiple researchers in behavioural information systems research and technology-supported teams to assess content and face validity of items. I adapted the instructions from referring to perceptions of ‘a group during a task’ to perceptions of ‘members of the DT regarding interactions with them in the past month’. Items included “I did not really feel that I was interacting with people” and “I felt that I was interacting with a computer rather than a human being”. Despite originating from a lab study, this measure is appropriate for the current study because it was designed and devised methodically in the same way it would otherwise have been if it were originally devised for a purely survey-based study. Additionally, this measure was designed to capture dehumanisation, rather than to manipulate it. Alnuaimi et al. (2010) demonstrated adequate content, face and discriminant validity of this measure, with factor loadings mostly above .87 with one item at .06, and very good reliability with a Cronbach’s α of .89. In the current study, dehumanisation demonstrated good reliability with an α of .91 in wave one and .83 in wave two.

Cooperative attitudes towards their team was measured with a three-item scale from Klein et al. (2001) and adapted by Aube and Rousseau (2005). This measure was originally developed to measure individuals’ commitment to team goals and is used in the current study to

operationalise cooperative attitudes because "cooperative attitudes reflect a focus on team goals rather than individual interests" (Robert, 2016). This description by Robert shows that the measure of commitment to team goals is essentially a proxy for – and therefore appropriate to use as a measure of - the construct of individuals' cooperative attitudes in teams. The Cronbach's α of the scale in Aube and Rousseau's (2005) study was .85, demonstrating good reliability. The Cronbach's α of cooperative attitudes in the current study was .90, indicating very good reliability.

Cooperative behaviours with their team were measured with a five-item scale from Chatman and Flynn (2001). This scale was originally designed to measure cooperative team behavioural norms. I adapted the items to reflect respondents' own cooperative behaviours with their team, rather than expected behaviours from the team overall. For example, items were changed from "It is/was important for us to maintain harmony with the team" to "it is important to me to maintain harmony within the team", and "there is/was a high level of cooperation between team members" to "there is a high level of cooperation between myself and other team members". In the original article, the Cronbach's α was .77, demonstrating adequate reliability. In the current study, cooperative behaviours demonstrated a Cronbach's α of .69, indicating adequate reliability.

Coordination behaviour with their team was measured with a five-item scale from Lewis (2003), adapted to refer to the individual in the team. For example, the referent was changed from the team to the respondent as they interacted with the team. Specifically, the item, "our team worked together in a well-coordinated fashion", was changed to, "I work together with other team members in a well-coordinated fashion". The scale was originally used to measure coordination behaviours as a part of transactive memory systems in teams. This scale was chosen because the concept of coordination, as measured and described for this scale, fits well with this thesis' conceptualisation of coordination and strong theoretical ties between transactive memory systems and CLT. At the individual team member level, Lewis (2003) provided a Cronbach's α of .78, indicating adequate internal consistency. They also demonstrated a CFA showing a good fit of this scale to the data at the individual level, with

adequate convergent and discriminant validity. In the current study, this scale demonstrated adequate reliability with a Cronbach's α of .78.

Conflict between the respondent and their team was measured with items from the intragroup conflict scale (Jehn, 1995), with additional items measuring process conflict found in Shah and Jehn (1993). Relationship conflict, task conflict, and process conflict were each measured with three items, on a five-point Likert scale ranging from one (none or not at all) to five (very much or very often). These items were previously modified to measure an individual's experience of conflict with their workgroup; i.e., Tidd, McIntryre and Friedman (2004) changed the items from "in your work unit" or "workgroup" to "between you and the people you work with". For my study, I adapted items from "in your workgroup" to "between you and the other people in the team", to reflect the individual-level experience of conflict between the respondent and other members of a team. Tidd et al. (2004) found Cronbach's α of .93 and .87 for relationship and task conflict, respectively. Jehn and Mannix (2001) demonstrated good reliability with Cronbach's α's of .94, .94 and .93 for relationship, task and process conflict, respectively. These three scales appear to be distinct, with Jehn and Mannix' (2001) factor analysis confirming the sub-scale factor structure. However, as I will discuss in a later section, the three types of conflict were not distinct in the current study; an amalgamated 'conflict' variable made from the three types of conflict in the current study demonstrated a Cronbach's α of .91.

Communication frequency by medium. Frequencies of separate communication media were measured with a scale from O'Leary et al. (2014). Participants were asked to indicate how often, in the past month, they communicated with other members of the virtual team using each of the following communication media; face-to-face, email, online chat, instant text message, telephone or voice-over-IP (VOIP), video CMC, social media, and 'other'. Responses were indicated on a scale from one (not at all) to six (more than five times a day). This scale was used by O'Leary et al. (2014) to examine the combined effects of communication onto outcomes via an index calculated by summing all frequency variables (including face-to-face communication), however this was a crucial limitation of their study; in the current study, I aim

to investigate more specific communication frequencies and their effects, considering their unique characteristics.

To investigate the effects of face-to-face, video CMC (allowing video and audio), and phone (allowing audio), I used the face-to-face, video and phone frequencies, respectively, as provided by the survey. For lean CMC, I created a composite score, which I henceforth refer to as text-based CMC, by summing the frequencies of email, texting, and real-time chat. Due to the very low adoption of social media to communicate with team members and associated statistical abnormalities of this variable (see Section 3.10), social media was excluded from the composite variable and subsequent analyses. The logic informing summing lean CMC, and not summing other forms of communication, was guided by general literature on media richness (e.g., Daft & Lengel, 1986). That is, email, texting and real-time chat are similar in terms of the richness they afford. Researchers may argue that examining CMC media in this way is erroneous because using particular communication channels would reduce the need to use other media. For instance, if an individual communicates frequently via email and face-to-face, they may not need to use video CMC because they have communicated all they need with the other media. However, the frequency of each communication medium is likely to be independent. None of the correlations (see Table 3.8 in Section 3.13.2) between communication frequencies were negative. Instead, these correlations were positive and of medium magnitudes, indicating that not only does the frequency of one communication medium not decrease another but that using one or two media more frequently may mean higher frequencies of other communication media.

Task interdependence was measured for use as a control variable. It was measured with a 3-item scale from Koster et al. (2007). Items include, "I need information from my co-workers to be able to carry out my job", and, "I am very dependent on my co-workers to be able to be able to carry out my job". Koster et al. (2007) found this scale to be fairly reliable with a Cronbach's α of .77. In the current study, task interdependence demonstrated a similar Cronbach's α of .76.

3.6 Data analytic strategy

To examine the factor structure of the scale variables in my research context and sample, I used confirmatory factor analyses in AMOS to further assess the factor structure, divergent validity and convergent validity of the scale variables (Hair et al., 2014). To test the hypothesised relationships among the variables in Model One, I used multiple regressions. To test the hypotheses in Model One, I used path analyses with maximum likelihood estimation (MLE) in AMOS. Path analysis was the most appropriate analytical tool to test these hypotheses because it:

(i) Facilitates the investigation of the relationships between variables while using some of them as dependent variables and independent variables simultaneously;
(ii) Allows the investigation of simultaneous mediators in parallel (i.e., psychological distance and DT identification) and their relative magnitudes of impact in the model; and
(iii) Has lower sample size requirements than structural equation modelling (SEM); I did not obtain an adequate sample size for testing my model with acceptable power in SEM.

To obtain unbiased results, the assumptions of analyses must be met. The assumptions underlying path analysis and multiple regressions include univariate normality, homoscedasticity, linearity, and multicollinearity of the data (Hair et al., 2014). These assumptions are addressed in Section 3.12. Prior to these tests, I checked the data for missing values, ran factor analyses to examine the factor structure and reliability of each scale, assessed common method variance (CMV), and identified univariate outliers, per standard procedures as recommended by Hair et al. (2014).

3.7 Assessment and treatment of missing values

To check cases for missing values across all items to be used in later analyses, I used missing variable analysis (MVA) in SPSS. Missing values of less than 10% do not typically bias results and can be overlooked (Hair et al., 2014). No cases were missing scale variables for waves one or

two. Several cases were missing items from demographic questions such as tenure, age, or gender; these missing data were not imputed because they were objective, rather than subjective, questions. After assessing and treating missing values, I reverse coded negatively worded items where necessary (Appendix C indicates reverse-coded items).

3.8 Factor analysis and reliability of scales

I conducted confirmatory factor analysis (CFA) for all scale variables used in subsequent analyses. I conducted CFAs in AMOS. I tested the reliability of each scale using Cronbach's α in SPSS, which evaluates the internal consistency across items in a scale.

3.8.1 Confirmatory factor analyses

To further test the factor structure, validity, and reliability of the scales, I conducted CFAs in AMOS. CFA models were used to test various combinations of variables taken from both waves (e.g., including psychological distance from wave one with dehumanisation from wave two in one model, then in another model including both variables from wave two, and so on). The CFA results did not differ between models in any meaningful way. The model discussed from here onwards, including Table 3.5, includes DT identification, psychological distance, and task interdependence from wave one, and dehumanisation, cooperation, coordination, and conflict from wave two. As per the EFA results, the nine conflict items were assigned to one latent variable representing conflict overall. I treated conflict in this way for two reasons; a) the EFA supported conflict as one factor rather than three separate dimensions, and b) with three dimensions of conflict, the CFA contained too many parameters to estimate for the number of cases in the dataset to provide reliable estimates. Modification indices over 20 indicated strong associations between items for identification (items two and three) and conflict (item eight with items seven and nine). Per the EFA and assessment of AVE, cooperative behaviours items three and four, coordination items one and four, and conflict item three were removed due to poor fit, loadings onto parent factors, cross loadings in the CFA, and improvements in the measurement model after removal. Co-variances were added between each pair of variables to

improve model fit. Table 3.5 presents the model fit indices and relevant rules of thumb for assessing the fit of the model to the data:

Table 3.5. Model fit indices, rules of thumb, and results of confirmatory factor analyses.

Model fit index	Rule of thumb	Result
Chi-square / *df*	< 3 (Byrne, 2009)	1.64
Tucker-Lewis index (*TLI*)	> .9 (Bentler, 1990)	.92
Incremental Fit Index (*IFI*)	> .9 (Bentler, 1990)	.93
Comparative Fit Index (*CFI*)	> .9 (Hu & Bentler, 1999)	.93
Goodness-of-fit (*GFI*)	< .95 (Hu & Bentler, 1999)	.84
Root mean square error of approximation (*RMSEA*)	< .05 (Hu & Bentler, 1999)	.05

According to the model fit indices and rules of thumb in Table 3.5, the measurement model provided a good fit to the data. Though a significant chi-square ($p > .05$) indicated that the model was significantly different from the data, other model fit indices were within the recommended ranges. For instance, the chi-square divided by degrees of freedom, which accounts for the sample size and number of parameters to be estimated, indicated a good fit for the data.

3.8.2 Reliability checks

The Cronbach's α for each scale is presented in Table 3.6:

Table 3.6. Reliabilities of scale measures.

Scale	Wave	Cronbach's α
Psychological distance	1	.90
	2	.92
DT identification	1	.86
	2	.87
Dehumanisation	1	.91
	2	.83
Cooperative attitudes	2	.90
Cooperative behaviours	2	.69
Coordination	2	.78
Conflict: All items	2	.91
Task interdependence	1	.76

An α of .70 or above is the typically recommended rule of thumb for adequate reliability (Hair et al., 2014). As shown in Table 3.6, all scales demonstrate adequate reliability with α above or very close to .70. At this stage, composite scores were created for each variable by computing an average of their items.

3.9 Assessing common method variance

For all survey research using 'subjective' scales, CMV can be problematic and must be addressed (Podsakoff, MacKenzie, Lee, & Posakoff, 2003). CMV is variance attributable to measurement methods rather than the constructs themselves. It occurs when multiple constructs are measured via the same methodology, and that methodology itself accounts for some amount of variance in the responses across the constructs. For example, CMV includes common rater bias (i.e., all items are answered by the same respondent), particularly when variables are measured at the same time, location, and with the same format (Podsakoff et al., 2003). High CMV can be problematic because it can change the magnitude and even the direction of results by artificially inflating the relationships between predictors and target variables**.**

Obtaining variables at separate time points or from separate sources may diminish CMV. In my study, I collected all items at two separate time points (waves one and two), and used variables from wave one (i.e., spatial distance, communication, task interdependence), wave two (i.e., cooperation, coordination and conflict), and versions of the same scales from both waves (i.e., DT identification, psychological distance, and dehumanisation; for hypothesis testing and robustness checks). I also attempted to gather data from a separate source (co-workers) but, as I outlined in Section 3.4.3, I did not receive enough responses for these data to be useful.

Once data are obtained, researchers traditionally assess CMV with the Harman single factor test (Podsakoff et al., 2003). However, newer techniques are becoming standard practice. Specifically, the common latent factor technique has gained popularity, representing a more robust test of CMV (Podsakoff et al., 2003; Williams, Hartman & Cavazotte, 2010). Accordingly, I used the common latent factor technique to assess CMV among my variables. To use this technique, I created a measurement model for all scale variables in AMOS and included an additional latent variable with a variance of one to represent CMV. Then, I drew paths from the CMV variable to all observed scale items and constrained these paths to be equal. The subsequent analysis demonstrated a variance of .001 for the common latent variable, indicating CMV was not a significant problem for my data. There was also no meaningful difference in standardised regression weights between models with and without the CMV factor (all differences < .2). I concluded that CMV did not significantly bias my results, and I did not retain the CMV variable in further analyses.

3.10 Univariate outliers

To check the data for univariate outliers with the potential to bias results, I used two typically recommended methods. First, I created z-scores for all variables and used these z-scores to indicate outliers; Z-scores above 3.29 or below -3.29 (representing at least 3.29 standard deviations from the mean) indicate problematic outlier(s) (Aguinis, Gottfredson, & Joo, 2013a; Tabachnick & Fidell, 1997). Second, I explored outliers visually with box-plots and outlier analyses, whereby SPSS automatically marks problematic outliers (Aguinis et al., 2013a).

Several cases demonstrated z-scores beyond +/-3.29 for spatial distance, DT identification (wave 2), dehumanisation (wave 2), cooperative attitudes, cooperative behaviours, coordination, conflict, and video CMC frequency. The highest z-scores were found for spatial distance and conflict, with z-scores above 4.6. Interpretation of box-plots confirmed nine problematic outliers among spatial distance, dehumanisation, DT identification, cooperative attitudes, cooperative behaviours, coordination and conflict. These nine outliers that were indicated by both methods were excluded from further analyses. Additionally, the frequency of social media CMC demonstrated a severe lack of variability and normality, with over 160 cases indicating they did not use social media to communicate with other team members, with all other cases representing outliers. Social media was not included in subsequent analyses (it was also not included in the calculation of the text-based CMC composite variable).

3.11 Violations of assumptions of multivariate analysis

Each statistical test requires specific assumptions about the data to be met. Violations of these assumptions indicate that the test, and associated conclusions, may be invalid. Before conducting analyses, I checked the data for violations of assumptions associated with path analyses—normality, linearity, homoscedasticity, and multicollinearity—per standard procedures (Hair et al., 2014).

3.11.1 Univariate normality

Many multivariate statistical tests, including path analysis, assume that each variable is normally distributed (Hair et al., 2014; Kline, 2005). If the data are not normally distributed, the results may be biased. Normality is typically assessed two ways; visually (with histograms, box plots and Q-Q plots) and numerically (by examining kurtosis and skewness statistics) (Hair et al., 2014). For robustness, I applied both approaches to assess the normality of each variable. Visually, the plots indicated a high positive skew for spatial distance. Additionally, DT identification appeared to be negatively skewed, and face-to-face communication appeared positively skewed. Other variables appeared to be approximately normal.

Numerically, a kurtosis statistic between -2 and +2 is acceptable (Hair et al., 2014). All variables demonstrated kurtosis statistics within the acceptable range, indicating that kurtosis was not problematic in my dataset. A skewness statistic between .5 and -.5 indicates a normal distribution; between -1 and -.5, or .5 and 1, indicates a moderately skewed distribution; less than -1 or greater than +1 indicates a highly skewed (Hair et al., 2014). Spatial distance, face-to-face communication and video CMC, demonstrated skewness statistics of 1.52, 1.19, and 1.32, respectively, confirming their scores were highly positively skewed. Dehumanisation from wave 2 was moderately skewed (skewness statistic = .58). Dehumanisation was left untransformed.

Transforming variables is typically undertaken to correct non-normal distributions (Tabachnick & Fidell, 2007). Accordingly, I applied square root, log-10, and inverse transformations to correct highly skewed distributions for spatial distance, and frequencies of face-to-face and video CMC variables, and then assessed their subsequent distributions (per Hair et al., 2014; Tabachnick & Fidell, 2007). The best performing transformations were log-10 for spatial distance (skewness statistic=-.56), face-to-face communication frequency (skewness statistic=.12), and video CMC frequency (skewness statistic=.40). The transformed versions of these variables were used in analyses from this point onwards.

3.11.2 Homoscedasticity

Path analysis also assumes homoscedasticity of the data. Homoscedasticity means that the error term or variability of each continuous variable is practically the same across all levels of the independent variables (Hair et al., 2014). Violations of this assumption indicate that the relationships between variables may be overestimated. To test homoscedasticity, I ran the following regressions in SPSS (with each regression producing histograms and scatter plots of standardised residuals with the standardised predicted values):

(i) Regressing spatial distance and all communication variables from wave one onto psychological distance from wave two;

(ii) Regressing spatial distance and all communication variables from wave one onto DT identification from wave two;

(iii) Regressing spatial distance, all communication variables, psychological distance and DT identification from wave one onto dehumanisation from wave two; and

(iv) Regressing all the above variables from wave one onto:

a. Cooperative attitudes,

b. Cooperative behaviours,

c. Coordination, and

d. Conflict.

Each of the seven histograms demonstrated approximately normally distributed residuals. Almost all the scatterplots indicated homoscedasticity, demonstrating an approximately rectangular distribution with most scores in the middle. However, the cooperative attitudes, cooperative behaviours and coordination variables produced scatterplots indicating potential issues, as shown in Figures 3.1, 3.2 and 3.3;

Figure 3.1. Scatterplot of standardised residuals and standardised predicted values for cooperative attitudes.

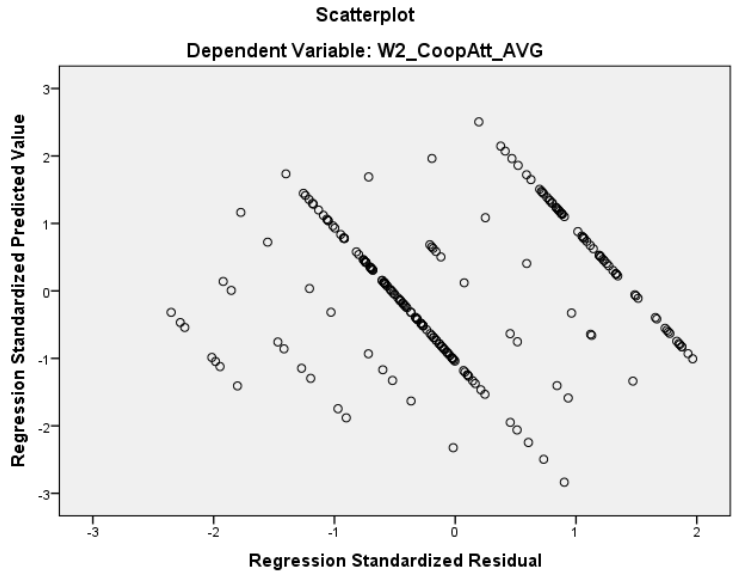


Figure 3.2. Scatterplot of standardised residuals and standardised predicted values for cooperative behaviours.

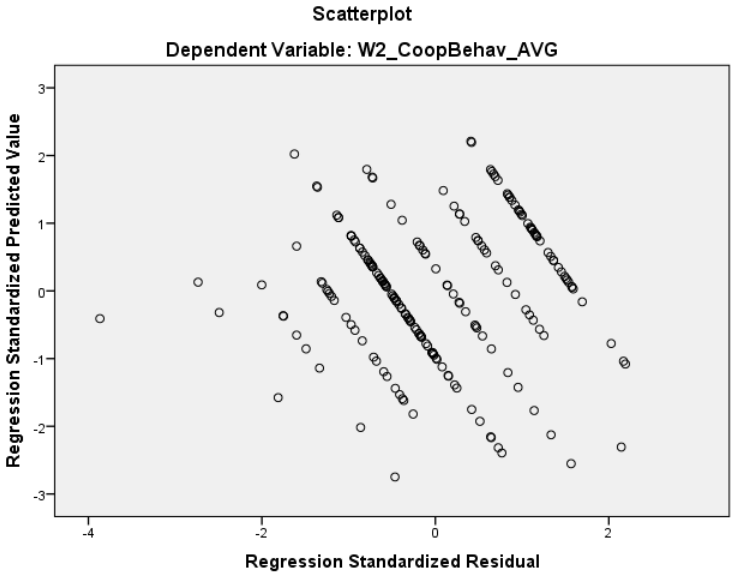
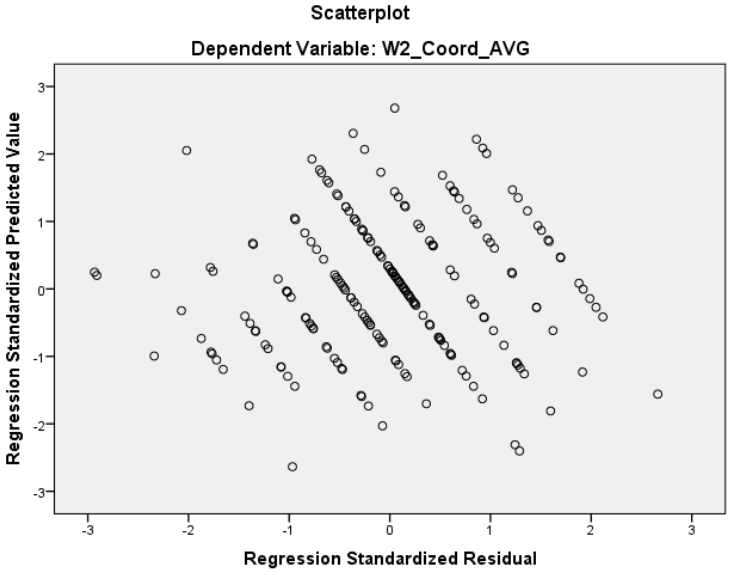


Figure 3.3. Scatterplot of standardised residuals and standardised predicted values for coordination with team members.



Although the previous checks did not indicate a problematic non-normal distribution of cooperative attitudes, cooperative behaviour, or coordination, additional investigation revealed a restricted range among most cases. For instance, cooperative attitudes (after removing a

small number of univariate outliers) had a range of 3—5; many cases demonstrated an average cooperative attitudes score of four (50 percent of cases) or five (30 percent of cases). Cooperative behaviours was similar, with 39 percent demonstrating an average of four, and 30 percent with an average of 5. In contrast, conflict demonstrated scores that were more normally dispersed across its range. The scatterplots were not improved after transforming the cooperative attitudes variable using square root, log, or inverse transformations. Though I still include these measures in the hypotheses tests, I note that the results are likely more conservative than they would be if these scores demonstrated a greater range.

3.11.3 Linearity

Many statistical tests, such as multiple regression and path analyses, are based on correlations between variables. Consequently, like bivariate correlations, these tests assume linear relationships among variables. Otherwise, these estimates may be biased and inaccurate (Tabachnick & Fidell, 2007). I assessed this linearity by visually examining bivariate scatterplots. The scatterplots indicated approximately linear relationships between the variables of interest (Hair et al., 2014).

3.11.4 Multicollinearity

The final assumption of path analysis is multicollinearity, which may be violated when two predictor variables are so strongly related that they may represent the same construct (Hair et al., 2014). Researchers typically assess multicollinearity in two ways; first, by checking bivariate correlations; correlations exceeding .80 indicate multicollinearity (Chatterjee, Hadi & Price, 2000); and second, by checking that variance inflation factors (VIF) do not exceed ten (Hair et al., 2014). Inspection of the correlation matrix revealed no correlations greater than .80. The highest correlation was .64 (between cooperative behaviours and DT identification with the team). Additionally, all VIF scores were below three. Together, these checks indicate that multicollinearity was not an issue among the variables in my study.

3.12 Multivariate outliers

In addition to univariate outliers, multivariate outliers may also bias results. Multivariate outliers represent cases containing a set of scores across multiple variables that represent extreme deviations from other cases. The Mahalanobis Distance is typically used to discover multivariate outliers (Hair et al., 2014). I conducted multiple regression analyses, calculating the Mahalanobis Distance for each analysis, in SPSS. Specifically, I regressed the scale variables (psychological distance, DT identification, dehumanisation, cooperation [attitudes, behaviours], coordination, and conflict) onto a randomly generated dependent variable (computed in SPSS using the RV.CHISQ command with 7df). I then calculated the critical Mahalanobis Distance to identify outliers using the equation $(N - 1)*(h - 1/N)$ - where N is the number of cases and h is the alpha set at .001 (Tabachnick & Fidell, 2007). Three cases demonstrated a Mahalanobis Distance above this critical score and were identified as multivariate outliers. These cases were removed from the dataset. I repeated the process with the non-scale variables included (i.e., spatial distance and CMC variables); two additional multivariate outliers were identified. At the end of this process, 206 cases remained in the final dataset.

3.13 Descriptive statistics

3.13.1 Means and standard deviations

To summarise the data, descriptive statistics are presented in Table 3.7;

Table 3.7. Means and standard deviations for variables in the main study.

Variable	*M*	*SD*
Average spatial distance from other team members (km)	299.28	407.74
Psychological distance: Wave one	2.56	1.00
Psychological distance: Wave two	2.58	0.98
DT identification: Wave one	4.03	0.65
DT identification: Wave two	4.04	0.61
Dehumanisation: Wave one	2.13	0.82
Dehumanisation: Wave two	2.07	0.72
Cooperative attitudes: Wave two	4.26	0.55
Cooperative behaviours: Wave two	4.25	0.51
Coordination: Wave two	3.93	0.60
Conflict: Wave two	1.90	0.53
Task interdependence	3.40	0.88
Face-to-face communication frequency	2.41	1.34
Video CMC frequency	1.92	1.09
Phone frequency	3.00	1.44
Text-based CMC frequency	9.29	3.08
Email frequency	4.18	1.30
Real-time chat frequency	2.60	1.71
Texting (i.e., SMS) frequency	2.50	1.48

Note: n = 206. All variables are untransformed. All variables measured at Wave one unless otherwise indicated.

The descriptive statistics in Table 3.7 reveal points of interest in the data. Variables for which I included versions from both waves (psychological distance, DT identification, and dehumanisation) demonstrate stable means (e.g., psychological distance wave one *M* = 2.56, wave two *M* = 2.58) and standard deviations (e.g., psychological distance wave one *SD* = 1.00, wave two *SD* = .98) across time points. Spatial distance (measured at wave one) demonstrates a high standard deviation (*SD* = 407.74) concerning its mean (*M* = 299.28), which reflects its high skew (corrected through a transformation for inferential analysis; see Section 3.11.1). The descriptive results for communication variables (measured at wave one) are as expected; Email is, on average, by far the most frequently used communication medium among the respondents (*M* = 4.18), followed by phone (*M* = 3.00). Video CMC is the least frequently used communication medium (M = 1.92).

3.13.2 Bivariate correlations

Correlations are typically used to provide an overview of relationships between variables. The correlation matrix for the current study, using untransformed variables, is presented in Table 3.8:

Table 3.8. Bivariate correlation matrix for variables in the main study.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Spatial Distance (w1)	-														
2. Psychological Distance (w1)	.19**	(.90)													
3. Psychological Distance (w2)	.12	.60**	(.92)												
4. DT identification (w1)	-.05	-.44**	-.36**	(.86)											
5. DT identification (w2)	-.11	-.40**	-.41**	.70**	(.87)										
6. Dehumanisation (w1)	.09	.48**	.43**	-.34**	-.37**	(.91)									
7. Dehumanisation (w2)	.06	.30**	.43**	-.29**	-.43**	.54**	(.83)								
8. Cooperative Attitudes	.02	-.12	-.22**	.42**	.54**	-.16*	-.40**	(.90)							
9. Cooperative Behaviours	-.11	-.15*	-.23**	.43**	.64**	-.30**	-.42**	.54**	(.69)						
10. Coordination	-.12	-.26**	-.36**	.30**	.37**	-.31**	-.49**	.42**	.38**	(.78)					
11. Conflict	.00	.20**	.22**	-.22**	-.22**	.28**	.33**	-.25**	-.16*	-.44**	(.91)				
12. Task Interdependence	.02	.00	-.01	.21**	.18**	-.03	-.03	.08	.12	-.08	.22**	(.76)			
13. Face-to-face comms. freq.	-.24**	-.14*	-.20**	.14*	.15*	-.10	-.03	.12	.20*	.11	.18**	.18**	-		
14. Phone frequency	-.03	.00	-.04	.05	.11	-.04	-.01	.05	.12	-.20**	.17*	.24**	.26**	-	
15. Video CMC frequency	.05	.07	.08	.04	.10	.03	.06	.05	.07	-.11	.05	.10	-.06	.30**	-
16. Text-based CMC frequency	.03	-.08	-.07	.21**	.22**	.03	.05	.11	.09	-.10	.17*	.10	.16*	.39**	.42**

Note. The reliability of each scale is provided in parentheses on the diagonal. All variables measured at wave one unless otherwise indicated.

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

As shown in Table 3.8, the bivariate correlations between the variables of interest were largely, but not entirely, in the expected ranges and directions. Specifically, spatial distance was positively, but weakly, correlated with psychological distance at wave one (r = .19, p < .01). However, spatial distance did not significantly correlate with DT identification, dehumanisation, or any outcome variable directly. DT identification (negatively) and psychological distance (positively) demonstrated high-moderate correlations with dehumanisation; these correlations were consistent within and across waves. These three constructs also demonstrated significant correlations with all individual-level contribution and conflict variables in the expected directions and magnitudes (i.e., higher psychological distance and dehumanisation were associated with lower coordination and coordination, and greater conflict; higher DT identification associated with higher coordination and coordination, and lower conflict). Task interdependence demonstrated positive correlations with DT identification at wave one (r = .21, p < .01) and two (r = .22, p < .01), and with conflict (r = .22, p < .01). Task interdependence was also positively correlated face-to-face communication (r = .18, p < .01) and text-based CMC (r = .16, p < .01). All communication frequencies correlated positively with other communication frequencies, providing evidence counter to suggestions that as individuals more frequently use particular media, they reduce their use of other media. I also note that face-to-face communication negatively correlated with spatial distance (r = -.24, p < .01), psychological distance at waves one (r = -.14, p < .05) and two (r = -.20, p < .01), and positively correlated with social identity at waves one (r = .14, p < .05) and two (r = .15, p < .05), and cooperative behaviours (r = .20, p < .05). Text-based communication also positively correlated with DT identification at waves one (r = 21, p < .01) and two (r = .22, p < .01), and conflict (r = .17, p < .05). Video CMC did not significantly correlate with the perceptual process variables or contributions to teamwork variables.

Several correlations were in the opposite direction than expected or lower than expected. Though psychological distance and dehumanisation correlated with their counterparts across waves, these correlations may be considered slightly lower than expected, indicating instability in these constructs over time. This instability is consistent with the expected nature of these cognitive constructs and their theoretical susceptibility to the influence of day-to-day conditions. For example, low face-to-face communication for one week may lead to the experience of high psychological distance from the team; more frequent face-to-face communication in the following week should correlate with reduced

psychological distance. Additionally, the frequency of richer CMC (e.g., video) did not significantly correlate with psychological distance; I will explore this non-association in relation to subsequent multiple regression results in the next chapter. Moreover, phone frequency correlated negatively with coordination (r = -20, p < .01) and positively with conflict (r = .17, p < .05); this correlation is opposite to expectations at first glance, but it may be explained by the mediating effects of DT identification in subsequent analyses.

The correlations have implications for subsequent analyses (in Chapter 4) and theoretical discussion (in Chapter 5). For Model One and associated path analyses, the correlations support the associations between psychological distance, DT identification, dehumanisation, and individual-level contributions to teamwork. However, spatial distance is not correlated with its proposed outcomes, except for psychological distance, indicating that spatial distance not likely to present significant direct effects on DT identification, dehumanisation, or the individual-level contributions to teamwork. It may still exert some weak indirect effects on variables in Model One, and interaction effects with communication on psychological distance and DT identification in Model Two. Thus, I retain spatial distance in both models for the analyses. I also note that, alongside the significant correlations of the proposed mediating variables and the end outcomes, the correlations indicate that psychological distance, DT identification and dehumanisation are much more important than spatial distance for individual-level contributions to teamwork in DTs.

For Model Two and planned multiple regression analyses, the correlations indicate that the frequencies of face-to-face and text-based CMC, and not video CMC or phone, are related to psychological distance and DT identification. The absence of significant associations between communication frequencies and dehumanisation indicate that the effects of communication on psychological distance and DT identification are more proximal and important. Moreover, relying on phone communication may create difficulties coordinating compared to other methods. Face-to-face, phone CMC, and text-based CMC unexpectedly positively correlated with conflict, indicating that the more frequently team members communicate in general, the greater their experience of conflict. This makes sense considering that conflict must arise through interactions with others. Alternatively, communication may increase as a result of conflict, because team members may need to communicate more frequently to produce results despite conflict.

I note that these correlations provide an initial overview rather than substantive analyses of the relationships in the model. Subsequent path analyses and regressions in the following chapter (results) will demonstrate more accurately the actual relationships between the constructs of interest and the separate variance in each construct accounted for by each variable in parallel, as per the theoretical model.

4 CHAPTER 4: RESULTS

4.1 Introduction

In Chapter 3, I outlined the design of my study, including the quantitative survey design and underlying philosophical approach, how the data were collected via an online panel, and the measures included in surveys. I also described how each variable was created and provided an overview of the final dataset and sample alongside the data analytical strategy to test my hypotheses. This strategy involves path analyses to test Model One and multiple regressions to test Model Two. I concluded Chapter 3 by presenting the descriptive statistics and correlations among the variables.

In this chapter, I present and briefly discuss the quantitative tests of the hypotheses I developed in Chapter 2. I begin by testing the hypotheses included in Model One. Recall from Chapter 2, these hypotheses pertain to the relationships among spatial distance, psychological distance, DT identification, dehumanisation, and individual-level contributions to teamwork. I then summarise whether the data supported each hypothesis. Following these analyses, I check the robustness of these results with additional analyses. A similar structure is then followed to present the analyses and hypotheses tests for Model Two. Model Two's hypotheses pertain to the main effects of the frequencies and media of communication—types of CMC media (i.e., video, phone and text-based CMC) and face-to-face communication—and their effects and interactions with spatial distance, onto psychological distance and DT identification.

Generally, the results support Model One, yet the analyses of Model Two were mixed. Specifically, the data broadly supports the proposed direct and indirect roles of psychological distance, DT identification, and dehumanisation, for contributions to teamwork in DTs. However, the tests of hypotheses in Model Two, concerning spatial distance and communication, indicate unexpected effects (or lack of effects). The results support the underlying theory-building from Chapter 2 concerning the roles of psychological distance, DT identification and dehumanisation in the model, and indicate areas that require modification of the conceptual model and associated theorising. Additional research to address the empirical limitations of the current study is discussed in the next chapter (Chapter 5: Discussion).

4.2 Hypothesis testing

4.2.1 Hypothesis testing overview

In this sub-section, I test the hypotheses and detail the results of the path analyses and multiple regression analyses. This section involves two main models:

(i) Model One; the main structural model, including relationships among spatial distance, psychological distance, DT identification, dehumanisation, individual-level contributions to teamwork; and

(ii) Model Two; the impact of spatial distance and communication media (frequencies), including their interaction effects, on psychological distance and DT identification.

I used the approach outlined in Section 3.6 to test the hypotheses in Model One and Model Two. Model One and its included hypotheses (Table 2.1 in Section 2.5.11) were tested with path analyses in AMOS. Path analysis is typically used to test structural models and included direct and indirect relationships (Byrne, 2009). The hypothesis testing for Model One was conducted in two steps; first, I assessed the overall model fit; and second, I assessed the significance of each hypothesised relationship. To assess model fit, I examined typically recommended model fit statistics (see Byrne, 2009, and Hair et al., 2014). Model fit statistics generally demonstrate whether the data supports the theories overall (Byrne, 2009). The most commonly used model fit test, the chi-square (χ^2), indicates that a specified model does not differ from the data if the statistic is small and non-significant (Byrne, 2009). In addition to the chi-square, I assessed model fit using the standardised root mean square residual (*SRMR*), root mean square error of approximation (*RMSEA*), and comparative fit index (*CFI*). The *SRMR* indicates model fit by averaging the difference between the sample and model-implied correlations (Hu & Bentler, 1999). The *RMSEA* estimates how well the model is expected to fit the population with unknown but optimal parameter estimates (Byrne, 2009). The *CFI* represents the relative reduction in lack of fit by comparing the sample covariance matrix with the null model (i.e., the model that assumes all latent variables are uncorrelated); the *CFI* is generally robust to smaller sample sizes (Hu & Bentler, 1999). I tested Model Two and its included hypotheses (see Table 2.2 in section 2.6.7) with multiple regression analyses in SPSS. For this purpose, the overall regression statistics were assessed for the significance and the degree to which the IVs together predicted the DVs at

each step (Hair et al., 2014). Then, the regression coefficients for each variable were assessed to determine their individual significance and their magnitude of impact on the DVs (Hair et al., 2014).

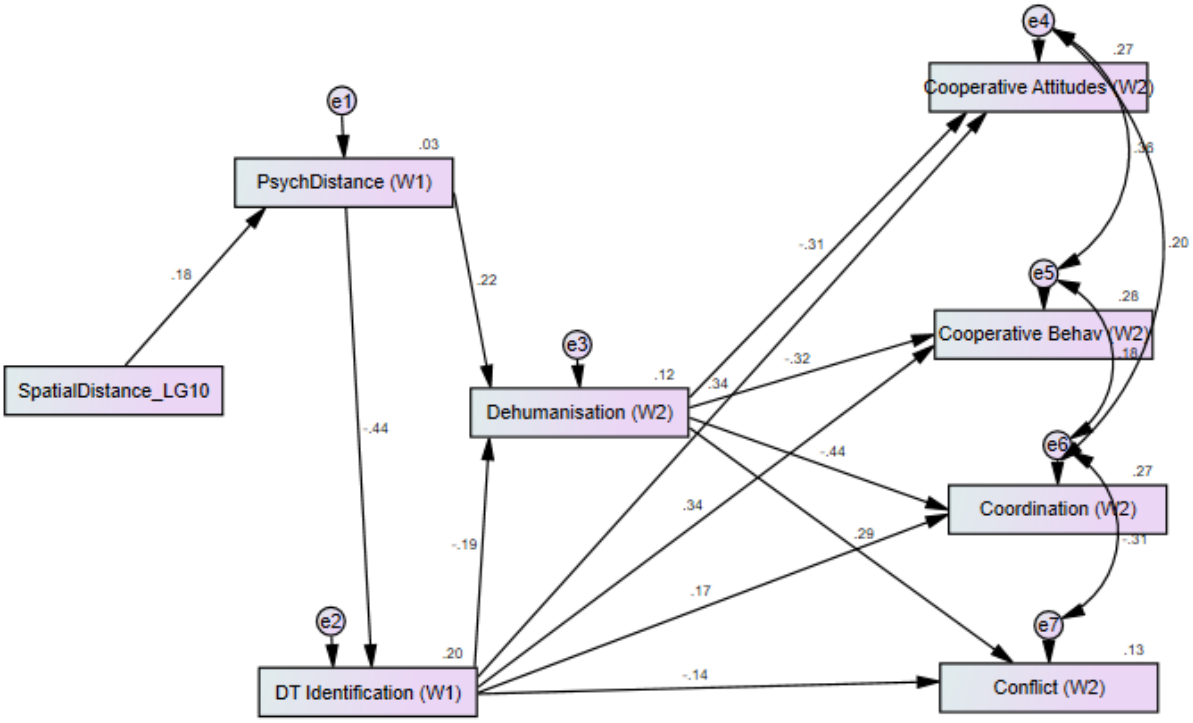
4.2.2 Model One: Hypothesis testing with path analyses

A full model including psychological distance and DT identification from wave one, and dehumanisation from wave two, was used to test the relationships among spatial distance, psychological distance, DT identification, dehumanisation, and individual-level contributions to teamwork. Other models were used as robustness checks (Models 1B and 1C), and post-hoc analysis (Model 1D), which are discussed in Section 4.2.5.

The goal of testing the models was to iteratively assess and adjust each model so that they eventually reflect the variances and covariances in the data. Model fit is typically assessed by conducting a path analysis with the expected paths, examining model fit indices, and removing non-significant paths (Kaplan, 2000). I deleted each non-significant path ($p < .05$), one at a time, in the order of furthest from statistical significance (i.e., the path with the largest non-significant p-value), until no non-significant paths remained. This procedure was applied to all path analyses in this thesis.

After removing a non-significant path from spatial distance to DT identification ($\beta = .04$), the final version of Model 1A provided a statistically good fit for the data; $\chi^2(12) = 14.533$, $p = .268$, $\chi^2/df = 1.211$, TLI = .983, IFI = .993, CFI = .993, RMSEA = .032. Figure 4.1 illustrates the final model, including standardised parameter estimates for the structural paths and the degree of variance, explained for each endogenous variable. The model accounted for variance in psychological distance (3%), DT identification (20%), dehumanisation (12%), cooperative attitudes (27%), cooperative behaviours (28%), coordination (27%), and conflict (13%).

Figure 4.1. Significant standardised parameter estimates for final path analysis of Model 1A.



Among the individual-level contributions to teamwork, the predictors in Model 1A most strongly predicted cooperative behaviours and coordination. They also strongly predicted cooperative behaviours and conflict, accounting for substantial variance in each. Moreover, the variance in DT identification accounted for by psychological distance (20%) was larger than the combined variance in dehumanisation accounted for by the model (12%), supporting the more proximal nature of DT identification to psychological distance.

All significant main effects in the model were in the expected directions. According to Cohen (1988), effect sizes can be within a small-range (β < .13), medium-range (β between .13 and .26), and large-range (β > .26). So, as Figure 4.3 shows, spatial distance was directly related only to psychological distance, demonstrating a medium positive effect (β = .18). Psychological distance demonstrated a large negative effect on DT identification (β = -.44) and a medium positive effect on dehumanisation (β = .22). Psychological distance also demonstrated indirect effects on cooperative attitudes, cooperative behaviours, coordination, and conflict via dehumanisation (See Table 4.1 and subsequent discussion for more detail regarding indirect effects in Model 1A). DT identification with the DT demonstrated expected effects on other variables, with medium negative effects on dehumanisation (β = -.19) and conflict (β = -.14), large positive effects on cooperative attitudes (β = .34) and cooperative behaviours (β = .34), and a medium positive effect on

coordination (β = .17). Dehumanisation had large effects on each individual-level contribution to teamwork variable, with negative effects on cooperative attitudes (β = -.31), cooperative behaviours (β = -.32), and coordination (β= -.44), and a moderate positive effect on conflict (β= .29).

Including task interdependence as a control variable did not influence the original estimates in any meaningful or significant way. I re-tested Model 1A with the inclusion of task interdependence as a control variable, modelling its effects on psychological distance, DT identification, dehumanisation, and the individual-level contributions to teamwork. In this model, task interdependence related positively to DT identification (β =.21) and negatively to coordination (β = -.14). The inclusion of this control variable did not significantly change the original estimates of the relationships between the variables. From here, I will continue to focus on the model without task interdependence because it retains greater statistical power, considering that the model was already complex, with many variables and relationships between them.

To further explore mediation in the model, I assessed the indirect effects of each variable (where applicable). To assess their significance, I analysed Model 1A with bootstrapping (2000 samples and bias-corrected confidence intervals) and AMOS generated the bias-corrected, two-tailed significance of each indirect effect. Table 4.1 reveals the standardised indirect effects in Model 1A.

Table 4.1. Standardised indirect effects and confidence intervals (95%) from final path analysis of Model 1A

	Spatial distance (LG10)	Psychological distance	DT identification
DT identification	-.08** [-.14, -.02]		
Dehumanisation	.05** [.01, .11]	.09* [.01, .17]	
Cooperative attitudes	-.04** [-.08, -.01]	-.24*** [-.32, -.17]	.06* [.01, .12]
Cooperative behaviours	-.04** [.01, .05]	-.25*** [.08, .23]	.06*[-.12, -.01]
Coordination	-.04** [-.07, -.01]	-.21*** [-.29, -.13]	.08* [.01, .16]
Conflict	.03** [-.08, -.01]	.15*** [-.32, -.18]	-.06* [.01, .13]

*p < .05, **p < .01, ***p < .001, confidence intervals (95%) provided in brackets.

As Table 4.1 shows, all indirect effects were significant, supporting the expected mediating effects. Yet, many of these effects were small, particularly from spatial distance.

Spatial distance had small indirect negative effects on DT identification (via psychological distance), cooperative attitudes and cooperative behaviours, and coordination (via psychological distance, DT identification, and dehumanisation), and small indirect positive effects on dehumanisation (via psychological distance, and potentially via DT identification), and conflict. DT identification had small indirect effects, via dehumanisation, on each individual-level contribution to teamwork (positive) and conflict (negative). Relative to spatial distance and DT identification, psychological distance demonstrated moderate indirect negative effects on cooperative attitudes, cooperative behaviours, and coordination, and moderate indirect positive effects on conflict. In addition to its direct effects on dehumanisation, psychological distance demonstrated small indirect effects on dehumanisation via DT identification. Table 4.2 shows the standardised direct effects of spatial distance, psychological distance, DT identification and dehumanisation on other variables in the model.

Table 4.2. Standardised total effects from final path analysis of Model 1A

	Spatial distance (LG10)	Psychological distance	DT identification	Dehumanisation
Psychological distance	.18**			
DT identification	-.08**	-.44***		
Dehumanisation	.05**	.30***	-.19*	
Cooperative attitudes	-.04**	-.24***	.39**	-.31***
Cooperative behaviour	-.04**	-.25***	.40**	-.32***
Coordination	-.04**	-.21***	.26***	-.44**
Conflict	.03**	.15***	-.20***	.29***

**$p < .01$, ***$p < .001$

As Table 4.2 shows, the total effects of each variable in the model were significant and in the expected directions. The total effects of psychological distance were almost all large in magnitude and were consistently much greater than the effects of spatial distance, which were mostly low in magnitude except for its direct impact on psychological distance. Additionally, the results indicate a critical mediating role for dehumanisation, explaining most of the influence of psychological distance on the various individual-level contributions to teamwork. Dehumanisation also explains a portion of the impact of DT identification on

key outcomes. Moreover, incorporating psychological distance and DT identification explain variance above and beyond that of spatial distance.

4.2.3 Model One: Summary of hypotheses testing

The hypothesis tests of Model One, as conducted and demonstrated with Model 1A, are provided in Table 4.3:

Table 4.3. Model One (1A) hypothesis tests.

Hyp.	Hypothesised relationship	Support/Partial Support/Reject
1	Spatial distance to psychological distance (+)	Support
2	Spatial distance to DT identification (-)	Reject: Mediated by psychological distance.
3a-d	DT identification to DT work contributions	Support
4a-d	DT identification mediates the relationship between spatial distance and DT work contributions	Reject: Mediated by psychological distance.
5	Psychological distance to DT identification (-)	Support: Causality supported with post-hoc analysis (Model 1D in section 4.2.5, below)
6	Psychological distance to dehumanisation (+)	Support
7	DT identification to dehumanisation (-)	Support
8a-d	Dehumanisation to DT work contributions: (a) Cooperative attitudes (-); (b) Cooperative behaviours (-); (c) Coordination (-); and, (d) Conflict (+).	Partial support: (a) Reject: Failed robustness check (Model 1C in section 4.2.4, below) (b) Support (c) Support (d) Support
9a-d	Dehumanisation mediates between psychological distance and DT work contributions	Partial support: (a) Reject (failed robustness check) (b) to (d) Support: Full mediation
10a-d	Dehumanisation mediates between DT identification and DT work contributions	Partial support: (a) Reject (failed robustness check) (b) to (d) Support: Partial mediation

The data support the majority of hypotheses and the core theories underlying Model One, whereby: spatial distance matters for DT member contributions, and the intervening processes, but also that it is much less critical for these outcomes compared to psychological distance and DT identification (Hypotheses 1 and serial mediation effects implicit in the model); psychological distance reduces DT identification and increases dehumanisation (Hypotheses 5 and 6); DT identification reduces dehumanisation and the

contributions to teamwork (Hypotheses 3a-d and 7); and, dehumanisation reduces three out of four individual-level contributions to teamwork (Hypotheses 8b-d). These results demonstrate that dehumanisation is a key mechanism for the effects of psychological distance and a portion of the effects of DT identification on individual-level contributions in DTs (Hypotheses 9b-d and 10b-d).

Despite this general support, not all hypotheses in Model One were fully supported: the data fully support hypotheses 1, 3a-d, 5, 6 and 7, partially support hypotheses 8-10, and do not support hypotheses 2 and 4. Spatial distance did not directly influence DT identification, leading to the rejection of hypotheses 2, which predicted this direct effect, and hypothesis 4, which predicted that DT identification mediates a portion of the effects of spatial distance. However, an examination of indirect effects (Table 4.1) reveals a moderate negative effect, fully mediated by psychological distance, in addition to an indirect positive effect on dehumanisation. Spatial distance also demonstrated significant indirect effects on contributions to teamwork, serially mediated via psychological distance, DT identification, and dehumanisation. These indirect effects are more important than the direct effects to largely support the central theories and ideas presented in Chapter 2. Additionally, three sub-hypotheses—8a, 9a, and 10a—were not supported by the data because the path between dehumanisation and cooperative attitudes failed a robustness check (see Section 4.2.4, below).

The data supports the central mediating relationships in the model; specifically, the mediating role of dehumanisation (construal-level) for the effects of psychological distance and some of the effects of DT identification on individual-level contributions to teamwork in DTs. As expected by Hypothesis 5, psychological distance demonstrated a large negative effect on DT identification (β=-.46), with the post-hoc cross-lagged analysis confirming the causal direction of this association. This relationship has additional implications to those specifically hypothesised; it means that the effects of psychological distance on dehumanisation and the contributions to teamwork are also mediated by DT identification with the team. In addition, it indicates that the mediating role of DT identification for the effects of psychological distance, in parallel with the mediating role of dehumanisation, needs further consideration.

These results have important theoretical implications which I will discuss in Chapter 5. Further consideration of the direct and indirect associations between all variables in the

model reveals overall support for Model One, with some alterations (e.g., removal of a direct path from spatial distance to DT identification). In addition, although spatial distance may be a concern for DT members' contributions, the data indicate that this concern is secondary compared to the more proximal socio-cognitive processes determining individual-level functioning. The fully mediated effects of psychological distance via dehumanisation provide strong evidence for the conceptualisation of dehumanisation-as-construal-level, in addition to its role for individual-level outcomes in DTs. The results also demonstrate that DT identification, in addition to construal-level alone, is a powerful process for explaining the effects of psychological distance in DTs. Psychological distance had a stronger direct effect than DT identification on dehumanisation, with additional indirect effects via DT identification. Nonetheless, both processes significantly influence dehumanisation of others, and contributions to teamwork in DTs. I will discuss these broad interpretations in greater detail in Chapter 5 (discussion).

4.2.4 Model One Robustness checks: Temporal effects of psychological distance, distributed team identification and dehumanisation from wave ones and two

Two additional models (1B and 1C) were created to test other combinations of variables from waves one and two to check the robustness of, and provide additional support for, the relationships (and causal direction) between psychological distance, DT identification, and dehumanisation. These models, in contrast to Model 1A, were:

(i) Model 1A (primary model; tested above in Section 4.2.2);
    a. Wave 1: Psychological distance and DT identification.
    b. Wave 2: Dehumanisation.

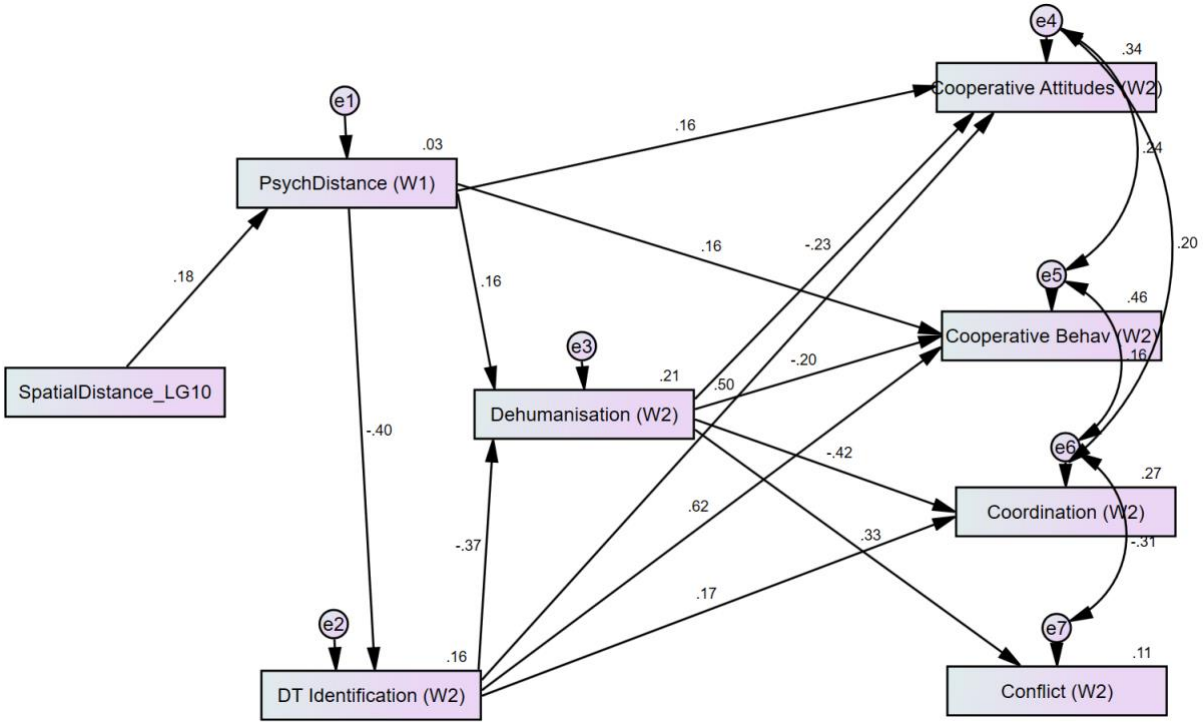
(ii) Model 1B;
    a. Wave 1: Psychological distance.
    b. Wave 2: DT identification and dehumanisation.

(iii) Model 1C;
    a. Wave 1: Psychological distance, DT identification, and dehumanisation.

Model 1B

After removing non-significant paths, and adding significant paths from psychological distance to cooperative attitudes and cooperative behaviours - indicated by significant modification indices (per Kaplan, 2000; to illustrate the difference between Model 1A and Model 1B) – the final version of Model 1B provided a statistically good fit for the data; $\chi^2(11) = 9.055$, $p = .617$, $\chi^2/df = .823$, TLI = 1.012, IFI = 1.014, CFI = 1.000, RMSEA = .000. The model accounted for 3%, 16%, 21%, 34%, 46%, 27%, and 11%, of the variance of psychological distance, DT identification, dehumanisation, cooperative attitudes, cooperative behaviours, coordination, and conflict, respectively. Figure 4.4 illustrates the significant paths in the final version of Model 1B.

Figure 4.2. Significant standardised parameter estimates for final path analysis of Model 1B.



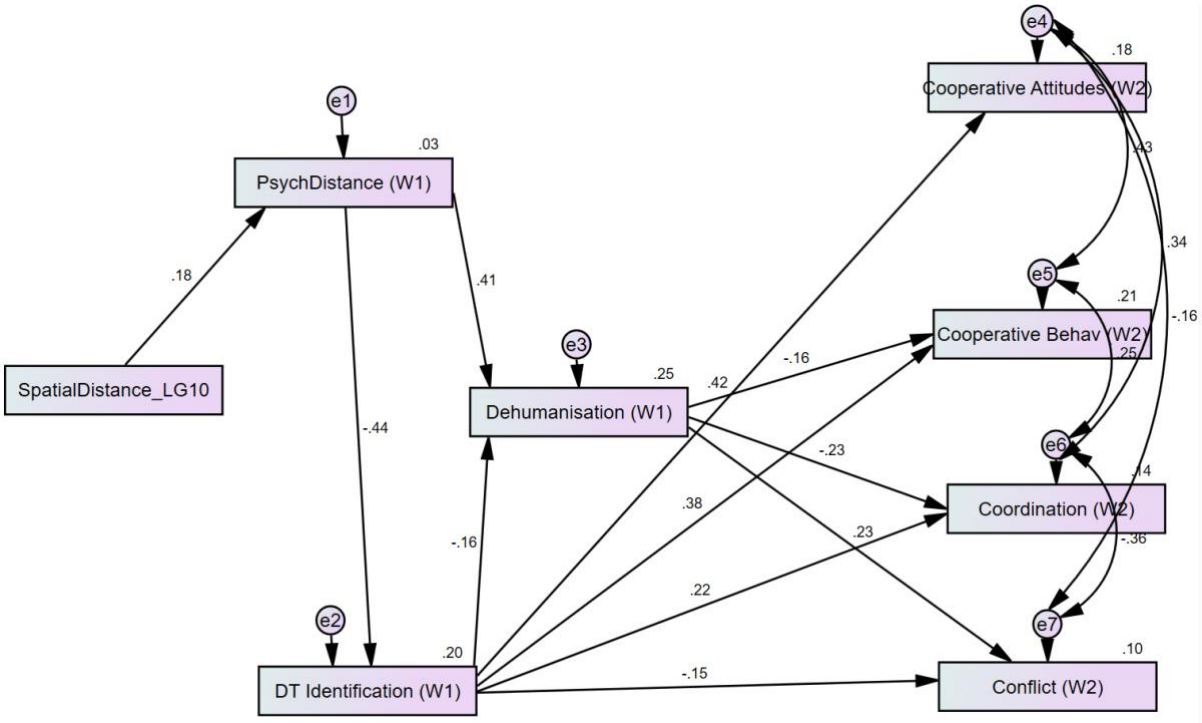
The purpose of Model 1B is to further test the relationship between psychological distance (wave one) and DT identification (wave two). As Figure 4.2 shows, this relationship in Model 1B is like the corresponding relationship found in Model 1A in which both variables were from wave one, providing support for the robustness of these significant paths found in Model 1A. The relationship between DT identification and dehumanisation in this model is inflated compared to Model 1A. Consequently, the effect of DT identification on conflict becomes fully mediated by dehumanisation, and the direct effect of psychological distance onto dehumanisation is weakened, which then leads to positive effects from psychological

distance to cooperative attitudes and cooperative behaviours. One possible explanation for the inflated relationship between DT identification and dehumanisation, and the subsequent anomalous direct effects of psychological distance, is more significant CMV with DT identification and dehumanisation variables taken from the same wave, compared to different waves in Model 1A. Another possible explanation is that measuring the variables closer together, rather than across waves, offers a more accurate result if waves one and two represented too large of a time delay to capture all the effects of psychological distance. This last possibility is discussed next concerning Model 1C.

Model 1C

The final version of Model 1C, shown in Figure 4.5 below, provided a statistically good fit for the data; $\chi^2(12) = 8.331$, $p = .759$, $\chi^2/df = .694$, TLI = 1.025, IFI = .1.010, CFI = 1.000, RMSEA = .000. The model accounted variance in psychological distance (3%), DT identification (20%), dehumanisation (25%), cooperative attitudes (18%), cooperative behaviours (21%), coordination (14%), and conflict (10%).

Figure 4.3. Significant standardised parameter estimates for final path analysis of Model 1C.



The purpose of Model 1C, in Figure 4.5 above, is to check whether relationships between dehumanisation and the individual-level contributions to teamwork variables hold

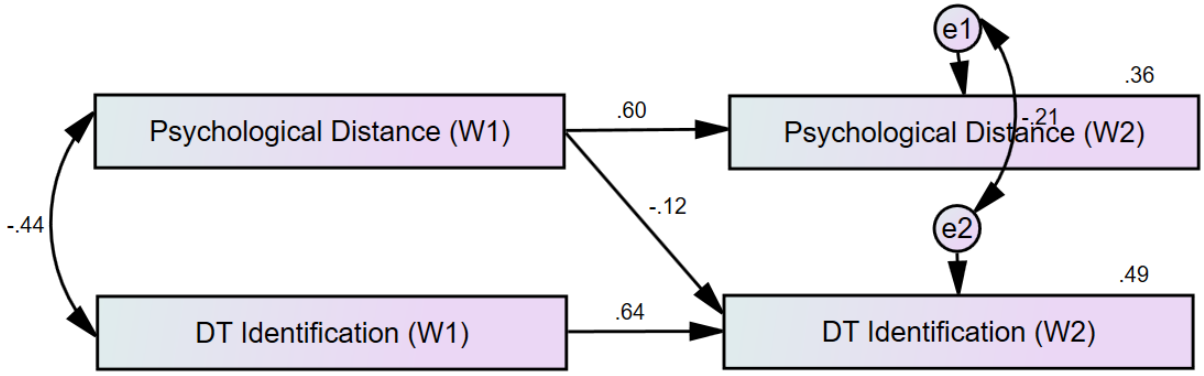
when dehumanisation from wave one is used in the model. As Figure 4.3 shows, the significant relationships in Model 1A generally hold in Model 1C, except for the pathway from dehumanisation to cooperative attitudes, which was non-significant and consequently removed from this robustness check model. Typically, this may mean that the relationship between dehumanisation and cooperative attitudes, and associated mediating effects, found in Model 1A, may be inflated by common method effects of these variables measured at the same time. Also, the relationship between psychological distance and dehumanisation is much higher in Model 1C (.41) compared to Model 1A (.30). However, the checks for common method effects, presented in the Methods chapter (Section 3.9) demonstrated no significant differences in estimates or biased results after adding a common method latent variable to the model. Alternatively, cooperative attitudes may be more time-sensitive to dehumanisation, and dehumanisation may be more time-sensitive to psychological distance, which may require a shorter time delay between waves. If the greater pathway strength between psychological distance and dehumanisation was due to CMV, then the pathway between DT identification and dehumanisation should also be inflated from Model 1A to 1C. However, this pathway was stable across models. Thus, the discrepancy is likely an issue with the time delay between waves one and two, whereby psychological distance may be unstable over three months and influences dehumanisation more immediately. Therefore, this robustness check either indicates that the hypotheses around dehumanisation and cooperative attitudes are unsupported or may be explained by the delay between waves.

4.2.5 Model One: Test of causality between psychological distance and distributed team identification with cross-lagged panel design

Additionally, a cross-lagged model (Model 1D) was created to test the causal direction of effects from psychological distance to DT identification (see Section 2.2.3). To verify the causal direction of the association between psychological distance and DT identification, I used the standard approach of cross-lagged effects analysis using path analysis (Kearney, 2017). Though the sample size was inadequate to conduct a robust test of the full model using a cross-lagged design, it was adequate to conduct a cross-lagged analysis of the direction of causation between psychological distance and DT identification. To investigate

these cross-lagged associations, a path analysis model was created in which paths were drawn from psychological distance and DT identification from wave one to their counterparts from wave two. A non-significant path was then removed, resulting in the final model. The final model provided a good fit to the data; $\chi^2(1) = 3.113$, $p = .078$, $\chi^2/df = 3.113$, TLI = .956, IFI = .956, CFI = .993, RMSEA = .102.

Figure 4.4. Significant standardised cross-lagged associations between psychological distance and DT identification at two time points.



As Figure 4.4 shows, psychological distance at wave one is significantly associated with psychological distance and DT identification at wave two, whereas DT identification at wave one is only significantly associated with DT identification at wave two and not with psychological distance at wave two. This model provides evidence for the direction of causality from psychological distance to social DT identification, and evidence against the opposite causal direction. This evidence has implications for previous research, supporting those studies proposing the impact of psychological distance on social DT identification and not supporting other studies proposing the reverse direction of impact. It also supports the current study and associated theory developed in Chapter 2 and has implications for future research which will be discussed in Chapter 5.

4.2.6 Model Two: Hypothesis testing with multiple regression analyses

The analyses of Model One revealed that spatial distance is positively associated with psychological distance directly, reduces DT identification indirectly via psychological distance, and increases dehumanisation indirectly via psychological distance and DT identification. Moreover, these three variables affected by spatial distance are important for

individual-level contributions to teamwork in the expected directions. Thus, the results confirm the benefits of reducing psychological distance and strengthen DT identification in DTs, which may at least partly be accomplished by the effects of spatial distance.

As I previously noted, Model Two is proposed to account for the impact of frequencies of communication media (i.e., video CMC, phone, text-based CMC, and face-to-face communication) on psychological distance and DT identification, alongside spatial distance. To test the hypothesised relationships in Model Two, multiple regressions were run to test the model's communication variables (measured at wave one) as predictors of psychological distance and DT identification (at wave two). Blocks of predictor variables were entered into the multiple regressions in the following steps; (1) control variables (i.e., task interdependence, supervisor/manager, and temporary/ongoing team), (2) spatial distance, (3) communication frequency variables (i.e., face-to-face, video CMC, phone, and text-based CMC), and (4) spatial distance and communication frequencies two-way interactions. Tables 4.4 and 4.5 present the results of the multiple regression analyses for psychological distance and DT identification, respectively.

Table 4.4. Results of hierarchical regression analyses for psychological distance.

Predictor variables	Regression 1	Regression 2	Regression 3	Regression 4
Task interdependence	.03	.03	.05	.05
Supervisor/manager	.20**	.20**	.19**	.18*
Tenure in DT (years)	.05	.03	.04	.05
Spatial distance LG10		.14*	.08	.07
Face-to-face frequency (LG10)			-.20**	-.20**
Video CMC frequency (LG10)			.13†	.13†
Phone frequency			.01	.02
Text-based CMC frequency			-.08	-.09
SD x Face-to-face frequency				-.05
SD x Video CMC frequency				-.01
SD x Phone frequency				.09
SD x Text-based CMC frequency				-.10
R2	.04*	.06***	.12**	.12*
R2 Change	.04*	.02*	.06*	.01
R2Adj	.03	.04	.08	.07

Note: For supervisor/manager, 'no' is the reference category.
†$p < .10$, *$p < .05$, **$p < .01$.

Table 4.5. Results of hierarchical regression analyses for distributed team identification.

Predictor variables	Regression 1	Regression 2	Regression 3	Regression 4
Task interdependence	.15*	.16*	.14†	.13†
Supervisor/manager	-.14*	-.14*	-.11	-.12†
Tenure in DT (years)	-.08	-.07	-.06	-.07
Spatial distance LG10		-.09	-.08	-.07
Face-to-face frequency (LG10)			.07	.07
Video CMC frequency (LG10)			.00	.00
Phone frequency			-.03	-.02
Text-based CMC frequency			.19*	.19*
SD x Face-to-face frequency				.06
SD x Video CMC frequency				.07
SD x Phone frequency				.02
SD x Text-based CMC				-.02
R2	.06**	.06**	.10**	.11*
R2 Change	.06**	.01	.04†	.01
R2Adj	.04	.05	.07	.06

Note: For supervisor/manager, 'no' is the reference category.
†$p < .10$, *$p < .05$, **$p < .01$.

As Table 4.4 and Table 4.5 show, step three best predicts the DVs, demonstrating a significant change in R square from step two and no change in step four. Step three of the regression model—with control variables, spatial distance, and frequencies of face-to-face, video CMC, phone and text-based CMC—accounted for significant variance in psychological distance (7.9% after adjusting for the number of predictors; $R^2 = .115$, $F(8,196) = 3.177$, $p < .01$) and DT identification (5.6% after adjusting for number of predictors; $R^2 = .103$, $F(8,196) = 2.804$, $p < .01$).

Control variables significantly predicted variance in the DVs. Being in a non-supervisory role in a DT (compared to supervisors) significantly predicted greater psychological distance from the team (β = .19), and task interdependence positively predicted DT identification with the team (β = .14). Being a non-supervisor also negatively predicted DT identification, but only in the weaker models (model steps 1, 2 and 4) with the significance disappearing after adding communication frequency variables.

In step three, three variables explained significant variance in psychological distance: occupying a non-supervisory role in the DT (medium positive effect, β = .19), face-to-face communication (medium negative effect, β = -.20), and video CMC (small-medium positive effect, β = .13; though this effect is not strictly significant, $p < .10$). Spatial distance predicted other variables in step two, but its effects disappeared when communication frequencies

were introduced in step 3. This result indicates that spatial distance increases psychological distance at least partially by reducing face-to-face communication (recall the significant negative correlation between these variables in Section 3.13.2).

DT identification was significantly associated with the frequency of text-based CMC (medium positive effect, β = .19), in addition to task interdependence (small positive effect, β = .14). Moreover, in Steps 1 and 2 of the regressions, occupying a non-supervisory role negatively related to DT identification, though this effect disappeared in Step 3 with text-based communication as a significant predictor. Comparisons of IV and DV means between supervisory and non-supervisory respondents revealed more frequent text-based CMC in the supervisory group. Therefore, the positive effects of occupying a supervisory role on DT identification in DTs may be explained in part by more their more frequent communication with employees using text-based CMC, necessitated by their role. No interaction variables were significant.

4.2.7 Model Two: Post-hoc analyses

Post-hoc regression analyses demonstrated that additional controls – i.e., team size, hours per week worked for the team, whether the team was temporary or ongoing, and age - did not predict psychological distance or DT identification. Model significance and included predictor variables when including additional controls did not change from the primary regression analyses. Additionally, post-hoc regressions with dehumanisation as the DV were non-significant. Consequently, if communication influences dehumanisation, it does it indirectly.

4.2.8 Model Two: Summary of hypotheses testing

The following table presents each hypothesised relationship in Model Two, in addition to post-hoc tests, and whether the multiple regression results support them:

Table 4.6. Model Two hypothesis tests.

Hyp	Hypothesised Relationship	Support/Reject
1	*Spatial distance to psychological distance (+)*	Reject: Differs from Model 1A. Face-to-face communication may explain this association
2	*Spatial distance to DT identification (-)*	Reject: Confirms Model 1A
11	Communication frequency to psychological distance (-), whereby the frequency of face-to-face communication demonstrates the strongest effect, followed by video CMC, phone, and text-based CMC.	Partial support: Face-to-face frequency demonstrates a negative effect; video CMC demonstrates a positive effect ($p < .01$).
12a	The relationship between spatial distance and psychological distance is moderated by the frequency of communication, such that the relationship is weaker when communication is more frequent.	Reject
12b	The moderating effect of communication frequency is stronger from face-to-face communication, followed by video CMC, phone, and text-based CMC.	Reject
13a	Frequency of text-based CMC to DT identification (+)	Support
13b	The frequency of face-to-face, phone, and video CMC to DT identification (no effect)	Support
14	The frequency of text-based communication weakens the relationship between spatial distance and DT identification.	Reject

The analyses of Model Two fully support two hypotheses (Hypotheses 13a and 13b), partially support two hypotheses (Hypotheses 1 and 11) and reject four hypotheses (Hypotheses 2, 12a, 12b, and 14). Hypotheses 2 is rejected, confirming a similar result from Model 1A. In contrast to Model 1A, hypothesis 1 is rejected, because the significant positive effect of spatial distance on psychological distance disappeared once face-to-face communication was entered into the model. This result indicates that face-to-face may explain this association, with implications for Model One. Concerning hypotheses 11, 13a and 13b, communication frequency reduced psychological distance and strengthened DT identification. Counter to hypothesis 11, only face-to-face communication reduced psychological distance, with no effect from text-based CMC or phone, and video CMC reduced psychological distance – though this effect was not technically significant. Text-based CMC – but not richer CMC or face-to-face - strengthened DT identification as expected

by hypotheses 13a and 13b. Hypotheses 12a, 12b, and 14 are rejected because communication did not moderate the effects of spatial distance on psychological distance or DT identification. Considering these results, Model Two requires re-evaluation and adjustment, particularly regarding the effects of communication on psychological distance. Further interpretation of these, including implications for theory and past research, is addressed in Chapter 5 (discussion).

4.3 Summary of Chapter 4: Results

In this chapter, I presented statistical tests of the hypotheses I developed in Chapter 2. Overall, these tests support the theories underlying Model One. The results support dehumanisation as a form of construal-level, and the expected pathways between psychological distance, DT identification, dehumanisation and individual-level contributions to teamwork. Dehumanisation acted as a shared mediating mechanism, fully mediating the effects of psychological distance and partially mediating the effects of DT identification, as expected. However, the mediated effects of spatial distance are more complex than expected. Spatial distance demonstrated indirect, mediated effects in the model, but it was not as crucial to dehumanisation and subsequent teamwork contributions compared to the socio-cognitive processes.

The results were more complicated regarding Model Two and its underlying theories, indicating further evaluation and revision of the model, and consideration of the study's limitations. The results demonstrate that face-to-face strengthens DT identification and text-based CMC improves psychological distance, indicating that these communication channels benefit DT members via different mechanisms. Regarding DT identification, the results support the predictions of the SIDE model. The text-based CMC results, alongside a 'psychological distancing' effect from video CMC and the non-significance of phone communication, are contrary to expectations from media richness theory.
In the following chapter (Discussion), I continue to unpack these results concerning the theories and literature on which my theoretical models were built.

5 CHAPTER 5: DISCUSSION

This research aimed to address challenges in DT by investigating the socio-cognitive processes that promote DT members' contributions to teamwork (Minton-Eversole, 2012; Salas et al., 2005; Wilson et al., 2013). In Chapter 1, I highlighted a problem for DT functioning: working with others in DTs can be successful, yet this mode of work often fails; the conditions associated with this success or failure are unclear due to insufficient understanding and integration of the processes leading to DT members' contributions to teamwork. To begin addressing this problem, I formulated and investigated two research questions: i) How do the socio-cognitive processes of psychological distance and social identification work together to influence individual team members' contributions to distributed teamwork?; and ii) How can communication and associated technologies be used to improve the socio-cognitive processes that determine perceptions of other team members and subsequent teamwork in DTs.

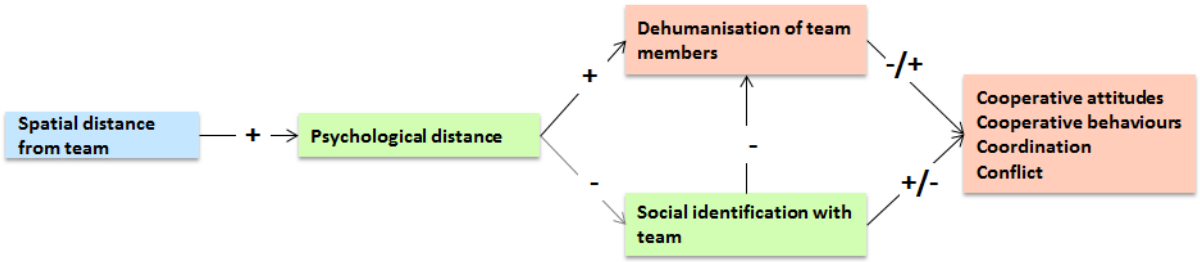
In Chapter 2, I developed two theoretical models informed by CLT and SIT, and a review of relevant works in the domains of distributed teamwork, psychological distance, social identification, dehumanisation, and computer-mediated communication. I developed those models to answer my research questions, leading to testable hypotheses. In Chapters 3 and 4, I designed a field study and collected quantitative survey data to test my hypotheses, presented my findings, and demonstrated their robustness. I broadly concluded that my data support Model One and its underlying theories, but due to some unexpected findings aspects of Model Two – and consequently Model One – must be re-evaluated and modified. This re-evaluation and further research must also consider the methodological limitations of the current study.

In this final chapter, I further interpret the significance of my findings; first with consideration to the previous research that I reviewed in Chapter 2, and then concerning the broader theoretical and practical contributions, methodological limitations, and general implications of my study. I also present a research agenda with ways to extend and clarify critical findings in my study. I conclude this paper with the key messages.

5.1 Significance of findings from Model One

As demonstrated in Chapters 3 and 4, the main study produced reliable and valid data with which to test the hypotheses included in Model One. The testing of Model One answered the first research question. Broadly, the results support the hypothesised roles of the socio-cognitive processes for individual-level contributions to distributed teamwork. The analysis of this model demonstrates that the context of varying spatial distance from other team members worsens cooperation, coordination and conflict in DTs, but that these effects are weak and indirectly occur via mediating socio-perceptual processes. More critical than spatial distance to these teamwork contributions are psychological distance, DT identification and dehumanisation. The data demonstrate that psychological distance worsens these attitudes and behaviours by weakening individuals' DT identification and reducing the degree to which they perceive other team members' humanity. Moreover, the findings confirm the causal effect from psychological distance to DT identification rather than the opposite direction. The findings do not support the hypothesised direct positive effect from spatial distance to DT identification. However, this non-significant relationship was not entirely unexpected; it demonstrates that psychological distance, rather than spatial distance, influences the drivers of DT identification (i.e., salience and social attraction). A revised version of Model One illustrates the significant pathways, in Figure 5.1:

Figure 5.1. Revised Model One with significant pathways.



5.1.1 The role of spatial distance for DT teamwork contributions and intervening socio-cognitive processes

The current study demonstrates the effects of spatial distance in DTs more directly than previous studies, using the most appropriate level - the individual level - for the constructs

of interest. I directly theorised and empirically established the separate effects of spatial distance and psychological distance on contributions to teamwork, in contrast to previous research that ambiguously manipulated spatial or psychological distance (e.g., Brander & Mark, 2002; Fujita et al., 2006). The findings show that greater spatial distance from others in DTs leads to poorer outcomes (e.g., Alnuaimi et al., 2010; Bradner & Mark, 2002; Cramton & Hinds, 2001; Cramton et al., 2007; Hertel et al., 2004; Hinds & Bailey, 2003). However, socio-cognitive processes fully and serially mediate the effects of spatial distance on DT member contributions.

This study also establishes that distributed teamwork contributions are more likely to worsen as a result of greater psychological distance rather than spatial distance. Spatial distance from others reduced cooperative attitudes, cooperative behaviours, coordination, and increases conflict, by generating psychological distance rather than by directly reducing visibility, awareness, and salience of others (e.g., Bradner & Mark, 2002; Hinds & Bailey, 2003; Hogg & Terry, 2001). This finding extends previous research by demonstrating that psychological distance mediates the effects of spatial distance onto teamwork outcomes at the team level, by demonstrating these effects at the individual level (Siebdrat et al., 2013).

The current study shows a significant positive relationship between spatial distance and psychological distance – at least without considering communication. This finding contradicts studies that found no significant relationship between these constructs (i.e., O'Leary et al., 2013; Siebdrat et al., 2013). This relationship likely occurs in some way, but as I discussed in Sections 2.2.1 and 2.5.3, previous studies did not measure both constructs directly, or at the individual-level concerning other members in a DT. In contrast, I directly measured these constructs at the individual level, providing a more robust indication of their actual relationship.

However, the tests of Model Two indicate support for Siebdrat et al.'s (2013) argument that spatial distance generates psychological distance by making it more difficult to meet face-to-face. After entering the communication variables in the regression analysis, a significant positive effect of spatial distance became non-significant and was replaced by a significant effect of face-to-face communication (see section 4.2.6). Moreover, spatial distance and face-to-face communication were negatively correlated (see section 3.13.2). Therefore, it is likely that spatial distance generated psychological distance in Model One because it reduces face-to-face communication. This supports aspects of previous research

indicating that communication, rather than spatial distance, is critical to the development of psychological distance (e.g., O'Leary et al., 2014; Ruiller et al., 2019).

This study is the first to directly examine the effect of spatial distance on DT identification, demonstrating that this direct effect does not occur. I noted in Chapter 2 that both constructs are poorly operationalised in previous studies (see Section 2.5.3). Consequently, researchers had not robustly tested the association between these two constructs directly. The non-significant interaction effects between spatial distance and communication in Model Two indicate that this non-effect is not due to interaction effects that had been unaccounted for (Hogg & Terry, 2001; Radner & Mark, 2002).

5.1.2 The consequences of psychological distance, distributed team identification and dehumanisation for distributed teamwork contributions

The study demonstrates that instead of spatial distance, psychological distance has a critical negative influence on DT identification. It establishes the previously unknown simultaneous effects of psychological distance from other DT members and spatial distance on DT identification. The findings demonstrate that psychological distance, and not spatial distance, reduces DT identification. That is, perceptions of distance are more important than actual spatial distance to the drivers of social identification (e.g., it reduces social attraction and salience of the team; Hogg & Terry, 2001). This finding is counter to a previously theorised direct effect of spatial distance on DT identification (e.g., Foster et al., 2015). It is consistent with narrative evidence whereby the experience of working remotely increases feelings of distance (Bartel et al., 2012). The current study further establishes these effects directly with quantitative data. It also confirms that spatial distance and social identification are not directly associated in DTs (O'Leary et al., 2014).

As noted in Chapter 2, the causal effects between psychological distance and social identification, and thus their relative place in a model of individual-level contributions in DTs, were previously unknown because they had not been well theorised or directly tested. The current study contributes to theory by resolving these issues. It reveals the roles of each construct in DTs by returning to SIT for a back-to-basics approach to hypothesise and demonstrate the direction of effects from psychological distance to DT identification. The findings confirm the hypothesised negative casual influence of psychological distance on DT

identification (Wilson et al., 2013), and contradict the opposite path suggested in other studies (O'Leary et al., 2014; Ruiller et al., 2019; Wilson et al., 2008). My findings are more robust than previous studies for demonstrating this direction of effects for two reasons: first, the model (and my tests of the model) have a stronger foundation in SIT (see Sections 2.2.3 and 2.5.6); and second, I empirically established causality with a cross-lagged analysis of two-wave data from individuals in real-world DTs (see Section 4.2.5). Ultimately, my study contributes to literature applying SIT and PD to DTs by being the first to establish that psychological distance from others in a DT serves as the basis for DT identification (Siebdrat et al., 2014; Wilson et al., 2013), rather than DT identification representing a stronger social tie which reduces psychological distance (O'Leary et al., 2014; Wilson et al., 2008).

This study confirms similar outcomes of psychological distance found in previous studies (e.g., Bradner & Mark, 2002; Cha et al., 2014; O'Leary et al., 2014; Ruiller et al., 2019; Siebdrat et al., 2013). More significantly, I extend these findings by demonstrating empirically that dehumanisation of other people mediates the effects of psychological distance on more specific teamwork contributions (Trope & Liberman, 2010; Wilson et al., 2013).

Overall, by conceptualising construal of others with dehumanisation, my findings are the first to directly support the broadest aspects of Wilson et al.'s (2013) theoretical model – which supposed that psychological distance from other DT members leads to more abstract perceptions of them and subsequent effects of this construal – and indicates aspects to modify. The results support Wilson et al.'s proposed relationship between abstract construal of other people and reduced coordination in DTs, based on reduced awareness of others and their contexts. The findings are also consistent with previously demonstrated effects of dehumanisation; reduced prosocial behaviours towards others in a general context and increased non-cooperation in distributed work contexts (Alnuaimi et al., 2010; Andrighetto et al., 2014; Cuddy et al., 2007).

I extend these previous works by demonstrating that psychological distance is an antecedent, and additional teamwork contributions are outcomes, of dehumanisation in DTs. The current study is the first to empirically establish the positive effect of psychological distance on dehumanisation of other team members in DTs. This result extends into the DT domain the relationship between psychological distance and dehumanisation found in other domains (e.g., Bastian et al., 2012; Haslam, 2006; Haslam & Bain, 2007; Haque & Waytz,

2012). My results also confirm and extend a previously established positive association between dehumanisation and conflict in other contexts to the context of DTs (Kim et al., 2016; Leidner et al., 2013).

By empirically establishing these antecedents and consequences of dehumanisation, my findings support conceptualising construal of other people with dehumanisation in the domain of DTs. Dehumanisation performed in ways that are consistent with construal of people, as predicted by CLT. Whereby, dehumanisation's relationships with psychological distance, DT identification, and individual teamwork contributions were in the expected directions and magnitudes, per CLT.

Alongside psychological distance, the results confirm that DT identification improves individuals' teamwork contributions and that dehumanisation of others in the DT partially mediates these effects (e.g., Haslam 2006; Leyens et al. 2001; Leyens et al., 2003; Vaes et al. 2003). The findings support theoretical relationships between these variables that were proposed by other scholars. That is, DT identification improves individual-level contributions to distributed teamwork, partially via its negative effects on dehumanisation. These relationships likely occur from perceptions of shared similarity and meaning (Bjorn & Ngwenyama, 2009), and consequently viewing others in the team more concretely rather than abstractly (Liviatan et al., 2008). Additionally, my study shows that stronger DT identification improves individuals' teamwork contributions directly by encouraging them to internalise and work towards team goals over their own goals (Brewer, 1999; Postmes et al., 1998). These findings confirm prior theorising around social identification and dehumanisation processes, which by extension mean that in-group members are humanised by those who strongly identify with the DT (Leyens et al., 2001; Leyens et al., 2003; Vaes et al., 2003). These findings also support and extend previous studies that demonstrated a positive relationship between similarity and humanisation of other people within groups (Alnuaimi et al., 2010; Rodriquez-Perez et al., 2012). My study provides more robust evidence for these effects by addressing the methodological issues and theoretical issues in previous research. It addressed these issues by directly measuring the strength of DT identification, investigating dehumanisation within groups as a function of DT identification, and demonstrating these effects in a distributed work context.

The findings indicate that psychological distance and CLT should be investigated further in dehumanisation research alongside social identification and SIT. They show that

psychological distance and social identification influence teamwork contributions via dehumanisation as a shared mechanism. Therefore, this study empirically supports the ways I theoretically integrated CLT and SIT in Chapter 2, by better establishing the relative roles of psychological distance, social identification, and dehumanisation in a model of individual-level DT contributions.

This study contributes to dehumanisation research that has focused on social identification as its antecedent by demonstrating that psychological distance is a strong parallel—and related—antecedent in the context of DT. Psychological distance demonstrated a stronger total effect on dehumanisation compared to its effect on DT identification.

These findings also establish that psychological distance, rather than spatial distance, is important to dehumanisation in DTs. Alnuaimi et al. (2010) proposed that spatial distance leads to greater dehumanisation in DTs. Yet, my study demonstrates that it is the perceptions of distance, rather than actual spatial distance, which increases dehumanisation in DTs, and that in accordance with CLT, dehumanisation mediates the effects of psychological distance on pro-social attitudes and behaviours in DTs.

The results demonstrate that DT identification also partially mediates the effects of psychological distance on dehumanisation and more distal outcomes. I had not actively considered DT identification as a mediator of the effects of psychological distance, but I had included this mediating relationship implicitly in the theoretical model. The findings extend a previous account of mediation, whereby DT identification mediates the effects of spatial distance on team outcomes (Foster et al., 2015). My study extends Foster et al.'s account of mediation, indicating that DT identification mediates the effects of psychological distance on specific individual-level outcomes (i.e., cooperative attitudes and behaviours, coordination, and conflict).

The variance in DT identification accounted for by psychological distance (20%) was larger than the combined variance in dehumanisation accounted for by the direct paths from psychological distance and DT identification to dehumanisation (12%). This difference may have occurred from the instability of these effects between waves, as discussed in Section 4.2.4 concerning Model 1C. That is, when the wave one measures of these variables were used in analyses, 25% of the variance in dehumanisation was accounted for by psychological distance and DT identification, with a stronger effect of psychological distance

(β=.41) compared to DT identification (β=-.15). This pattern of results potentially indicates that a shorter period between waves would more accurately indicate the full and stronger effects of psychological distance on dehumanisation.

Dehumanisation at wave one failed to significantly associate with cooperative attitudes at wave two (Section 4.2.4). Aside from the possibility of a non-effect, there are two methodological explanations for this failed robustness check. First, when taking both variables from wave two, common method variance inflates their association. Second, the time delay between waves is too long to demonstrate the full effect of dehumanisation onto cooperative attitudes. The first possibility is less likely because dehumanisation at wave one significantly predicts the other teamwork contribution variables, indicating that CMV may not be the cause of the non-significant association with cooperative attitudes.

Taken together, the results for Model One confirm and meaningfully expand on Wilson et al.'s (2013) propositions. The results confirm the general chain of effects whereby spatial distance generates psychological distance, which then increases the abstract construal of others (dehumanisation), which then worsens individuals' teamwork contributions. The current study extends our theoretical understanding beyond Wilson et al.'s model by theorising around and demonstrating empirically, dehumanisation of other team members as a shared mediator of the effects of psychological distance and social identification in DTs. The results support theory indicating that dehumanisation entails more abstract perception of other team members, and therefore less awareness and attention of their needs, context, and relevance to the self. Therefore, dehumanised others are also less well understood, and their actions may be attributed to personality traits rather than their context (Haslam, 2006; Wilson, 2014). These processes then lead to reduced cooperation and coordination and more conflict with other team members. My study also demonstrates that DT identification mediates some of the effects of psychological distance onto dehumanisation and the teamwork contribution outcomes.

5.2 Significance of findings from Model Two

The study of Model Two addresses the second research question, asking how the use of communication and associated technologies may improve processes associated with teamwork in distributed teams. Addressing this question addresses calls to investigate mediating mechanisms underlying the effects of communication in DTs (Marlow et al.,

2017), to clarify inconsistent outcomes of CMC in DTs (e.g., Han et al., 2011; Ho & McLeod, 2008; Schweitzer & Duxbury, 2010). The findings demonstrate that the effects of the frequency of communication are more nuanced than typically considered (O'Leary et al., 2014; Wilson et al., 2008; Wilson et al., 2013). Overall, they demonstrate mixed support for the hypotheses in Model Two.

The results indicate that more frequent face-to-face communication reduces psychological distance, whereas video CMC makes others seem more distant. This influence of video CMC is contrary to expectations from media richness and is inconsistent with the findings of two papers discussed in Chapter 2 (O'Leary et al., 2014, Walther & Bazarova, 2008). Recall that Walther and Bazarova found that choosing leaner CMC when a richer medium was available led to an outcome like greater psychological distance, but this effect did not occur in groups where only one medium was available. In contrast to the finding that video CMC increases psychological distance, O'Leary et al. (2014) found negative correlations between psychological distance and each form of CMC (i.e., phone, text-based and video conferencing). However, as noted in Chapter 2, methodological limitations mean these results may not represent the actual effects of media. The current study more accurately reflects how communication occurs and influences processes in DTs in the real-world. Real-world distributed team members are typically free to use multiple communication channels. I examined communication and its effects in a more robust manner than previous research, by quantitatively examining the direct effect of face-to-face communication on psychological distance alongside multiple CMC media simultaneously, with multivariate analysis while controlling for other variables.

The results indicate that other aspects of CMC or affordances other than media richness provided by CMC explain the negative influence of video CMC on psychological distance. For example, it can be challenging to see or hear other people when communicating via video CMC, especially when communicating with a group of people who are in the same physical space in front of the same camera. These difficulties may increase psychological distance from others because it draws attention to the mediated nature of the communication and makes it harder to communicate effectively. Alternatively, video CMC can be challenging to arrange, which may mean the communicators feel more distant from others because of the effort it takes to arrange communication via video CMC. Video CMC, such as video conferencing, requires more careful scheduling, equipment, quiet places, and so on.

Another possibility suggested by O'Leary et al. (2014) is that individuals may attach a 'distancing' meaning to video CMC (e.g., low accessibility or greater formality may be attributed to video CMC; Wiesenfeld et al., 1999). However, further research is needed to determine precisely why video CMC distances others.

The results support the SIDE model and provide additional evidence that DT identification is strengthened by lean CMC rather than rich CMC (e.g., Haines & Mann, 2011; Lea et al., 2001; Postmes et al., 1998; Postmes et al., 2005; Postmes & Spears, 2000; Spears & Lea, 1994; Spears & Postmes, 2015; Tanis & Postmes, 2003; Tanis & Postmes, 2005; Wang et al., 2009). Contrary to the view that text-based CMC is less useful than face-to-face (Stranko & Gibson, 2009), the SIDE model and supporting also indicate that text-based CMC media provides unique benefits in DTs by supporting DT identification. The study contributes to resolving empirical issues in the CMC literature by providing more robust support for the SIDE model. In contrast to previous studies of the SIDE model, the current study demonstrates ecological validity in real-world teams allowed to use multiple communication media and face-to-face, and directly measured of DT identification (e.g., Chan, 2010; Croes et al., 2016; Haines & Mann, 2011; Lea et al., 2001; Postmes et al., 1998; Tanis & Postmes, 2003). Moreover, the results are likely more generalisable than previous findings which contradicted the SIDE model (Klitmoller et al., 2015).

The analysis indicated that supervisors or managers of DTs identified more strongly with their DT and reported lower psychological distance from their DT, than non-supervisors or non-managers. These findings make intuitive sense: the DT should be more chronically salient and vital for supervisors/managers because their roles and responsibilities are more central to the DT. To check for other potential reasons for these effects, I ran independent samples t-tests that compared the means of various variables for supervisors and non-supervisors. The results of these tests are reported in Appendix D. These results revealed that compared to employees without supervisory responsibilities, supervisors reported greater task interdependence with others in their DT and communicated more frequently with their DT via text-based CMC. Therefore, in addition to direct salience effects and their more central role in their DTs, greater interdependence and more frequent text-based CMC may be responsible for supervisors' greater DT identification and lower psychological distance from their DT.

The results may help to clarify the inconsistent outcomes of CMC by considering Models One and Two together. As I noted in Section 5.6, outcomes of CMC are inconsistent. Investigating the socio-cognitive mediating mechanisms in my model indicate that distinct media and face-to-face have unique effects on these mediators. These results indicate that the effects of CMC are more complex and nuanced than is typically assumed in studies of CMC outcomes in DTs. They also indicate that the effects of CMC media and spatial distance do not interact (Wiesenfeld et al., 1999; Robert & You, 2018; Wilson et al., 2013). The effect of greater spatial distance from other team members on psychological distance may occur simply because greater spatial separation makes meeting face-to-face more difficult. That is, face-to-face communication determines whether a team feels close regardless of how close or far they are. This effect indicates that the paradox of being far yet feeling close, and being close yet feeling far, may be a result of how frequently team members communicate *while* in a face-to-face situation or meeting face-to-face *despite* being spatially separated most of the time. Therefore, despite Wilson and colleagues' suggestion that spatial distance should generate psychological distance, I demonstrate that it is the frequency of face-to-face communication that negatively influences psychological distance and that spatial distance makes this more challenging to arrange. I was able to determine these effects by accounting for and empirically testing the role of communication alongside spatial distance, significantly building upon previous research (O'Leary et al., 2014; Siebdrat et al., 2013).

5.3 Theoretical contributions

Overall, the development of Model One and subsequent analysis offer two main significant theoretical contributions. First, they address the under-theorising of socio-cognitive processes in DTs, by clarifying theory and past literature in terms of how spatial distance, psychological distance, social identification, and construal-level are considered to work together to influence individual-level outcomes in DTs. I addressed the under-theorising of the socio-cognitive processes through which spatial distance influences teamwork contributions in DTs, and how they work together. My study theoretically grounds relationships between these socio-cognitive processes by better integrating CLT and SIT. By re-evaluating theory and results, and choosing the most convincing path, my study establishes the previously unknown directional effects from psychological distance to social identification (O'Leary et al., 2014; Siebdrat et al., 2013; Wilson et al., 2008; Wilson et

al., 2013). That is, we knew that they were negatively related (e.g., Fujita et al., 2006; O'Leary et al., 2014; Ruiller et al., 2019) but this is the first study to re-evaluate and determine the causal direction of these effects. Thus, it is the first to establish theoretically and empirically how these constructs fit together in a model of individual team members' teamwork contributions. Second, this study theoretically and empirically addresses the issue of operationalising construal of others in DTs. It provides a way to advance applied CLT research by utilising dehumanisation as a DT domain-specific form of construal of other people. In conjunction with the first contribution, it provides a focal point with which to tie SIT and CLT together, whereby dehumanisation at least partially mediates the effects of DT identification, and by extension represents a shared mechanism for the effects of psychological distance and DT identification.

As I have discussed, the results for Model One are largely consistent with previously theorised models - notably the model by Wilson et al. (2013) - but they also indicate areas of modification to more accurately represent how the processes of interest work together in DTs. My study establishes that spatial distance generates psychological distance. However, this effect is not direct and appears to reflect difficulties in arranging face-to-face communication in DTs with greater spatial distance. Thus, instead of spatial distance, and instead of being a moderator in their model, communication frequency and media should be added as direct antecedents of psychological distance, and may then help to resolve inconsistent findings of their effects in DTs. My study established theoretically and empirically that dehumanisation is important because it confirms the utility of thinking about domain-specific versions of the construct. So, models of individual-level processes in DTs - like Wilson et al.'s (2013) - should include dehumanisation as the DT-specific form of construal of others and as an antecedent of individuals' DT contributions. Moreover, my study confirms that both psychological distance and social identification are central to our understanding of DTs and for dehumanisation of others in DTs, indicating that both processes should be included in such models going forward and illuminating how these processes work together to influence outcomes via dehumanisation.

Considering psychological distance and social identification, as critical antecedents of DT contributions via dehumanisation, helps to explain inconsistent outcomes of spatial distance and CMC in DTs. Psychological distance and social identification are related, but they also represent competing processes that are influenced by different communication media.

However, the mixed empirical findings regarding Model Two mean that its theoretical contributions are also mixed. They indicate that the effects of CMC on socio-cognitive processes in DTs do not just depend on media richness may also or instead depend on other affordances. Specifically, the study supports the application of media richness and the SIDE model to DTs to explain how lean CMC can strengthen social identification in these teams. However, it does not support media richness theory to explain the effects of communication media on psychological distance. It does, however, indicate avenues for further theorising and empirical enquiry. Specifically, the pattern of results indicates that other affordances of CMC, such as the degree that they afford ease of accessibility to others (e.g., Wiesenfeld et al., 1999) may be responsible for CMC's effects on psychological distance. As I have mentioned, text-based CMC affords easier access to other individuals compared to video CMC, which may be more challenging to arrange and requires more resources. A potential proposition that could be tested in future research, therefore, is that the ease of connecting and assembling to others in DTs afforded by each media reduces psychological distance.

5.4 Practical contributions and implications

My theoretical model and findings have practical managerial implications for DTs. As I noted in chapter 1, DT performance is challenging compared to co-located teams, yet they can perform well despite these challenges (Jarvenpaa & Keating, 2011; Krumm et al., 2013; Schmidt et al., 2001; Staples & Zhao, 2006). DTs must be carefully managed to reach their potential. My study and its findings, in conjunction with previous research on best practices for team management, indicate that we can address challenges in DTs by managing them in ways that make team members see each other in more concrete and humanised ways.

This study demonstrated that humanised (as opposed to dehumanised) perceptions of other team members are essential to individuals' contributions to their DTs. It answered calls for interventions that address the under-researched causes of dehumanisation, considering targets' perspectives and experiences (Castro & Zautra, 2012; Haslam & Loughnan, 2014). The findings indicate that DT managers may reduce dehumanisation, and thus address challenges in getting DT members to cooperate, coordinate, and manage conflict across spatial distance, by making team members feel closer together and increasing the salience and attractiveness of the team. The findings show that managers may accomplish this by enabling and encouraging face-to-face meetings and communication

via text-based CMC. Though we may interpret these findings as a warning against using video conferencing because of potential distancing effects, the reasons behind video CMC's effects are uncertain. More generally, the study indicates that managers should not dwell on spatial distance in DTs. Instead, they should focus on increasing perceptions of humanity in the team driven by reducing psychological distance and strengthening social identification through more frequent face-to-face meetings and communication via text-based CMC when separated.

Considering this study in the broader context of best practices for managing DT performance, it indicates how DT managers can focus their efforts to improve DT members' contributions. For example, in a seminal article, Aguinis et al. (2013b) proposed some 'best practices' for managing team performance. Two of these best practices are particularly relevant to DTs and the current study. They suggested that managers should focus on processes rather than outcomes, and to focus on individual-level and team-level processes, to improve DT outcomes.

First, Aguinis et al. recommended that managers measure processes to diagnose why particular outcomes occur and how they can be improved by focusing on individuals' contextual performance. By processes and contextual performance, Aguinis et al. meant work behaviours of DT members, including seeking and considering other team members' opinions and adopting policies. However, my study demonstrates that managers should focus on the perceptual processes in teams, which can be influenced by particular behaviours (e.g., aspects of communicating with other team members).

The current model adds further insight into how 'best practice' may improve DT functioning by focusing on the processes and interactions in DTs that lead to humanisation of others. That is, managers may improve the performance of their DTs by reducing psychological distance and strengthening DT identification. This makes sense because, as my study shows, particular individual-level processes or mechanisms, rather than the end outcomes, represent the essential challenges for DTs. Indeed, focusing on outcomes rather than the processes that lead to those outcomes is similar to how I addressed the inconsistent outcomes of CMC in DTs by focusing on theoretically grounded proximal processes (Marlow et al., 2017). The current study indicates that managers should focus on the individual-level socio-cognitive processes in DTs and how they might influence these processes to achieve outcomes rather than focus on the end outcomes or spatial distance.

Measuring outcomes cannot tell us why or how to improve them in DTs, because the challenge for DT performance is in getting individuals to perceive each other in more humanised ways. It indicates that DT managers could diagnose challenges in their teams and how to address them by measuring individuals' psychological distance from their team, their DT identification, and their 'dehumanised' perceptions of other team members. Considering the perceptual processes also further supports practical advice for DT leaders to promote inclusion by frequently interacting with team members – not just through leader-member exchange processes, but by influencing individuals' perceptions of their team (Gajendran & Joshi, 2012).

Second, Aguinis et al. (2013b) suggested that team managers can more effectively manage DT performance by focusing on processes at both the individual and team levels. This suggestion can be likened to the processes of individuals' psychological distance from others and their team identity, to improve humanisation among team members. At the team level, focusing on these processes means fostering greater salience and relevance of the team across the DT, strengthening DT identification and making individuals feel like they are 'in it together'. At the individual level, it means encouraging individuals to more frequently interact via face-to-face and text-based CMC, to reduce their psychological distance from other team members and further strengthen their DT identity.

5.5 Limitations

Despite providing theoretical and empirical contributions to multiple research areas, I acknowledge that the study contains methodological limitations. For example, the data I obtained were self-reported by participants. Self-report can be problematic because individuals may not accurately report their behaviours and attitudes, particularly if these constructs are considered positive or negative (the social desirability bias; Fisher, 1993). Unfortunately, relying on self-report could not be avoided. Many of the variables of interest required self-report data (i.e., psychological distance, DT identification, and dehumanisation) or were objective (i.e., communication frequencies and spatial distance). However, self-reported positive (i.e., cooperation and coordination) and negative (i.e., conflict) work-related behaviours and attitudes may be inflated or deflated due to the social desirability bias (e.g., Fisher, 1993; King & Bruner, 2000). As discussed in Section 3.4.3, my attempts at recruiting a large enough sample from third party respondents to collect data

for the initial respondents' teamwork contribution outcomes were unsuccessful. This may have led to their restricted range (demonstrated in Section 3.11.2). Though I still found the expected relationships with these outcomes despite their restricted ranges, further studies should seek to replicate these relationships using third party data rather than self-report.

CMV is a common limitation in social research (Podsakoff et al., 2012). However, I addressed potential problems stemming from CMV before and after data collection, by measuring the constructs at two separate waves and using statistical tests of the influence of CMV. I collected data at two time points to assess causality between psychological distance and DT identification, to allow robustness checks of the data using constructs from alternate waves, and to reduce the presence of CMV. Although this two-wave design is more robust than a cross-sectional study, four or more waves would be better to test the model more completely. Nonetheless, the robustness checks demonstrated the validity of the findings (See Section 3.9).

The survey length limited the spatial distance measure. Recall from Section 3.4.2, the spatial distance measure asked respondents to indicate the relative location of up to nine of their team members, yet many respondents had over nine other members in their DT. Therefore, the spatial distance measure captured the average of a portion of these respondents' spatial distance from their DT. This inaccuracy may have weakened the effects of spatial distance. However, asking respondents to report their distance from more of their team members was not feasible with the resources available and the maximum viable survey length. I also examined the average spatial distance from the members reported, and adding more team members, if they exist, to this calculation may not significantly affect the result.

Contributions to teamwork may differ between dyads in the team based on the spatial distance and even psychological distance and dehumanised perceptions between each dyad. This is a general limitation of this paper, in that I was not able to measure all the variables with this level of granularity. However, the theory and findings relate to the individual-level concerning the team, and the results at least show general relationships with these variables. If these effects do occur on a dyadic basis more strongly, theory predicts similar effects and the influence of each variable maybe even stronger than my results indicate. Nevertheless, future research could test each effect across networks of dyads in DTs separately.

Examining the theoretical models at multiple levels, including the team and organisational levels, would have allowed for a deeper inquiry into the embeddedness of individuals within their teams as a whole, and other aspects such as the dyadic relationships within those teams. However, I chose to focus solely on the individual level for reasons I outlined in Section 1.3, including the individual focus of current theorising around construal and psychological distance, and the difficulties in obtaining an adequate sample of distributed teams in one organisation to reliably test the models. Future research could build upon this work with multi-level data.

Technically, I did not longitudinally examine the serial-mediation of effects in model 1. Although I collected data at two time points, and examined the model with variations of variables taken from multiple time points, I did not examine the model in a way that shows how the mediation processes occur over time or establish the direction of causality across these multi-stage mediations. This approach, using what some researchers may consider to be the equivalent of cross-sectional data, may have biased the effects of unstable variables (negative bias if the mediator is more stable than the predictor; positive if the reverse is true; Maxwell & Cole, 2007). If we take the correlations between the same variables at waves 1 and 2 as an indication of stability over time, the mediated effects of psychological distance and social identification via dehumanisation have been smaller due to negatively biased results. Although this also indicates that the mediated effects of psychological distance via social identification may have been positively biased (Maxwell & Cole, 2007), the cross-lagged analysis indicates the directional and temporal causality between these variables. With greater resources, future studies may examine the whole model longitudinally with more than two waves of data.

A potential criticism of representing construal of other people with dehumanisation is that I did not conclusively statistically determine that they are the same concept. Unfortunately, no valid and reliable direct measure of construal of other people exists. I attempted to create and test two measures of construal of other people. However, neither measure demonstrated adequate validity and they were subsequently abandoned (Section 3.4.2). In future research, I may re-attempt to develop a measure of construal of other people and examine its correlation with measures of dehumanisation of the same target(s) to quantitatively demonstrate its representativeness of construal-level. However, I argue that there is no pressing need to create a new measure of construal of people. I maintain

from my observations of 'both' concepts in Chapter 2 (Section 2.4) that dehumanisation and abstract construal of other people are conceptually the same phenomenon with the same antecedents and consequences – and the current study empirically supports these observations.

5.6 Further research

Considering that my study provides clear support for the theoretical Model One overall, there are obvious directions that future research should take. In Section 2.2.1, I noted that researchers could explore other dimensions of distance in addition to spatial distance once this study established the initial model. Other dimensions of distance, such as configurational (i.e., the number and proportion of team members at each location), temporal (e.g., time zone differences), and social (e.g., cultural distances) may influence psychological distance and DT identification (Klitmøller et al., 2015; O'Leary & Cummings, 2007). Researchers explore these additional distances to broaden the model to globally DTs, because they are more central to teams dispersed across countries.

However, the mixed support for Model Two indicates further research to determine why the unexpected effects occurred. Specifically, it indicates that other affordances of CMC, such as accessibility or ease of access to others, rather than media richness may explain why text-based CMC reduced psychological distance whereas video CMC (video conferencing) increased it. This proposition will need to be tested in additional studies.

I note that dehumanisation only partially mediates the effects of social identification in Model One. This means that specific social identification processes influence outcomes independently to its influence through construal processes. Therefore, future research should measure and delve deeper into which specific social identity mechanisms, such as internalising team goals over individual goals, can explain direct effects of DT identification independently from these mediated effects.

Additional research can also address the limitations of this study. Taking a realist approach means to accept that the findings may not be valid in other settings or with other samples (O'Gorman & MacIntosh, 2015). Thus, to further demonstrate the validity of the model and establish its generalisability, the findings must be replicated in distinct organisations, industries, or other relevant settings. Moreover, a replication of the study may obtain third-party data for the teamwork contribution variables (e.g., cooperation) to

address potential issues with self-report and establish their socio-cognitive antecedents. With more resources, I could also collect four waves of data or more to test the model in full.

5.7 Conclusion

This research aimed to contribute to theoretical and empirical knowledge to address challenges for distributed teamwork. I addressed this aim by clarifying how fundamental characteristics of DTs – spatial distance and communication – and socio-cognitive mechanisms – including psychological distance, DT identification, and dehumanisation as a form of construal of other people – influence key contributions to distributed teamwork. In addressing my aim, I answered two research questions: i) How do the socio-cognitive processes of psychological distance and social identification work together to influence individual team members' contributions to distributed teamwork?; and building on the first question, ii) How can communication and associated technologies be used to improve the socio-cognitive processes that determine perceptions of other team members and subsequent teamwork in DTs? I addressed the first research question by demonstrating that psychological distance influence DT identification (rather than the reverse relationship), which then influence teamwork contributions mediated by dehumanisation of others in the DT. I also demonstrated that DT identification, in parallel, mediates the effects of psychological distance in the model, while exerting unique direct effects on the outcome variables. I began to address the second research question by hypothesising and testing specific effects of CMC media and face-to-face communication on psychological distance and DT identification. I established that text-based CMC, but not other communication media, can be used to strengthen DT identification. In doing so, I provide further and more robust support for the SIDE model (e.g., Lea, Spears, & de Groot, 2001; Postmes & Spears, 1998; 2000; 2005; Postmes & Tanis, 2001). My study also found that face-to-face communication is best for reducing psychological distance. However, I found that video CMC may increase psychological distance, yet I was not able to discern exactly why. Thus, while I made a substantial advancement on the second research question, my results indicate further research is needed.

As humans, we need to work well with other humans in work teams. However, working well with others that do not work in the same physical space is more difficult in part

because their humanity is less salient. To better acknowledge their humanity (e.g., to humanise them) and more easily work well with these colleagues (i.e., cooperate, coordinate, and manage conflict), they need to seem closer (i.e., reduce psychological distance) and more relevant to us (i.e., strengthen DT identification). Frequent communication is key to improving these aspects, but it depends on how this communication occurs. Face-to-face meetings are ideal for making others seem closer again, whereas CMC media may not help in this regard. Text-based CMC helps in another way – it reminds us of the team's existence and relevance to us. Though video CMC is intended to make other people seem closer or more relevant, it can actually counter-intuitively lead to greater cognitive 'distance' from others. Further research is needed to confirm these effects in specific contexts and with third-party data for outcome variables, as well as to further clarify the reasons for the effects of CMC on psychological distance.

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APPENDICES

Appendix A: Central papers that have examined psychological distance in distributed work contexts.

Author(s) (year)	Level	Aim	Methods	Core constructs	Core relationships and theoretical reasoning	Key findings
Wilson et al. (2008)	Dyads	Introduce PD to the work context.	NA	**Spatial distance** **Communication** **Shared similarity/Social identification** **Psychological distance**	**SD-->PD (+):** Not provided. **SD-->Comms (-)**: Greater SD means greater difficulty meeting FtF. **SD-->SI (-):** Not provided. **Comms-->PD (-)**: Greater salience and certainty (e.g., makes others' more understandable and predictable). **SI-->PD (-):** Provides common ground, positive attributions, certainty and predictability of others' behaviour.	NA
Wilson et al. (2013)	Individuals in teams	Extend CLT to the effects of objective distances and psychological distance in DTs through a shared mechanism.	NA	**Spatial distance** **Psychological distance** **Construal-level** **Cognitive outcomes**	**SD-->PD (+):**Not provided. **PD-->CL (+):** Draws from CLT - greater distance from a target means greater reliance on 'schematic' and 'prototypical' information when thinking about a target (Fujita et al., 2006). **CL-->Outcomes:** Provided example of coordination; abstract construal of other people means less awareness of their details and contexts, including their needs and interdependencies.	NA
O'Leary et al. (2014)	Dyads	Build upon and test Wilson et al.'s (2008) model to predict and	Mixed methods survey	**Spatial distance:** Point-to-point distance between them (in miles). **Shared identification:** Ratings of similarity	**SD→PD (+):** Not provided. **SD→Comms (-):**Not provided. **SD→SI (-):**Not provided.	**Not supported:** SD→PD (+) and Shared identity (-) Communication→Relationship quality (+)

		explain relationship quality in distributed work dyads.	study	to colleague based on age, gender, personal values, and commitment to their work. (does not measure social identification) **Communication:** Aggregated and separate communication frequencies by medium. **Psychological distance:** Developed 12-item scale that appears face-valid. **Relationship quality:** Adapted Hackman's (1990) dimensions of team effectiveness to the dyadic level (e.g., relationship satisfaction, leaning from distant colleague, and desire to work with them in future)**.**	**Comms→PD (-):** communication, when it is frequent, deeper in substance, and more interactive (i.e., more interdependent, reciprocal exchanges), increases salience, reduces uncertainty, and allows individuals to envision others' context. **SI→PD (-)**: by creating common ground, reducing uncertainty, and engendering positive attributions when real data is absent. **PD→Relationship Quality (-):**Not provided.	**Supported** SD→Communication (Partially) (-) (correlations) Communication→PD (+) (correlations) PD→Relationship quality (-) Shared identity→Relationship quality (+).
Siebdrat et al. (2013)	Teams	Examine the relationship between objective and subjective dimensions of dispersion in DTs, and their impact on teamwork.	Quantitative survey study	**Spatio-temporal distance:** Team leaders identified each team member's office location, used to calculate the index of 'objective dispersion' (per O'Leary & Cummings, 2007). **Psychological distance:** Four-item measure capturing effort required to meet other team members face-to-face, and the virtuality of communication (e.g., percentage of communication conducted via CMC). **Team collaboration:** Items capturing quality of communication, task coordination, balance of contribution, effort, mutual support, and cohesion (scales from Hoegl et al., 2004).	**Spatio-temporal distance→PD (+):** SD generates PD by reducing FtF communication and increasing reliance on CMC, which then reduces salience and visibility of the team, which then increases PD. **PD→Team collaboration (-):** increased "categorisation processes" and less salience of others' behaviours and affects.	**Not supported** Spatio-temporal distance→PD **Supported** PD→Team collaboration (-)

***Notes**: SD=Spatial distance, PD=Psychological distance, SI=Social identification, CL=Construal-level, FtF=Face-to-face.*

Appendix B: Pilot study survey.

FILTER QUESTION

This study focuses on virtual teams, otherwise known as distributed teams. A virtual team is defined as: *"A team in which team members are not located in the same physical space (i.e., the same office or building) and conduct the majority of their work together over geographic distance".*

For this research, respondents need to be currently working in a virtual team in which the core members of the team are located within Australia. According to the definition, **are you currently working in a virtual team located within Australia? Y/N**

INSTRUCTIONS

For all the following questions, please answer concerning ONE virtual team in which you currently work, that is located within Australia. If you are in multiple virtual teams, answer questions concerning the virtual team in which you work the most hours.

Including yourself, please indicate how many individual employees are in the virtual team:__

For all the following questions, please answer concerning **a virtual team** in which you currently work. If you are in multiple virtual teams, answer questions concerning **the virtual team in which you put the most amount of time.**

MEASURES

Communication medium frequency.

In the past month, how often have you communicated with other members of the virtual team using each of the following media, on average?

Items	Never	Less than once a week	One to four times a week	Once a day	Two to five times a day	More than five times a day
Face-to-face	1	2	3	4	5	6
Email	1	2	3	4	5	6
Online chat (real time)	1	2	3	4	5	6
Instant text message	1	2	3	4	5	6
Telephone or voice-over-IP (VOIP)	1	2	3	4	5	6
Video	1	2	3	4	5	6
Social media	1	2	3	4	5	6
Other	1	2	3	4	5	6

If you have selected 'other', please indicate which other forms of communication you have been using in the past month to communicate with other members of the virtual team:

Social identification with the team.

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. I identify with other members of the team	1	2	3	4	5
2. I see myself as a member of the team	1	2	3	4	5
3. I am glad to be a member of the team	1	2	3	4	5
4. I feel strong ties with other members of the team	1	2	3	4	5

Implicit coordination.

Rate the degree to which you feel the items describe your behaviours towards the virtual team.

Items	Extremely inaccurate				Extremely accurate
5. I provide task-related information to other members without being asked	1	2	3	4	5
6. I proactively help individual members when they need assistance	1	2	3	4	5
7. I monitor the progress of all members' performance	1	2	3	4	5
8. I effectively adapt my behaviour to the actions of other members	1	2	3	4	5

Psychological distance.

When I think about my teammates in the virtual team….

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
9. …I expect that they and I will be working together more regularly on the team's task in the future	1	2	3	4	5
10. …They and I will start working on the team task eventually	1	2	3	4	5
11. …Most of my work with them on the team's task is yet to come	1	2	3	4	5
12. …They and I will begin working on the team's duties later	1	2	3	4	5
13. …I feel like there are major differences between them and me	1	2	3	4	5
14. …Their ways of doing things are quite distinct from mine	1	2	3	4	5
15. …Their positions are dissimilar from mine on key issues	1	2	3	4	5
16. …They seem to approach things differently than me	1	2	3	4	5
17. …I have only a fuzzy idea of the complete list of my teammates	1	2	3	4	5
18. …I only have a vague sense of who specifically is on the team	1	2	3	4	5
19. …I feel like they and I are a team in name only	1	2	3	4	5
20. …I only have a faint impression of being on a team with them	1	2	3	4	5
21. …I have a feeling that they are remote from me	1	2	3	4	5
22. …I feel like I am physically isolated from them	1	2	3	4	5
23. …It seems like they are far away from me	1	2	3	4	5
24. …I have a sense that I am separated from them	1	2	3	4	5

Cooperative behaviours.

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. I help my co-workers to finish tasks	1	2	3	4	5
2. I am willing to help co-workers when things go wrong unexpectedly	1	2	3	4	5
3. I apologise to my co-workers when I have made a mistake	1	2	3	4	5
4. I try to divide the pleasant and unpleasant tasks equally between myself and my co-workers	1	2	3	4	5
5. I live up to agreements with my co-workers	1	2	3	4	5

Cooperative attitude.

Indicate the extent to which you agree or disagree with the following statements about your own work in your team.

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. I am committed to pursuing the team's goals	1	2	3	4	5
2. I think it is important to reach the team's goals	1	2	3	4	5
3. I really care about achieving the team's goal	1	2	3	4	5

Work-related construal-level of team members.

Imagine that your teammates in the virtual team are focused on working on a project. This project requires your team to conduct each of the following tasks, listed on the left. For each task, please indicate the activity that best describes what **<u>your teammates</u>** are doing

Work activity	[Low-level]	[High-level]
Preparing a report (R)	Compiling information	Showing progress
Using a computer	Typing on a keyboard	Processing information
Filling out a business form (R)	Filling in blanks with information	Following work protocol
Obtaining information from others in your team	Asking relevant questions	Gaining knowledge
Making a presentation to your team(R)	Presenting relevant material	Communicating knowledge
Assigning work to others in your team	Telling someone what to do	Getting things done
Communicating information to others in your team	Sending an email or talking to someone	Keeping someone informed
Analysing a dataset (R)	Comparing numbers	Identifying trends
Attending a meeting with others in your team	Being present and paying attention	Staying up to date
Developing a procedure (R)	Writing down step-by-step instructions	Increasing work efficiency
Writing business correspondence to others in your team (R)	Composing an email	Maintaining a good business relationship
Hiring someone	Interviewing candidates	Maintaining staff level
Developing a budget	Listing expenses and revenues	Managing funds
Proofreading a document (R)	Reading carefully for errors	Ensuring accuracy
Training others in your team (R)	Showing someone how to do things	Increasing someone's productivity

Analysing an operational report	Reviewing information	Ensuring smooth operation
Orienting a new worker in your team (R)	Showing a new worker around	Acclimating a new worker
Evaluating someone's performance in your team	Reviewing quality of work	Providing feedback

Spatial distance questions.
Indicate the location of the office where you are based when you conduct most of your work with the virtual team: ___

The answers to this question will be used to enable you to identify which team member to think about when answering subsequent questions about their location concerning your own. This data will not be used by the researchers to identify you or other members of your team.

Indicate an identifier for the first boxes, representing each of your virtual team members, **other than yourself**. Leave the other text boxes blank. This identifier can be initials, name or role that will allow you to understand which team member you need to think about for the next section of questions.

Team member 1 _____
Team member 2 _____
Team member 3 _____
…
Team member 9 _____

Spatial distance.

1. In which Australian state or territory are you typically located when conducting work for the virtual team: [choose from Australian states/territories from a drop-down menu]
2. In which city or town are you typically located when conducting work for the virtual team: _____
3. Indicate an *identifier for the first [up to 9 team members], representing each of your virtual team members, other than yourself. *This identifier can be initials, name or role that will allow you to understand which team member you need to think about for the next section. (NOTE: This question will be used to identify which team member to think about when answering subsequent questions about their location. This data will not be used by us to identify you or other members of your team and anonymity is still guaranteed.) _____
4. Answer this question for each of your team members. Concerning yourself, where is [Team Member X] typically located when conducting work for the virtual team? The same office and/or the same floor in the same building/a different floor in the same building/a different building in the same city or town/a different city or town. **[this question is repeated for up to 9 team members]**
5. Depending on the answer to question 4, the respondent will be asked one of the following questions:
    a. Which state or territory is [Team Member X] typically located when conducting work for the virtual team?
    b. Which city/town is [Team Member X] typically located when conducting work for the virtual team?
    c. Approximately how many kilometres away is the building where [Team Member X] is typically located when conducting work for the virtual team? ___ km

Biographical information

1. What is your current work status (choose one)? full-time, part-time, casual, other

2. On average, how many hours do you work per week? _____ hours
3. On average, how many hours do you perform work for your virtual team? ____ hours
4. How long have you been working in your current organisation? _____ years and _____ months
5. How long have you been working in your current virtual team? _____ years and ____ months
6. Is your virtual team TEMPORARY or ONGOING?
7. What is your age in years?
8. What is your gender? Male/female/other
9. Are you a supervisor and/or manager for the virtual team?

END SURVEY.

Appendix C: Main study survey.

FILTER QUESTION

This study focuses on your experience in a virtual team or distributed team. To qualify for participation, you must be currently working in a team in which at least one team member typically works from a different location to you and / or other team members. This could mean they work in a different building close by, or a different city or town in Australia. They will also primarily complete their work activities and interact with other team members using communication technologies (phone, email, Skype, etc.,) rather than face-to-face.

According to the above, are you currently working in a virtual/distributed team that is located within Australia? Y/N/Unsure

INSTRUCTIONS

For all the following questions, please answer concerning ONE virtual/distributed team in which you currently work, that is located within Australia. If you are in multiple virtual teams, answer questions concerning the virtual/distributed team in which you work the most hours.

NOT including yourself, how many members are there in the virtual team: ___

MEASURES

Social identification with the team.

Indicate to what extent you agree with each of the following statements concerning the virtual team

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. I identify with other members of the team.	1	2	3	4	5
2. I see myself as a member of the team.	1	2	3	4	5
3. I am glad to be a member of the team.	1	2	3	4	5
4. I feel strong ties with other members of the team.	1	2	3	4	5

Cooperative behaviours.

Indicate the extent to which you agree or disagree with the following statements about your own work in your virtual team.

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. It is important to me to maintain harmony within the team.	1	2	3	4	5
2. There is little collaboration between myself and other team members, tasks are individually delineated.	1	2	3	4	5
3. There is a high level of cooperation between myself and other team members.	1	2	3	4	5
4. I am willing to sacrifice my self-interest for the benefit of the team.	1	2	3	4	5
5. There is a high level of sharing between myself and other team members.	1	2	3	4	5

Cooperative attitude.

Indicate the extent to which you agree or disagree with the following statements about your own work in your virtual team.

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. I am committed to pursuing the team's goals.	1	2	3	4	5
2. I think it is important to reach the team's goals.	1	2	3	4	5
3. I really care about achieving the team's goal.	1	2	3	4	5

Communication medium frequency.

In the past month, how often have you communicated with other members of the virtual team using each of the following media, on average?

Items	Never	Less than once a week	One to four times a week	Once a day	Two to five times a day	More than five times a day
Face-to-face	1	2	3	4	5	6
Email	1	2	3	4	5	6
Online chat (real time)	1	2	3	4	5	6
Instant text message	1	2	3	4	5	6
Telephone or voice-over-IP (VOIP)	1	2	3	4	5	6
Video	1	2	3	4	5	6
Social media	1	2	3	4	5	6
Other	1	2	3	4	5	6

If you have selected 'other', please indicate which other forms of communication you have been using in the past month to communicate with other members of the virtual team:

Psychological distance.

When I think about my teammates in the virtual team….

Items	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. …I expect that they and I will be working together more regularly on the team's task in the future.	1	2	3	4	5
2. …They and I will start working on the team task eventually.	1	2	3	4	5
3. …Most of my work with them on the team's task is yet to come.	1	2	3	4	5
4. …They and I will begin working on the team's duties later.	1	2	3	4	5
5. …I feel like there are major differences between them and me.	1	2	3	4	5
6. …Their ways of doing things are quite distinct from mine.	1	2	3	4	5
7. …Their positions are dissimilar from mine on key issues.	1	2	3	4	5
8. …They seem to approach things differently than me.	1	2	3	4	5
9. …I have only a fuzzy idea of the complete list of my teammates.	1	2	3	4	5
10. …I only have a vague sense of who specifically is on the team.	1	2	3	4	5
11. …I feel like they and I are a team in name only.	1	2	3	4	5
12. …I only have a faint impression of being on a team with them.	1	2	3	4	5
13. …I have a feeling that they are remote from me.	1	2	3	4	5
14. …I feel like I am physically isolated from them.	1	2	3	4	5
15. …It seems like they are far away from me.	1	2	3	4	5
16. …I have a sense that I am separated from them.	1	2	3	4	5

Implicit coordination.

Rate the degree to which you feel the items describe your behaviours towards the virtual team.

Items	Extremely inaccurate				Extremely accurate
1. I provide task-related information to other members without being asked.	1	2	3	4	5
2. I proactively help individual members when they need assistance.	1	2	3	4	5
3. I monitor the progress of all members' performance.	1	2	3	4	5
4. I effectively adapt my behaviour to the actions of other members.	1	2	3	4	5

Dehumanisation.

Indicate the extent to which you agree with the following statements regarding your interactions with the members of the virtual team in the past month:

Items	Strongly disagree				Strongly agree
1. I did not really feel that I was interacting with people.	1	2	3	4	5
2. The human aspect of other team members was not obvious.	1	2	3	4	5
3. I felt that I was interacting with a computer rather than a human being.	1	2	3	4	5
4. I did not have a feeling of the human aspect of the interaction.	1	2	3	4	5

'Trap' questions [inserted into other parts of this survey]

Items	Strongly disagree				Strongly agree
Please select strongly disagree if you are paying attention.	1	2	3	4	5
I think that two plus two equals seven.	1	2	3	4	5

Spatial distance.

1. In which Australian state or territory are you typically located when conducting work for the virtual team: [choose from Australian states/territories from a drop-down menu]
2. In which city or town are you typically located when conducting work for the virtual team: _____
3. Indicate an *identifier for the first [up to 9 team members], representing each of your virtual team members, other than yourself. *This identifier can be initials, name or role that will allow you to understand which team member you need to think about for the next section. (NOTE: This question will be used to identify which team member to think about when answering subsequent questions about their location. This data will not be used by us to identify you or other members of your team and anonymity is still guaranteed.)
    a. Team Member 1: _____
    b. Team Member 2: _____
    c. …
    d. Team Member 9: _____
4. Answer this question for each of your team members. Concerning yourself, where is [Team Member X] typically located when conducting work for the virtual team? The same office and/or the same floor in the same building/a different floor in the same building/a different building in the same city or town/a different city or town. **[this question is repeated for up to 9 team members]**
5. Depending on the answer to question 4, the respondent will be asked one of the following questions:
    a. Which state or territory is [Team Member X] typically located when conducting work for the virtual team?
    b. Which city/town is [Team Member X] typically located when conducting work for the virtual team?
    c. Approximately how many kilometres away is the building where [Team Member X] is typically located when conducting work for the virtual team? ___ km

Conflict.

Indicate the extent to which you experience the following in the virtual team:

Items	None or none at all	Little or rarely	Some	Much or often	Very much or very often
1. How much relationship tension is there between you and the other people in the virtual team?	1	2	3	4	5
2. How often do people get angry when working in the virtual team?	1	2	3	4	5
3. How much emotional conflict is there between you and the other people in the virtual team?	1	2	3	4	5
4. How much conflict of ideas is there between you and the other people in the virtual team?	1	2	3	4	5
5. How frequently do you have disagreements with the other people in the virtual team about the tasks you are working on?	1	2	3	4	5
6. How often are there conflicting opinions about the project you are working on between you and the other people in the virtual team?	1	2	3	4	5
7. How often are there disagreements about who should do what between you and the other people in the virtual team?	1	2	3	4	5
8. How much conflict is there between you and the other people in the virtual team about task responsibilities?	1	2	3	4	5
9. How often are there disagreements about resource allocation between you and the other people in the virtual team?	1	2	3	4	5

Task interdependence.

Indicate the extent to which you agree or disagree with the following statements about your own work in the virtual team:

Items	Strongly disagree				Strongly agree
1. I need information from the other team members to be able to carry out my job.	1	2	3	4	5
2. I am very dependent on the other team members to be able to carry out my job.	1	2	3	4	5
3. I have to work closely together with the other team members to be able to carry out my job.	1	2	3	4	5

Biographical information

1. What is your current work status? FT/PT/Casual/Other
2. On average, how many hours do you work per week? ___
3. On average, how many hours do you perform work for the virtual team per week? ___
4. How long have you been working at your current organisation? ____
5. How long have you been working in the virtual team? ____
6. Please indicate whether the virtual team is temporary or ongoing? ___
7. What is your age in years? ___

8. What is your gender? M/F/Other
9. Are you a supervisor and/or manager for the virtual team? Y/N
10. What percentage of your virtual team is not currently employed at your organisation, if any? ___
11. This survey will have a follow-up survey in 6-8 weeks. Do you give your consent to be contacted for the next stage? Y/N

End of survey

Appendix D: Independent samples t-test comparing supervisors of distributed teams to non-supervisors.

Group Statistics

	Group	N	*M*	*SD*	*SEM*
Task interdependence	Non-supervisors	140	3.27	0.95	0.08
	Supervisors	66	3.68	0.65	0.08
Face-to-face frequency	Non-supervisors	140	2.38	1.37	0.12
	Supervisors	66	2.48	1.28	0.16
Video CMC frequency	Non-supervisors	140	1.85	1.05	0.09
	Supervisors	66	2.06	1.16	0.14
Phone frequency	Non-supervisors	140	2.91	1.43	0.12
	Supervisors	66	3.21	1.45	0.18
Text-based CMC frequency	Non-supervisors	140	8.78	3.07	0.26
	Supervisors	66	10.38	2.81	0.35
Tenure in DT (years)	Non-supervisors	140	3.20	3.39	0.29
	Supervisors	65	3.86	3.89	0.48
Age (years)	Non-supervisors	140	43.59	12.26	1.04
	Supervisors	66	46.48	11.20	1.38

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	*t*	df	Sig. (2-tailed)	Mean Difference	SE Difference	Lower	Upper
Task interdependence	Equal variances assumed	15.74	.00	-3.18	204.00	.00	-0.41	0.13	-0.66	-0.16
	Equal variances not assumed			-3.63	177.24	.00	-0.41	0.11	-0.63	-0.19
Face-to-face frequency	Equal variances assumed	0.00	.98	-0.53	204.00	.60	-0.11	0.20	-0.50	0.29
	Equal variances not assumed			-0.54	135.68	.59	-0.11	0.20	-0.49	0.28
Video CMC frequency	Equal variances assumed	0.40	.53	-1.30	204.00	.20	-0.21	0.16	-0.53	0.11
	Equal variances not assumed			-1.25	116.79	.21	-0.21	0.17	-0.54	0.12
Phone frequency	Equal variances assumed	0.79	.38	-1.42	204.00	.16	-0.31	0.21	-0.73	0.12
	Equal variances not assumed			-1.41	125.65	.16	-0.31	0.22	-0.73	0.12
Text-based CMC frequency	Equal variances assumed	1.02	.32	-3.58	204.00	.00	-1.60	0.45	-2.48	-0.72
	Equal variances not assumed			-3.70	138.23	.00	-1.60	0.43	-2.46	-0.75
Tenure in DT (years)	Equal variances assumed	0.96	.33	-1.23	203.00	.22	-0.66	0.53	-1.71	0.39
	Equal variances not assumed			-1.17	110.56	.24	-0.66	0.56	-1.77	0.46
Age (years)	Equal variances assumed	0.75	.39	-1.62	204.00	.11	-2.89	1.78	-6.40	0.62
	Equal variances not assumed			-1.68	138.46	.10	-2.89	1.72	-6.30	0.52