



Research Article

A Systematic Literature Review on Virtual Teams: Comparing Pre- and Post-pandemic Research

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Abstract

Virtual teams have increased over time due to globalization and advances in technology. With this article, we want to showcase the impact of the COVID-19 pandemic on the evolution of research in the field. To accomplish this aim, we continue the study presented in the article "Virtual Teams: Thematic Taxonomy, Constructs Model and Future Research Directions" prepared by Alaid, Alnsour and Alsharo, who researched virtual teams between the years 2007 and 2018. The systematic review of the literature was performed using the methodology proposed by Ramey and Rao, the same used in the aforementioned article. We applied inclusion and exclusion criteria after the initial data collection (n=996). The final sample of the articles analyzed was 18. We analyzed two types of categories, the constructs studied and their role in the empirical research. The most studied constructs after the pandemic are: cultural diversity, e-leadership, trust, performance, communication, social interaction, communication mediated by computer tools, and the adoption of virtual teams. We identified independent, dependent, moderating, and mediating variables. The wider number of dependent and independent variables demonstrates the expansion of the field of study. Moderation and mediation structures in research show that recent studies are more statistically sophisticated. These findings allowed for mapping the constructs, thus developing a conceptual model for virtual teams' research which can be a starting point for the academic community. We also analyzed recent years' papers according to the internal and external validity, and, based on the results, we provide suggestions for future research.

Keywords: Conceptual model; COVID-19 pandemic; Systematic literature review; Virtual teams

Introduction

Rapid technological advances supported the emergence of virtual teams (Batarseh et al., 2017). Virtual teams are defined as a group of individuals geographically dispersed who communicate through technology to perform the tasks of an organization, that is with a common goal (Hassett et al., 2018; Munkvold and Zigurs, 2007). Technology has been having a strong impact on people's personal lives and professionally, considering the growing number of people who use technological tools to interact with their co-workers (Raghuram et al., 2019).

When the COVID-19 pandemic outbreak hit, social distancing measures were put in place, and legislation was introduced that mandated the practice of telecommuting whenever possible. In this context, information and communication technologies enabled and generalized working anytime and anywhere (Contreras et al., 2020).

We aim at understanding how the COVID-19 pandemic has impacted virtual teams' research. To perform this objective, we continue the study started by Alaiad et al. (2019). We use the same methodology as the reference article and performed a results analysis of the recent years' research. We then compare the results obtained during the period from 2019 to 2021 to the data obtained from 2007 to 2018 in the reference article.

Theoretical framework

Compiling several authors' definitions of virtual teams, it was unanimous that teams are virtual when members are geographically dispersed and work through computer-mediated communication to achieve a common goal of the organization (Bell & Kozlowski, 2002; Beranek & Martz, 2005; Gibson & Gibbs, 2006; Handke et al., 2021; Jarvenpaa & Leidner, 1999; Krishnan, 2018; Martins et al., 2004).

Several advantages of working with VT are parallel to remote work: reduces the need to travel between locations and decreases costs concerning time, money and commuting stress (Kilcullen et al., 2021). At distance work, using VTs also allows companies to hire the best talent regardless of their geographic location (Kilcullen et al., 2021).

However, working virtually with other people, that is communicating through technological communication devices with other people, limits the understanding of the nuances of communication, namely nonverbal, which can create barriers. It also makes it harder to resolve misunderstandings and conflicts (Glikson & Erez, 2020).

Literature highlights several areas that have a substantial impact on performance: trust (Klonek et al., 2021), cohesion (Garro-Abarca et al., 2021), and e-leadership (Baughman, 2019).

Trust within teams is a very important topic because it is associated with better performance among fellow members and is, therefore, an important goal which will help them to succeed at their shared tasks (Klonek et al., 2021).

VT consist of a group of people that probably do not know each other personally, and who are in different geographical locations, and effective communication is needed to achieve the organization's goals (Handke et al., 2021). Team cohesion is a key element to achieving those goals (Garro-Abarca et al., 2021).

Leading VT presents unique challenges that are related to technological skills, new work patterns, decision styles, building relationships of trust and conflict management, as well as providing the cohesion that makes a set of people a team (Baughman, 2019).

The Role of the Pandemic in the Growth of Virtual Teams

The COVID-19 pandemic led to a mindset change making people more open to working remotely. To reduce the spread of the virus, organizations adopted remote work policies, even for employees who had never worked remotely before putting everyone working on VT (Contreras et al., 2020; Garro-Abarca et al., 2021). Thus, the emergence of the COVID-19 pandemic led to a widespread transition to telework, so organizations suddenly were having massive numbers of VT (Chamakiotis et al., 2021).

Although some organizations already used VT as a competitive differentiator, many others were not prepared for this format, but due to the

COVID-19 pandemic, they had to adapt, which accelerated the adoption of VT (de Almeida et al., 2021).

The pandemic seems to have normalized remote work and is seen as a logical work option by the population, forcing companies that want to attract talent to adapt. This explains the exponential growth of virtual teams (Peñarroja et al., 2020).

Methodology

In this article, the systematic review of the literature is used to extend the period of analysis from 2019 to 2021 of Alaiad et al. (2019) article, which studies virtual teams from 2007 to 2018. Thus, following the same structure, we divided the process into three phases: (1) review planning, (2) review performance and (3) data extraction and synthesis (Ramey and Rao, 2011).

Review planning

In review planning we identified the research questions and objectives, which are the issues to study.

The research question that grounds this study is: what was the COVID-19 impact on virtual teams' study?

To deal with this question, this study aims at (1) identifying the main constructs analyzed by VT research from 2019 to 2021, and (2) identifying the differences of constructs studies between the period from 2007 to 2018 to the period from 2019 to 2021.

Conducting the review

This is the research strategy, which refers to the description of the steps performed, that is, the choice of the database, the keywords and the selection rules that will be applied in the search, using the PRISMA (Preferred Reporting Items for Systematic Reviews & MetaAnalyses) model (Gunnell et al., 2022).

Web of Science database was used to collect the data, considering it is a well reputed database which covers quality scientific production within an academic field as sources for this review, as Alaiad et al. (2019).

The keywords used in the search are the following: virtual AND teams; virtual AND collaboration; distributed AND teams; computer-

mediated AND teams; virtual team AND collaboration; online AND group (Alaiad et al., 2019).

The inclusion criteria applied aimed at finding the same field as Alaiad et al. (2019), applying to the complementary covid and post-covid period: Studies from 2019 to 2021; Articles from scientific journals and conference proceedings; Books, book chapters, notes and technical reports were not included; English language; Only the "Business Economics" filter was included.

Data extraction and synthesis

This step of the systematic literature review refers to collecting and analyzing retrieved data (Alaiad et al., 2019; Ramey & Rao, 2011).

Data collection extracted 996 articles. After excluding the repetitions, 921 articles remained for the screening process.

Simultaneously and independently, two researchers read the title and abstract of the articles to decide about their inclusion in the study. When reading the abstract and title, whenever there were doubts about the inclusion, the article was signed as 'not yet decided' and analyzed in another moment. With this procedure, we aimed at avoiding excluding valuable research (Sampaio and Mancini, 2007). Both screenings were compared and, when they were not in agreement, a third researcher decided if the papers should be included in the study.

A last review to the full paper of the remaining 21 papers allowed to define the final paper list (n=18) and to fill an Excel sheet with the papers that constitute the *corpus* of this study (Figure 1).

A considerable number of papers were excluded from the final list (880 articles disregarded) in the title and abstract analysis due to not being within the topic that we aimed at in this study. Some of the topics that emerged in large numbers in data collection focused on software development, the perception of teachers/educators during the COVID-19 pandemic, and the perception of virtual teams in the world of online gaming. This happened because the keywords used were quite broad, and several topics emerged that were related to the keywords but not specifically related to the virtual teams' functioning in the organizational context.

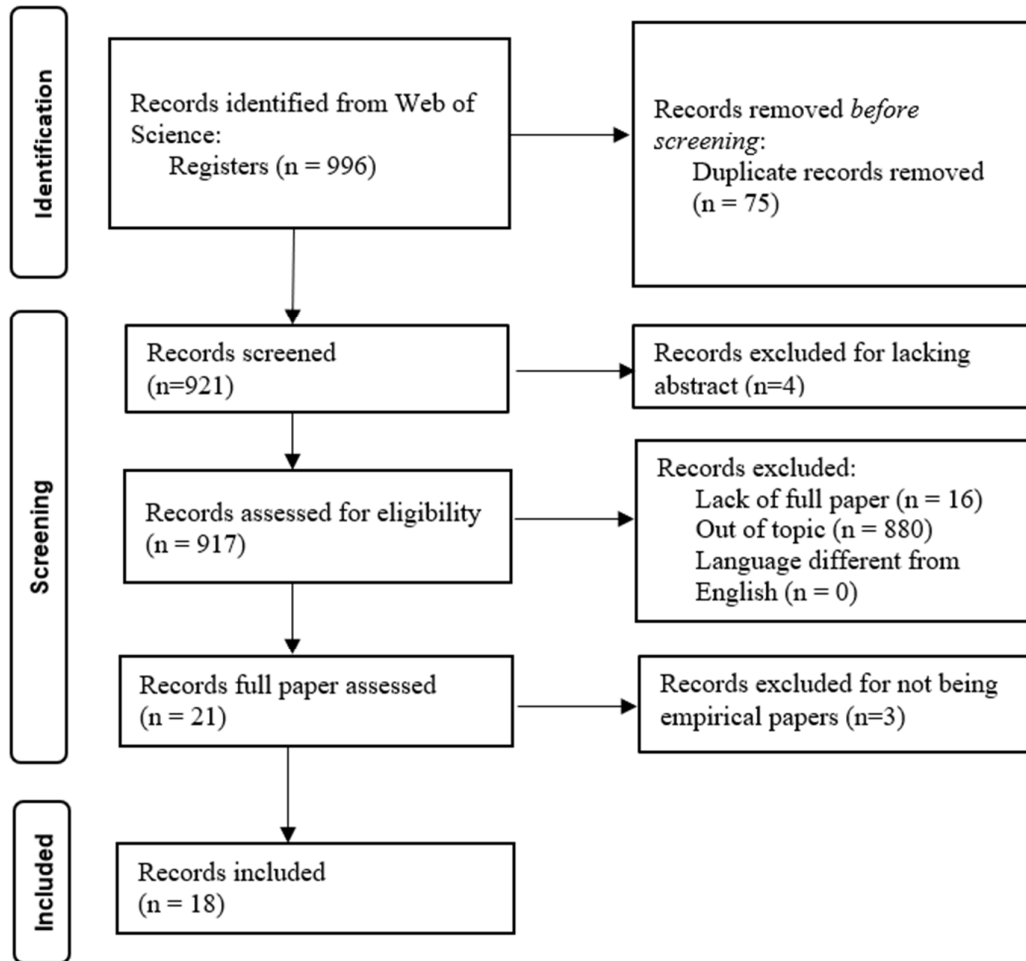


Figure 1: PRISMA diagram

To analyze the data, we organized them into categories. The introductory category collection briefly refers to a simple description of the documents: publication year, type of publication, and keywords. The following category grouping relates to study goals centered on the VTs research topics. To identify the VTs constructs studied between 2019 and 2021, we defined six categories: independent, dependent, moderator, mediator variables, variables assuming more than one type, and studies' methodological limitations. This allows analyzing the research, as well as comparing to Alaiad et al. (2019) study.

Business Research (Castellano et al., 2021; Richter et al., 2021), *Journal of International Management* (Jackowska and Luring, 2021; Taras et al., 2019), and *Team Performance Management: An International Journal* (Jaakson et al., 2019; Müller and Antoni, 2020). The most mentioned word in the papers' keywords was *teams* (n=8), *virtual teams*, *global teams*, *trust* and *team performance* were equally mentioned (n=4) (Figure 2). (Ben Sedrine et al., 2021; Castellano et al., 2021; Glikson and Erez, 2020; Han et al., 2020; Jaakson et al., 2019; Lin et al., 2019; Müller and Antoni, 2020)

Data Presentation and Analysis

The final *corpus* of analysis of this study includes 18 documents, with balanced publication years: six in 2019, eight in 2020, and seven in 2021. All 18 papers were published in academic journals. There are three journals that published two papers of this *corpus* under analysis: *Journal of*



Figure 2: Word cloud of the papers' keywords

Virtual Teams' Constructs Studied (2019-2021)

To analyze the constructs studied between 2019 and 2021, we categorized them according to their role in the empirical studies. Such categorization will later allow comparing to the previous period and enlightening this research regarding the evolution of the study on the VT topic during and after the COVID-19 pandemic.

Independent Variables

Among the 18 articles identified published between 2019 and 2021, 20 independent

variables were found, and categorized in 9 dimensions: personal characteristics, culture, leadership, dispersion, trust, communication, technology, performance, and training (Table 1).

Cultural intelligence was the most frequently studied independent variable (n=3). VTs bring together people from various cultures who have to interact with each other and collaborate towards a common goal; and for reasons like these, cultural intelligence has become increasingly important because it takes skill to understand and interact with other cultures (Mangla, 2021; Richter et al., 2021; Shaik et al., 2021).

Table 1: Independent variables and their dimensions

<i>Paper</i>	<i>Independent variables (frequency)</i>	<i>Dimensions of independent variables (frequency)</i>
(Mangla, 2021; Richter et al., 2021; Shaik et al., 2021)	Cultural Intelligence (n=3)	Culture (n=4)
(Velez-Calle et al., 2020)	Cultural Differences	
(Castellano et al., 2021)	Leadership Styles (Shared Leadership and Self-Leadership)	Leadership (n=3)
(Ben Sedrine et al., 2021)	Leadership Styles (transformational and transactional)	
(Lin et al., 2019)	Knowledge-oriented leadership	
(Jackowska and Luring, 2021)	Mobility	Dispersion (n=3)
(Han et al., 2020)	Geographical Dispersion	

(Mell et al., 2021)	Temporal Dispersion	
(Glikson and Erez, 2020)	Communication	Communication (n=3)
(Grözinger et al., 2020)	Online media	
(Kanagarajoo et al., 2019)	Media tools	
(Müller and Antoni, 2020)	Shared mental models in the use of ICT	Technology (n=2)
(Gilstrap, 2019)	Technology	
(Jaakson et al., 2019)	VT performance	Performance (n=2)
(Han et al., 2020)	VT formation	
(Cole et al., 2019)	Emotional Intelligence	
(Taras et al., 2019)	Personal Diversity	Personal Characteristics (n=2)
(Jaakson et al., 2019)	Trust	
		Trust (n=1)

Dependent Variables

Between 2019 and 2021 of the 18 articles identified, 17 dependent variables were studied, and there are 6 macro categories of these variables, namely: collaboration, trust, communication, leadership, contextual diversity, and performance (Table 2).

The dependent variable most studied in the articles under analysis was the one called VT performance (n=7), that is, there were 7 articles whose objective was to understand how to improve the team's performance based on different independent variables (Table 2).

Although the denomination "performance" appeared in 7 articles, there are additionally 7 other dependent variables in 6 articles that also refer to performance, but with other denominations, totalizing 13 articles, in the total of 18 articles under study. These variables that refer to performance and that have other designations are the following: creative performance of VTs (Grözinger et al., 2020), the effectiveness of VTs (Mangla, 2021), team effectiveness (perceptions of location and the use of knowledge) (Jackowska & Lauring, 2021), project management (Kanagarajoo et al., 2019), interaction and performance of VTs ((Richter et al., 2021) quantity and quality of work and the volume of work (Mell et al., 2021)

Table 22: Dependent variables and their dimensions

<i>Paper</i>	<i>Dependent variables (and frequency)</i>	<i>Dimensions of dependent variables (frequency)</i>
(Cole et al., 2019)	Team collaboration	Collaboration (n=2)
(Shaik et al., 2021)	Employee engagement/commitment	
(Jaakson et al., 2019)	Trust	Trust (n=2)
(Mell et al., 2021)	Integrative complexity at VT	
(Müller and Antoni, 2020)	Communication	Communication (n=1)
(Gilstrap, 2019)	Leadership	Leadership (n=2)
(Müller and Antoni, 2020)	VT Coordination	
(Taras et al., 2019)	Contextual Diversity	Contextual diversity (n=2)
(Velez-Calle et al., 2020)	Virtual Teams with Millennial Members	
(Castellano et al., 2021) (Ben Sedrine et al., 2021) (Glikson and Erez, 2020) (Jaakson et al., 2019) (Han et al., 2020) (Lin et al., 2019) (Müller and Antoni, 2020)	VT performance (n=7)	Performance (n=13)

(Grözinger et al., 2020)	Creative performance of VT	
(Mangla, 2021)	Effectiveness of VT	
(Jackowska and Luring, 2021)	Effectiveness of the team (perceptions of location and use of knowledge)	
(Kanagarajoo et al., 2019)	Project management	
(Richter et al., 2021)	VT interaction and performance	
(Mell et al., 2021)	Quantity and quality of work	
(Mell et al., 2021)	Workload	

Moderating Variables

Of the 18 articles analyzed, 16 of these articles do not have moderating variables (Ben Sedrine et al., 2021; Castellano et al., 2021; Cole et al., 2019; Gilstrap, 2019; Glikson and Erez, 2020; Grözinger et al., 2020; Han et al., 2020; Jaakson et al., 2019; Kanagarajoo et al., 2019; Lin et al., 2019; Mangla, 2021; Müller and Antoni, 2020; Richter et al., 2021; Shaik et al., 2021; Taras et al., 2019; Velez-Calle et al., 2020).

The moderating variable is a variable that affects the strength and direction of the relationship between the independent variable and the dependent variable (Vieira, 2009). From the analyzed articles, 4 moderating variables emerged, which are: personal context (Jackowska and Luring, 2021), coordination, workload, and integrative complexity in VT (Mell et al., 2021) (Table 3).

Table 33. Moderating Variables

<i>Article</i>	<i>Moderating variables</i>
(Mell et al., 2021)	Coordination
(Mell et al., 2021)	Workload
(Mell et al., 2021)	Integrative complexity in VT
(Jackowska and Luring, 2021)	Personal context

Mediating variables

In this study, in addition to the moderating variables, articles emerged that studied the mediation relationship, although there were no mediating variables in the reference article, we decided to include it in this study to become more complete.

The mediating variable exerts a relationship of influence between the independent and

dependent variables, to reduce the strength of the impact of the independent variable on the dependent variable (Vieira, 2009).

Of the 18 articles, 7 mediating variables emerged: SOAR (strengths, opportunities, aspirations, and results), trust, power and commitment, trust and operational cohesion, collective effectiveness of ICT, trust and effectiveness of the leadership role.

Table 4. Mediating variables

<i>Article</i>	<i>Mediating variables</i>
(Cole et al., 2019)	Strengths, opportunities, aspirations and results (SOAR)

(Ben Sedrine et al., 2021) (Castellano et al., 2021) (Jaakson et al., 2019)	Confidence
(Castellano et al., 2021)	Team power
(Castellano et al., 2021)	Commitment/Commitment
(Ben Sedrine et al., 2021)	Operational cohesion
(Lin et al., 2019)	Collective effectiveness of ICT
(Han et al., 2020)	Effectiveness of the leadership role

Variables that assume more than one type

Some variables have been studied as independent and dependent and/or intermediate. The trust variable emerges as a dependent variable, but also as an independent and mediating variable (Jaakson et al., 2019). In the same article, the performance variable appears as a dependent and independent variable. This article has several studies and for this reason, presents a complex approach to the

investigation of VT. The workload variable, in the article "Bridging Temporal Divides: Temporal Brokerage in Global Teams and Its Impact on Individual Performance," emerges as a moderating variable, and as a dependent variable (Mell et al., 2021). In the same article, the variable integrative complexity in VT appears as a dependent and moderating variable. This article, as well as the previous one, has several studies, presenting a complex approach to the investigation of VT.

Table 5. Variables that assume more than one type

Article	Independent variable	Dependent variable	Moderator variable	Mediator variable
(Jaakson et al., 2019)	Confidence	Confidence		Confidence
	Performance	Performance		
(Mell et al., 2021)		Workload	Workload	
		Integrative complexity in VT	Integrative complexity in VT	

Studies Methodological Limitations

The identified limitations compromise the *internal* and *external validity* of the studies under analysis.

Internal validity refers to the methodological rigor (data collection, sampling, control of variables, etc.) in a given study that impacts the validity of the results of that study (Ollaik and Ziller, 2012).

They used only one member of the group to analyze the team's behavior. Future research should use the team as a source for analyzing their behavior, not just one member (Cole et al. 2019).

There was no control over the degree of virtuality, and, as some of the team members were from the same country, they may have decided to perform the tasks face-to-face, which may have affected the results obtained (Jaakson et al. 2019).

They used a sample consisting of individual data rather than data from a team to study the shared mental models in ICT use (Müller and Antoni 2020).

Leadership styles and team performance are assessed through self-declarations which is a gap as it leads to the bias of results since participants may underestimate or minimize the actual performance of VTs (Castellano et al., 2021).

External validity refers to the ability to generalize the results of the study and verify that the results are true and reliable (Ollaik and Ziller, 2012).

The samples of the various studies conducted are composed of VT of university students and management/business students from various countries, which makes it difficult to generalize the data because there is variation in the types of cultural school systems and technological environments in which students live (Velez-Calle et al., 2020).

The sample was obtained from Danish organizations which can cause bias in the data because Denmark is a technologically developed country when compared to many other countries. In addition, in Danish companies, work-life balance is important, which can influence how work from home is viewed (Jackowska and Lauring, 2021). Therefore, results cannot be generalized.

Shaik et al. (2021) study is limited to a single organization and four project VTs, through interpretive analysis of surveys, and for this reason, the relationship between cultural intelligence and employee engagement is not generalizable to either the organization or to the general population.

Construct model: comparison between the two periods of analysis

The comparative analysis of the data collected in the guiding study of this work (Alaiad et al., 2019) allows us to perceive the evolution of the constructs that were studied in the scope of VT.

The comparison between the two studies identified many variables that were not

recognized in previous studies, that is, the focus of the study of VT is changing.

The variables that appear in both studies are underlined in pink. The variables that appear only in the 2019-2021 study are underlined in blue.

The **independent variables** that are being studied since 2007, that is, appear in both periods' (2007-2018 and 2019-2021) studies, are: communication, trust, culture, technology, leadership, and training and dispersion.

The **independent variables** most studied in the reference article were communication and trust. In this study, the most studied independent variable was cultural intelligence (Mangla, 2021; Richter et al., 2021; Shaik et al., 2021) which emerged more recently and was not mentioned in the baseline study (Alaiad et al., 2019).

The **dependent variables** researched in both periods are: collaboration, coordination, trust, performance, VT interaction and VT efficacy. Performance was the most studied **dependent** variable in the base article, which means that, over time, it remains the most frequent interest in studies on VT.

More moderating variables were reported from the reference article than in this study and there are no common moderating variables. In this study, only 4 moderating variables appeared in comparison with the reference article, 16 variables appeared, and no common moderating variables were obtained. In this study, 7 **mediating variables emerged**, but they were not included in the reference article.

Table 6. Virtual teams' research constructs conceptual model

<i>Independent Variables Dimensions</i>	<i>Moderator variables</i>	<i>Dependent Variables Dimensions</i>
<i>Communication</i>	Coordination	<i>Communication</i>
<i>Dispersion</i>	Workload	<i>Leadership</i>
<i>Performance</i>	Integrative complexity in VT	<i>Performance</i>
<i>Technology</i>	Personal context	<i>Trust</i>
<i>Trust</i>	<i>Mediator variables</i>	Collaboration
Culture	Confidence	Contextual diversity
Leadership	Team power	
Personal Characteristics	Commitment/Commitment	
	Operational cohesion	
	Collective effectiveness of ICT	
	Effectiveness of the leadership role	

	Strengths, opportunities, aspirations and results (SOAR)	
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Caption: *Variables that appear in both studies (2007-2018 & 2019-2021)*

Variables that appear only in the 2019-2021 study

Source: Authors' own elaboration, based on the variables identified in the research on VT between 2019 and 2021

(for detailed variables and their dimensions see Appendix 1)

Conclusion

With this paper, our goal is gaining insight into the effects of the COVID-19 pandemic on research conducted on virtual teams. Building on the study conducted by Alaiad et al. (2019), focusing on the period between 2007 and 2018, we've employed the same systematic literature review methodology and analyzed the research in the following years (2019 to 2021). We then characterize the research on VT performed in these recent years and, finally, compare the findings of the research of both periods, analyzing the evolution of the research on the field.

The systematic literature review began with 996 retrieved articles applying the inclusion criteria. The deeper analysis in the subsequent steps of the process filtered to 18 articles, which constitute the *corpus* of the study of VTs between 2019 and 2021.

To be able to compare to the reference study and draw an evolution line, we defined the type of variables as the core analysis of the papers: independent, dependent, moderators, mediators, and variables that assume more than one type. This study's findings offer a conceptual model that synthesizes the key constructs utilized in recent research on virtual teams. The model's simplicity, based on the dimensions of the constructs, offers an advantage as it also highlights the original variables in case further details are needed.

This paper is centered around a study on virtual teams, which was recently published in the field of business research. The study uncovered that, even though virtual teams have yet to be fully explored in the business field, the pandemic has had a beneficial impact on research in this area.

Virtual teams seem to be still under-studied among management and business research, since in the three years when working based on technology increased exponentially, and, with them, virtual teams constituted by inexperienced people the research on the business field did not focus much on the topic, since only 18 empirical studies were published, distributed in an even

way throughout the three years under study. It could be expected to have much more.

Even being published in reputable academic journals, indexed by the Web of Knowledge database, studies displayed some methodological limitations referring to internal validity, that is the methodological rigor compromising the validity of the results of the study, and external validity, compromising the generalization of the results. This kind of flaws appears in underdeveloped fields of research.

After the pandemic, a wider range of independent and dependent variables emerged when researching VTs. Additionally, between 2019 and 2021, the studies on VT that we analyzed incorporated more moderating variables than those reported in the reference article. Notably, there were no common moderating variables across the studies. Moreover, our research identified the emergence of mediating variables, which further enriched the conceptual model. These findings suggest that the field of VT is evolving towards more complex studies and a deeper understanding of the processes involved in virtual teamwork.

By providing a clear and comprehensive overview of virtual teams' functioning, the conceptual model presented in this study can serve as a valuable framework for future studies in this area for researchers and a useful guide for practitioners alike.

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Appendix 1. Conceptual model of Virtual teams’ research

Independent variables and its categories	Moderating variables	Dependent variables and its categories
Culture	Coordination	Collaboration
Cultural Intelligence	Workload	Team collaboration
Cultural Differences	Integrative complexity in VT	Employee engagement/commitment
Leadership	Personal context	Trust
Leadership Styles (Shared Leadership and Self-Leadership)	Mediating variables	Trust
Leadership Styles (transformational and transactional)	SOAR (Strengths, opportunities, aspirations and results)	Integrative complexity at VT
Knowledge-oriented leadership	Confidence	Communication
Dispersion	Team power	Communication
Mobility	Commitment/Commitment	Leadership
Geographical Dispersion	Operational cohesion	Leadership
Temporal Dispersion	Collective effectiveness of ICT	VT Coordination
Communication	Effectiveness of the leadership role	Contextual diversity
Communication		Contextual Diversity
Online media		Virtual Teams with Millennial Members
Media tools		Performance
Technology		VT performance
Shared mental models in the use of ICT		Creative performance of VT
Technology		Effectiveness of VT

Performance
VT performance
VT formation
Personal Characteristics
Emotional Intelligence
Personal Diversity
Trust
Trust

Effectiveness of the team (perceptions of location and use of knowledge)
Project management
VT interaction and performance
Quantity and quality of work
Workload

Caption:

Variables that appear in both studies
Variables that appear only in the 2019-2021 study
Name of the dimension

Source: Own elaboration, based on the variables identified in the research on VT between 2019 and 2021