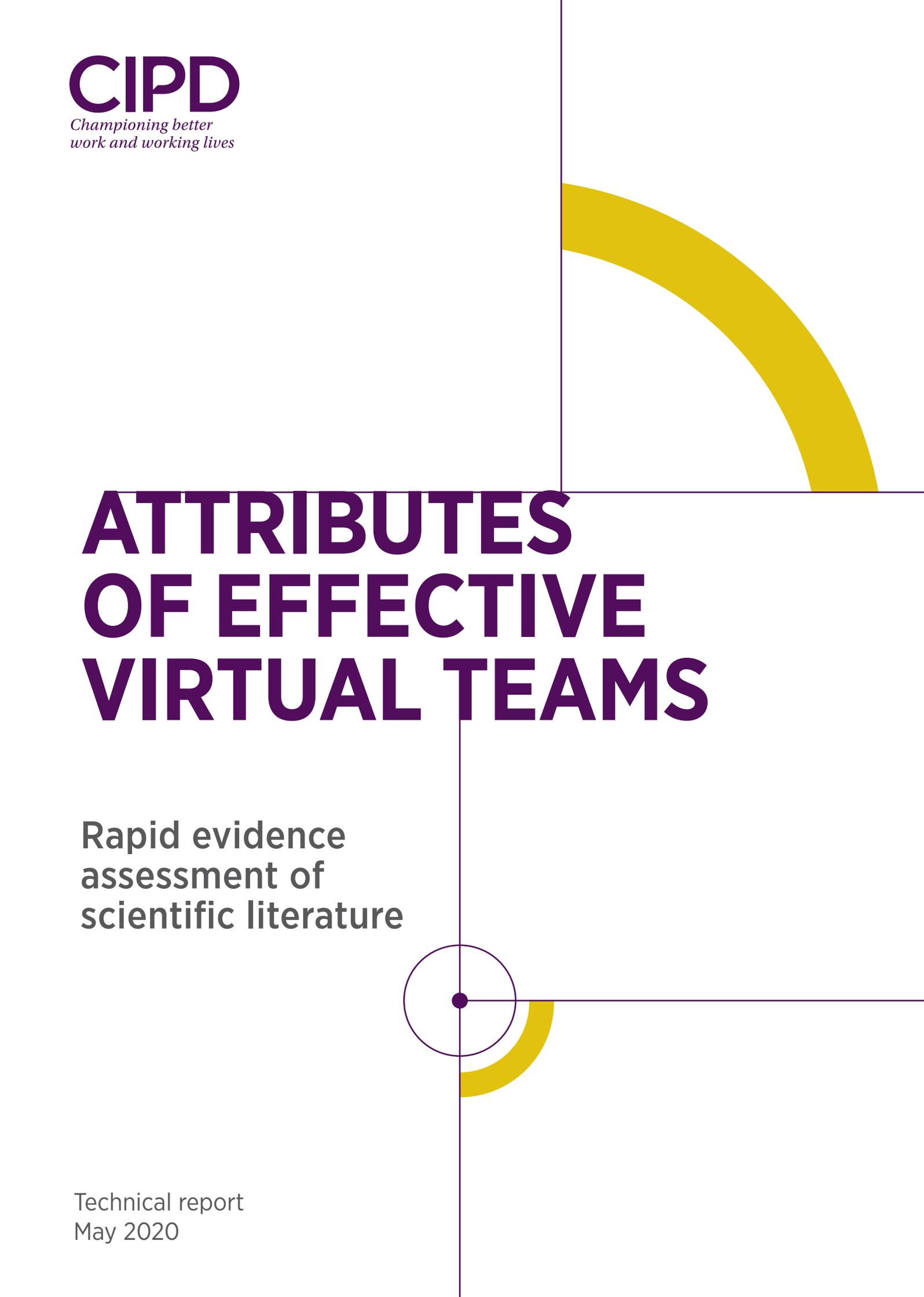


**CIPD**

*Championing better  
work and working lives*



# ATTRIBUTES OF EFFECTIVE VIRTUAL TEAMS

Rapid evidence  
assessment of  
scientific literature

Technical report  
May 2020

The CIPD is the professional body for HR and people development. The registered charity champions better work and working lives and has been setting the benchmark for excellence in people and organisation development for more than 100 years. It has more than 150,000 members across the world, provides thought leadership through independent research on the world of work, and offers professional training and accreditation for those working in HR and learning and development.

**Contents**

- 1. Rationale for this review .....2
- 2. What is a rapid evidence assessment? .....2
- 3. Main question: what will the REA answer? .....2
- 4. Search strategy: how was the research evidence obtained? .....2
- 5. Selection: How were studies selected? .....3
- 6.1. Critical appraisal: how was the quality of the evidence judged? .....3
- 6.2. Critical appraisal: what is the quality of the studies included? .....3
- 7. Main findings .....4
- 8. Conclusion .....10
- 9. Limitations .....10
- References .....11
- Appendix I: Search terms and results .....17
- Appendix II: Selection of studies .....18
- Appendix III: Data extraction table – Meta Analyses and Systematic Reviews .....19
- Appendix IV: Data extraction table – primary studies .....25

**Acknowledgements**

This report was written by the Center for Evidence-Based Management (CEBMa). It is based on an update of a rapid evidence assessment conducted by CEBMa in 2014, which was funded by Advanced Workplace Associates (AWA). The CIPD's [practice-oriented summary](#) of the evidence review and recommended action points are available at [www.cipd.co.uk/virtualteams](http://www.cipd.co.uk/virtualteams).



## **1. Rationale for this review**

In the summer of 2014, Advanced Workplace Associates (AWA) identified an interest in looking into the subject of managing virtual teams, that is, those who need to work together when they are not always physically in the same place. Is there a difference between workers of this kind and traditional teams? For this reason, AWA approached the Center for Evidence Based Management (CEBMA) to undertake a rapid evidence assessment (REA) of the best available scientific evidence. The REA was completed in September 2014. In 2020, the Chartered Institute of Personnel and Development (CIPD) approached CEBMA to provide an update of the REA. This review presents an overview of the main findings.

## **2. What is a rapid evidence assessment?**

Evidence reviews come in many forms. One of the best known is the conventional literature review, which provides an overview of the relevant scientific literature published on a topic. However, a conventional literature review's trustworthiness is often low: clear criteria for inclusion are lacking and studies are selected based on the researcher's individual preferences. As a result, conventional literature reviews are prone to bias. This is why 'rapid evidence assessments' (REAs) are used. An REA is a specific research methodology that aims to identify the most relevant studies on a specific topic as comprehensively as possible, and to select appropriate studies based on explicit criteria. In addition, the methodological quality of the studies included is assessed by two independent reviewers on the basis of explicit criteria. In contrast to a conventional literature review, an REA is transparent, verifiable, and reproducible, and, as a result, the likelihood of bias is considerably smaller.

## **3. Main question: what will the REA answer?**

What is known in the scientific literature about attributes of effective virtual teams?

Sub-questions that form the basis of the update:

- 1 What constitutes a virtual team?
- 2 How can a team's degree of virtuality be measured?
- 3 Does team virtuality affect team effectiveness (and if so, how)?
- 4 Does team virtuality affect worker-related outcomes, such as motivation, satisfaction, well-being, and work-life balance?
- 5 What are the most important factors that enhance the effectiveness of virtual teams?
- 6 What leadership styles and interventions are known to influence the effectiveness of virtual teams?

## **4. Search strategy: how was the research evidence obtained?**

Four databases were used to identify studies: ABI/INFORM Global from ProQuest, Business Source Premier from EBSCO, PsycINFO from Ovid, and Google Scholar. Our search applied the following general search filters:

- 1 scholarly journals, peer-reviewed
- 2 published in the period 1980 to 2020 for meta-analyses and 2010 to 2020 for primary studies
- 3 articles in English.

A search was conducted using combinations of various search terms, including 'virtual', 'mobile', 'remote', 'distributed', 'dispersed', 'team', and 'group'. In addition, the references listed in the retrieved studies were screened in order to identify additional studies for possible inclusion in the REA. We conducted eight different search queries and screened the titles and abstracts of more than 350 studies. An overview of all search terms and queries is provided in Appendix I.

## 5. Selection: how were studies selected?

Study selection took place in two phases. First, titles and abstracts of the 350+ studies identified were screened for relevance. In case of doubt or lack of information, the study was included. Duplicate publications were removed. This first phase yielded 16 meta-analyses and 51 primary studies. Second, studies were selected based on the full text of the article using these inclusion criteria:

- 1 **type of studies:** focusing on quantitative, empirical studies
- 2 **measurement:** only studies in which relationships among team attributes, contextual factors and outcomes were quantitatively measured
- 3 **context:** only studies related to workplace settings
- 4 **level of trustworthiness:** only studies that were graded level C or above (see below).

In addition, the following exclusion criteria were applied:

- studies on the drivers/determinants for the uptake and implementation of virtual working
- studies on teams working within a virtual world
- studies on virtual student teams or virtual training groups
- studies on the effect tools aimed at supporting virtual teams.

This second phase yielded a total number of 10 meta-analyses and 35 primary studies. An overview of the selection process is provided in Appendix II.

### 6.1. Critical appraisal: how was the quality of the evidence judged?

In almost any situation it is possible to find a scientific study to support or refute a theory or a claim. Thus, it is important to determine which studies are trustworthy (that is, valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. To determine the methodological appropriateness of the included study's research design, the classification system of Shadish (2002) and Petticrew (2006) was used. In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Finally, the effect sizes were identified. An effect (for example a correlation, Cohen's *d* or omega) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size – a standard measure of the magnitude of the effect – of the studies included was assessed.

For a detailed explanation of how the quality of included studies was judged, see *CEBMA Guideline for Rapid Evidence Assessments in Management and Organizations* (Barends, 2017).

### 6.2. Critical appraisal: what is the quality of the studies included?

The overall quality of the studies included is high. Of the nine meta-analyses included, five were based on controlled studies and were therefore graded level A or higher. Of the 29 primary studies, 23 were randomised controlled studies (RCTs). However, both the ecological validity (type of organisations) and population validity (type of employees) of these RCTs was rather low, because most were set in an artificial context and involved students. As a result, one must be cautious in generalising the findings of such studies to the context and population of this REA, that is, knowledge workers in virtual teams. An overview of all studies included and information regarding year of publication, research design, sample size, population, main findings, effect sizes and limitations is provided in Appendix III and IV.

## 7. Main findings

### Question 1: What constitutes a virtual team?

#### Finding 1: There is no generally agreed definition of a virtual team

There is no commonly used and generally agreed definition of a virtual team (or virtual work). This has to do with the fact that virtual teams have many forms, different objectives, membership criteria, task types, and so on. As a result, research has focused on many different team characteristics associated with virtual work and produced a variety of distinct definitions of virtual teams (Curseu, 2008). However, the basic consensus is that a virtual team consists of:

- two or more persons, who
- collaborate interactively to achieve common goals, while
- at least one of the team members works in a different location, or at a different time, so that
- communication and co-ordination are predominantly done by means of electronic media.

#### Finding 2: The difference between a traditional team and a virtual team is a continuum

Most authors acknowledge that the difference between a traditional/collocated team and a virtual one is a continuum. As Hertel (2005) points out: 'While extreme cases of virtual teams can be imagined in which all members are working at different locations and communicate only via electronic media, most of the existing virtual teams have some face-to-face contact. At the same time, electronic communication media are not only used in virtual teams but also in conventional teams. Instead of trying to draw a clear line between virtual and non-virtual teams, it might be more fruitful to consider the relative "virtuality" of a team and its consequences for management.'

### Question 2: How can a team's degree of virtuality be measured?

#### Finding 3: There are several criteria to measure a team's degree of virtuality

To determine a team's degree of virtuality, different indicators are suggested, including physical/geographic dispersion, crossing of time boundaries, crossing of organisational boundaries, duration, dynamic structure, use of electronic communication media, asynchronicity of communication, and so on. An evaluation of criteria for defining virtuality was conducted by Schweitzer and Duxbury (2010), who suggest that a team's degree of virtuality should be defined only on the following two criteria:

- 1 geographic dispersion
- 2 asynchronicity of communication.

Other criteria, such as duration, crossing of boundaries, and cultural/national diversity, were determined to be inappropriate. In addition, the authors state that although virtual teams can be expected to rely on communication technology, this reliance should be considered as a consequence of virtuality, rather than a criterion. In their paper the authors provide a practical tool to measure a team's degree of virtuality, based on:

- the proportion of work time that a team's members spend apart
- the proportion of team members who work virtually
- the degree of separation of the team members.

### **Question 3: Does virtuality affect team effectiveness (and if so, how)?**

#### **Finding 4: Team virtuality moderates team effectiveness (Level AA)**

Many scholars argue that a team's degree of virtuality affects its dynamics, communication frequency, consensus, level of conflicts, social interaction, and – consequently – team outcomes. Indeed, a large number of meta-analyses have consistently demonstrated that team virtuality negatively affects team effectiveness (Baltes, 2002; Breuer, 2016; De Jong, 2016; Lin, 2008; Marlow, 2018; Mesmer-Magnus, 2011; Ortiz de Guinea, 2012; Purvanova, 2014). In particular, it was found that:

#### **Finding 5: Computer-mediated communication is negatively related to team effectiveness (Level A)**

Virtual teams are highly dependent on communication. However, virtual teams may experience limitations in the quantity and quality of the information communicated because face-to-face communication is often not an option. As such, virtual teams are highly dependent on computer-mediated communication (CMC). However, CMC is negatively related to team effectiveness (Baltes, 2002). In particular, findings from both quantitative and qualitative studies (see for example Cramton, 2001; Wong, 2001; Gibson, 2006; Kankanhalli, 2006; Mesmer-Magnus, 2011; Espinosa, 2015; Fuller, 2016) indicate that:

- CMC negatively affects the amount of information shared among team members.
- CMC makes it more difficult for team members to interpret information.
- CMC may hinder understanding and complicate knowledge transfer, especially when the information is ambiguous.
- CMC reduces non-verbal cues in interpersonal interactions, such as tone, warmth, and attentiveness, which can have a negative effect on message clarity and interpretation of feedback.
- CMC tends to delay feedback, which may result in negative feelings between members (who may feel they are being ignored), and negatively affects the time to complete tasks.

#### **Finding 6: However, the impact of computer-mediated communication is moderated by media richness (Level A)**

Communication between team members can take various forms, which differ in terms of richness. The richest medium is face-to-face communication, followed by video-conferencing, audio-conferencing, telephone calls, chat, email, text messaging, and print communication. Several studies demonstrated that media richness moderates the negative effects of CMC, and as such is positively associated with team effectiveness (Hassel, 2020; Kahai, 2012; Mesmer-Magnus, 2011; Ortiz de Guinea, 2012). Several controlled studies, however, found no difference between video-conferencing and face-to-face communication (Lira, 2007; Martinez-Moreno, 2012), suggesting that video-conferencing can be a good alternative for face-to-face communication. Given the fact that video-conferencing is now common practice in most organisations, differences between virtual and traditional teams may be less pronounced.

#### **Finding 7: Physical dispersion and asynchronicity is negatively related to team effectiveness (Level A)**

Virtual teams are, as a rule, physically dispersed, often crossing organisational, geographical, and time boundaries. This may lead to what is known as 'temporal distance': work schedule differences between team members due primarily but not exclusively to time zone separation. Several studies have found

that asynchronicity and temporal distance may affect team effectiveness (Espinosa, 2015; Hassel, 2020). Possible explanations for this finding are:

- In physically dispersed teams, there are shorter windows of time for synchronous meetings, and many meetings take place outside standard working time. Physical dispersion therefore increases coordination requirements, which may delay communication and performance (Gibson, 2006).
- Physically dispersed teams have a lower degree of shared contextual knowledge. This potentially complicates issues for team members, as they may be unaware of events or concerns involving a team member (Hertel, 2005).
- Physical dispersion and time zone differences cause communication delays, which can result in misunderstandings and negatively affect relationships between team members (Kankanhalli, 2006).

Of course, asynchronicity may also have positive effects. For example, the additional processing time created by the communication time lag may enable team members to process information more deeply than they would 'on the fly' in a face-to-face meeting (Mesmer-Magnus, 2011). However, the meta-analyses identified by this review suggest that, in general, the negative effects of asynchronicity outweigh the positive.

#### **Question 4: Does team virtuality affect worker-related outcomes, such as motivation, satisfaction, well-being, and work–life balance?**

##### **Finding 8: There are some indications that team virtuality may affect worker-related outcomes, but the evidence is limited and the effect sizes small (Level C)**

Several studies suggest that team virtuality affects worker-related outcomes, for example reducing job satisfaction, well-being, organisational commitment and perceived autonomy, and increasing job stress, absenteeism, turnover intent and work–family conflict. However, most of these studies focus on the effects of telecommuting and/or flexible working arrangements and are cross-sectional in nature. In addition, most of the effect sizes found were rather small (De Menezes, 2011; Gajendran, 2007; Martin, 2012).

#### **Question 5: What are the most important factors that enhance the effectiveness of virtual teams?**

##### **Finding 9: Factors known to enhance team effectiveness are even more important for virtual teams (Level AA)**

In general, teams are not automatically more effective than (a group of) individual employees. Working in teams may impede performance because of the potential conflict between individual and group interests. In addition, a team's performance may decline due to a phenomenon known as social loafing: the tendency of team members to get by with less effort than what they would have put in when working alone. Not surprisingly, attributes of effective teams are one of the most widely researched topics in organisational psychology. A large number of high-quality primary studies and meta-analyses consistently indicate that effective teams are not so much determined by their composition, but rather through the emergence of socio-affective (in particular intra-team trust, psychological safety and social cohesion) and cognitive (in particular cognitive consensus, information-sharing and transactive memory system) states. In addition, factors such as team reflexivity and supervisory/organisational support are also known to have a large impact on a team's effectiveness. An overview of the most important factors that affect team effectiveness can be found in *A Rapid Evidence Assessment of the Scientific Literature*

*on the Attributes of Effective Teams and Interventions Increasing Team Effectiveness* published by the Center for Evidence Based Management (CEBMA, 2019). Several meta-analyses and high-quality primary studies consistently demonstrate that these factors are even more important for virtual teams. More specifically, it was found that:

#### Factor 1: Intra-team trust

Several meta-analyses and high-quality studies demonstrate that intra-team trust is an important attribute of effective teams (Breuer, 2016; De Jong, 2016; Webber, 2008; Lin, 2008). Scholars often distinguish two types of trust: cognition-based trust (a member's cognitive evaluation of the reliability, integrity, and competence of other members) and affect-based trust (a member's emotional feelings/evaluation of the reliability, integrity, and competence of other members). It was found, however, that intra-team trust is even more important for teams with a high level of virtuality, as the trust–performance relationship is stronger when virtuality is high (De Jong, 2016; Lin, 2008). This finding was confirmed by several randomised controlled studies that demonstrate that virtual teams with high intra-team trust outperform teams in which trust is low (see for example Capiola, 2019). More specifically, it was found that virtual teams with high intra-team trust display higher levels of team performance, organisational commitment, information-sharing, and team learning (Breuer, 2016). A possible explanation for this finding is that intra-team trust allows members to suspend their judgement about others and thus helps prevent potential misunderstandings and conflicts that may occur due to low media richness and asynchronicity. In addition, high intra-team trust heightens team members' willingness to trust in each other's knowledge and share information (De Jong, 2016). In traditional teams, team members need to rely less on trust to work together effectively.

A relevant additional finding is the impact of negative behaviour on intra-team trust, such as deceptive communication (that is, information deliberately shared – or omitted – with the intention to foster a false belief or conclusion among team members). Several controlled studies found that virtual teams in which one of the members shared deceptive information showed less intra-team trust and, consequently, were less effective (Fuller, 2011; Giordano, 2013). Finally, a recent longitudinal study suggests that negative feedback (for example about poor team performance) may decrease intra-team trust (Jaakson, 2019).

#### Factor 2: Social cohesion

Several meta-analyses have demonstrated that social cohesion has a moderate to large impact on a team's performance (Chiocchio, 2009; Evans, 2012; Mathieu, 2015). Social cohesion refers to a shared liking or attraction to the group, emotional bonds of friendship, caring and closeness among group members, and enjoyment of each other's company (Chiocchio, 2009). Other constructs that are related to social cohesion, such as relationship-building, team familiarity, friendship, social network density, have shown a similar impact on team outcomes (Drescher, 2016; Chung, 2018; De Jong, 2016). It was found that the positive effect of social cohesion is even stronger within virtual teams (Lin, 2008; Fang, 2014; Jarrett, 2016; De Jong, 2016), and that in virtual teams, social cohesion has a positive effect on the development of team trust (Webber, 2008). However, several studies have suggested that social cohesion and relationship-building are harder to develop in virtual teams because computer-mediated communication reduces social cues required to build relationships (Lin, 2008). For this reason, it is suggested that when managing a virtual team, emphasis should be put on building relationships and social cohesion, especially in the initial stage of the team development process. In fact, when team members have no common past and have never met face-to-face, building trust and social cohesion in a virtual environment can be highly problematic (Lin, 2008).

### Factor 3: Information sharing

Information sharing (IS) refers to the extent to which a team utilises its individual members' knowledge and expertise for the team's benefit. The extent to which a team effectively shares information plays a considerable role in team performance. If information is not effectively shared among team members, the team is not able to fully capitalise on the informational resources initially distributed throughout their team, and as a result, team members don't share their knowledge and don't exchange ideas (Hülshager, 2009). In addition, sharing information with teammates is important for the development of trust and social cohesion, which in turn increases team performance. Several meta-analyses have indicated that team virtuality relates negatively to information sharing (see for example Ortiz de Guinea, 2012). More precisely, experimental studies show that virtuality improves the sharing of unique information, but lowers the amount of information shared (Mesmer-Magnus, 2011). Due to the limitations of CMC, members of virtual teams tend to limit their communication to problem-focused information, and refrain from process-focused and social communication. However, it was found that sharing problem-focused information is more important to the performance of face-to-face teams, whereas sharing process information and connecting with team members on a social level is more important to the performance of virtual teams.

### Factor 4: Transactive memory system

An important concept related to IS is that of the transactive memory system (TMS). TMS within a team refers to a form of knowledge that is embedded in a team's collective memory. This collective memory works like an indexing system that tells members who knows what. Results from meta-analyses consistently show that TMS has a large, positive effect on team performance (Bachrach, 2019; Mesmer-Magnus, 2011; Turner, 2014). Several studies suggest that virtuality negatively affects the development of a TMS (Yoo, 2001), especially in teams that are geographically dispersed (O'Leary, 2010; Curseu, 2008). The indirect interactions between team members, the physical and temporal distance, the lack of collaborative history and the impact of CMC on intra-team interaction – all result in individuals having less exposure to, and thus information about, other members' knowledge and expertise (Alavi, 2002).

## **Question 6: What leadership styles and interventions are known to influence the effectiveness of virtual teams?**

### **Finding 10: There is limited evidence that leadership style affects the effectiveness of virtual teams**

The management of virtual teams is an area with little basis in the empirical literature. Most studies on this topic are descriptive or correlational in nature, and the more rigorous studies often use student samples, which can be a major limitation. Although there are studies indicating that leadership is relevant for the performance of virtual teams (see for example Chen, 2011), we conclude that the evidence that a particular leadership style is more effective than others is limited. However, there are some indications from correlational studies that suggest that in virtual teams:

- The perceived quality of the manager–employee relationship tends to be higher when a manager has a more transformational (that is, people-oriented/motivational/visionary) leadership style (Brunelle, 2013; Whitford, 2009).
- A transactional (task-oriented/direction-giving) leadership style improves task cohesion and quantitative performance, whereas a transformational leadership style enhances social cohesion and qualitative/creative performance (Huang, 2010; Kahai, 2012; Kai-Tang, 2014; Wang, 2009, Hoch, 2014). However, these outcomes are mediated by media richness and occur only when the latter is low (Huang, 2010; Kahai, 2012; Hoch, 2014). In addition, the effect sizes found were rather small.

- A transformational leadership style tends to have a stronger effect on the task performance of teams that use computer-mediated communication only (Purvanova, 2014; Hoch, 2014).
- Virtual teams with a leader who is perceived as humble report more psychological safety (Swain, 2018), which is an important attribute of effective teams in general (Frazier, 2017).

**Finding 11: Co-ordination has a positive effect on the effectiveness of virtual teams (Level A)**

Co-ordination refers to the degree of effort team members exert to manage collective resources and the extent to which the work activities of team members are logically consistent and coherent. In traditional teams, co-ordination is often a task of the team leader. Members of a virtual team, however, often have a high degree of autonomy and therefore may be less efficient in co-ordination. A meta-analysis based on 60 controlled studies (Lin, 2008) and a recent randomised controlled study (McLarnon, 2019) indicates that co-ordination – tracking progress and tasks, accounting for outcomes, as well as melding the team together – has a positive effect on the performance of virtual teams. In addition, there is evidence that suggests that setting communication rules (frequency, response time, feedback, explicitness), deadlines, and clear goals may also have a positive effect on the effectiveness of virtual teams (Cheng, 2016; Walther, 2005; Hertel, 2005; Cordes, 2016).

**Finding 12: Team-building, especially at the start, has a positive effect on the effectiveness of virtual teams (Level A)**

As stated under ‘Finding 9 – Social cohesion’, when managing a virtual team, emphasis should be put on building relationships and social cohesion, especially in the initial stage of the team development process. In fact, when members of a virtual team have no common past and have never met face-to-face, building trust and social cohesion in a virtual environment can be highly problematic (Lin, 2008; Fang, 2014). For this reason, managers may want to require an initial face-to-face session (that is, more than just a ‘meet and greet’) to prepare members to virtually work together in the future (Kennedy, 2010). In addition, team-building techniques could be employed to improve relationships and cohesion. Although team-building encompasses a wide range of activities (for example members disclosing information about themselves and their expectation for the team, developing social protocols for resolving conflict, scheduling periodic conference calls or face-to-face meetings, and so on), the term refers to a class of formal and informal team-level interventions that focus on improving social relations and clarifying roles. As such, team-building typically does not target skill-based competencies. A meta-analysis of longitudinal studies shows that, in general, team-building interventions have a moderate, positive indirect effect on team performance, and a moderate to large positive direct effect on trust, social cohesion, and internal communication (Klein, 2009).

**Finding 13: Teamwork training has a positive effect on the effectiveness of virtual teams (Level A)**

In the scientific literature a distinction is made between ‘taskwork’ and ‘teamwork’. In short, taskwork represents *what* teams are doing, whereas teamwork describes *how* they are doing it. Teamwork training involves education of team members about the importance of providing social support within the team or promoting ways to manage interpersonal conflict among teammates. A recent systematic review that included studies on virtual teams (for example Beranek, 2005; Martinez-Moreno, 2014) shows that teamwork training, in general, tends to have a large, positive effect on team performance and reduces miscommunication and dysfunctional conflicts (McEwan, 2017). This study confirmed the findings of previous meta-analyses, which demonstrated that teamwork training not only has a large,

positive effect on team performance, but also on a team's affective, social, and cognitive states (Delise, 2010; Salas, 2008).

#### **Finding 14: Guided reflexivity and debriefing sessions have a positive effect on the effectiveness of virtual teams (Level A)**

When we look at teams in general, several studies indicate that team reflexivity – the extent to which team members overtly reflect upon the team's goals, collaboration, decision-making processes, internal communication, and so on – seems to moderate the effect of team cognition on team performance (Schippers, 2013; Widmann, 2018). Put differently, if teams don't periodically reflect on how the team is doing, the positive effects of information sharing and a shared memory system on team performance will decrease. It was found, however, that the effect of reflexivity is higher when it is 'guided' and combined with feedback (compared with non-facilitated or loosely structured sessions) (Konradt, 2015; Kring, 2004). Guided reflexivity and debriefing sessions lead teams through a series of questions that allow its members to reflect on a recent experience, construct their own meaning from their actions, and uncover lessons learned in a non-punitive environment (Peñarroja, 2017; Tannenbaum, 2013). Although there is some evidence that the effect on virtual teams may be somewhat lower (Jarrett, 2016), meta-analyses and randomised controlled studies have consistently found that, when appropriately conducted, guided reflexivity and debriefing sessions can lead to substantial improvement of a virtual team's performance (Konradt, 2015). In addition, it was found that sessions are most effective when the following requirements are met (Tannenbaum, 2013):

- The focus of the session should be on learning and improvement, rather than evaluation or judgement. A developmental, non-punitive focus not only yields more honest and accurate feedback, but also enhances experiential learning.
- The session should focus on specific activities, episodes or events, rather than performance or results in general.
- The session should be informed by a variety of perspectives and evidence sources. For example, the review should include input from multiple participants and at least one additional source of evidence (for example organisational data).

## **8. Conclusion**

The scientific literature provides a strong warning to managers and organisations: compared with face-to-face teams, virtual teams tend to display lower levels of intra-team trust, social cohesion, communication, consensus, information sharing, and tend to have less developed transactional memory systems. As a result, virtual teams are less effective than face-to-face teams. However, the factors that are negatively affected by a team's virtuality can also be used as a lever to *increase* its effectiveness and performance. In addition, team leaders have several ways to improve a virtual team's effectiveness, by actively managing the team's collective resources and ensuring that activities of its members are logically consistent and coherent. Finally, interventions such as team-building, teamwork training, and guided team reflexivity can improve a virtual team's effectiveness and contribute positively to the organisation's mission and objectives.

## **9. Limitations**

This REA aims to provide a balanced assessment of what is known in the scientific literature about the attributes of effective virtual teams by using the systematic review method to search and critically appraise empirical studies. In order to be 'rapid', concessions were made in relation to the breadth and

depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on empirical research published in the period 1980 to 2020 for meta-analyses and 2010 to 2020 for primary studies. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of their tests, scales and questionnaires.

A third limitation concerns the focus on meta-analyses and high-quality studies, that is, studies with a control group and/or longitudinal studies. For this reason, cross-sectional studies were excluded. As a consequence, new, promising findings relevant for practice may have been missed.

Finally, both the ecological validity (type of organisations) and population validity (type of employees) of the included primary studies were rather low, because most were set in an artificial context and involved students. As a result, one must be cautious in generalising the findings of such studies to the context and population of this REA, that is, knowledge workers in virtual teams.

Given these limitations, care must be taken not to present the findings presented in this REA as conclusive.

## References

- Alavi, M. and Tiwana, A. (2002) Knowledge integration in virtual teams: the potential role of KMS. *Journal of the American Society for Information Science and Technology*. Vol 53, No 12. pp1029–37.
- Bachrach, D.G., Lewis, K., Kim, Y., Patel, P.C., Campion, M.C. and Thatcher, S. (2019) Transactive memory systems in context: a meta-analytic examination of contextual factors in transactive memory systems development and team performance. *Journal of Applied Psychology*. Vol 104, No 3. p464.
- Baltes, B.B., Dickson, M.W., Sherman, M.P., Bauer, C.C. and LaGanke, J.S. (2002) Computer-mediated communication and group decision making: a meta-analysis. *Organizational Behavior and Human Decision Processes*. Vol 87, No 1. pp156–79.
- Barends, E., Rousseau, D.M. and Briner, R.B. (eds) (2017) *CEBMA guideline for rapid evidence assessments in management and organizations*, Version 1.0. Amsterdam: Center for Evidence Based Management. Available at: [www.cebma.org/guidelines/](http://www.cebma.org/guidelines/)
- Beranek, P.M. and Martz, B. (2005) Making virtual teams more effective: improving relational links. *Team Performance Management: An International Journal*. Vol 11, No 5/6.
- Breuer, C., Hüffmeier, J. and Hertel, G. (2016) Does trust matter more in virtual teams? A meta-analysis of trust and team effectiveness considering virtuality and documentation as moderators. *Journal of Applied Psychology*. Vol 101, No 8. p1151.
- Brunelle, E. (2013) Leadership and mobile working: the impact of distance on the superior-subordinate relationship and the moderating effects of leadership style. *International Journal of Business and Social Science*. Vol 4, No 11.
- Capiola, A., Alarcon, G.M., Lyons, J.B., Ryan, T.J. and Schneider, T.R. (2019) Collective efficacy as a mediator of the trustworthiness–performance relationship in computer-mediated team-based contexts. *The Journal of Psychology*. Vol 153, No 7. pp732–57.

- CEBMA (2019) *A Rapid Evidence Assessment of the Scientific Literature on the Attributes of Effective Teams and Interventions Increasing Team Effectiveness*. Amsterdam: Center for Evidence-Based Management.
- Chen, C.C., Wu, J., Ma, M. and Knight, M.B. (2011) Enhancing virtual learning team performance: a leadership perspective. *Human Systems Management*. Vol 30, No 4. p215.
- Cheng, X., Fu, S. and Druckenmiller, D. (2016a) Trust development in globally distributed collaboration: a case of U.S. and Chinese mixed teams. *Journal of Management Information Systems*. Vol 33, No 4. pp978–1007.
- Cheng, X., Fu, S., Sun, J., Han, Y., Shen, J. and Zarifis, A. (2016b) Investigating individual trust in semi-virtual collaboration of multicultural and unicultural teams. *Computers in Human Behavior*. Vol 62, pp267–76.
- Chiocchio, F. and Essiembre, H. (2009) Cohesion and performance: a meta-analytic review of disparities between project teams, production teams, and service teams. *Small Group Research*. Vol 40, No 4. pp382–420.
- Chung, S., Lount Jr, R.B., Park, H.M. and Park, E.S. (2018) Friends with performance benefits: a meta-analysis on the relationship between friendship and group performance. *Personality and Social Psychology Bulletin*. Vol 44, No 1. pp63–79.
- Cohen, J. (1988) *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cordes, S. (2016) Don't even think: virtual team process for flexible decision making. *Journal of Organizational Psychology*. Vol 16, No 1. pp24–32.
- Cramton, C.D. (2001) The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science*. Vol 12, No 3. pp346–71.
- Curseu, P. L., Schalk, R., and Wessel, I. (2008) How do virtual teams process information? A literature review and implications for management. *Journal of Managerial Psychology*, Vol 23, No 6. pp628–652.
- De Jong, B. A., Dirks, K. T., and Gillespie, N. (2016) Trust and team performance: a meta-analysis of main effects, moderators, and covariates. *Journal of Applied Psychology*. Vol 101, No 8. p1134.
- Delise, L.A., Allen Gorman, C., Brooks, A.M., Rentsch, J.R. and Steele-Johnson, D. (2010) The effects of team training on team outcomes: a meta-analysis. *Performance Improvement Quarterly*. Vol 22, No 4. pp53–80.
- De Menezes, L.M. and Kelliher, C. (2011) Flexible working and performance: a systematic review of the evidence for a business case. *International Journal of Management Reviews*. Vol 13, No 4. pp452–74.
- Dennis, A. R., Robert Jr, L. P., Curtis, A. M., Kowalczyk, S. T., & Hasty, B. K. (2012). Research note—trust is in the eye of the beholder: A vignette study of postevent behavioral controls' effects on individual trust in virtual teams. *Information systems research*, Vol 23, No 4. pp546-558.
- Drescher, G. and Garbers, Y. (2016) Shared leadership and commonality: a policy-capturing study. *The Leadership Quarterly*. Vol 27, No 2. pp200–217.
- Dutcher, E. G. (2012). The effects of telecommuting on productivity: An experimental examination. The role of dull and creative tasks. *Journal of Economic Behavior & Organization*, Vol 84, No 1. pp355-363.

- Espinosa, J.A., Nan, N. and Carmel, E. (2015) Temporal distance, communication patterns, and task performance in teams. *Journal of Management Information Systems*. Vol 32, No 1. pp151–91.
- Evans, C.R. and Dion, K.L. (2012) Group cohesion and performance: a meta-analysis. *Small Group Research*. Vol 43, No 6. pp690–701.
- Fang, C., Limin, Z. and Latimer, J. (2014) How much has my co-worker contributed? The impact of anonymity and feedback on social loafing in asynchronous virtual collaboration. *International Journal of Information Management*. Vol 34, No 5. pp652–59.
- Frazier, M.L., Fainshmidt, S., Klinger, R.L., Pezeshkan, A. and Vracheva, V. (2017) Psychological safety: a meta-analytic review and extension. *Personnel Psychology*. Vol 70, No 1. pp113–65.
- Fuller, C.M., Marett, K. and Twitchell, D.P. (2011) An examination of deception in virtual teams: effects of deception on task performance, mutuality, and trust. *IEEE Transactions on Professional Communication*. Vol 55, No 1. pp20–35.
- Fuller, R.M., Vician, C.M. and Brown, S.A. (2016) Longitudinal effects of computer-mediated communication anxiety on interaction in virtual teams. *IEEE Transactions on Professional Communication*. Vol 59, No 3. p166.
- Gajendran, R.S. and Harrison, D.A. (2007) The good, the bad, and the unknown about telecommuting: meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*. Vol 92, No 6. p1524.
- Gibson, C.B. and Gibbs, J.L. (2006) Unpacking the concept of virtuality: the effects of geographic dispersion, electronic dependence, dynamic structure, and national diversity on team innovation. *Administrative Science Quarterly*. Vol 51, No 3. pp451–95.
- Giordano, G. and George, J.F. (2013) The effects of task complexity and group member experience on computer-mediated groups facing deception. *IEEE Transactions on Professional Communication*. Vol 56, No 3. pp210–25.
- Han, H. J., Hiltz, S. R., Fjermestad, J., & Wang, Y. (2011). Does medium matter? A comparison of initial meeting modes for virtual teams. *IEEE transactions on professional communication*, Vol 54, No 4. pp376-391.
- Hassell, M.D. and Limayem, M. (2020) Media impacts and performance in dispersed teams. *Journal of Computer Information Systems*. Vol 60, No 1. pp18–25.
- Hertel, G., Geister, S. and Konradt, U. (2005) Managing virtual teams: a review of current empirical research. *Human resource management review*. Vol 15, No 1. pp69–95.
- Hoch, J.E. and Kozlowski, S.W. (2014) Leading virtual teams: hierarchical leadership, structural supports, and shared team leadership. *Journal of Applied Psychology*. Vol 99, No 3. p390.
- Huang, R., Kahai, S. and Jestice, R. (2010) The contingent effects of leadership on team collaboration in virtual teams. *Computers in Human Behavior*. Vol 26, No 5. pp1098–1110.
- Hülshager, U.R., Anderson, N. and Salgado, J.F. (2009) Team-level predictors of innovation at work: a comprehensive meta-analysis spanning three decades of research. *Journal of Applied Psychology*. Vol 94, No 5. p1128.
- Jaakson, K., Reino, A. and McClenaghan, P.B. (2019) The space between – linking trust with individual and team performance in virtual teams. *Team Performance Management*. Vol 25, No 1/2. pp30–46.

- Jarrett, S.M., Glaze, R.M., Schurig, I., Muñoz, G.J., Naber, A.M., McDonald, J.N., ... Arthur, W. (2016) The comparative effectiveness of distributed and colocated team after-action reviews. *Human Performance*. Vol 29, No 5. pp408–27.
- Kahai, S.S., Huang, R. and Jestice, R.J. (2012) Interaction effect of leadership and communication media on feedback positivity in virtual teams. *Group and Organization Management*. Vol 37, No 6. p716.
- Kai-Tang, F., Yuan-Ho, C., Ching-Wen, W. and Chen, M. (2014) E-leadership effectiveness in virtual teams: motivating language perspective. *Industrial Management and Data Systems*. Vol 114, No 3. pp421–37.
- Kankanhalli, A., Tan, B.C. and Wei, K.K. (2006) Conflict and performance in global virtual teams. *Journal of Management Information Systems*. Vol 23, No 3. pp237–74.
- Kennedy, D.M., Vozdolska, R.R. and McComb, S.A. (2010) Team decision making in computer-supported cooperative work: how initial computer-mediated or face-to-face meetings set the stage for later outcomes. *Decision Sciences*. Vol 41, No 4. pp933–54.
- Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C.S., Lyons, R. and Goodwin, G.F. (2009) Does team building work? *Small Group Research*. Vol 40, No 2. pp181–222.
- Konradt, U., Schippers, M.C., Garbers, Y. and Steenfatt, C. (2015) Effects of guided reflexivity and team feedback on team performance improvement: the role of team regulatory processes and cognitive emergent states. *European Journal of Work and Organizational Psychology*. Vol 24, No 5. p777.
- Kring, J.P. (2004) *Communication modality and after action review performance in a distributed immersive virtual environment*. University of Central Florida, Electronic Theses and Dissertations. Available at: <https://stars.library.ucf.edu/etd/99/>
- Lin, C., Standing, C. and Liu, Y.-C. (2008) A model to develop effective virtual teams. *Decision Support Systems*. Vol 45, No 4. p1031.
- Lira, E.M., Ripoll, P., Peiró, J.M. and González, P. (2007) The roles of group potency and information and communication technologies in the relationship between task conflict and team effectiveness: a longitudinal study. *Computers in Human Behavior*. Vol 23, No 6. pp2888–2903.
- Lira, E.M., Ripoll, P., Peiró, J.M. and Zornoza, A.M. (2013) The role of information and communication technologies in the relationship between group potency and group maintenance outcomes: a longitudinal study. *Behaviour and Information Technology*. Vol 32, No 2. pp147–55.
- Marlow, S.L., Lacerenza, C.N., Paoletti, J., Burke, C.S. and Salas, E. (2018) Does team communication represent a one-size-fits-all approach? A meta-analysis of team communication and performance. *Organizational Behavior and Human Decision Processes*. Vol 144. pp145–70.
- Martin, B.H. and MacDonnell, R. (2012) Is telework effective for organizations? A meta-analysis of empirical research on perceptions of telework and organizational outcomes. *Management Research Review*. Vol 35, No 7. pp602–16.
- Martínez-Moreno, E., Zornoza, A., González-Navarro, P. and Thompson, L.F. (2012) Investigating face-to-face and virtual teamwork over time: when does early task conflict trigger relationship conflict? *Group Dynamics: Theory, Research and Practice*. Vol 16, No 3. pp159–71.

Martínez-Moreno, E., Zornoza, A., Orengo, V. and Thompson, L.F. (2014) The effects of team self-guided training on conflict management in virtual teams. *Group Decision and Negotiation*. Vol 24, No 5. pp905–23.

Mathieu, J.E., Kukenberger, M.R., D'Innocenzo, L. and Reilly, G. (2015) Modeling reciprocal team cohesion–performance relationships, as impacted by shared leadership and members' competence. *Journal of Applied Psychology*. Vol 100, No 3. p713.

McEwan, D., Ruissen, G.R., Eys, M.A., Zumbo, B.D. and Beauchamp, M.R. (2017) The effectiveness of teamwork training on teamwork behaviors and team performance: a systematic review and meta-analysis of controlled interventions. *PLoS One*. Vol 12, No 1.

McLarnon, M.J.W., Taras, V., Donia, M.B.L., O'Neill, T.A., Law, D. and Steel, P. (2019) Global virtual team communication, coordination, and performance across three peer feedback strategies. *Canadian Journal of Behavioural Science*. Vol 51, No 4. pp207–18.

Mesmer-Magnus, J.R., DeChurch, L.A., Jimenez-Rodriguez, M., Wildman, J. and Shuffler, M. (2011) A meta-analytic investigation of virtuality and information sharing in teams. *Organizational Behavior and Human Decision Processes*. Vol 115, No 2. p214.

O'Leary, M.B. and Mortensen, M. (2010) Go (con)figure: subgroups, imbalance, and isolates in geographically dispersed teams. *Organization Science*. Vol 21, No 1. pp115–31.

Ortiz de Guinea, A., Webster, J. and Staples, D.S. (2012) A meta-analysis of the consequences of virtualness on team functioning. *Information and Management*. Vol 49, No 6. p301.

Peñarroja, V., Orengo, V. and Zornoza, A. (2017) Reducing perceived social loafing in virtual teams: the effect of team feedback with guided reflexivity. *Journal of Applied Social Psychology*. Vol 47, No 8. pp424–35.

Petticrew, M. and Roberts, H. (2006) How to appraise the studies: an introduction to assessing study quality. *Systematic Reviews in the Social Sciences: A Practical Guide*, pp125–63.

Purvanova, R.K. (2014) Face-to-face versus virtual teams: what have we really learned? *The Psychologist-Manager Journal*. Vol 17, No 1. pp2–29.

Rico, R., Bachrach, D. G., Sánchez-Manzanares, M., & Collins, B. J. (2011). The interactive effects of person-focused citizenship behaviour, task interdependence, and virtuality on team performance. *European Journal of Work and Organizational Psychology*, Vol. 20, No 5. pp700-726.

Salas, E., DiazGranados, D., Klein, C., Burke, C.S., Stagl, K.C., Goodwin, G.F. and Halpin, S.M. (2008) Does team training improve team performance? A meta-analysis. *Human Factors*. Vol 50, No 6. pp903–33.

Schippers, M.C., Homan, A.C. and Van Knippenberg, D. (2013) To reflect or not to reflect: prior team performance as a boundary condition of the effects of reflexivity on learning and final team performance. *Journal of Organizational Behavior*. Vol 34, No 1. pp6–23.

Schweitzer, L. and Duxbury, L. (2010) Conceptualizing and measuring the virtuality of teams. *Information Systems Journal*. Vol 20, No 3. pp267–95.

Shadish, W.R., Cook, T.D. and Campbell, D.T. (2002) *Experimental and quasi-experimental designs for generalized causal inference*. New York: Houghton, Mifflin and Company.

Shaughnessy, J.J. and Zechmeister, E.B. (1985) *Research methods in psychology*. New York: Alfred A. Knopf.

- Swain, J. E. (2018). Effects of leader humility on the performance of virtual groups. *Journal of Leadership Studies*, 12(1), 21-37.
- Tannenbaum, S.I. and Cerasoli, C.P. (2013) Do team and individual debriefs enhance performance? A meta-analysis. *Human Factors*. Vol 55, No 1. pp231–45.
- Turner, J.R., Chen, Q. and Danks, S. (2014) Team shared cognitive constructs: a meta-analysis exploring the effects of shared cognitive constructs on team performance. *Performance Improvement Quarterly*. Vol 27, No 1. pp83–117.
- Walther, J.B. and Bunz, U. (2005). The rules of virtual groups: Trust, liking, and performance in computer-mediated communication. *Journal of Communication*. Vol 55, No 4. pp828-846.
- Wang, C.W., Hsieh, C.T., Fan, K.T. and Menefee, M.L. (2009) Impact of motivating language on team creative performance. *Journal of Computer Information Systems*. Vol 50, No 1. pp133–40.
- Webber, S.S. (2008) Development of cognitive and affective trust in teams: a longitudinal study. *Small Group Research*. Vol 39, No 6. pp746–69.
- Whitford, T. and Moss, S.A. (2009) Transformational leadership in distributed work groups: the moderating role of follower regulatory focus and goal orientation. *Communication Research*. Vol 36, No 6. pp810–37.
- Widmann, A. and Mulder, R.H. (2018) Team learning behaviours and innovative work behaviour in work teams. *European Journal of Innovation Management*.
- Windeler, J., Maruping, L. M., Robert, L. P., & Riemenschneider, C. K. (2015). E-profiles, conflict, and shared understanding in distributed teams. *Journal of the Association for Information Systems*, Vol. 16 No 7.
- Wong, S.S. and Burton, R.M. (2001) Virtual teams: what are their characteristics, and impact on team performance? *Computational and Mathematical Organization Theory*. Vol 6, No 4. pp339–60.
- Yoo, Y. and Kanawattanachai, P. (2001) Developments of transactive memory systems and collective mind in virtual teams. *International Journal of Organizational Analysis*. Vol 9, No 2. pp187–208.

## Appendix I: Search terms and results

ABI/Inform Global, Business Source Elite, PsycINFO, peer reviewed, scholarly journals, March 2020

Search terms	ABI	BSP	PSY
S1: ti(virtual* AND team*) OR ti(virtual* AND work*) OR ti(virtual AND group*) OR ab("virtual team*") OR ab("virtual work*") OR ab("virtual group*")	1,220	1,369	862
S2: ti(mobile AND team*) OR ti(mobile AND work*) OR ab("mobile team*") OR ab("mobile work*")	303	394	361
S3: ti(remote AND team*) OR ti(remote AND work*) OR ab("remote team*") OR ab("remote work*")	164	188	178
S4: ti(distributed AND team*) OR ti(distributed AND work*) OR ab("distributed team*") OR ab("distributed work*")	379	435	453
S5: ti(dispersed AND team*) OR ti(dispersed AND group*) OR ti(dispersed AND work*) OR ab("dispersed team*") OR ab("dispersed group*") OR ab("dispersed work*")	136	161	152
S6: ti("telework*") OR ab("telework*") OR ti(telecommut*) OR ab(telecommut*)	805	906	520
S7: S1 OR S2 OR S3 OR S4 OR S5 OR S6	<b>2,807</b>	<b>3,258</b>	<b>2,390</b>
S7: S6 AND filter systematic review OR meta-analysis	<b>15</b>	<b>16</b>	<b>25</b>
S8: S6 AND filter controlled/longitudinal studies, date > 2010	<b>136</b>	<b>187</b>	<b>81</b>



### Appendix III: Data extraction table – Meta Analyses and Systematic Reviews

1st author & year	Design included studies & sample size	Sector / population	Main findings	Effect sizes	Limitations	Level
1 Baltes, 2002	meta-analysis (incl exp studies)  k = 37		<p>1 Overall, computer-mediated communication (CMC) is negatively related to (a) group effectiveness, (b) time to decision, and (c) member satisfaction.</p> <p>2 CMC groups are as effective as face-to-face groups when task time is open-ended but somewhat less effective when task time is limited (H1).</p> <p>3 Any positive outcomes associated with CMC, relative to FTF groups, are NOT enhanced in larger groups and any negative outcomes associated with CMC are NOT minimised in larger CMC groups (H4).</p>	<p>1a. <math>d = -.40</math> 1b. <math>d = -1.71</math> 1c. <math>d = -.52</math></p> <p>2. <math>d &lt; .1</math> 3. <math>d = 0</math></p>	<p>design and quality of the studies included not reported</p> <p>all included studies are &lt; 20 years old</p>	C
2 Breuer, 2016	meta-analysis of cross-sectional, longitudinal and/or controlled studies  k = 52 n = 12,615 (1,850 teams)	mixed	<p>1 Team trust is positively related with (a) satisfaction with the team, (b) commitment to the team, (c) perceived team cohesion, and (d) effort intentions toward the team (H1).</p> <p>2 Team trust is positively related with (a) knowledge-sharing and (b) team learning (H2).</p> <p>3 Team trust is positively related with (a) team task performance and (b) contextual performance in teams (H3).</p> <p>4 Team virtuality moderates the relationship between team trust and team task performance (H4).</p> <p>5 Documentation of team members' interactions moderates the relationship between team trust and team (H5).</p>	<p>1a: <math>\rho = .69</math> 1b: <math>\rho = .60</math> 1c: <math>\rho = .75</math> 1d: <math>\rho = .30</math></p> <p>2a: <math>\rho = .53</math> 2b: <math>\rho = .55</math></p> <p>3a: <math>\rho = .27</math> 3b: <math>\rho = .27</math></p> <p>4: virtual: <math>\rho = .33</math>     fff: <math>\rho = .22</math></p> <p>5: virt &amp; doc: <math>\rho = .26</math> virt &amp; n-doc: <math>\rho = .38</math></p>	<p>Effect sizes are moderated by research design (larger in cross-sectional designs)</p> <p>Sample sizes of some effect size are rather small</p> <p>Virtuality was coded as a dichotomous variable</p>	AA

3 Gajendran, 2007	meta-analysis of cross-sectional studies  k = 46 (n = 12,883)	mixed	<p>1 Telecommuting is positively related to perceived autonomy (H1).</p> <p>2 Telecommuting is negatively related to work–family conflict (H2).</p> <p>3 Telecommuting is NOT negatively related to telecommuter–supervisor relationship quality (H3a).</p> <p>4 Telecommuting is NOT related to telecommuter–co-worker relationship quality (H3b).</p> <p>5 Telecommuting is positively related to job satisfaction (H4).</p> <p>6 Telecommuting is NOT related to job performance (H5).</p> <p>7 Telecommuting is negatively related to turnover intent (H6).</p> <p>8 Telecommuting is negatively related to employee role stress (H7).</p> <p>9 Telecommuting is NOT related to perceived career prospects (H8).</p> <p>10 Telecommuting’s effects on individual outcomes are mediated by (a) perceived autonomy, (b) relationship quality with the supervisor, and (c) telecommuting intensity (H9).</p> <p>11 Telecommuting intensity moderates the effect of telecommuting on (a) work–family conflict and (b) co-worker relationship quality ... but does NOT moderate the effect on perceived autonomy, the quality of employees’ relationship with their supervisors.</p>	<p>1: <math>\rho = .22</math></p> <p>2: <math>\rho = -.13</math></p> <p>3: <math>\rho = .12</math></p> <p>5: <math>\rho = .10</math></p> <p>7: <math>\rho = -.10</math></p> <p>8: <math>\rho = -.13</math></p> <p>10a: full 10b: partial</p> <p>11a: <math>r = -.05</math> vs <math>-.16</math> 11b: <math>r = .03</math> vs <math>-.19</math></p>	<p>study is 13 years old</p> <p>focuses mainly on the impact of flexible work locations (rather than virtuality)</p> <p>large number of hypotheses tested</p>	C
4 De Jong, 2016	Meta-analysis  k = 112 N = 7.763	various	Team virtuality moderates the relationship between intra-team trust and team performance, such that this relationship is stronger when virtuality is high than when it is low.	1. $\rho = .26$ vs $.35$	<p>Search terms not specified</p> <p>Design included studies not specified (refs suggest some are longitudinal or controlled)</p>	A
5 Lin, 2008	S1: meta-analysis, includes exp studies k = 60 and S2: field experiment (n = 25 teams) and S3: survey (n = 198 )	S1: mixed  S2: business students from 4 Australian universities  S3: idem	<p>1 (MA). It was found that only five factors ((a) relationship-building, (b) cohesion, (c) trust, (d) communication and (e) co-ordination) had affected the performance of virtual teams.</p> <p>2 (MA). Other factors such as task–technology–structure fit, culture, design, and technical expertise were found to have no significant impact on performance and satisfaction of virtual teams.</p> <p>3 Communication is positively related to (a) relationship-building and (b) cohesion (H1 &amp; 2).</p> <p>4 Relationship-building is positively related to co-ordination (H3).</p> <p>5 Cohesion is positively related to co-ordination (H4).</p>	<p>1a: <math>\rho = .21</math></p> <p>1b: <math>\rho = .36</math></p> <p>1c: <math>\rho = .29</math></p> <p>1d: <math>\rho = .32</math></p> <p>1e: <math>\rho = .53</math></p> <p>2: <math>\rho = ns</math></p> <p>3–6: only SEM path coefficients are reported</p>	<p>no serious limitations</p> <p>note: concerns global virtual teams</p>	AA/A

			<p>6 Co-ordination is positively related to performance (H5).</p> <p>7 Performance was directly affected by co-ordination, the paths that affected performance were:  (1) communication &gt; relationship-building &gt; co-ordination &gt; performance; and (2) communication &gt; cohesion &gt; co-ordination &gt; performance.</p>			
6 Marlow, 2018	Meta-analysis of 150 cross-sectional studies; n = 9,702 teams	Teams of students and employees (fields such as management, sales, research and development, surgical teams, search and rescue teams, and simulated war games)	<p>Communication is positively and significantly related to team performance (H1).</p> <p>The relationship between communication and team performance is stronger in familiar teams than in unfamiliar teams (H2), and in face-to-face teams comparing with virtual teams (H3, the difference between hybrid teams and face-to-face teams was not significant). Moreover, the relationship between communication quality and performance seems to be stronger than the relationship between communication frequency and performance (H7).</p> <p>The relationship between communication and team performance does not depend on leadership style (shared vs hierarchical leadership, H4), task interdependence (H5), task type (cognitive-based vs action-based, H6), content of communication (task-oriented vs personal communication, H8).</p>	<p>H1: <math>\rho = .31</math></p> <p>H2: <math>\beta = 0.3</math></p> <p>H3:  <math>\rho = .10</math> (virtual teams)  <math>\rho = .29</math> (hybrid teams)  <math>\rho = .32</math> (face-to-face teams)</p> <p>H4 (not supported):  <math>\rho = .27</math> (shared leadership)  <math>\rho = .33</math> (hierarchical leadership)</p> <p>H5 (not supported):  <math>\rho = .27</math> (highly independent tasks)  <math>\rho = .39</math> (low independent tasks)</p> <p>H6 (not supported):  <math>\rho = .30</math> (cognitive-based tasks)  <math>\rho = .26</math> (action-based tasks)</p> <p>H7:  <math>\rho = .36</math> (quality)  <math>\rho = .19</math> (frequency)</p> <p>H8 (not supported):  <math>\rho = .22</math> (personal communication)  <math>\rho = 0.35</math> (task-related communication)</p>	No serious limitations	C

7 Martin, 2012	meta-analysis k = 19	mixed	<p>1 Telework is positively associated with perceptions of increased productivity (H1).</p> <p>2 Telework is positively associated with perceptions of employee retention (H2).</p> <p>3 Telework is positively associated with perceptions of organisational commitment (H3).</p> <p>4 Telework is positively associated with perceptions of performance (H4).</p> <p>5 Overall, there is a positive relationship between telework and the four organisational outcomes (H5).</p>	<p>1. <math>r_c = .23</math></p> <p>2. <math>r_c = .10</math></p> <p>3. <math>r_c = .10</math></p> <p>4. <math>r_c = .16</math></p> <p>5. <math>r_c = .17</math></p>	<p>design and quality of the included studies not reported</p> <p>some pooled ES based on a limited number of studies</p> <p>outcome concerns perceptions!</p>	C
8 Mesmer-Magnus, 2011	meta-analysis of mainly experimental studies k = 94 (5,596 groups, n = 19,702)	mostly student samples	<p>1 High virtuality teams share more unique information than either low virtuality or face-to-face teams (H1).</p> <p>2 High virtuality teams exhibit less open information-sharing than either low virtuality or face-to-face teams (H2).</p> <p>3 The relationship between information-sharing and team performance will be moderated by both the type of information being shared and the degree of virtuality of the teams, such that (a) for face-to-face teams, uniqueness will be more strongly related to team performance than openness, whereas (b) for virtual teams, openness will be more strongly related to team performance than uniqueness (H3).</p>	small	some outcomes based on small sample	AA
9 Ortiz de Guinea, 2012	meta-analysis of correlational and experimental studies k = 80	mixed	<p>1 Virtualness relates positively to task conflict (H1).</p> <p>2 Virtualness relates negatively to communication frequency (H2).</p> <p>3 Virtualness relates negatively to knowledge-sharing (H3).</p> <p>4 Virtualness relates negatively to team performance (H4).</p> <p>5 Virtualness relates negatively to team satisfaction (H5).</p> <p>6 The level of analysis (group versus individual) moderates the virtualness relationships. More specifically, for groups, rather than for individuals, virtualness relates more positively to (a) conflict and more negatively to (b) communication frequency, (c) knowledge-sharing, (d) team performance, but NOT for (e) satisfaction (H6).</p> <p>7 Team duration moderates the virtualness relationships. More specifically, for shorter-term rather than longer-term teams, virtualness relates more positively to (a) conflict and more negatively to (b) knowledge-sharing, (c) team performance, (d) satisfaction, but NOT for (e) communication frequency (H8).</p>	<p>1. <math>\rho = .14</math></p> <p>2. <math>\rho = -.11</math></p> <p>3. <math>\rho = -.22</math></p> <p>4. <math>\rho = -.09</math></p> <p>5. <math>\rho = -.08</math></p> <p>6. ind vs group</p> <p>a. <math>\rho = .05</math> vs <math>-.33</math></p> <p>b. <math>\rho = -.04</math> vs <math>-.30</math></p> <p>c. <math>\rho = -.15</math> vs <math>-.34</math></p> <p>d. <math>\rho = -.04</math> vs <math>-.19</math></p> <p>e. <math>\rho = -.11</math> vs <math>.00</math></p> <p>7. short vs long</p> <p>a. <math>\rho = .37</math> vs <math>-.18</math></p> <p>b. <math>\rho = .05</math> vs <math>-.18</math></p> <p>c. <math>\rho = -.67</math> vs <math>-.10</math></p> <p>d. <math>\rho = -.27</math> vs <math>-.07</math></p> <p>e. <math>\rho = -.22</math> vs <math>.05</math></p> <p>note ES 1–5 are overall values</p>	<p>No serious limitations</p> <p>note: most studies investigating short-term teams involved students, whereas studies focusing on longer-term teams involved students &amp; employees</p>	AA

<p>10 Purvanova, 2014</p>	<p>qualitative review of meta-analyses (of exp studies) and separate review of field/case studies</p> <p>k = 8 + 57</p>		<p>1 MA exp: face-to-face teams have been found to have (a) better performance, (b) greater efficiency, (c) better communication (including more frequent communication, greater communication volume, and better knowledge-sharing), and (d) shorter decision-making time.</p> <p>2 MA exp: Virtual teams generate more ideas.</p> <p>3 MA exp: Face-to-face team members are more likely to reach consensus than virtual team members.</p> <p>Summary: On balance, the experimental literature provides little reason to be positive about virtual teams. This literature shows that virtual teams perform worse, reach less accurate decisions, are less efficient, communicate less, share less knowledge, take longer to complete tasks, are less likely to agree, and are less satisfied. In addition, whereas virtual teams are more task-focused and produce more ideas, these ideas are not necessarily of higher quality than those produced by face-to-face teams, and in fact, tend to be less accurate.</p> <p>4 Surprisingly, case and field studies on virtual teams in business organisations show that though virtual team members report generally low trust in fellow teammates, and feel that virtual communication is no substitute for face-to-face communication, the vast majority of the virtual teams contribute positively to their organisations' effectiveness.</p>	<p>1a. varies from <math>\rho = -.09</math> to <math>d = -.40</math>  1b. not reported  1c. varies from <math>\rho = -.11</math> to <math>-.16</math>  1d. varies from <math>d = -.67</math> to <math>-1.71</math></p> <p>2. varies from <math>d = .86</math> to <math>d = 1.12</math></p> <p>3. varies from <math>d = -.35</math> to <math>-.53</math></p> <p>4. not reported</p>	<p>Search strategy, appraisal and synthesis unclear (limited info)</p> <p>Outcome 1a (performance) is based on MAs that are included in this review</p> <p>Most MAs included are rather old &gt; 20 years</p>	<p>A/C</p>
---------------------------	---	--	--	--	---	------------

### ***Overview of excluded studies***

1 Charalampous, 2019	Narrative synthesis of quantitative and qualitative studies, no quantitative outcomes or effect sizes are reported.
2 Curşeu, 2008	Traditional literature, no quantitative outcomes or effect sizes are reported.
3 De Croon, 2005	Traditional literature, no quantitative outcomes or effect sizes are reported.
4 Han, 2016	Narrative synthesis of quantitative and qualitative studies, no quantitative outcomes or effect sizes are reported.
5 Hosseini, 2015	Qualitative meta-analysis, conceptual paper.
6 Nayani, 2018	Narrative synthesis, merely descriptive, no quantitative outcomes or effect sizes are reported – primary outcome is occupational safety.

## Appendix IV: Data extraction table – primary studies

1st author & year	Design & sample size	Sector / population	Main findings	Effect sizes	Limitations	Level
1 Capiola, 2019	RCT n = 320 (64 teams)	undergraduate students and general public in the US	1 Individual-level trustworthiness perceptions is positively related to team performance in a computer-mediated task. 2 Individual-level trustworthiness perceptions have indirect effects on team performance in a computer-mediated task through group-level collective efficacy across time.	only unstandardised co-efficients are reported	artificial setting and tasks (airport simulation)	A
2 Chen, 2011	Quasi experiment  k = 14 (of 12–13 members) n = 178	Undergraduate students enrolled in an online MIS course of a private university in Taiwan	F1: The higher a team member's propensity to trust others, the higher degree of team trust a virtual community member perceives (H1). F2a: The higher leadership effectiveness a virtual learning team member perceives, the higher degree of trust she or he has (H2a). F2b: The higher leadership effectiveness a virtual team perceives, the higher team performance a virtual learning team achieves (H2b). F2c: The higher leadership effectiveness a virtual team perceives, the higher team satisfaction a virtual learning team has (H2c). F3a: The higher trust a virtual learning team member perceives, the higher team performance a virtual learning team achieves (H3a). F3b: The higher trust a virtual learning team member perceives, the higher team satisfaction a virtual learning team has (H3b). F4a: THE RELATIONSHIP BETWEEN TEAM COMMUNICATION AND TRUST: the more frequently team members communicate with each other, the higher degree of trust a virtual learning team member has; WAS NOT FOUND (H4a not supported). F4b: The more frequently team members communicate with each other, the higher performance a virtual learning team achieves. F4c: THE RELATIONSHIP BETWEEN TEAM COMMUNICATION AND SATISFACTION: the more frequently team members communicate with each other, the higher satisfaction a virtual learning team has; WAS NOT FOUND (H4c not supported).	F1: $\beta = .38$  F2a: $\beta = .20$  F2b: $\beta = .18$  F2c: $\beta = .43$  F3a: $\beta = .22$  F3b: $\beta = .42$  F4b: $\beta = .49$	No serious limitation	B/C

4 Cheng, 2016a	Multi-method study / longitudinal case study n = 172  Control group: n = 84  Treatment group: n = 88	Undergraduate students	There were significant differences between groups (treatment group vs control group*) for: F1a: risk. F1b: benefit. F1c: trust.  * The difference between the treatment group and the control group was in the process control and collaboration tools. The control group received no process guidance: the collaboration process was disorganised, with the teams using only WeChat and Skype. For the treatment group, one student was selected to be the facilitator of the teamwork. The facilitator was instructed to facilitate collaboration process, and to use the Discussion system (collaboration tool).	Not reported. The authors reported unstandardised mean differences.	It is not clear whether the allocation to treatment vs controlled group was random.	C
5 Cheng, 2016b	Longitudinal case study k = 36 n = 144	Undergraduate students who are attending the same course called <i>Management of E-commerce Projects</i> at a university in China.	F1: Comparison of trust level between multicultural groups and unicultural groups revealed no significant difference. F2: The trust level of the multicultural group decreases over time. However, for the unicultural group, the trust level increases over time. F3: The individual trust development in multicultural groups is less stable than that seen in unicultural groups.	Not reported	Effect sizes not reported (not sufficient information to calculate them).	C
6 Cordes, 2016	Controlled study k = 26 n = 104	Students at two midwestern US universities	F1: Action process structure* was found to be positively related to decision accuracy (H1). F2: Action process structure was found to be positively related to decision quality (perceived suitability) (H2).  *Action process structure refers to a structured decision process including co-ordination, monitoring and backup behaviours, while control teams used ad hoc processes.	F1: OR = 2.52  F2: $\eta^2 = .038$ .	The description of the study design is very vague.	C
7 Dennis, 2012	RCT n = 317	Undergraduate business students at a large US public university	F1: Participants using PEBC* had lower trust beliefs in characters with fulfilling behaviour and higher trust beliefs in characters with renegeing behaviour than those without PEBC (H1 not supported). F2: The impact of disposition to trust on trust belief was stronger in the presence of PEBC.  *PEBC = post-event behavioural controls (for example, performance reports).	Not reported	Effect sizes are not reported (not sufficient information to calculate them).  Little information about the virtual teams the participants belong to.  Results are on individual level, but the participants of the experiment were members of virtual teams.	A

8 Drescher, 2016	RCT Sample 1: n = 262 Sample 2: n = 99	Sample 1: Students from universities in the United States and Germany  Sample 2: Employees of different companies from the United States and Germany	<p>F1: Shared leadership led to higher team performance and greater satisfaction than hierarchical leadership (H1).</p> <p>F2: High commonality* led to higher team performance and greater satisfaction than low commonality (H2).</p> <p>F3: Commonality moderated the effects of leadership on satisfaction in such a manner that high commonality in shared leadership teams led to greater satisfaction than does low commonality; IN CASE OF PERFORMANCE, SUCH EFFECT WAS FOUND ONLY IN SAMPLE 1 (H3 partially supported).</p> <p><b>H1, H2 and H3 did not differentiate between virtual and face-to-face teams.</b></p> <p>F4: Communication mode moderated the effects of leadership on satisfaction and performance such that shared leadership led to higher performance and greater satisfaction in virtual teams than in face-to-face teams (H4).</p> <p>F5: Virtual teams rated performance and satisfaction higher than in face-to-face teams only when commonality was low. Moreover, in sample 2, face-to-face teams seemed to benefit more from high commonality than virtual teams (H5 not supported).</p> <p>*Commonality – the feeling of similarity, and it describes the sense that team members hold the same attitudes, arguments, feelings, or beliefs.</p>	<p>F1: Sample 1 <math>\beta = \text{unclear}</math> (satisfaction) <math>\beta = -0.45</math> (performance)</p> <p>Sample 2 <math>\beta = -0.59</math> (satisfaction) <math>\beta = -0.42</math> (performance)</p> <p>F2: Sample 1 <math>\beta = 1.47</math> (satisfaction) <math>\beta = 1.15</math> (performance)</p> <p>Sample 2 <math>\beta = 1.16</math> (satisfaction) <math>\beta = 0.75</math> (performance)</p> <p>F3: Sample 1 <math>\beta = 0.29</math> (satisfaction) <math>\beta = 0.28</math> (performance)</p> <p>Sample 2 <math>\beta = 0.14</math> (satisfaction)</p> <p>F4: Sample 1 <math>\beta = -0.94</math> (satisfaction) <math>\beta = -0.73</math> (performance)</p> <p>Sample 2 <math>\beta = -0.73</math> (satisfaction) <math>\beta = -0.47</math> (performance)</p> <p>F5: Sample 1 <math>\beta = 1.18</math> (satisfaction) <math>\beta = 0.88</math> (performance)</p> <p>Sample 2 <math>\beta = 1.02</math> (satisfaction) <math>\beta = 0.70</math> (performance)</p>	Belonging to virtual (or face-to-face) team was hypothetical – the participants replied to the hypothetical, but were not a members of an actual virtual team.	A
------------------	--	--	--	--	--	---

9 Dutcher, 2012	RCT n = 125	Students at Florida State University	<p>The study investigates the implications of the telecommuting environmental effects on productivity of creative and dull tasks (on the individual, not team, level).</p> <p>F1: Overall, the participants were 6–10% less productive outside the lab in the dull task (H1). This result was mainly driven by: F1a: males (H2) F1b: those who do not procrastinate (H3) F1c: those who do not desire personal control (H4) F1d: the lower-productivity workers (H5).</p> <p>F2: Overall, the participants were 11–20% more productive outside the lab when performing the creative task (H1). The result was true for: F2a: males (H2) F2b: those who desire more personal control (H4) F2c: participants at all productivity levels (H5).</p>	<p>Effect sizes not reported; our calculations are:</p> <p>F1a: d = -0.53; CI [-0.89, -0.17] F1b: d = -0.46; CI [-0.81, -0.10] F1c: d = -0.37; CI [-0.72, -0.02] F1d: d = -0.35; CI [-0.71, -0.01]</p> <p>F2a: d = 0.60; CI [0.24, 0.96] F2b: d = 0.53; CI [0.18, 0.89] F2c: d = 0.24; CI [-0.11, 0.59] d = 0.38; CI [0.03, 0.73]</p>	<p>No serious limitation</p> <p>Results are at the individual level</p>	A
10 Espinosa, 2015	RCT k = 132 n = 164	Not clear, 66.9% of the participants were college students	<p>F1: Temporal distance* was positively associated with task completion speed (H1).</p> <p>F2: Temporal distance was negatively associated with task product quality (H2).</p> <p>F3: Controlling for temporal distance, communication frequency had a positive effect on conveyance communication** (H3).</p> <p>F4: Controlling for temporal distance, turn-taking in communication had a negative effect on conveyance communication (H4).</p> <p>F5: Controlling for temporal distance, communication frequency had a positive effect on convergence communication*** (H5).</p> <p>F6: Controlling for temporal distance, turn-taking in communication had a positive effect on convergence communication (H6).</p> <p>F7: Higher levels of conveyance communication were associated with higher task completion speed [controlling for temporal distance] (H7). F7a: Conveyance was not associated with task product quality.</p> <p>F8: Higher levels of convergence communication were associated with higher task product quality [controlling for temporal distance] (H8). F8a: Convergence was not associated with task completion speed.</p>	<p>F1: <math>\rho = 0.28</math></p> <p>F2: <math>\rho = -0.21</math></p> <p>F3 t/m F8: only unstandardised betas are provided</p>	<p>Little information about the context/sample</p> <p>Artificial setting and tasks</p> <p>Concerns dyadic teams</p>	A

			<p>*Regarding the temporal distance, the authors considered four scenarios, in which work time overlap was full (100%), partial (67% and 33%), and there was no overlap (0%).</p> <p>**Conveyance is associated with the transmission of new information (for example, task instruction, task request or information discovery statement).</p> <p>***Convergence has to do with reaching a common understanding of the meaning of the information via discussions (for example, acknowledgements, evidence or repair of miscommunication, clarifications, confirmations of activity completion, and task questions).</p>			
11 Fang, 2014	RCT n = 285 (95 teams)	students from Taiwan	<p>1 Compared with teams in which members are familiar with each other, teams in which members are strangers have lower performance.</p> <p>2 Compared with teams in which task results are visible, teams in which these results are invisible do NOT have lower performance.</p> <p>3 Compared with teams in which team members are not perceived as engaging in co-worker loafing, teams in which members are perceived as engaging in co-worker loafing do NOT have lower team performance.</p>	no effect sizes reported	artificial setting and tasks (brainstorming)	A
12 Fuller, 2011	RCT k = 60? n = 121	Students enrolled in information systems and business classes at three universities in the midwestern and southern US	<p>F1. Virtual teams which were subjected to deceptive communication by one of their members performed a collaborative task less successfully than virtual teams without deceptive communication (H1).</p> <p>F2a. In deceptive groups, receivers were perceived to be less deceptive than senders (H2a).</p> <p>F2b. Receivers in truthful groups perceived lower levels of deception in senders than receivers in deceptive groups (H2b).</p> <p>F3. The perception of deceptive communication was negatively associated with perceptions of trustworthiness among virtual team members (H3).</p> <p>F4. The perception of deceptive communication was negatively associated with feelings of mutuality among virtual team members (H4).</p>	<p>F1: not reported; our calculates are: d = 1.65; CI [1.07 – 2.24]</p> <p>F2a &amp; F2b: not reported</p> <p>F3: <math>\beta = -0.31</math></p> <p>F4: <math>\beta = -0.33</math></p>	Some of the information (sample size/some of the results) are not clear	A
13 Fuller, 2016	Longitudinal, controlled study k = 22 n = 110	Undergraduate students at three North American universities enrolled in introductory database courses	<p>The project consisted of two different phases, each with deliverables to be submitted. Each project phase required virtual team collaboration and communication for the purpose of developing project deliverables, a deliverable submission, and evaluative feedback.</p> <p>F1a: Individuals with high CMC** anxiety tended to participate less (send fewer messages) via computer-mediated communication technology than those with low CMC anxiety initially – in phase I (H1a), and in phase II (H4a).</p> <p>F1b: No differences in the number of words per message between the individuals with high CMC anxiety and those with low CMC anxiety were found in phase 1 (H1b not supported), nor in phase 2 (H4b not supported).</p>	Not reported	<p>When discussing the results of hypotheses testing (t-test), the authors reported only the p-values, but not the t-statistics.</p> <p>The only measure of performance is perceived performance (subjectively evaluated by the participants).</p>	C

			<p>F2a: Individuals with high CMC anxiety tended to send fewer task-oriented messages via computer-mediated communication technology than those with low CMC anxiety initially – in phase I (H2a), and in phase II (H5a).</p> <p>F2b: Individuals with high CMC anxiety WERE NOT FOUND TO send fewer social-oriented messages via computer-mediated communication technology than those with low CMC anxiety, neither initially – in phase I (H2b not supported) – nor in phase II (H5b not supported).</p> <p>F2c: Initially, individuals with high CMC anxiety tended to have lower participation quality (introduced fewer novel communication topics) than those with low CMC anxiety when interacting via CMC initially – in phase I (H2c), and in phase II (H5c).</p> <p>F3: Individuals high in CMC anxiety were found to be rated SOMEWHAT lower in performance by the other members on their team, initially – in phase I (H3 moderately supported), and in phase II (H6 moderately supported).</p> <p>*CMC – computer-mediated communication</p>			
14 Giordano, 2013	<p>Controlled study</p> <p>Baseline experiment: k = 24 n = 96</p> <p>Main experiment: k = 40 n = 160</p>	Upper-level undergraduate students at a large US university	<p>Two experiments were conducted where multiple student groups performed computer-mediated collaborative tasks.</p> <p><b>Baseline experiment:</b> Groups <b>without deceivers</b> performed a low- vs high-complexity task to establish baseline performance scores.</p> <p><b>Main experiment:</b> Groups <b>with a deceiver</b> (that had a goal opposite that of the group) performed a low- vs high-complexity task and either had group members that had vs did not have experience with each other.</p> <p>F1: Computer-mediated groups facing a high-complexity task were found to be less accurate at detecting deception than groups facing a low-complexity task (H1).</p> <p>F2: Computer-mediated settings facing a low-complexity task were NOT found have lower task performance (compared with groups without deceivers) than groups facing a high-complexity task (H2 not supported).</p> <p>F3: Computer-mediated groups with members who have experience with each other were NOT found to be more accurate at detecting deception than groups with members who do not have experience with each other (H3 not supported).</p> <p>F4: Computer-mediated groups facing deceivers and with members who have experience with each other tended to have higher task performance than groups with members who do not have experience with each other.</p>	Effect sizes not reported; our calculates are:  F1: d = 0.68, CI [0.04 – 1.32]  F4: d = 1.22, CI [0.54 – 1.89]	No serious limitation	C

15 Han, 2011	RCT k = 30 n = 136	Graduate students (masters and PhD) in computer science, information systems, and management information systems from a national technological university in the northeastern part of the US.	<p>The study investigated whether the initial meeting mode (face-to-face, desktop audio-conferencing, desktop video-conferencing, text only) impacts decision-making quality, creativity, group development, and process satisfaction in virtual teams.</p> <p>F: There were no statistically significant differences in the VT's outcomes (decision-making quality, creativity, group development, and process satisfaction) among the four conditions ( face-to-face, desktop audio-conferencing, desktop video-conferencing, text only).</p> <p>NOTE: The meeting concerned a single, initial and short meeting of a group that subsequently worked together via asynchronous text communication.</p>	N/A	Small number of groups per condition (provide insufficient statistical power).	A
16 Hassel, 2020	Controlled lab study k = 50 (all virtual) n = 152 individuals	Students and employees at a large university in the US	<ol style="list-style-type: none"> <li>1 Teams that use video-conferencing (medium is richer, higher in social presence and closer to face-to-face interaction) do NOT perform better in equivocal tasks than teams who use email (medium is leaner, poorer in social presence and further away from face-to-face interaction) (H1, H2, H3).</li> <li>2 Teams that use email (lower-synchronicity media) for the conveyance process of a task and video-conferencing (higher synchronicity media) for the convergence process of a task do NOT perform better than teams using the same medium throughout the task-solving process (H4).</li> <li>3 Teams that use video-conferencing (medium is richer, higher in social presence and closer to face-to-face interaction) complete the task faster than teams who use email (medium is leaner, poorer in social presence and further away from face-to-face interaction) or a combination of email and video-conferencing (H1, H2, H3).</li> <li>4 Teams that use video-conferencing throughout the task-solving process complete the task quicker than teams using email or a combination of email and video-conferencing (fitting the phase of the process) (H4).</li> <li>5 Richness of media used is positively associated with team members' process satisfaction and perceived participation. Teams that use only email are less satisfied and perceive less participation than teams using video-conferencing or a combination of email and video-conferencing. (no H).</li> <li>6 The social presence of the media used is associated with team members' process satisfaction and perceived participation (no H).</li> </ol>	<ol style="list-style-type: none"> <li>1. <math>d = -.01</math>, <math>CI = [-.80; .54]</math></li> <li>2. <math>d = .17</math>, <math>CI = [-.44; .79]</math></li> <li>3. <math>d = -.97</math>, <math>CI = [-1.68; -.27]</math></li> <li>4. <math>d = -.97</math>, <math>CI = [-1.56; -.38]</math></li> <li>5. process satisfaction: <math>r = .63</math>, <math>CI = [.52; .72]</math>; participation: <math>r = .20</math>, <math>CI = [.04; .35]</math></li> <li>process satisfaction: <math>r = .49</math>, <math>CI = [.36; .60]</math>; participation: <math>r = .26</math>, <math>CI = [.10; .40]</math></li> </ol>	wide confidence intervals	B
17 Huang, 2010	RCT n = 485	undergraduate students from an introductory MIS course	Results suggest that transactional leadership behaviours improve task cohesion of the team, whereas transformational leadership behaviours improve co-operative climate within the team which, in turn, improves task cohesion. However, these effects of leadership depend on media richness. Specifically, they occur only when media richness is low. Results also suggest that task cohesion leads to group consensus and members' satisfaction with the discussion, whereas co-operative climate improves discussion satisfaction and reduces time spent on the task.	All effect sizes are very small	student population and artificial setting	A

18 Jaakson, 2019	<p>Uncontrolled study with a pretest (3 measurement points along 8 weeks: before, at 50% task completion, and after task was completed and feedback received)</p> <p>k = 71 (all virtual) n = 305 students</p>	<p>Students at four universities in Finland, Estonia, Latvia and Russia</p>	<ol style="list-style-type: none"> <li>1 Feedback about poor performance predicts a decrease in team trust and team members' trustworthiness, while feedback about positive performance does not predict change in trust or trustworthiness (RQ1).</li> <li>2 Trust does NOT mediate the relationship between individual performance and team performance (H1).</li> <li>3 Trustworthiness partially mediates the relationship between team performances in two consecutive measurement points (H2).</li> <li>4 Team members' prior virtual teams experience is not related to team trust, team trustworthiness, team performance, or individual performance (no H).</li> <li>5 Team trust predicts team performance (no H).</li> <li>6 Team trustworthiness does not predict team performance (no H).</li> </ol>	<ol style="list-style-type: none"> <li>1. trust: <math>d=.35</math>, <math>CI=[.06; .63]</math>; trustworthiness: <math>d=4.51</math>, <math>CI=[4.06; 4.97]</math></li> <li>2. SEM co-efficients reported only</li> <li>3. SEM co-efficients reported only</li> <li>4. r co-efficients <math>&lt;.06</math></li> <li>5. <math>r=.22</math>, <math>CI=[-.01; .43]</math></li> <li><math>r=.07</math>, <math>CI=[-.04; .18]</math></li> </ol>	<p>Data is analysed at individual level, not at team level</p>	<p>C</p>
------------------	--	---	---	--	--	----------

19 Jarrett, 2016	Randomised controlled lab study k = 123 (face-to-face and virtual) n = 492 individuals	Students from a large southwestern public university in the US	<ol style="list-style-type: none"> <li>1 After-action reviews (AARs) in virtual teams are positively related to team performance, team efficacy, openness of communication, and cohesion (H1).</li> <li>2 After-action reviews have a stronger effect on team performance, team efficacy, openness of communication and cohesion in face-to-face teams than in virtual teams (H1).</li> <li>3 Face-to-face teams going through AAR have higher team performance, team efficacy, openness of communication and cohesion than virtual teams doing AAR (H2).</li> <li>4 There is no difference in the effects of objective and subjective after-action reviews in team performance, but subjective AAR resulted in higher team efficacy, openness of communication, and cohesion (no H).</li> <li>5 Team efficacy has a positive effect on team performance (no H).</li> <li>6 Team openness of communication and team cohesion are positively related to team performance (no H).</li> </ol>	<ol style="list-style-type: none"> <li>1. performance: <math>d=.09</math> and <math>.19</math>; efficacy: <math>d=.48</math>; openness of comm.: <math>d=.52</math>; cohesion: <math>d=.62</math></li> <li>2. performance: <math>d=.72</math> (F2F) vs <math>d=.19</math> (virtual); efficacy: <math>d=1.04</math> vs <math>.48</math>; openness of comm: <math>d=1.50</math> vs <math>d=.52</math>; cohesion: <math>d=1.40</math> vs <math>d=.62</math>.</li> <li>3. performance: <math>d=-.09</math> and <math>.05</math>; efficacy: <math>d=-.22</math>; openness of comm: <math>d=-.19</math>; cohesion: <math>d=-.09</math></li> <li>4. performance: <math>d=.14</math> and <math>.02</math>; efficacy: <math>d=-.22</math>; openness of comm: <math>d=-.19</math>; cohesion: <math>d=-.09</math>.</li> <li>5. efficacy: <math>r=.25</math>; <math>CI=[.08; .41]</math> openness of comm: <math>r=.34</math>; <math>CI=[.17; .49]</math>; cohesion: <math>r=.33</math>, <math>CI=[.16; .48]</math> (also lower correlations with performance episodes further away in time)</li> </ol>	Massed protocol (5 hours for several performance episodes) might not be adequate to represent teams working on complex tasks (no time for some team processes to develop)	A
20 Kahai, 2012	Randomised controlled lab study without a pre-test k = 34 (all virtual) n = 160	Undergraduate business students	<ol style="list-style-type: none"> <li>1 Communication medium in virtual teams moderates the effect of leadership on feedback positivity (transformational leadership led to greater feedback positivity than transactional leadership in instant messaging medium, but there was no difference in terms of feedback positivity between leadership styles in the virtual world medium) (H1).</li> <li>2 Feedback positivity is positively related to discussion satisfaction (H2).</li> <li>3 Feedback positivity is positively related to social presence (H3).</li> <li>4 Feedback positivity is positively related to group cohesion (H4).</li> <li>5 Feedback positivity is positively related to group efficacy (H5).</li> <li>6 Feedback positivity is NOT related to consensus (H6).</li> <li>7 Feedback positivity is negatively related to decision quality (H7).</li> <li>8 Feedback positivity is negatively related to time on task (H8).</li> </ol>	<ol style="list-style-type: none"> <li>1. tested through interaction term in PLS regression and ANOVA</li> <li>2. <math>r=.40</math>, <math>CI=[.07; .65]</math></li> <li>3. <math>r=.42</math>, <math>CI=[.10; .66]</math></li> <li>4. <math>r=.58</math>, <math>CI=[.30; .77]</math></li> <li>5. <math>r=.44</math>, <math>CI=[.12; .68]</math></li> <li>6. <math>r=.02</math>, <math>CI=[-.32; .36]</math></li> <li>7. <math>r=-.34</math>, <math>CI=[-.60; -.002]</math></li> <li>8. <math>r=-.08</math>, <math>CI=[-.41; .26]</math></li> </ol>	Massed protocol	A

			<p>9 Team size is negatively related to social presence, group cohesion, group efficacy, consensus, decision quality and time on task (no H).</p> <p>10 Transformational leadership is associated with more feedback positivity, discussion satisfaction, social presence, group efficacy, decision quality, and time on task than transactional leadership (no H).</p> <p>11 Transformational leadership is associated with less consensus than transactional leadership (no H).</p> <p>12 Richness of communication medium (virtual world vs instant messaging) is negatively related to feedback positivity, social presence, group cohesion, consensus, decision quality, and time on task (no H).</p> <p>13 Richness of communication medium (virtual world vs instant messaging) is positively related to discussion satisfaction and group efficacy (no H).</p> <p>14 Leader gender is not related to feedback positivity (no H).</p>	<p>for findings 2–8, also PLS regression path co-efficients are reported.</p> <p>9. social presence: <math>r=-.13</math>, <math>CI=[-.44; .22]</math>; cohesion: <math>r=-.17</math>, <math>CI=[-.48; .18]</math>; efficacy: <math>r=-.19</math>, <math>CI=[-.50; .16]</math>; consensus: <math>r=-.20</math>, <math>CI=[-.50; .14]</math>; decision quality: <math>r=-.31</math>, <math>CI=[-.59; .03]</math>; time on task: <math>r=-.17</math>, <math>CI=[-.48; .18]</math></p> <p>10. feedback positivity: <math>r=.20</math>; discussion satisfaction: <math>r=.23</math>; social presence: <math>r=.25</math>; group efficacy: <math>r=.26</math>; decision quality: <math>r=.32</math>; time on task: <math>r=.55</math>.</p> <p>11. <math>r=-.17</math></p> <p>12. feedback positivity: <math>r=-.10</math>; social presence: <math>r=-.30</math>; cohesion: <math>r=-.09</math>; consensus: <math>r=-.26</math>; decision quality: <math>r=-.06</math>; time on task: <math>r=-.31</math></p> <p>13. discussion satisfaction: <math>r=.01</math>; efficacy: <math>r=.05</math></p> <p>14. PLS regression <math>\beta=.12</math>, <math>t=.68</math></p>		
21 Kai-Tang, 2014	Randomised controlled study n = 107 students (30 virtual teams)	Students from universities in Taiwan	<p>1 The leader's motivational language (direction-giving vs empathetic) has no effect on team members' individual creativity (H1a,b).</p> <p>2 The leader's feedback approach (encouraging vs demanding) has no effect on team members' individual creativity (H2a,b).</p> <p>3 The leader's feedback approach moderates the effect of motivational language used on team members' individual creativity: direction-giving language and demanding feedback results in the best creativity performance, followed by empathetic language and encouraging feedback, then empathetic language and demanding feedback, and finally by direction-giving language and encouraging feedback (H3a).</p> <p>4 The leader's motivational language (direction-giving vs empathetic) has no effect on team members' number of ideas generated (no H).</p>	<p>1. <math>d=-.05</math>, <math>CI=[-.44; .33]</math></p> <p>2. <math>d=-.13</math>, <math>CI=[-.52; .26]</math></p> <p>3. only F value reported</p> <p>4. <math>d=.01</math>; <math>CI=[-.40; .41]</math></p> <p>5. <math>d=-.21</math>; <math>CI=[-.62; .19]</math></p> <p>only F value reported</p>	No control of face-to-face team meetings – they were possible	A

			<p>5 The leader's feedback approach (encouraging vs demanding) has no effect on team members' number of ideas generated (no H).</p> <p>6 The leader's feedback approach moderates the effect of motivational language used on team members' number of ideas generated: direction-giving language and demanding feedback results in the highest number of ideas, followed by empathetic language and encouraging feedback, then empathetic language and demanding feedback, and finally by direction-giving language and encouraging feedback (H3b).</p>			
22 Kennedy, 2010	RCT n = 294 (98 teams)	undergraduate business students from a large public university in the northeastern US	<p>Results indicate computer-mediated teams reported lower participative decision-making than face-to-face teams after the first session and the disparity continued at the second session.</p> <p>Results suggest that practitioners may want to require an initial face-to-face session (that is, more than just a meet and greet) to prepare members to work together in the future.</p> <p>In addition, when setting up a computer-supported team, practitioners need to consider how the duration of the team's existence may impact the team's process development and outputs. Teams that are assembled to complete a specific task in a very short period may not have time to successfully develop processes as would a team working on a project over a much longer duration. In such cases, assigning team members that are well acquainted with each other may be most appropriate.</p>	no effect sizes reported	artificial setting and tasks	A
23 Konradt, 2015	RCT n = 294 (98 teams)	university students (Dutch and German?)	<p>1 Reflection is higher in teams (irrespective of virtual or face-to-face) that receive guided reflexivity combined with feedback, as compared with teams who receive either (a) guided reflexivity without feedback or (b) neither guided reflexivity nor feedback.</p> <p>2 Virtual teams do NOT show lower team reflection than face-to-face teams.</p> <p><i>Note: Guided team reflexivity (sometimes referred to as briefing/debriefing) refers to an intervention to induce reflection in groups.</i></p>	<p>1. <math>\beta = .34</math> vs <math>\beta = .24</math></p> <p>2. <math>\beta = -.13</math> ns</p>	artificial setting and tasks	A
24 Lira, 2007	RCT without a pre-test k = 44 (F2F and virtual) n = 176 individuals	Psychology students in Spain	<p>1 There was no difference between virtual (video-conferencing) and face-to-face teams in work outcomes (task performance), cohesiveness, and outcome satisfaction (no H).</p> <p>2 Communication media (face-to-face vs virtual) doesn't moderate the relationship between task conflict and group effectiveness (task performance, cohesion, outcome satisfaction).</p>	performance: $d = .33$ , $CI = [-.26, .93]$ ; cohesiveness: $d = .11$ , $CI = [-.48, .70]$ ; outcome satisfaction: $d = .07$ , $CI = [-.52, .66]$	Outcomes were measured four times, after each work session, but only data for the last session is reported	A
25 Martinez-Moreno, 2012	Randomised controlled study k = 66 (F2F and virtual) n = 264 individuals	Undergraduate psychology students in Spain	<p>1 In teams with rich communication medium (face-to-face and video-conferencing), early task conflict is related to relationship conflict later on. In teams using instant chat to communicate, early task conflict does not predict subsequent relationship conflict (RQ).</p> <p>2 Teams' communication medium does not significantly moderate the relationship between early process conflict and subsequent relationship conflict (RQ).</p>	unstandardised regression coefficients reported	no serious limitations	A

26 Martinez-Moreno, 2014	Randomised controlled study k = 54 (all virtual) n = 212 individuals	Undergraduate psychology students in Spain	<ol style="list-style-type: none"> <li>1 Team self-guided training increases teams' use of some functional conflict management strategies (open communication, rotating responsibilities), but has no effect on other strategies (debate, consensus, and team rules) (H1).</li> <li>2 Team self-guided training decreases teams' use of the dysfunctional conflict management strategy of avoiding, but has no effect on the strategy of voting (H2).</li> <li>3 There is NO difference between teams going through self-guided training and teams with no training in their use of some functional conflict management strategies (debate, consensus, and team rules) (H3).</li> <li>4 Teams going through self-guided training use some functional conflict management strategies (open communication, rotating responsibilities) more frequently than teams with no training (H3).</li> <li>5 There is NO difference between teams going through self-guided training and teams with no training in their use of the dysfunctional conflict management strategy of avoiding (H3).</li> <li>6 Teams going through self-guided training use the dysfunctional conflict management strategy of voting less frequently than teams with no training (H3).</li> </ol> <p><i>Team self-guided training consisted of a team debriefing strategy in which members are given process feedback and outcome feedback that enable them to discuss constructively how to improve their results on a team level. This training consisted of one session between 60 and 90 minutes' duration.</i></p>	<ol style="list-style-type: none"> <li>1. F values for interaction terms are reported</li> <li>2. F values for interaction terms are reported</li> <li>3. debate: <math>d = -.38</math>, <math>CI = [-.91, .16]</math>; consensus: <math>d = .26</math>, <math>CI = [-.27, .80]</math>, team rules: <math>d = .52</math>, <math>CI = [-.02, 1.07]</math></li> <li>4. open communication: <math>d = .62</math>, <math>CI = [.08, 1.17]</math>; rotating responsibilities: <math>d = 1.00</math>, <math>CI = [.43, 1.56]</math></li> <li>5. avoiding: <math>d = -.40</math>, <math>CI = [-.94, .14]</math></li> </ol> <p>voting: <math>d = -.65</math>, <math>CI = [-1.20, -.10]</math></p>	no serious limitations	A
27 McLamon, 2019	Non-randomised controlled before-after study k = 1,839 (all virtual) n = 13,224	Students from 40 countries	<ol style="list-style-type: none"> <li>1 Communication frequency is NOT related to process co-ordination (H1).</li> <li>2 Process co-ordination is positively related to team performance (H2).</li> <li>3 Process co-ordination does NOT mediate the communication frequency to performance relation (H3).</li> <li>4 Peer feedback moderates the indirect effect of communication frequency on performance, as mediated by process co-ordination: peer feedback that was collected and distributed regularly strengthens the indirect effect of communication frequency on team performance through process co-ordination (H4).</li> </ol> <p>Peer feedback: post-project only, gathered weekly but shared only post-project, gathered and shared weekly.</p>	<ol style="list-style-type: none"> <li>1-4: r reported only separately for each experimental condition; values vary strongly between the 3 groups (also from negative to positive); path co-efficients/unstandardised regression co-efficients are also reported</li> </ol>	no serious limitations	B
28 O'Leary, 2010	Non-randomised controlled before-after study	Undergraduates from two medium-sized (CA and US) universities	<p>Compared with collocated teams:</p> <ol style="list-style-type: none"> <li>1 Teams with geographically defined subgroups will experience lower identification with the team than teams without such subgroups.</li> <li>2 Teams with geographically defined subgroup configurations will experience less effective transactive memory than teams without such subgroups.</li> <li>3 Teams with geographically defined subgroup configurations will experience more conflict than teams without such subgroups.</li> <li>4 Teams with geographically defined subgroups will experience more co-ordination problems than teams without such subgroups.</li> </ol>	not reported	no serious limitations	B

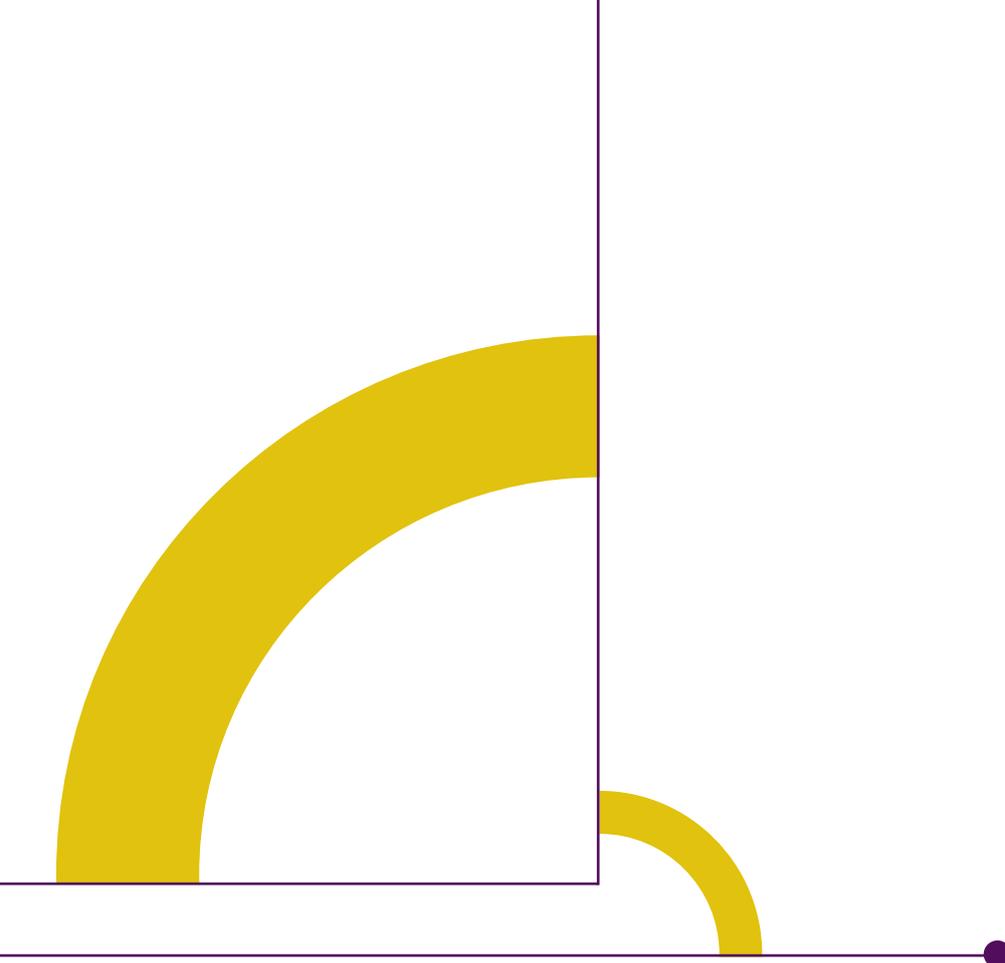
<p>29 Peñarroja, 2017</p>	<p>Randomised controlled study without a pre-test k = 54 (all virtual)  n = 212 individuals</p>	<p>Students at a university (probably Spain)</p>	<ol style="list-style-type: none"> <li>1 Team feedback combined with guided reflexivity has NO effect on group cohesion or satisfaction with the team, and has a NEGATIVE effect on satisfaction with the result (H1).</li> <li>2 Team feedback combined with guided reflexivity has a negative effect on perceived social loafing (H2).</li> <li>3 Perceived social loafing is negatively related to group cohesion, satisfaction with the team, and satisfaction with the result (H3).</li> <li>4 Perceived social loafing mediates the effect of team feedback combined with guided reflexivity on group cohesion, satisfaction with the team and satisfaction with the result (H4).</li> </ol>	<p>1-3 only unstandardised regression co-efficients are reported  4. Preacher &amp; Hayes estimates reported</p>	<p>Concerns about construct validity: variables correlated strongly between them (esp. cohesion and satisfaction with team)  Unclear when social loafing was measured (presumably at the same time as the other self-report variables)</p>	<p>A</p>
<p>30 Rico, 2011</p>	<p>Randomised controlled study without a pre-test k = 64 (all virtual)  n = 192 individuals</p>	<p>Psychology students at a university in Spain</p>	<ol style="list-style-type: none"> <li>1 There is a three-way interaction between person-focused OCB (OCBP), task interdependence, and virtuality on team performance (H1).</li> <li>2 Task interdependence moderates the effect of OCBP on team performance in low virtual teams, so that the relationship between OCBP and team performance is positive in high task interdependent teams (H1a) and negative in low task interdependent teams (H1b).</li> <li>3 The degree of virtuality moderates the relationship between OCBP and team performance in low task interdependent teams, so that the relationship is more negative in low virtual teams than in high virtual teams (H1c).</li> <li>4 The degree of task interdependence moderates the relationship between OCBP and team performance in high virtual teams, so that the relationship is more positive in low task interdependent teams than in high task interdependent teams (H1d).</li> <li>5 Perceived team performance has no effect on OCBP (no H).</li> <li>6 Degree of virtuality has no effect on team performance (high virtuality = treatment) (no H).</li> <li>7 Degree of task interdependence has no effect on perceived performance (high interdependence = treatment) (no H).</li> <li>8 Task interdependence has no effect on OCBP (high interdependence = treatment) (no H).</li> <li>9 Team virtuality has no effect on OCBP (high virtuality = treatment) (no H).</li> </ol>	<ol style="list-style-type: none"> <li>1. <math>\beta</math> for interaction = <math>-.53</math>, accounting for 8% of variance in team performance; partial eta-squared = <math>.15</math></li> <li>2. slope analysis t-test provided</li> <li>3. slope analysis t-test provided</li> <li>4. slope analysis t-test provided</li> <li>5. <math>\beta = -.01</math></li> <li>6. <math>d = -.38</math>, CI = <math>[-.88; .11]</math></li> <li>7. <math>d = .12</math>, CI = <math>[-.37; .61]</math></li> <li>8. <math>d = .10</math>, CI = <math>[-.39; .59]</math></li> <li>9. <math>d = .47</math>, CI = <math>[-.03; .97]</math></li> </ol>	<p>Only 19% of the participants were male  Teams were in the same room, but were limited in their ability to communicate face-to-face, still, low ecological validity</p>	<p>A</p>
<p>31 Swain, 2018 Study 1</p>	<p>Randomised controlled study without a pre-test  n = 320 individuals (no teams)</p>	<p>Amazon M-Turk participants</p>	<ol style="list-style-type: none"> <li>1 Leader humility has a positive effect on psychological safety (H1).</li> <li>2 Leader humility has a positive effect on liking for the leader (H2).</li> <li>3 Psychological safety and liking for the leader have an effect on intended information flow behaviours (H3).</li> <li>4 Psychological safety and liking for the leader mediate the effect of leader humility on information flow (H4).</li> </ol>	<p>only unstandardised co-efficients are reported and not enough data to calculate other effect sizes</p>	<p>Finding 3 is based on cross-sectional data  Simulation (individuals read a scenario and have to imagine they work in that team), not real teams working together</p>	<p>A</p>

32 Swain, 2018 Study 2	Randomised controlled study without a pre-test n = 317 individuals (no teams)	Amazon M-Turk participants	<p>1 Leader humility has a positive effect on psychological safety (H1).</p> <p>2 Leader humility has a positive effect on liking for the leader (H2).</p> <p>3 Psychological safety and liking for the leader have an effect on intended information flow behaviours (H3).</p> <p>4 Psychological safety and liking for the leader mediate the effect of leader humility on information flow (H4).</p> <p><i>(same findings as in study 1, just this time the experimental procedure controlled for leader's rejection or acceptance of all suggestions and advice)</i></p>	only unstandardised co-efficients are reported and not enough data to calculate other effect sizes	Simulation (individuals read a scenario and have to imagine they work in that team), not real teams working together	A
33 Swain, 2018 Study 3	Randomised controlled study without a pre-test k = 49 (all virtual) n = 147 individuals	No specific characteristic	<p>1 Teams with a humble leader felt more psychological safety than those with a leader who was not humble (H1).</p> <p>2 Participants with a humble leader liked their leader more than participants with a leader who was not humble (H2).</p> <p>3 Information flow was higher in groups with a humble leader than with a leader who was not humble (H3).</p> <p>4 Leader humility has no effect on team performance (H4), even after controlling for age and gender.</p> <p><i>(same findings as in study 1 and 2, just this time tested using real teams)</i></p>	<p>1. d=1.00, CI=[.41, 1.60]</p> <p>2. d=1.41, CI=[.78, 2.03]</p> <p>3. d=.19, CI=[-.37, .75]</p> <p>d=.03, CI=[-.53, .59]; no effect sizes provided while controlling for age and gender</p>	No information on sample size of the two experimental groups (effect size calculated assuming 24 vs 25 teams)	A
34 Walther, 2005	Randomised controlled study n = 44	students from two major research universities in the northeastern US	Setting communication rules (frequency, response time, feedback, explicitness), deadlines, and clear goals enhance the performance of virtual teams.	moderate (varies from .25 to .65)	Large number of variables tested	A
35 Windeler, 2015	Randomised controlled study without a pre-test k = 46 teams (all virtual) n = 169 individuals	students from a university in the US	<p>1 Exposure to information on the deep-level similarities of team members through eprofile use does NOT influence relational conflict (H1).</p> <p>2 Exposure to information on the deep-level similarities of team members through eprofile use negatively influences task conflict (H2).</p> <p>3 Relational conflict does NOT influence shared understanding (H3).</p> <p>4 Task conflict negatively influences shared understanding (H4).</p> <p>5 Shared understanding positively influences the effectiveness of distributed teams (H5).</p> <p>6 Relational and task conflict are negatively related with team effectiveness (no H).</p> <p>7 Shared understanding mediates the relationship between task conflict and team effectiveness (no H).</p>	<p>1. r=-.2, d=-.3, CI=[-.88, .28]</p> <p>2. r=-.64, d=-1.6, CI=[-2.3, -.96]</p> <p>3. r=-.16, CI=[-.43, .14]</p> <p>4. r=-.57, CI=[-.74, -.34]</p> <p>5. r=.66, CI=[.46, .80]</p> <p>6. Rel r=-.46, CI=[-.66, -.20]; Task: r=-.43, CI=[-.64, -.16]</p> <p>7. only unstandardised beta co-efficients reported</p>	no serious limitations	A

## Excluded studies

Author & year	Reason for exclusion
1 Assudani, 2011	Longitudinal qualitative study, no quantitative outcome or effect size reported.
2 Bonet, 2017	Cross-sectional study.
3 Brahm, 2012	Cross-sectional study.
4 Cash, 2017	Controlled study on the effect of 'question asking training'. Context and results unclear, effect sizes not reported.
5 Charlier, 2016	RCT, limited relevance: examines the antecedents (for example communication mode and team configuration) of the emergence of leadership in virtual teams.
6 Collins, 2014	This research combines a case-study approach with a quasi-experimental design and collects different sources of evidence, such as observation, face-to-face interviews and surveys, in order to obtain a better understanding of virtual team phenomena in the Asia-Pacific region. The quantitative part is limited to analysing whether the participant's (master's programme students from the Asia-Pacific region) individual differences (age, gender, study/work abroad experience) are related to their satisfaction with the outcome and the process of co-operation in the VT.
7 Eddleston, 2017	1 Study conducted on the individual (not team) level. 2 The variable of interest is work-family conflict.
8 Ellwart, 2015	This study doesn't investigate VT performance directly.
9 Hoch, 2014	Cross-sectional study.

10 O Neill, 2014	Not about virtual teams, but about individuals working remotely (all analysis is at individual level, not controlled whether they were working as part of teams or not).
11 Pazos, 2012	Cross-sectional study.
12 Romeike, 2016	Cross-sectional study.
13 Sewell, 2015	Case study.
14 Sherman, 2020	Not about virtual teams, but about individuals working remotely (all analysis is at individual level, not controlled whether they were working as part of teams or not).
15 Turel, 2012	Cross-sectional study (outcome is relevant).
16 Windeler, 2017	Not about virtual teams, but about individuals working remotely (all analysis is at individual level, not controlled whether they were working as part of teams or not).



# CIPD

Chartered Institute of Personnel and Development  
151 The Broadway London SW19 1JQ United Kingdom  
**T** +44 (0)20 8612 6200 **F** +44 (0)20 8612 6201  
**E** [cipd@cipd.co.uk](mailto:cipd@cipd.co.uk) **W** [cipd.co.uk](http://cipd.co.uk)

Incorporated by Royal Charter  
Registered as a charity in England and Wales (1079797)  
Scotland (SC045154) and Ireland (20100827)

Issued: May 2020 Reference: 8021



© CEBMA 2020