doi: 10.36689/uhk/hed/2022-01-047 HED Hradec Economic Days

Management Methods for Global Virtual Teams - A Review of Current Literature and Directions for Future Research

Guangyan LUO

Wrocław University of Technology, Wrocław, Poland; pannyluo@gmail.com

Abstract: Global virtual teams, whose members are geographically dispersed across time, space and cultures have become increasingly prevalent as an organizational form in the modern industrial development, especially fueled by the unprecedented COVID pandemic conditions. To understand how to manage this unique organizational form to sustain and excel in the challenging business environment becomes extremely relevant and imperative. This paper conducted a systematic review of published literature on the findings from virtual team research in the past two decades (from 2001 to 2021) in an effort to shed light on the understanding of the management methods for global virtual teams. The review is organized around the variables repeatedly examined and verified by researchers in pursuit of the knowledge, then it classified the literature into different themes according to how to manage those variables on the purpose of understanding the methods to deal with them. Based upon the review, suggestions for further research that can guide future inquiry are proposed.

Keywords: virtual teams; management methods; systematic literature review

JEL Classification: M16; L23

1. Introduction

Globalization has been leading an accelerating path towards connectivity across geographical and time-zone boundaries. Commercial activities of today have no longer clear national hallmarks in all areas spanning from designing, developing, shipping, marketing, and sales. One of the building blocks of the success along the path is virtual team which has prevailed as a preferred form of organization due to its nature of less bond to physical proximity. The emergent need of this form was made prominent under the unprecedented COVID pandemic situation which made it an obligation rather than choice for many organizations (Kniffin et al., 2021). All these make the understanding of global virtual team and ways to optimize its operation imperative to researchers.

Global virtual teams

While existing studies on general teams may account for some of the description for a virtual team, however, there are essential differences that emphasize the need for a definition of its own. Driskell et al. defines virtual team as "a team or group whose members are mediated by time, distance, or technology." (2003, p. 297) A virtual team doesn't need to be a global one

when team members are from the same country, city, or even same building but with no or only limited physical contacts. Examples nowadays can be easily found under the COVID triggered workspace change when people who used to be working in the same office must work from home. Traditionally to collaborate with each other, members need to constantly communicate to exchange information and hinge upon all the work parts to form a whole. This need persists in global virtual teams but posts new challenges such as cultural differences, lack of collaboration history, time-zone differences etc. In addition, virtual setup on the one hand makes it possible to engage bigger variety of contributors holding particular skills, expertise, or information despite distance (Nydegger & Nydegger, 2010), but on the other hands limits the media for communications due to the absence of physical proximity. All of them add up to the complexity of global virtual teams that have drawn a large body of research.

Managing global virtual teams

As referred earlier, global virtual teams bring about significant challenges for companies and organizations. Many known challenges in traditional teams will be magnified in the virtual team context due to the organizational and process complexities. Management method is one of biggest (Malhotra et al., 2007). Existing studies suggest that teams with properly equipped skills in virtual setting is vital for business success. It necessitates a fresh inquiry into the role and nature of management methods in virtual settings (Hoch, 2014). Empirical studies revealed that management failure can cause team attrition, under-performing team members, lack of team spirit and crash of team goals (Malhotra et al., 2007).

One of the main challenges that leaders encounter in managing virtual teams is how to integrate business and information technology systems within organizations to fully leverage the potential of virtual teams. Global virtual team members face added complexity such as managing from distance, integrating members from different cultures, increasing flexibility to meet rapid technological changes, and particular facilitation skills with the help of technical tools. Transformational leadership is hypothesized to be the most suitable for managing virtual teams given the fast-changing environment and limited possibility of close task monitoring for traditional management transactions (Avolio et al., 2000; Bell & Kozlowski, 2002).

Given the goal to better understand management methods for global virtual teams, the research is structured as follows. The first chapter provides an overview of the primary subjects in question to form the conceptual basis for the study. Then I present an overview of the research methodology applied for conducting the systematic literature review, followed by sections that organize the selected literature centered around management methods for global virtual teams. Lastly, I summarize and discuss the findings and propose future studies that can advance our understanding of management methods for global virtual teams.

2. Methods

This study adopts the method for systematic literature review proposed by Kitchenham (2004) which can be summarized in three major steps:

Planning, during which researcher defines the research questions, laying out search strategy and determining the review protocol including inclusion and exclusion criteria.

Conducting, during which researcher applies the review protocol to find and review articles that can potentially answer the pre-defined research questions.

Reporting, during which researcher codes, validates and reports the review results.

The first two steps will be discussed in the current chapter in details, while the reporting step will be undertaken in the next chapter which codes the results by several themes.

2.1. Research Questions

This study aims to understand the examined management methods for virtual teams reported by empirical studies in the field or laboratory settings to address the following questions:

1. What are the main factors that can impact the performance of a global virtual team?
2. What are the management methods for the known factors in order to improve global virtual team performance?
3. What are the factors that are less studied which can be subjects for future research?

2.2. Literature Search Process

Multiple term-based searches were conducted based on the research questions to identify and in the attempt to exhaust potentially relevant publications. Google Scholar was used as the sole basis to look for articles that are relevant to selected terms since this search engine uses meta-search algorithm that returns results from all major scientific publication repositories. The first 10 pages of the research result were scanned to identify targeted articles. In addition, relevant keywords, citations, and bibliography in the collected articles were used to generate additional results. In the meanwhile, authors that have been prolific in writing about concerned subjects are further searched for collecting more articles. This results in 'snowballing' effect (Budgen et al., 2011) that can lead to the saturation of publications.

2.3. Inclusion and Exclusion Criteria

The following inclusion and exclusion criteria are applied to all the retrieved studies for selecting relevant primary studies to answer the research questions:

- Only publications between 2001 and 2021 are included.
- Only empirical studies that use methods such as case studies, surveys, experiments, and ethnographical studies are included.
- Studies which do not have implications that are relevant to management methods are excluded.
- Extended papers that are about the same topic but published in different journals are excluded.

Based on the inclusion and exclusion criteria as describe, 17 articles were excluded from the search results, leaving 39 articles for data synthesis and analysis.

2.4. Data Synthesis and Analysis

In order to answer the research questions, relevant content with sufficient details is extracted from the included search results including Author, Year, Title, Research Method, Independent and Dependent Variables, Finding, and Theory.

From the extraction, data is classified into several themes based on which the papers are matched accordingly.

Table 1. Previous research organized by themes

Themes	Publication
Temporal distance	Montoya-Weiss et al., 2001; Sarker & Sahay, 2002; Espinosa & Carmel, 2003; Holmstrom et al., 2006; Espinosa & Pickering, 2006; Lee & Sankey, 2007; Munkvold & Zigurs, 2007; Cummings et al., 2009
Spatial separation	Herbsleb et al., 2001; Sarker & Sahay, 2002; Gibson & Gibbs, 2006; Holmstrom et al., 2006; Espinosa et al., 2007; Nguyen et al., 2008; Cummings et al., 2009; Espinosa et al., 2014; Herbsleb, 2016
Communication technology	Lurey & Raisinghani, 2001; Kirkman et al., 2004; Gibson & Gibbs, 2006; Munkvold & Zigurs, 2007; Shachaf, 2008; Cummings et al., 2009; Pinjani & Palvia, 2013; Dossick et al., 2015; Brown et al., 2016; Zhu & Smith, 2019
Coordination and conflict management	Maznevski & Chudoba, 2000; Herbsleb et al., 2001; Lurey & Raisinghani, 2001; Montoya-Weiss et al., 2001; Ramesh & Dennis, 2002; Sarker & Sahay, 2002; Yates et al., 2003; Espinosa & Pickering, 2006; Espinosa et al., 2007; Herbsleb, 2016; Sánchez et al., 2018; Nordbäck & Espinosa, 2019
Trust	Jarvenpaa et al., 2004; Kotlarski & Oshri, 2005; Oertig & Buergi, 2006; Munkvold & Zigurs, 2007; Altschuller & Benbunan-Fich, 2010; Peñarroja et al., 2015 Lippert & Dulewicz, 2018; Davidavičienė et al., 2020
Cultural differences	Gibson & Gibbs, 2006; Holmstrom et al., 2006; Oertig & Buergi, 2006; Lee & Sankey, 2007; Munkvold & Zigurs, 2007; Shachaf, 2008; Lippert & Dulewicz, 2018; Davidavičienė et al., 2020; Kiely et al., 2021
Task (process, content, and distribution)	Munkvold & Zigurs, 2007; Sarker & Sarker, 2009; Bhat et al., 2017
Knowledge sharing	Hinds & Mortensen, 2005; Kotlarsky & Oshri, 2005; Espinosa et al., 2007; Draghici & Draghici, 2008; Xue et al., 2012; Pinjani & Palvia, 2013; Bhat et al., 2017

3. Results

3.1. Managing Temporal Distance

In terms of temporal distance or time difference as a key variable for determining the global virtual team performance, articles selected in the review spanned across 9 years. Temporal distance entails the form of asynchronous communication which greatly differs from the traditional synchronous communication wherein verbal and nonverbal can help regulate the flow of conversation. Lacking temporal coordination mechanism to clarify doubts and resolve misunderstandings can lead to severe conflicts. Montoya-Weiss et al. (2001) broke down the conflict management behaviors into 5 dimensions: Avoidance, Accommodation,

Competition, Collaboration and Compromise. They argued that temporal coordination mechanism could significantly weaken the negative effect of Avoidance and Compromise behaviors on virtual performance while having no moderation effect upon Accommodation, Competition and Collaboration (Montoya-Weiss et al., 2001). More of the negative effects of temporal distance was studied by Espinosa and Carmel (2003). They empirically found that time separation could affect planning of team interactions especially from the fact that timing mattered in time-separated contexts but not in only distance separation. Temporal boundaries are more difficult to cross with communication technologies than spatial boundaries (Cummings et al., 2009). Espinosa and Carmel (2003) proposed a mathematical model to calculate the vulnerability costs based on the degree of time separation which contributed to the quantification of the impact of temporal distance. From the aspect of managing the impact of temporal distance, Saker and Sahay (2002) argued that reducing friction of temporal distance required special attention to technical and social components, meanwhile, systematically developing a shared frame of reference and sense of mutuality could help deal with the communication complications. Holmstrom et al. (2006) revealed the same conclusion that temporal distance could be mitigated by deliberate planning of time overlaps, such as making time zone differences manageable by dividing work among a limited number of sites. Given all these challenges, can we state that virtual teams will be less efficient? Kelly and Sankey (2007) gave negative answer in their study and empirically showed that time, budget, and value delivery was evidently successful through virtual teams if effective coordination mechanism was in place. And such mechanism was summarized by Munkvold and Zigurs that "Swift-starting virtual teams need to structure their interaction from the onset, including introducing team members' background and discussing project goals and deliverables, defining roles and responsibilities, and setting milestones." (2007, p. 298)

3.2. Managing Spatial Separation

Spatial separation is the defining characteristic of virtual teams. Herbsleb et al. (2001) found that compared to same-site work, cross-site work took much longer, and required more people for work of equal size and complexity. They also revealed that delay in cross-site work and degree to which remote colleagues were perceived to help out when workloads were heavy were strongly related. Sarker and Sahay (2002) argued that reducing the friction of locational distance required attention to technical and social components in the form of a systematically developed framework of reference and sense of mutuality. In another empirical research (Gibson & Gibbs, 2006), creating a psychologically safe communication climate was shown effective in mitigating negative impact of spatial separation. Such climate as an organizational culture factor can be achieved by several means. Holmstrom et al. (2006) showed in their field case study that occasional face-to-face meetings for virtual teams could greatly contribute to it. Apart from it, Espinosa and colleagues (2007) in their in-depth interview-based field study noted that shared team knowledge in comparison to shared task knowledge could significantly alleviate the negative impact of geographic distance to coordination. Several studies (Nguyen et al., 2008; Herbsleb, 2016; Majchrzak et al., 2009)

have led us to believe that computer-mediated technology for synchronous and asynchronous communication plays a key role in achieving so.

3.3. Managing Communication Technology

The nature of virtual team determines that face-to-face communication is rare or even impossible which leads to the inevitable probing for alternative communication media and opens the gate of multitude of research on communication technology. Lurey and Raisinghani (2001) and Gibson and Gibbs's (2006) study showed similar stress on such internal group dynamics. Given all the computer-mediated communication media including e-mails, instant messaging applications, teleconferencing combined with audio and video e-meetings etc. (Shachaf, 2008), researchers still recommend occasional face-to-face meetings (Kirkman et al., 2004; Munkvold & Zigurs, 2007) when feasible as an effective means to compensate the negative side of virtuality. Pinjani and Palvia (2013) stressed the importance of the collaborative character of chosen technology, urging managers to select technology that promotes transparency and instant interactions. And Dossick et al. (2015) dissected and proved that the Messy talk communication style could satisfy the collaborative needs in virtual environment due to its flexible, informal and active characteristics. Furthermore, Brown et al. (2016) added into the technology profile the enablement of perceived identity communication which facilitates sense of continuity, coherence and mutual understanding. In 2019, Zhu and Smith (2019) examined the polychronic values with its moderating effect between communication technology and job satisfaction which further complete the epitome of ideal technology support for virtual teams.

3.4. Managing Coordination and Conflicts and Building Trust

The same as for traditional face-to-face teams, virtual teams won't be exempted from conflicts within team members, therefore it's important to understand how to coordinate the work in order to reduce clashes and build trust. Herbsleb et al. (2001) revealed that virtual teamwork took much longer time and requires more people for work of equal size and complexity compared with face-to-face work. And number of people involved in multi-site work remains a powerful predictor of delay (Herbsleb, 2016). This intertwined effect of size and complexity renders the difficulty of coordination and building trust. It was stronger in the early phase which effected one's trust in perception of team cohesiveness and later moderated relationships between communication and perceptual outcomes (Jarvenpaa et al., 2004). Altschuller and Benbunan-Fich (2010) argued that trust also mediated relation between virtual copresence and performance. In response to the challenge for establishing trust, Jarvenpaa et al. (2014) in their study promoted behaviors that conveyed enthusiasm, individual initiative, predictable communication patterns, substantive and timely response, and task-oriented leadership style to facilitate trust. Those promoted behaviors resonate with studies and suggestions from other researchers (Lurey & Raisinghani, 2001; Ramesh & Dennis, 2002) on strengthening social ties and relations while forming object-oriented team to avoid interpersonal clashes. Kotlarsky and Oshri (2005) stressed that human-related issues such as social ties and knowledge sharing were key to successful virtual teams especially

through rapport and transactive memory. Especially to swift-starting virtual teams, Munkvold and Zigurs (2007) recommended that the team needed to structure interaction from beginning, including introducing team members' background and competence, discussing project goals and deliverables, defining roles and responsibilities and setting milestones. Sánchez et al. (2018) suggested from their empirical study that team cross feedback was an effective intervention that guided members to reflect and learn, hence forming a stronger bond that fosters better cooperation. When it comes to intervention by leadership, Nordbäck and Espinosa (2019) suggested shared leadership through implicit and behavioral interventions to improve team effectiveness. And when intervention of feedback happens in a high climate of trust environment, team information process will be enhanced thus better learnings and cooperation effectiveness (Peñarroja et al., 2015).

3.5. Managing Cultural Differences

As a complex construct, culture has been studied broadly on many levels: international, national, regional, business, and organizational (Shachaf, 2008). But in the context of global virtual teams, what stands out from those levels as the most prominent is heterogeneity of national cultures of team members. Gibson and Gibbs (2006) concluded from their study that creating a psychologically safe communication climate served a powerful means to mitigate possible national cultural clashes. Another line of thoughts was examined by Holmstrom et al. (2006) that they postulated socio-cultural distance could be mitigated by formal and informal information sharing between participants. This conclusion was supported by Oertig and Buergi (2006) with additional emphasis that investment in language and intercultural training were also important for virtual team performance. Lee and Sankey (2007) revealed from their field interviews that there were doubts in real virtual teams whether ability of training could change inherent cultural style, however, the effect of simply being sensitive and build the cultural awareness were fundamental for successful virtual teams. An in-depth study by Lippert and Dulewicz (2018) showed that cultural differences in virtual teams would be dampened by the high-context and low-context communication styles which rendered different climate in teams such as directness and precision of information. This urges virtual team partitioners to adopt versatile methods in response to the high and low context members. Davidavičienė et al. (2020) took communication technology selection in the context of cultural differences and suggested media richness to adapt for different cultures, such as using content anonymity for collectivistic cultures. Kiely et al. (2021) postulated in their studies which were empirically verified that cultural differences negatively impact effectiveness of plans, formal and information mutual adjustments. This provides meaningful implications for better adaptation for team processes and tasks.

3.6. Managing Task and Knowledge Sharing

Among all the reviewed literature, two minor themes emerged in a few of the articles which are worth attention: task and knowledge sharing. The extent to which they have been studied seems to be much less than the other variables. Doubtlessly any type of focus will still

entail conflicts, but there are solutions provided. Hinds and Mortensen (2005) argued that shared context could moderate effect of distribution on task conflict while spontaneous communication would mitigate the distribution effect of both interpersonal and task conflicts.

When it comes to knowledge sharing, Espinosa et al. (2007) stated that virtual team members coordinated through team knowledge. Having shared team knowledge could fulfill the three distinct types of coordination needs – technical, temporal, and process and mitigated negative effect on coordination. Draghici and Draghici (2008) concluded similarly through their case study that knowledge sharing culture was crucial for virtual organizations. They went on to define phases for creating such culture: planning, organizing, leading and controlling. In specific, organization needs to generate knowledge through planning, to structure it through organizing, to encourage collaborative work through leading and to identify the increase in individual and organizational knowledge through controlling. In a study conducted by Bhat et al. (2017), empirical method was used to confirm the positive relation between team member task dependability, information sharing and virtual team effectiveness.

4. Discussion

The objective of this study is to understand how to manage global virtual teams. For the first two question it posted: what are the main factors that can impact the performance of a global virtual team? And what are the management methods for the known factors in order to improve global virtual team performance? They were answered through themes identified from the reviewed literature in Results chapter. One interesting finding is that several researches chose Adaptive structuration theory (DeSanctis & Poole, 1994) as basis for its adequate portrayal of the process by which technologies are adapted via structures, appropriations, and decision outcomes (Sarker & Sahay, 2002; Brown et al., 2016). Another prevalently used theory in the study of virtual teams is Media Richness theory (Daft & Lengel, 1986). The theory postulates that matching media characteristics with tasks can improve the information richness therefore is popularly cited in the context of coordination for time separation, spatial distance, and technology mediation (Ramesh & Dennis, 2002; Espinosa & Carmel, 2003; Shachaf, 2008). From the reviewed articles, many useful counteractions in the face of virtual team challenges were derived as described in the previous chapter. They offer valuable guidance to organizations especially under the acute COVID-19 circumstances.

The literature to date has successfully captured many variables that are related to virtual teams when each was examined extensively through empirical studies. Time distance, spatial separation and communication technology are the mostly discussed while cultural differences, task content and knowledge sharing seemed to still have vacancy to be filled (Cumming et al., 2009; Gibson & Gibbs, 2006). This provides answer to the third research question that future research is encouraged to explore more in these variables, furthermore, to design empirical methods that can incorporate more of the variables into the study model in order to provide a systematic view on global virtual teams.

5. Conclusion

This paper reviewed the literature on management methods for global virtual teams. When analyzing the literature, it is apparent that the research questions have been addressed by different researchers, setups, and aspects. The original aim of this article has been fulfilled, that is, to verify how much we know about managing virtual teams. The study is rigorously structured which first specify the concepts, then present a comprehensive list of issues that have been examined by research to date. The literature reviewed was categorized and synthesized into themes so as to provide easy reference and analysis of previous findings. Using themed methods illustrates well which variables play critical roles in managing virtual teams. These seven themes, which have good saturation of the subject in question are comprehensive. But through the systematic review and comparison, we could suggest gaps which are suitable for further exploration. I believe addressing these gaps has the potential to fill the void in our understanding of managing global virtual teams and spur both research and practice. It brings new opportunities to understand global virtual teams and the way to manage them better.

To summarize, global virtual team emerge as a new form of organization that offers unprecedented levels of flexibility and responsiveness which can potentially revolutionize our workplace. However, not being able to manage it properly to benefit from such advantages can cause more harm. Although this paper has made effort to systematically understand what we have known about it, extensive research is needed further to better the management of this unique form.

Conflict of interest: none

References

Altschuller, S., & Benbunan-Fich, R. (2010). Trust, performance, and the communication process in ad hoc decision-making virtual teams. *Journal of Computer-Mediated Communication*, *16*(1), 27-47. https://doi.org/10.1111/j.1083-6101.2010.01529.x

Avolio, B. J., Kahai, S., & Dodge, G. E. (2000). E-leadership: Implications for theory, research, and practice. *The leadership quarterly*, *11(4)*, 615-668. https://doi.org/10.1016/S1048-9843(00)00062-X

Bell, B. S., & Kozlowski, S. W. (2002). A typology of virtual teams: Implications for effective leadership. *Group & organization management*, *27*(1), 14-49. https://doi.org/10.1177/1059601102027001003

Bhat, S. K., Pande, N., & Ahuja, V. (2017). Virtual team effectiveness: An empirical study using SEM. *Procedia Computer Science*, *122*, 33-41. https://doi.org/10.1016/j.procs.2017.11.338

Brown, S. A., Thatcher, S. M., & Wilson, D. W. (2016, January). Measurement and outcomes of identity communication in virtual teams. In *2016 49th Hawaii International Conference on System Sciences (HICSS)* (pp. 888-897). IEEE. https://doi.org/10.1109/HICSS.2016.114

Budgen, D., Burn, A. J., Brereton, O. P., Kitchenham, B. A., & Pretorius, R. (2011). Empirical evidence about the UML: a systematic literature review. *Software: Practice and Experience, 41(4)*, 363-392. https://doi.org/10.1002/spe.1009

Cummings, J. N., Espinosa, J. A., & Pickering, C. K. (2009). Crossing spatial and temporal boundaries in globally distributed projects: A relational model of coordination delay. *Information Systems Research*, *20*(3), 420-439. https://doi.org/10.1287/isre.1090.0239

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management science*, *32*(5), 554-571. https://doi.org/10.1287/mnsc.32.5.554

Davidavičienė, V., Al Majzoub, K., & Meidute-Kavaliauskiene, I. (2020). Factors affecting knowledge sharing in virtual teams. *Sustainability*, *12*(17), 6917. https://doi.org/10.3390/su12176917

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization science*, *5*(2), 121-147. https://doi.org/10.1287/orsc.5.2.121

Dossick, C. S., Anderson, A., Azari, R., Iorio, J., Neff, G., & Taylor, J. E. (2015). Messy talk in virtual teams: Achieving knowledge synthesis through shared visualizations. *Journal of Management in Engineering*, *31*(1), A4014003. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000301

Draghici, A., & Draghici, G. (2008). Building a knowledge share culture in a virtual organization. Case Study for VRL-KCiP NoE. In *Methods and Tools for Effective Knowledge Life-Cycle-Management* (pp. 45-60). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-78431-9_3

Driskell, J. E., Radtke, P. H., & Salas, E. (2003). Virtual teams: Effects of technological mediation on team performance. *Group Dynamics: Theory, Research, and Practice*, *7*(4), 297. https://doi.org/10.1037/1089-2699.7.4.297

Espinosa, J. A., & Carmel, E. (2003). The impact of time separation on coordination in global software teams: a conceptual foundation. *Software Process: Improvement and Practice*, *8*(4), 249-266. https://doi.org/10.1002/spip.185

Espinosa, J. A., Lee, G., & DeLone, W. (2014). Global team boundary complexity: A social network perspective. In *2014 47th Hawaii International Conference on System Sciences* (pp. 321-330). IEEE. https://doi.org/10.1109/HICSS.2014.48

Espinosa, J. A., & Pickering, C. (2006). The effect of time separation on coordination processes and outcomes: A case study. In *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)* (Vol. 1, pp. 25b-25b). IEEE. https://doi.org/10.1109/HICSS.2006.463

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., & Herbsleb, J. D. (2007). Team knowledge and coordination in geographically distributed software development. *Journal of management information systems*, *24*(1), 135-169. https://doi.org/10.2753/MIS0742-1222240104

Gibson, C. B., & 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*, *51*(3), 451-495. https://doi.org/10.2189/asqu.51.3.451

Herbsleb, J. (2016). Building a socio-technical theory of coordination: why and how (outstanding research award). In *Proceedings of the 2016 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering* (pp. 2-10). https://doi.org/10.1145/2950290.2994160

Herbsleb, J. D., Mockus, A., Finholt, T. A., & Grinter, R. E. (2001). An empirical study of global software development: distance and speed. In *Proceedings of the 23rd International Conference on Software Engineering. ICSE 2001* (pp. 81-90). IEEE. https://doi.org/10.1109/ICSE.2001.919083

Hinds, P. J., & Mortensen, M. (2005). Understanding conflict in geographically distributed teams: The moderating effects of shared identity, shared context, and spontaneous communication. *Organization science*, *16*(3), 290-307. https://doi.org/10.1287/orsc.1050.0122

Hoch, J. E. (2014). Shared leadership, diversity, and information sharing in teams. *Journal of Managerial Psychology*, *29*(5), 541-564. https://doi.org/10.1108/JMP-02-2012-0053

Holmstrom, H., Conchúir, E. Ó., Agerfalk, J., & Fitzgerald, B. (2006). Global software development challenges: A case study on temporal, geographical and socio-cultural distance. In *2006 IEEE International Conference on Global Software Engineering (ICGSE'06)* (pp. 3-11). IEEE. https://doi.org/10.1109/ICGSE.2006.261210

Jarvenpaa, S. L., Shaw, T. R., & Staples, D. S. (2004). Toward contextualized theories of trust: The role of trust in global virtual teams. *Information systems research*, *15*(3), 250-267. https://doi.org/10.1287/isre.1040.0028

Kayworth, T. R., & Leidner, D. E. (2002). Leadership effectiveness in global virtual teams. *Journal of management information systems*, *18*(3), 7-40. https://doi.org/10.1080/07421222.2002.11045697

Kiely, G., Butler, T., & Finnegan, P. (2021). Global virtual teams coordination mechanisms: building theory from research in software development. *Behaviour & Information Technology*, 1-21. https://doi.org/10.1080/0144929X.2021.1909141

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of management journal*, *47*(2), 175-192. https://doi.org/10.5465/20159571

Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University*, *33(2004)*, 1-26.

Kotlarsky, J., & Oshri, I. (2005). Social ties, knowledge sharing and successful collaboration in globally distributed system development projects. *European Journal of Information Systems*, *14*(1), 37-48. https://doi.org/10.1057/palgrave.ejis.3000520

Kniffin, K. M., Narayanan, J., Anseel, F., Antonakis, J., Ashford, S. P., Bakker, A. B., ... & Vugt, M. V. (2021). COVID-19 and the workplace: Implications, issues, and insights for future research and action. *American Psychologist*, *76*(1), 63. https://doi.org/10.1037/amp0000716

Leidner, D. E., & Kayworth, T. (2006). A review of culture in information systems research: Toward a theory of information technology culture conflict. *MIS quarterly*, *30(2)*, 357-399. https://doi.org/10.2307/25148735

LePine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E., & Saul, J. R. (2008). A meta-analysis of teamwork processes: tests of a multidimensional model and relationships with team effectiveness criteria. *Personnel psychology*, *61(2)*, 273-307. https://doi.org/10.1111/j.1744-6570.2008.00114.x

Lippert, H., & Dulewicz, V. (2018). A profile of high-performing global virtual teams. *Team Performance Management: An International Journal*. https://doi.org/10.1108/TPM-09-2016-0040

Lurey, J. S., & Raisinghani, M. S. (2001). An empirical study of best practices in virtual teams. *Information & Management*, *38*(8), 523-544. https://doi.org/10.1016/S0378-7206(01)00074-X

Malhotra, A., Majchrzak, A., & Rosen, B. (2007). Leading virtual teams. *Academy of Management perspectives*, *21*(1), 60-70. https://doi.org/10.5465/amp.2007.24286164

Maznevski, M. L., & Chudoba, K. M. (2000). Bridging space over time: Global virtual team dynamics and effectiveness. *Organization science*, *11*(5), 473-492. https://doi.org/10.1287/orsc.11.5.473.15200

Montoya-Weiss, M. M., Massey, A. P., & Song, M. (2001). Getting it together: Temporal coordination and conflict management in global virtual teams. *Academy of management Journal*, *44*(6), 1251-1262. https://doi.org/10.2307/3069399

Munkvold, B. E., & Zigurs, I. (2007). Process and technology challenges in swift-starting virtual teams. *Information & Management*, *44*(3), 287-299. https://doi.org/10.1016/j.im.2007.01.002

Nguyen, T., Wolf, T., & Damian, D. (2008). Global software development and delay: Does distance still matter?. In *2008 IEEE International Conference on Global Software Engineering* (pp. 45-54). IEEE. https://doi.org/10.1109/ICGSE.2008.39

Nordbäck, E. S., & Espinosa, J. A. (2019). Effective coordination of shared leadership in global virtual teams. *Journal of Management Information Systems*, *36*(1), 321-350. https://doi.org/10.1080/07421222.2018.1558943

Nydegger, R., & Nydegger, L. (2010). Challenges in managing virtual teams. *Journal of Business & Economics Research (JBER)*, *8(3)*. https://doi.org/10.19030/jber.v8i3.690

Oertig, M., & Buergi, T. (2006). The challenges of managing cross-cultural virtual project teams. *Team Performance Management: An International Journal*. https://doi.org/10.1108/13527590610652774

Peñarroja, V., Orengo, V., Zornoza, A., Sánchez, J., & Ripoll, P. (2015). How team feedback and team trust influence information processing and learning in virtual teams: A moderated mediation model. *Computers in Human Behavior*, *48*, 9-16. https://doi.org/10.1016/j.chb.2015.01.034

Pinjani, P., & Palvia, P. (2013). Trust and knowledge sharing in diverse global virtual teams. *Information & Management*, *50(4)*, 144-153. https://doi.org/10.1016/j.im.2012.10.002

Ramesh, V., & Dennis, A. R. (2002). The object-oriented team: lessons for virtual teams from global software development. In *Proceedings of the 35th Annual Hawaii International Conference on System Sciences* (pp. 212-221). IEEE. https://doi.org/10.1109/HICSS.2002.993876

Rich, B. L., Lepine, J. A., & Crawford, E. R. (2010). Job engagement: Antecedents and effects on job performance. *Academy of management journal*, *53(3)*, 617-635. https://doi.org/10.5465/amj.2010.51468988

Sánchez, J., Zornoza, A., Orengo, V., Peñarroja, V., & Chamakiotis, P. (2018). Team Feedback Intervention and Team Learning in Virtual Teams: A Moderated Mediation Model of Team Cohesion and Personality. In *IFIP International Conference on Human Choice and Computers* (pp. 136-148). Springer, Cham. https://doi.org/10.1007/978-3-319-99605-9_10

Sarker, S., & Sahay, S. (2002). Information systems development by US-Norwegian virtual teams: Implications of time and space. In *Proceedings of the 35th Annual Hawaii International Conference on System Sciences* (pp. 10). IEEE. https://doi.org/10.1109/HICSS.2002.993875

Sarker, S., & Sarker, S. (2009). Exploring agility in distributed information systems development teams: An interpretive study in an offshoring context. *Information Systems Research*, *20*(3), 440-461. https://doi.org/10.1287/isre.1090.0241

Shachaf, P. (2008). Cultural diversity and information and communication technology impacts on global virtual teams: An exploratory study. *Information & Management*, *45*(2), 131-142. https://doi.org/10.1016/j.im.2007.12.003

Xue, Y., Liang, H., Hauser, R., & O'Hara, M. T. (2012). An empirical study of knowledge sharing intention within virtual teams. *International Journal of Knowledge Management (IJKM)*, *8*(3), 47-61. https://doi.org/10.4018/jkm.2012070103

Yates, J., Orlikowski, W. J., & Woerner, S. L. (2003). Virtual organizing: Using threads to coordinate distributed work. In *Proceedings of the 36th Annual Hawaii International Conference on System Sciences, 2003.* (pp. 10). IEEE. https://doi.org/10.1109/HICSS.2003.1174796

Zhu, Y., & Smith, S. A. (2019). Information and communication technology support for contextualization, polychronic values, and job satisfaction: Evidence from virtual teams. *International Journal of Business Communication*, 2329488419832075. https://doi.org/10.1177/2329488419832075