
Virtual Teams in The University: A Critical Literature Review and A Research Agenda

F. Javier Miranda¹ , Antonio Chamorro-Mera^{1*} 

¹ Department of Business Management and Sociology, Faculty of Economics and Business Administration, University of Extremadura, Spain

* Corresponding author: chamorro@unex.es

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Abstract: The incentives for the internationalization of universities and the digitalization of teaching driven by the situation of COVID-19 have increased the operation of virtual work teams in higher education institutions, both in terms of groups of students and groups of researchers. The objective of this study is to explore the evolution of academic research concerning virtual teams within university settings, aiming to delineate prominent research trajectories and outline a prospective agenda for future inquiry in this domain. This work involved a systematic review of the literature in the WoS and Scopus databases to identify what, when, who, where and how virtual teams in universities have been researched. The PRISMA method was used to guide the data collection process. Forty-seven articles were identified as relevant for analysis. Despite the significant development of academic research on virtual teams since the end of the last century, the necessary attention has still not been given to the specific case of virtual teams in universities. Most of the research has been conducted in the United States; however, previous research reveals that cultural aspects are relevant variables in the performance and efficiency of virtual teams, so it is advisable to extend this type of research to other countries and cultural contexts. In addition, we can also see that most of the works identified have analysed work teams formed by students, and there are very few studies on virtual teams of researchers, despite the importance of these teams in the context of encouraging the internationalization of research networks. Moreover, the review of the content of the articles as well as the future lines of research have been organized around a life cycle model, considering three categories: inputs, operating process and outputs-results. The second category is the most developed to date.

Keywords: collaborative technologies; COVID-19; higher education; research team; work team.

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1. Introduction. Globalization and the spectacular development of information technologies have changed radically over the last three decades in terms of the way organisations are structured and perform their productive and commercial activities. For example, Nesterenko et al. (2023) and Zadorozhnyi et al. (2023) assess the significant changes that the digital age revolution has brought about in marketing, communication and advertising. One of the most affected organisational aspects relates to the training and operation of work teams. Therefore, the structures involving permanent work teams with participants who work in the same facilities or, alternatively, who travel to meet in person have given way to temporary virtual teams created specifically to run a certain project. These virtual teams can involve people working in very geographically dispersed locations but sharing materials and documents through computing tools and meetings through video conferencing.

1) The academic literature contains many definitions of the concept of the virtual team (Kustiyono et al., 2022). Our definition of a virtual team is a group of individuals who work independently from different geographical locations but who share responsibility for achieving a certain outcome, use technology to facilitate communication between the different members and share working materials and documents. Collaborative software and digital tools have broken down the barriers that used to require members of a team to be in the same location. Commonly, technology tools for virtual teams are classified into three categories: (1) technologies that help us access information from any location (e.g., Google Drive or One Drive);

2) Technologies that allow us to be in constant communication regardless of where we are (e.g., different types of videoconferencing software);

3) Collaboration or collaborative technologies that allow us to take advantage of talent through collaboration (e.g., teams, Trello, etc.).

It should be noted that participants of a virtual team do not need to be separated by large distances in the style of multinational companies with offices in different countries. In contrast, there may be members of teams in different cities in the same country or even in different offices in the same city or building. In addition, being separated in time does not only mean working in different time zones. It could also mean working on a shared project at different moments, or in other words, the work being performed asynchronously, with some members of the team working on it at one point of the day or week and others at a different point.

Since the COVID-19 pandemic, organisations have accelerated this innovative adoption process, and many have chosen to have teams working virtually. Initially, there was a need to create virtual teams (or transform traditional teams into virtual teams) due to the home-confinement measures and mobility restrictions imposed in almost all countries. Subsequently, working in virtual teams has been voluntarily introduced in many organisations. In our view, this process has been boosted by less expensive access to the technologies that allow for collaborative synchronous and asynchronous working, by the growth in the number of suppliers of these technologies and, especially, by the reduction in the perceived risks and fears about changing the way we work. The question is whether the effectiveness and satisfaction level of these new work teams are better than those of traditional teams, as well as the type of organizations and specific conditions under which virtual teams work best.

This is the background of our research, which focuses on universities and other higher education institutions, such as business schools. These organisations have very specific characteristics. One of the characteristics of universities is that virtual teams can have members who are managers, academics and researchers; who are students; or even a mixture of the two. Second, there has been growth in the number of universities and online qualifications where students must work collaboratively with other students and even with the teaching staff. Third, another characteristic of universities is that the research activity they perform implies that academics develop research networks with other universities to allow them to exchange knowledge and work together. A focus on the internationalization of universities and the use of this factor as an indicator in establishing rankings of university quality have further boosted the creation of virtual work teams. The Best Global Universities Ranking, U-Multirank, CWTS-LEIDEN Ranking, Scimago Institutions Ranking and Times Higher Education World University Ranking are some examples where the number of international collaborations in joint publications is used as an indicator to calculate the final position of the institution.

Therefore, universities have not been an exception in this process of adapting the work of conventional teams to the virtual world. We can define a virtual university team as a group of academics, researchers and/or students who come together in a permanent or temporary way to complete a research, teaching or management project in the institution, using collaborative virtual working technologies as the main method of organization and communication.

Within the extensive literature on virtual teams (Morrison-Smith and Ruiz, 2020; Scott & Wildman, 2015; Ebrahim et al., 2009; Powell et al., 2004), the objective of this study is to trace the progression of research on virtual teams in university contexts, aiming to discern predominant research paths and outline a prospective research agenda in this area. To do this, we performed a systematic review of the academic literature. This type of bibliographical review follows a transparent, replicable and systematic methodology that contributes to the literature, summarizing it and contributing new ideas for future research. This bibliographical search was performed using the leading databases for academic journals and allows for the identification of the most important articles published on this research topic. In this way, we can find answers to the three research questions:

Research question 1: What are the main features of current research on virtual teams in university settings? the current studies on virtual teams within university settings? Once we have identified the most important articles on the research topic, we can generate descriptive statistics on their main characteristics. These include the year of publication, authors, country where the research was performed, type of research and main statistical techniques used. By identifying the evolution of this type of publication over time, we can answer the question of whether research on virtual teams increased after COVID-19.

Research question 2: What are the emerging topics in the relevant literature? Through an analysis of content, the key topics addressed in the articles identified on the research topic were extracted. It also allows us to determine how the different units or subjects of analysis, the work teams of students or academics, have been analysed.

Research question 3: What research gaps exist, and what are the potential research questions that offer new paths for future research? A brainstorming session between the authors of this work was performed to identify topics that have already been addressed in the literature on virtual work teams but not yet addressed in the field of university virtual teams and are considered relevant.

Thus, we make three contributions. First, we contribute to the academic literature on virtual research teams by spotlighting the growing interest among researchers in this type of team in the university setting. Second, we also compile prevailing findings while recognizing the array of methodologies employed to explore this captivating research subject. Finally, our review provides emerging topics that enable the establishment of a future research agenda.

2. Methodology and research methods. A systematic literature review has been conducted to identify and analyse previously published research articles on the topic of interest (Webster & Watson, 2002; Us & Gerulaitiene, 2023). Specifically, the PRISMA method has been used to guide the data collection process (Page et al., 2021).

Our first decision was to focus on two high-impact journal databases: the Web of Science Core Collection (WoS) and Scopus databases. These are the two databases most commonly used in leading university rankings. WoS, produced by Clarivate Analytics, covers over 30,000 journals. Renowned for its comprehensive citation data, WoS is frequently utilized by academic libraries as a primary research tool. Scopus is an abstract and citation database produced by the company Elsevier that includes approximately 24,500 serial publication titles from more than 5,000 publishers in 140 countries.

Table 1 shows the eligibility and exclusion criteria established for this bibliographical review: (a) only journal articles were considered; (b) only English language publications were considered; and (c) articles whose main research objective relates to virtual teams in universities were exclusively selected.

Table 1. Inclusion and exclusion criteria

Criterion	Eligibility	Exclusion
Document type	Journal articles including case studies	Conference reports and chapter from books
Language	English	Non-English
Focus of study	Virtual research teams in universities	Other

Sources: developed by the authors.

The systematic review process took place during February 2023 and involved four stages: identification of articles, sifting of articles, and eligibility and analysis of content. For the article identification stage, the first step consisted of choosing the keywords to use in the search engines of the two abovementioned databases. Specifically, the decision was made to combine two key expressions into a single chain: "virtual research teams" AND "university". We were aware that using a single search chain would return a very high number of results and would therefore require a longer and more complex sifting process, but it would also reduce the

risk of failing to identify any relevant articles. With this search chain, a total of 225 records in WOS and 291 in Scopus were obtained. The sifting process resulted in the exclusion of 195 records, in many cases because the same article had been found twice. Subsequently, during the eligibility phase, an additional 274 articles were excluded because they only tangentially addressed the concept of virtual university teams. Ultimately, we retained 47 studies that closely focused on this research topic. Figure 1 depicts the PRISMA flowchart used in this review, following the advice of Xiao & Watson (2019).

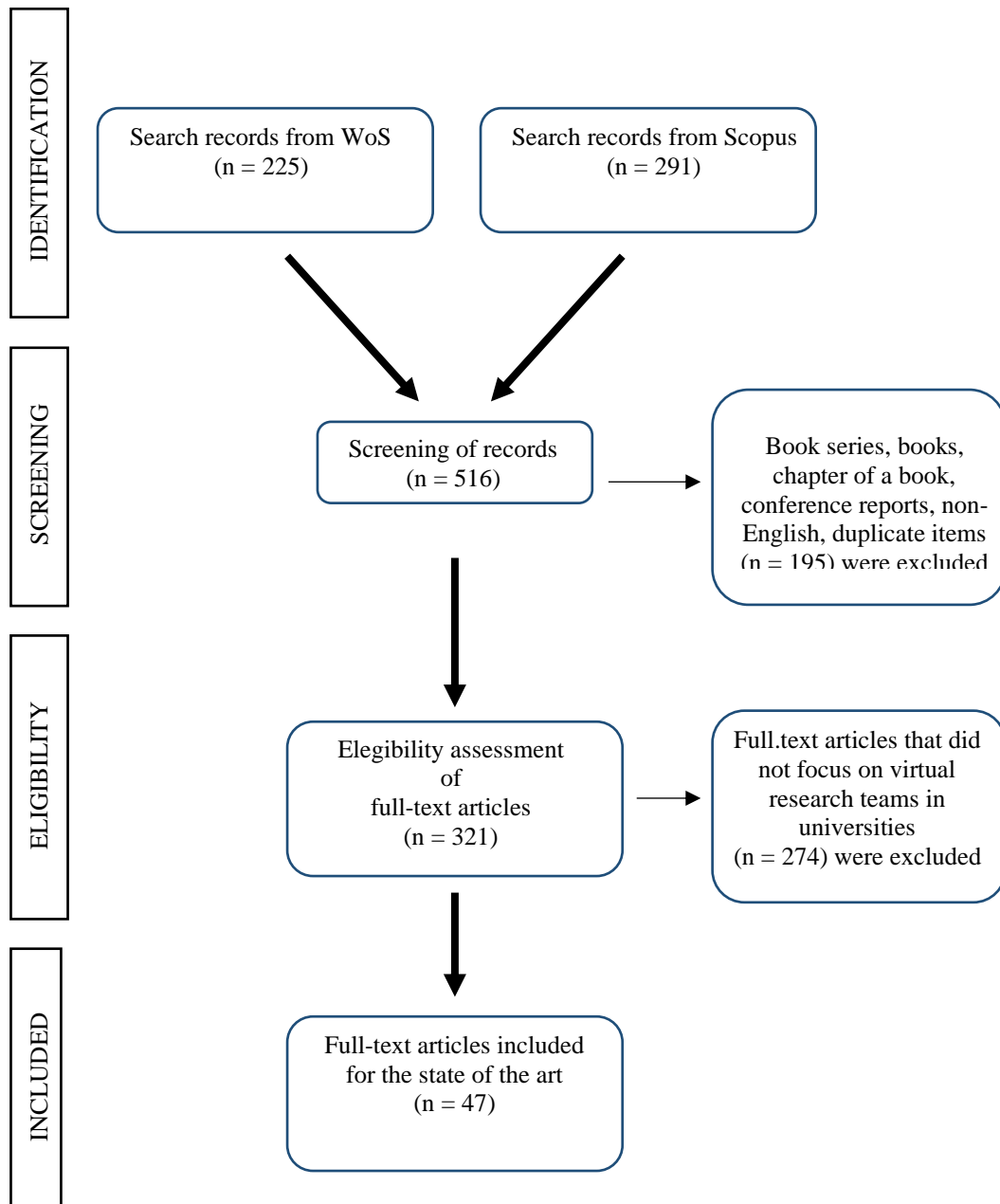


Figure 1. Study flowchart

Sources: developed by the authors.

A descriptive analysis was employed to synthesize the findings from the 47 selected articles and address the initial research question. Subsequently, content analysis was utilized to address the second and third research questions. In content analysis, data from each primary study are categorized under broad topics before examining the occurrences of each topic (Dixon-Woods et al., 2005). Initially, abstracts were scrutinized, followed by a thorough analysis of the full texts to extract pertinent data for addressing the research inquiries.

Each author independently conducted the analysis, and the results were compared and discussed collectively before the various sections of the paper were jointly drafted.

3. Results. The distribution of the 47 articles according to year of publication is shown in Figure 2. Despite virtual work teams becoming popular because of the COVID-19 pandemic, we can see that this research topic has been around for approximately two decades. Specifically, the first article focusing on virtual teams in universities was published in 1998 (Sengupta & Zhao, 1998). Since then, the number of articles has increased notably. This finding reinforces the importance this research topic will have over the next few years. Of the publications, 66% have been published since 2010, and 53.2% are from 2013-2022. An additional nine articles appeared between 2021 and 2022, or in other words, after the onset of COVID-19.

The 47 articles were published in 37 academic journals, the leading two in terms of the number of articles published being IEEE Transactions on Professional Communication (6) and Small Group Research (4). The articles are well distributed across four types of journals: those specific to education, those specific to technology and information systems, those looking at management and administration and, finally, a fourth type of journal whose editorial focus combines technology and education (such as Education and Information Technology, Technology, Pedagogy and Education and the British Journal of Educational Technology).

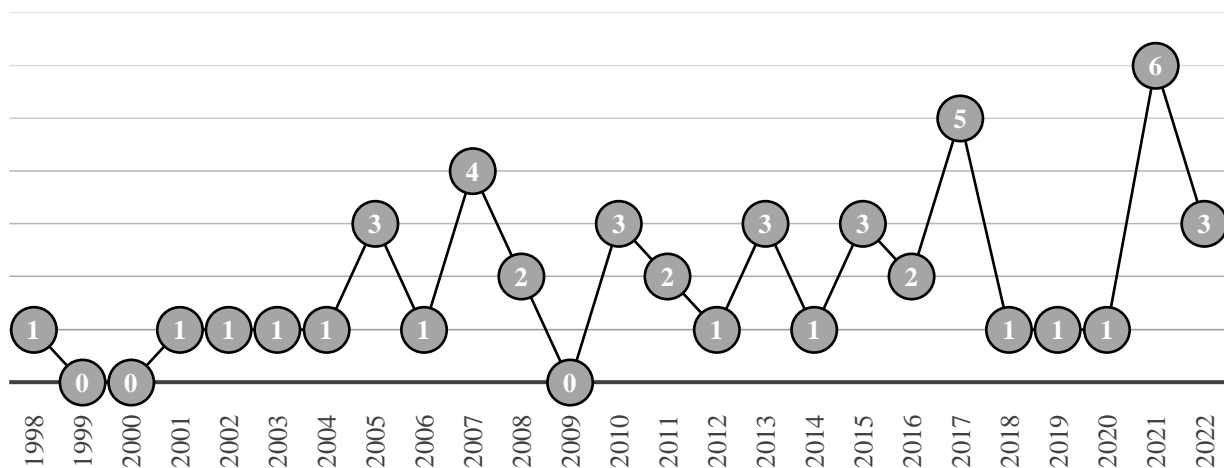


Figure 2. Number of publications per year
Sources: developed by the authors.

In relation to the main researchers, the ranking of the authors is in terms of the number of articles (see Table 2). With three publications each, Professors Mark A. Fuller (Washington State University, USA) and Andrew M. Hardin (College of William and Mary, USA) are the most prolific. With two publications, they were followed by the professors Jolanta Aritz (University of Southern California, USA), Dan V. Caprar (University of South Wales, UK), Vas Taras (University of North Carolina, USA), Robert M. Davison (University of Hong Kong, China), Niki Panteli (University of Bath, UK), Tiko Iyamu (Cape Peninsula University of Technology, South Africa) and Alanah Mitchell (Appalachian State University, USA). Some of these leading authors in this field have shared authorship in several publications.

Table 2. Top 10 authors

Author	Number of publications
Fuller, M.	3
Hardin, A.	3
Aritz, J.	2
Caprar, D. V.	2
Davison, E.	2
Iyamu, T.	2
Mitchell, A.	2
Panteli, N.	2
Taras, V.	2

Sources: developed by the authors.

In relation to the subject analysed, most articles reviewed analyse work teams formed by students, with only 10.6% of the works analysing the operation of virtual teams formed by academics (Sengupta & Zhao, 1998; Rasters et al., 2002; Laterza et al., 2007; Iyamu & Adalakun, 2021; Kustiyono et al., 2022).

4. Content analysis. Following previous works on virtual teams, a review of the content of the articles was organized around a life cycle model (Powell et al., 2004; Morrison-Smith & Ruiz, 2020). This approach considers three categories of content according to the stage of life of the work team being investigated: inputs, operating process and outputs or results. In Table 4, the 47 articles analysed are classified based on two dimensions: their main content (inputs, processes, and results) and the subjects being analysed (academics or students).

Table 4. Classification of articles on virtual teams in universities

	Inputs	Operating processes	Results
Academics and researchers		Sengupta & Zhao (1998) Laterza et al. (2007) Iyamu & Adalakun (2021) Kustiyono et al. (2022)	Rasters et al. (2002)
Students	Dineen (2005) Panteli & Davison (2005) Hardin et al. (2007) Olson-Buchanan et al. (2007) Gloor et al. (2008) Altschuller & Benbunan-Fich (2010) Ortega et al. (2010) Gilson et al. (2013) Cheng et al. (2016) Kesner et al. (2017) Li et al. (2017) Mitchell & Zygurs (2017) Petrovskaya & Shaposhnikov (2020) Dinca et al. (2021) Logemann et al. (2022)	Kayworth & Leidner (2002) Huang et al. (2003) Piccoli et al. (2004) Walther & Bunz (2005) Hardin et al. (2006) Kanawattanachai & Yoo (2007) Flammia et al. (2010) Pridmore & Phillips- Anderson (2011) Iorio et al. (2011) Wren (2011) Ayoko et al. (2012) Weimann et al. (2013) Gonzalez-Perez et al. (2014) Brewer et al. (2015) Soetanto et al. (2015) Killingsworth et al. (2016) Aritz et al. (2017) Davison et al. (2017) Mutudi & Iyamu (2018) Gomes de Siqueira et al. (2021) Ramalingam, 2021) Stoica et al. (2021) Zaharie (2021) Ismailov & Laurier (2022)	Gloor et al. (2008) Kanawattanachai & Yoo (2007) Panteli & Davison (2005) Nath et al. (2008) Taras et al. (2013) Hu (2015) Vanichvatana (2019)

Sources: developed by the authors.

The first category of content (**inputs**) includes articles focused on analysing the characteristics of the design and composition of virtual teams, as well as their skills and resources. Following the work of Powell et al. (2004), we have grouped previous research into the subcategories of the design of the structure and composition of the team, cultural differences, and technical/training knowledge. This category of articles represents approximately one-third of all articles identified on university virtual teams and is distributed more or less continuously from 2005 to 2022, so it can be considered a live line of research. Additionally, 100% of the articles grouped into this category had teams of students as the subject of analysis. No studies examining teams of academics or researchers were found.

The **design of the virtual team**, especially at the beginning of the team's life, influences the development of the shared language used by its members. The right composition of a virtual team is another of the key factors in achieving effectiveness in the development of a project. Gloor et al. (2008) use the social media analysis methodology to analyse the dynamics of relationships in virtual teams and their relationships with individual and team effectiveness in the performance of their tasks. Moreover, Panteli & Davison (2005) demonstrated that the appearance of subgroups within virtual teams does not always have a negative impact on team results. Another important issue relates to whether it is preferable for the members of virtual teams

to always be the same (stable teams) or to involve some rotation (fluid teams). Dineen (2005) showed that "team cohesiveness and social loafing behaviour were lower in fluid teams than in stable teams". Finally, research has also been conducted on the influence that members feeling that they belong to the team has on its effectiveness. Logemann et al. (2022) show that teams classified as "high-belonging teams" have greater levels of inclusion, which makes them more resilient in the face of problems.

On the other hand, **cultural differences** among participants have been analysed in several articles, as these differences can cause difficulties in coordination and effective communication. Hardin et al. (2007) concluded that, regardless of the cultural context, team members are more confident about the effectiveness of working in virtual teams than in traditional teams (face-to-face). In addition, members of individualistic cultures are more confident about their effectiveness than members of collectivist cultures. The results of the study carried out by Altschuller & Benbunan-Fich (2010) show that "virtual copresence" is significantly related to the internal confidence of the team and team performance.

Dinca et al. (2021) compared the operating dynamics of three types of virtual teams (unidisciplinary, multidisciplinary and multicultural). They conclude that multicultural teams are best if the aim is to improve group cohesion and the acceptance of diversity and increase the participation of team members. In contrast, a unidisciplinary team is the recommended option if the aim is to develop the professional skills of its members.

Similarly, Petrovskaya & Shaposhnikov (2020) concluded that working in multicultural virtual work teams contributes to the development of students' intercultural skills, so it can be a very effective and efficient tool for increasing student internationalization without the need to leave the country. In addition, Li et al. (2017) demonstrated the relationship between cultural intelligence and the quality of collaboration within global virtual teams. In contrast, Cheng et al. (2016) conclude that no significant performance differences exist between multicultural and unicultural teams. Language, values, and habitual behaviour led to differences between these two groups.

Researchers studying the impact of the **technical skills** of the participants of a virtual team have identified evidence about its impact on individual satisfaction and team performance. The right training of the members of a virtual team is essential to guarantee its success and is usually focused on generating confidence, promoting innovation and creativity, or simply allowing the members to get to know each other.

In our analysis of the literature, various works have analysed the most appropriate training methodologies to improve the effectiveness of virtual teams (Olson-Buchanan et al., 2007; Gilson et al., 2013; Kesner et al., 2017; Mitchell & Zigurs, 2017). Kesner et al. (2017) propose integrating this training into the curricula of business schools so that their graduates have the necessary skills to effectively integrate into virtual work teams. In addition, the results of the work by Ortega et al. (2010) show a mediating effect of team learning on the relationship between beliefs about the interpersonal context and group effectiveness.

In the second category (**operating process**), we have grouped the works focusing on analysing any of the following three aspects: trust between the participants of the virtual team; the most appropriate leadership to ensure success of these teams; and the most suitable technology tools to improve their performance. This is the best developed category of articles in terms of research into virtual university teams, accounting for almost 60% of the total. In addition, they are distributed almost uniformly across the more than two decades analysed, with the appearance of five articles since 2020 standing out since this has been a period when work teams have been dealing with the working situations and experiences derived from the COVID-19 pandemic. It should also be noted that four of the five research studies analysed virtual work teams formed by academics and researchers.

The literature on virtual teams is unanimous about **trust** being one of the variables determining the effectiveness of a team. We understand trust as the belief that the rest of the team members will be able to and will want to act appropriately and will not act in their own interests but rather will think about the shared team objectives. Davison et al. (2017), looking at the experience of 38 virtual teams of students, identified the main factors determining the success of a virtual team as the appropriate training of the instructor, the motivation of the participants, the technology platform used for group interactions, time coordination, and trust between members of the team. The findings of Gonzalez-Perez et al. (2014) highlight that despite the challenges associated with time differences, technological limitations and trust problems, most students perceive the use of virtual teams as a teaching tool that facilitates cultural understanding and learning.

In the model proposed by Zaharie (2021), the negative impact of the challenges perceived by the team on its performance was tested, as was the positive effect of trust on that performance. Killingsworth et al. (2016) conclude that trust, reciprocal benefits, and enjoyment are significantly related to a positive attitude toward knowledge sharing. Positive attitude, enjoyment, age, nationality, and computer experience are also related to

knowledge sharing behaviour. Kanawattanachai & Yoo (2007) conclude that it is in the early stages of a project where trust plays a fundamental role, while in later stages, it is coordination between team members (task-knowledge coordination) that takes on greater importance.

Soetanto et al. (2015) conclude that perceived risk has a significant influence on trust levels between members of a virtual team. In addition, this perceived risk decreases if members of the team have previous experience with virtual teams.

Stoica et al. (2021) show the relationship between global identity and the establishment of a collective mind and the exchange of knowledge within virtual teams. In addition, they show that "strong networking ties depend on the development of team collective mind and the willingness to share knowledge".

Finally, we can also highlight the work of Walther & Bunz (2005), who identified six communication rules and demonstrated that they contribute to increasing trust within virtual groups:

- Get started right away.
- Communicate frequently.
- Multitask, being organized and doing substantive work simultaneously.
- Overtly acknowledge that you have read one another's messages.
- Be explicit about what you are thinking and doing.
- Set deadlines and stick to them.

Virtual teams offer many benefits, but they also come with a greater risk of misalignment and lack of cooperation, which can have an impact on trust in the team and the involvement of employees if it is not done correctly. This is why one of the major challenges faced by virtual teams is managing the efforts of the team. To do this, it is essential to have the right **leadership** given the objectives sought and the nature of the team's members. Various studies analyse the effect of different leadership types on the effectiveness of virtual teams. Kayworth & Leidner (2002) conclude that the most effective leaders of virtual teams can perform various roles simultaneously, show a high level of empathy and, at the same time, are able to impose their authority when necessary and are effective in establishing strong communication channels with team members.

Piccoli et al. (2004) show that the satisfaction of the members of a virtual team is greater when they are in control (compared to those with external control), although the type of control does not influence the results of the team. Ismailov & Laurier (2022) showed that systems monitoring, affect management and strategy formulation and planning are crucial to increasing the effectiveness of virtual teams.

Huang et al. (2003) concluded that "virtual teams using a group support system with an embedded goal-setting structure foster better team cohesion, better team commitment and better collaboration climate, better perceived decision quality and generated more decision alternatives".

Brewer et al. (2015) concluded that to guarantee the success of a virtual team, there is a need to show balanced respect for team members, assign coherent and fair tasks and establish appropriate and fair evaluation measures. Hardin et al. (2006) concluded that there is a need to define new measures for the effectiveness of virtual teams since traditional measures are not appropriate in these environments, and without adequate measures, leaders cannot carry out their work correctly. Finally, Ayoko et al. (2012) propose a theoretical model that helps leaders manage emotional reactions in the event of a conflict arising in the team.

The use of online **collaborative technologies** is key to limiting the drawbacks of not sharing the same facilities and not being able to hold face-to-face meetings. Various studies have analysed how to use this type of technology and its relationship with the effectiveness of virtual teams (Laterza et al., 2007; Weimann et al., 2013; Mutudi & Iyamu, 2018; Iyamu & Adedokun, 2021; Anderson & Ramalingam, 2021).

In the work of Gomes de Siqueira et al. (2021), a series of tips were given for designing virtual collaboration spaces using immersive technologies to increase the effectiveness of a virtual team. Pridmore & Phillips-Wren (2011) conclude that when using these technologies, the time required to make decisions in virtual teams is longer, but their decision accuracy is better than that of face-to-face teams.

Lorio et al. (2011) analyse the factors that influence the use of collaborative technologies as support for the work of virtual teams. Among these factors, the simplicity of the tool, its effect on group cohesiveness and the perceived need for the tool stand out. Aritz et al. (2017) signal that the best coordinated virtual teams foresee the usefulness of deploying networking and richer communication channels and, after their use, emphasize the greater effectiveness of these richer channels, confirming the findings established in media richness theory (MRT). Finally, Sengupta & Zhao (1998), to solve communication problems within a virtual team, suggest incorporating mechanisms to retain organisational memory and mechanisms to formalize activity structures and incorporate information filters.

Studies on **the results** of virtual teams in the business world have focused on team performance (in other words, its effectiveness). We created this category to include studies that analyse, in addition to the final performance of the virtual team, other more specific aspects, such as satisfaction with the virtual team experience or the quality of the decision-making process (time required to make a decision or number of ideas or proposals generated within the team). This is the least developed category of the three, accounting for only approximately 13% of the total, and they are not uniformly distributed over the period analysed. We can see a gap in publications in recent years for analysing these topics in the context of the pandemic or postpandemic era. In addition, only one article from 2022 works with academic teams as the subject of analysis.

In the university setting, several works have compared the effectiveness of virtual teams to teams that share the same facilities, although they do not always come to the same conclusions. Nath et al. (2008) show that there are no significant differences in the quality of the projects performed by virtual groups of students compared to those performed by traditional groups (who share the same physical location).

In contrast, Vanichvatana (2019) concluded that face-to-face meetings are still preferable when running projects. However, the students with the best qualifications demand more training in the use of technologies that facilitate working in virtual teams. Similarly, Rasters et al. (2002) examined a case study on an application proposal for a European research project and concluded that face-to-face communication is more necessary in regard to solving complex problems.

Finally, Kanawattanachai & Yoo (2007) show that the location effect is greater in the early stages of a project but becomes less important as this advances. Meanwhile, Taras et al. (2013) and Hu (2015) conclude that virtual global teams are highly effective in facilitating student learning.

5. Future research agenda. In line with our introductory remarks, although there has been increasing interest in studying virtual teams since the late 20th century (Morrison-Smith & Ruiz, 2020), we believe that the scholarly literature has still not paid the necessary attention to the scenario of utilizing such teams within university settings.

In this section, of our bibliographical review, we perform a comparison between the themes or topics covered in the general research into virtual teams and those examined in the specific research into virtual university teams, or in other words, those mentioned in the previous section in this article. These differences were identified through a brainstorming session involving the authors. The results reveal the research gaps that could be examined in future works and that could supplement or expand the results obtained to date. We evaluated the sum of the knowledge about virtual teams to highlight the research areas that are the most promising and those that appear to have been overlooked. We can now identify areas of work that have not yet been sufficiently researched and that give rise to research questions for future work.

For future research, we recommend the following, grouped into three categories derived from the life cycle of a work team: inputs, process, and outputs.

5.1. Inputs

a) In terms of the type of team, the studies performed have not analysed the nature of the project or its interaction with other team design variables. Future research should analyse the most appropriate projects for virtual teams in universities and the appropriate size and composition of virtual teams working on each type of project. In relation to the duration of the life of the virtual team as a working unit, there is a need to analyse whether socioemotional processes and tasks develop differently in different types of virtual teams and, if so, whether the antecedents of effectiveness differ between long-term virtual teams and short-term ones.

b) In terms of the most appropriate composition of a virtual team, future research could examine in more detail the personal characteristics of the participants of a high-performance working team and what qualities should be sought when selecting the members of a virtual team. For example, one option is to analyse the influence that the heterogeneity of the experience of team members and the effect of training in collaborative working technologies have on its effectiveness.

c) Other lines include studying the effect of geographical distance and time differences on the effectiveness of virtual teams in universities and identifying measures (training, awareness, etc.) that could be adopted to mitigate the negative effects of different geographical locations and time zones.

5.2. Operating processes

a) Further studies should examine what socialization activities, if any, promote trust in the different types of virtual teams in universities.

b) Another interesting approach would be to analyse the characteristics and behaviour of virtual teams that have achieved significant levels of social identification to identify the types of leadership styles that promote an increase in social identity and therefore manage to overcome the limitations of the virtual world.

c) There could be an analysis of the effect of university institutions' support policies for virtual teams, both the degree to which the students and academics use them and their effectiveness.

d) Another interesting approach would be to analyse how appropriate leadership can reduce conflicts within a virtual group and contribute to increasing trust between its members.

e) In relation to the management structure and style of virtual teams, there is a need to analyse whether autonomy and self-management are the most appropriate team structures and what circumstances (such as team size, project type, team duration and composition) hinder their effectiveness. Another area for research is whether traditional management control mechanisms are still applicable in the virtual environment, determining the most appropriate management controls (formal or informal).

f) There could be a study of the effectiveness of meetings held through videoconferencing, whether the time is managed well, the debate, the trust in participating and the management of possible conflicts during the meeting.

g) Finally, it would be interesting to relate the different collaborative working technologies used by the team with their levels of effectiveness and with the level of trust between its members.

5.3. Output

a) Future research could identify the factors that determine the effectiveness of a virtual team in universities (training, level of trust, leadership, effectiveness of communication channels, etc.) and what processes are most appropriate for increasing the performance of these teams.

b) Another interesting approach would be to analyse whether the performance measures for virtual teams in universities used to date are the most appropriate for adapting to their special features. For example, if a member of the teaching staff evaluates the results of a work team of university students based on the skills they have developed, they need to consider that when working virtually, it is possible that different skills are developed that are not worked on when the work is face-to-face. In the case of virtual teams of researchers, team performance can be measured not only through joint publications but also through the presence of other professional and personal collaborations.

c) Another area is analysing the satisfaction level of the members of the virtual team and comparing it with their satisfaction level when involved in a face-to-face project.

All the research gaps and lines mentioned can be applied to the two units or subjects of analysis considered in virtual university work teams: students and academics and researchers. We consider new studies that analyse the teams formed by researchers to be particularly important, given that there is very little research carried out on this unit of analysis to date. Finally, it is crucial to highlight that these prospective research avenues should be explored across various geographical regions beyond the predominant focus on North America thus far. This is imperative because the efficacy of virtual teams in academic institutions is undoubtedly shaped by the unique characteristics of each country or region's university system, alongside its cultural and economic context.

In addition, as most of the research has used a qualitative approach, we recommend using quantitative methodologies to study the relationships among the different factors that could influence the success of a virtual team in universities.

6. Conclusions. Given the growing use of technology for collaborative working (synchronous and asynchronous) and video conferencing in universities and other higher education institutions, the aim of this research project was to summarize the existing academic literature on virtual work teams in universities. Throughout the process, we were guided by three research questions, the answers to which will be provided below.

The first research question aimed to determine what the characteristics of the research are published up to 2022. To do this, we analysed, among other aspects, the trends over time for the publications, the origin of their authors and the research method used. We identified that the number of studies in the area is still limited but that it is growing rapidly, with most of the studies published in recent years (2017-2022). There are publications from 2021 and 2022, which allows us to think that the situation arising from the COVID-19 pandemic and the changes imposed on the way teams work are already being analysed by academics. We also observe that the studies have been published widely in multiple journals with very different subject matters, from those specializing in technology systems to those specializing in business management, not forgetting those focusing on university education. One can conclude that researchers working on this research topic have a wide range of journals in which to publish, depending on who they see as their main audience, such as managers of higher education institutions or information systems specialists.

As discussed, most of the studies have been completed in the USA. However, the literature on work teams has demonstrated that cultural factors have a considerable influence on the operation and performance of these teams. Therefore, it would be interesting to replicate studies in different countries with distinctly different cultures or university systems. In relation to the methodologies and statistical techniques used, we can also identify that in most cases, the studies used qualitative analysis techniques, with very few using quantitative methodologies. In general, it is argued that quantitative research is an indicator of the maturity of a research line, so we consider it necessary for the factors debated in a qualitative way to be tested, adapted, and developed through the use of surveys for researchers and students working in virtual teams.

RQ2 was designed to analyse the key topics addressed to date by research on virtual university work teams. From this identification of the content researched, we were able to answer RQ3, or in other words, identify the gaps compared to the general literature about virtual work teams. These findings offer new research directions for the future. The first conclusion obtained was that almost all the literature analysed work teams formed by students to perform research in the context of their education. However, almost no studies have been conducted on work teams formed by lecturers or researchers. This is despite the incentive that all university systems provide for the internationalization of the research of their academics, seeking collaborations with researchers in other countries to enhance their prestige and position in university rankings.

In terms of the topics or variables researched, we divided these into three groups depending on the life cycle of the team: input, operating processes, and output. This grouping allows us to conclude that there are many gaps that have still not been addressed in relation to virtual university teams. Most of these studies have focused on analysing variables related to operating processes, and very few have analysed outputs. More work is needed to study output because it would be interesting to understand whether the effectiveness and satisfaction of virtual work teams improved with changes in context and new collaborative working tools that became more widespread after the COVID-19 pandemic.

The limitations of this study are that it is a systematic review of the academic literature. Although we selected two internationally prestigious databases, we had to choose some keywords and establish a search chain to use their search engines. This decision always implies the risk of excluding an important study in this field of research. However, it should be remembered that the aim of this type of bibliographical review is not to create an exhaustive list of all previous research but to extract conclusions to guide and justify progress in this field of knowledge. This is particularly useful for young researchers starting out in the topic. In our specific case, we can conclude that virtual teams represent a new form of organizing work that offers unprecedented flexibility and response capacity and can revolutionize the research activity of universities in a context where the internationalization of students and academics is encouraged. However, virtual teams do not represent an organisational panacea, so there is a need for in-depth research into what design and operation allows them to have higher levels of performance and satisfaction.

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Віртуальні колективи у вищих навчальних закладах: аналіз наукових праць та перспективи майбутніх досліджень

Ф. Хав'єр Міранда, кафедра управління бізнесом та соціології, факультет економіки та бізнес-адміністрування, Університет Естремадури, Іспанія

Антоніо Чаморро-Мера, кафедра управління бізнесом та соціології, факультет економіки та бізнес-адміністрування, Університет Естремадури, Іспанія

У контексті глобальних змін, викликаних пандемією COVID-19, університети зіткнулися з необхідністю адаптуватися до нових умов функціонування, що стало потужним стимулом для інтернаціоналізації та цифровізації освітніх процесів. Одним із важливих аспектів цього процесу стало зростання ролі віртуальних робочих груп, які об'єднують студентів і дослідників з різних країн та культурних контекстів. Метою дослідження є всебічний аналіз наукових робіт, присвячених віртуальним командам університетів, для визначення ключових напрямів розвитку та окреслення перспектив майбутніх досліджень у даній галузі. Використовуючи систематичний огляд літератури з баз даних WoS і Scopus та застосовуючи метод PRISMA для збору даних, було вибрано сорок сім відповідних наукових статей для аналізу. Основна увага приділялася визначенню того, які аспекти віртуальних команд були досліджені, коли і де це відбувалося, хто є провідними авторами у цій галузі, та які методи були застосовані. Проведене дослідження дозволило виявити, що, незважаючи на збільшення кількості досліджень віртуальних команд з кінця XX століття, університетські віртуальні команди не отримали достатньої уваги у науковій літературі. Водночас більшість досліджень було проведено у Сполучених Штатах, що свідчить про необхідність розширення дослідницьких горизонтів, враховуючи значний вплив культурних факторів на діяльність віртуальних команд. Також було зауважено, що переважна більшість аналізованих робіт зосереджена на студентських групах, у той час як дослідницькі команди, які відіграють важливу роль у підтримці інтернаціоналізації наукових мереж, залишаються недостатньо дослідженими. Дослідження пропонує аналітичний огляд на основі моделі життєвого циклу віртуальних команд, розділяючи аналіз на три основні категорії: вхідні дані (формування команд, технологічне забезпечення, культурні аспекти), операційні процеси (спілкування, управління проєктами, розвиток команд) та результати (ефективність команди, досягнуті результати, вплив на освітній процес). Отримані в роботі результати підкреслюють необхідність подальших досліджень віртуальних команд у різних культурних та географічних контекстах, а також розробку ефективних стратегій управління для підтримки продуктивної взаємодії між членами віртуальних команд у глобалізованому освітньому середовищі.

Ключові слова: колаборативні технології, COVID-19, вища освіта, дослідницька група, робоча група.