



Managing Virtual Teams and System Thinking: A Systematic Review

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Abstract: Advancements in technology have revolutionized communication, socialization, and work paradigms. The surges in globalization, the permeation of digital culture, and the expansion of online communication tools have prompted organizations globally to adopt virtual teams. These virtual environments, while beneficial, present a myriad of challenges that necessitate the application of system dynamics to optimize performance. A systematic review was conducted to analyze previous studies focusing on the leadership of virtual teams within the context of systems thinking. Seven databases, including Sage Online, Springer, JSTOR, Taylor and Wiley Online Library, Francis Online, Google Scholar, and Semantic Scholar, were utilized. From an initial pool of 5,070 studies, 30 were meticulously screened, summarized, and synthesized based on pre-established inclusion and exclusion criteria. The review highlighted the recurrent emphasis on factors such as communication technology, trust, intra-team relationships, and leadership strategies as pivotal for enhancing virtual team performance. This synthesis aims to present a comprehensive overview of current research trajectories in the field, delineating existing research gaps, limitations, and challenges.

Keywords: Virtual team leadership; Systems thinking; Systematic review; Communication technology; Trust; Intra-team relationships

1 Introduction

Both natural and man-made crises, encompassing wars, disasters, and epidemics, have historically been catalysts for transformative shifts in societal activities, dictating how populations live and work. Notably, the COVID-19 pandemic stands out as a contemporary global health challenge. Recommendations have been issued by health authorities, emphasizing the importance of preparedness for businesses, hospitals, schools, and citizens. In response, many organizations have adopted remote work models, aiming to mitigate potential health risks by eliminating the close physical proximity of employees. As a consequence, technological and digital systems have facilitated the emergence of novel work paradigms. Pivotal shifts in information and communication technologies have been observed to dictate communication modalities and collaboration methodologies within virtual organizations [1]. For such virtual entities, geographical boundaries have become inconsequential. Essential elements such as leadership, communication, trust, task characteristics, empowerment, and cohesion have been identified as crucial for virtual organizational performance [2]. Effective leadership is deemed central to the potential realization of such work groups, contingent on the leader's adeptness and relevant knowledge base.

The understanding of system thinking perspectives, especially in the context of leading virtual organizations, can offer invaluable insights to leaders. This enables them to align team activities to achieve organizational objectives more efficiently. Systems thinking is characterized as a holistic approach, emphasizing not only interactions among system components but also the broader interplay between multiple systems [3].

In the past decade, numerous studies have explored leadership within virtual teams and system thinking, albeit often in isolation [4–8]. Without a structured and systematic methodology for consolidating these disparate views, the existing body of literature might pose interpretative challenges. The proliferative nature of academic outputs further exacerbates potential confusion. Hence, there exists a pressing need to conduct a systematic review of the available literature, ensuring the coherent organization of data to curtail potential ambiguity. Consequently, this research aims to systematically dissect prior publications concerning leadership within virtual teams, identifying those system-thinking perspectives that hold relevance for this context.

Research questions:

Q1. How have studies, from 2010 to 2021, concerning leadership within virtual teams and associated system-thinking perspectives evolved? The pivotal nature of 2010 is acknowledged due to its recognition as the year wherein leadership within virtual teams and systems thinking gained pronounced significance within organizational and managerial contexts, attributable to technological advancements [9].

Q2. Which primary issues have been the focal point of academic discourse concerning leadership within virtual teams and their system-thinking dimensions?

Q3. Which tenets of system thinking appear pertinent in the context of leading virtual teams?

2 Materials and Methods

Initiation of this research involved the creation of an article screening flow diagram, concisely represented in Figure 1.

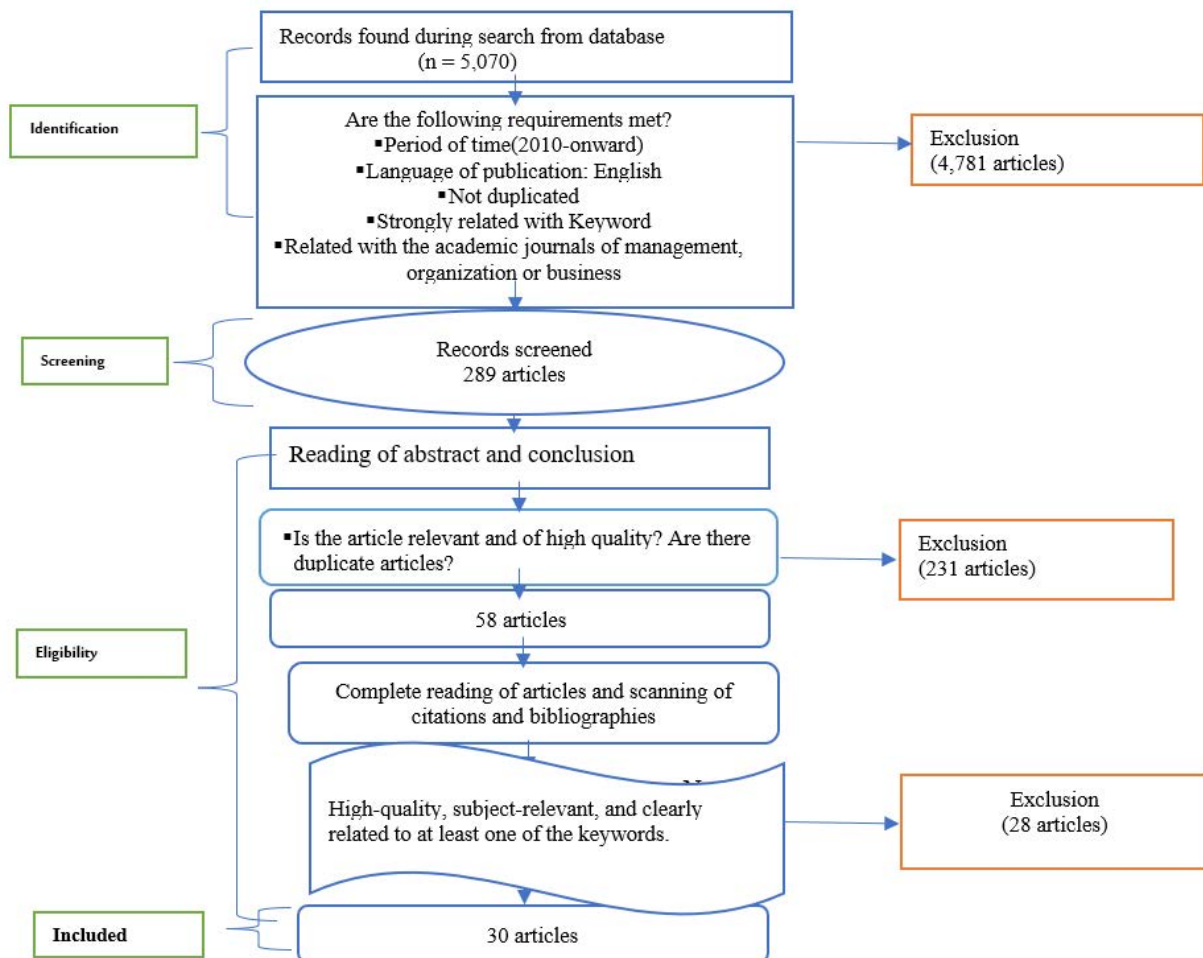


Figure 1. Article screening flow diagram

Source: Adapted with minor modifications from PRISMA Checklist, 2022 [10]

2.1 Database Selection

Studies were sought from seven prominent databases: Sage Online, Springer, JSTOR, Wiley Online Library, Google Scholar, Taylor & Francis Online, and Semantic Scholar. Keywords employed in the search encompassed: leading virtual team, mindset for leading virtual team, virtual teams, leading distributed teams, leading remote teams, leading computer-based teams, online teams' leadership, cross-site teams, big picture thinking, hierarchical thinking, holistic thinking, multidimensional thinking, systemic thinking, systems thinking and design thinking, and stems thinking and systems dynamics (Table 1).

Table 1. Search results by keywords (2010-2021)

Search Keywords	Search Result (Number of Papers)
Leading virtual team	181
Mindset for leading a virtual team	19
Virtual teams	250
Leading distributed teams	150
Leading remote teams	125
Leading computer-based teams	109
Online teams' leadership	310
Leading cross-site teams	419
Big picture thinking	482
Hierarchical thinking	100
Holistic thinking	520
Multidimensional thinking	467
Systemic thinking	773
Systems thinking and design thinking	979
Stems thinking and systems dynamics	186
Total	5070

Source: Own search result, 2022

2.2 Inclusion and Exclusion Criteria

The objective of the study mandated the adherence to specified inclusion and exclusion criteria. Four criteria were identified for inclusion: search boundary, publication period, language, and search string. The search boundary was delineated by academic journals pertinent to the realm of management and organization. Articles published between January 2010 and December 2021 were deemed eligible. The language criterion restricted inclusion to English-language articles exclusively. The search string was tailored to pinpoint topics correlating with leadership in virtual teams and associated system thinking perspectives.

Exclusion criteria encapsulated three facets: duplication, relevance, and quality. Abstracts and conclusions of retrieved articles were perused to assess alignment with these criteria. Relevance was ascertained by matching articles with the initial keywords, coupled with an evaluation of article quality. Articles in categories such as unpublished works, working papers, and conference presentations were precluded from consideration. Duplication was mitigated by assigning unique identification codes to each article and employing meticulous manual scrutiny.

2.3 Data Analysis

A descriptive data analysis approach was favored for this study. Visual representations and tabulations were extensively used, especially when elaborating on study characteristics [11]. Concurrently, content analysis emerged as the pivotal methodology for data inspection. Articles were manually encoded, post which an interpretative strategy was implemented to scrutinize study outcomes. Elements such as type, purpose, findings, implications, and limitations were systematically extracted from the included articles.

3 Results and Discussion

3.1 Trends in Publication

A significant surge in interest concerning leading virtual teams and system thinking was observed between the years 2010 and 2021, as depicted in Figure 2. Such heightened interest during this period can be attributed to the rapid advancements in technology, especially around the onset of 2010 [9]. These observations suggest an intrinsic link between technological shifts and scholarly investigations into digitalization, remote leadership, and system thinking.

3.2 Characteristics of Selected Studies

The results from selected databases for the review are shown in the below bar chart.

According to the data presented in Figure 3, a predominance of articles was accessed from JSTOR, subsequently followed by Google Scholar, Wiley, SAGE, Taylor & Francis, Semantic Scholar, and Springer in decreasing order.

As delineated in Figure 4, when classifying by the nature of the studies, a significant portion (62%) were empirical in nature. Systematic reviews accounted for 17%, meta-analyses represented 14%, mixed approaches stood at 4%, and panels composed 3% of the total. This distribution indicates a predominant reliance on empirical methods — a reflection of scholars seeking knowledge based on observed and measured phenomena rather than mere theoretical postulations.

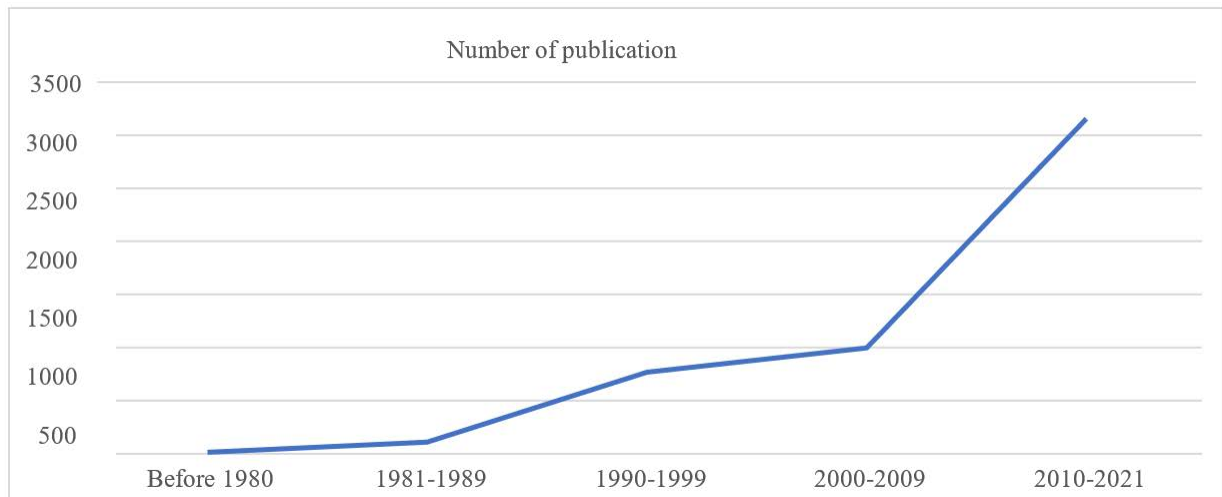


Figure 2. Trends in articles on virtual leadership and system thinking

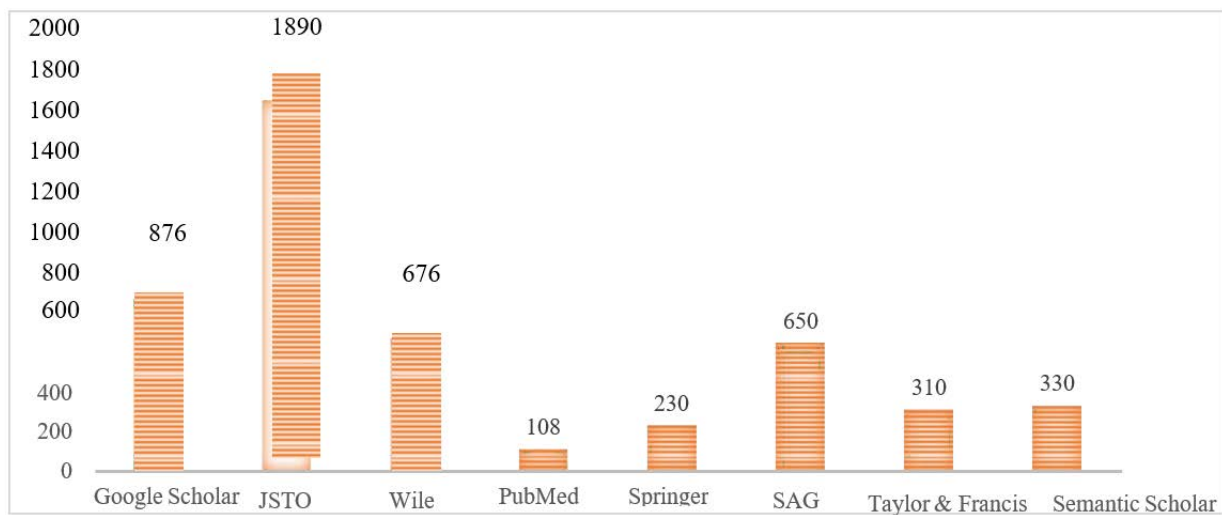


Figure 3. Distribution of articles across databases

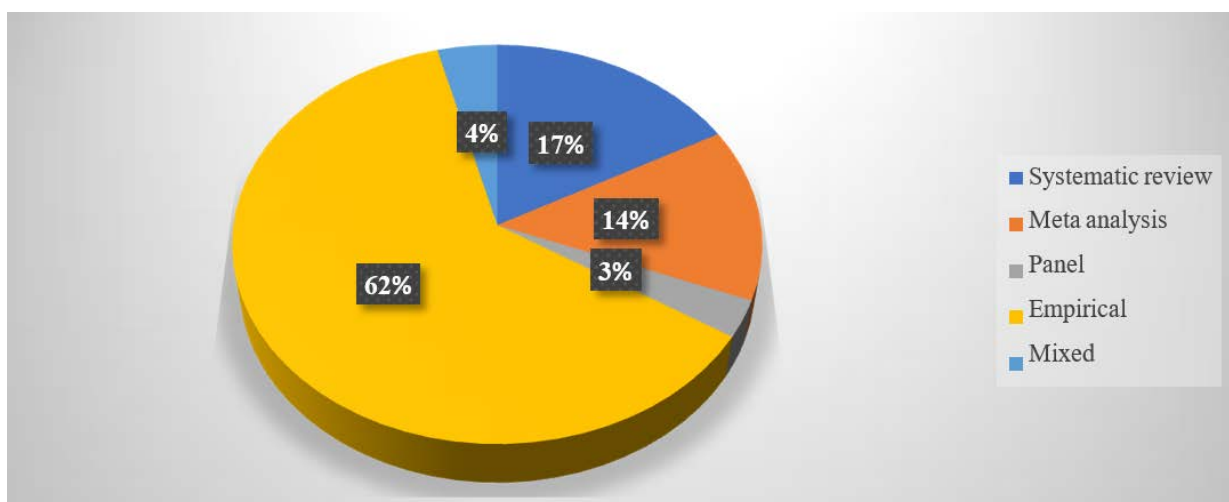


Figure 4. Distribution based on study type

3.3 Categorization by Source of Database

Upon categorizing search results, it was discerned that a substantial majority (70%) were journal articles, as illustrated in Figure 5. Conference papers followed at 16%, while books and trade publications constituted 11% and

3%, respectively. The prevalence of journals in the data underscores their pivotal role in nurturing and propelling forward-thinking on leading virtual teams and associated system thinking paradigms.

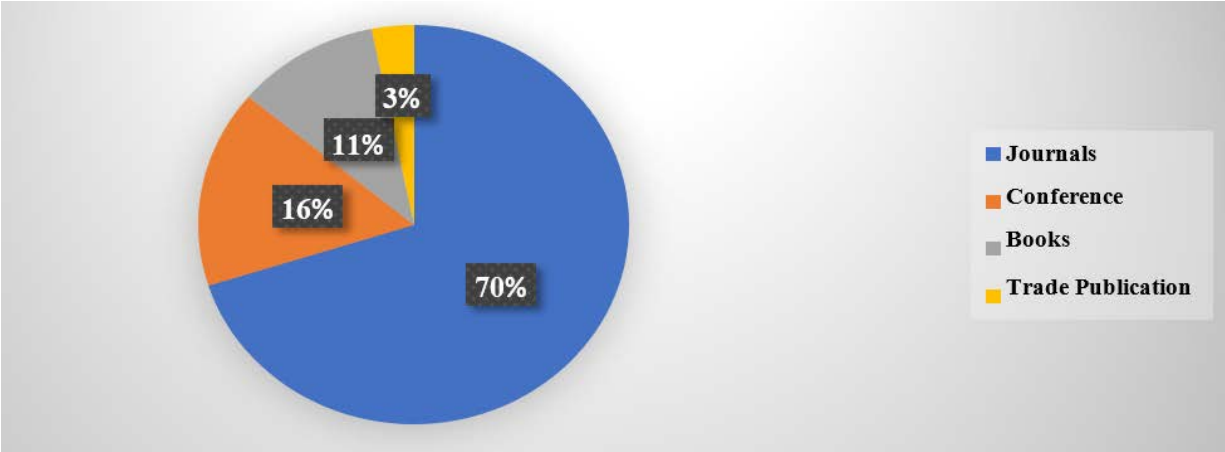


Figure 5. Publication distribution by source type

3.4 Analytical Depth of Studies

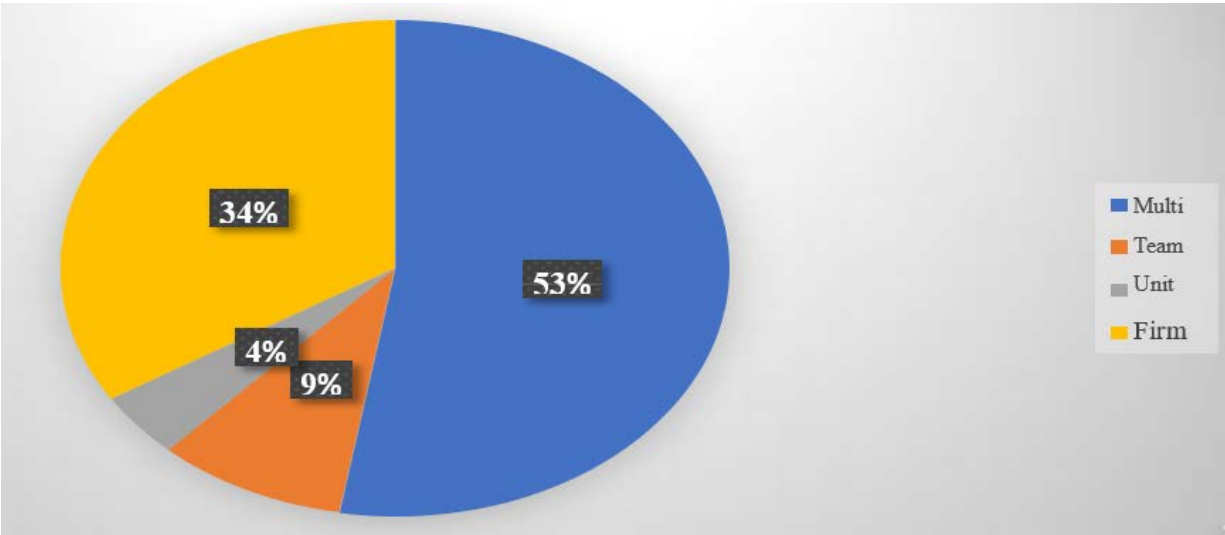


Figure 6. Studies categorized by level of analysis

In terms of analytical depth, Figure 6 depicts that 53% of the studies employed a multi-level analytical approach. Firm-level analyses accounted for 34%, team-level represented 9%, and unit-level analyses formed the remaining 4%. The preponderance of multi-level analytical approaches suggests an inclination among researchers to amalgamate diverse theoretical perspectives across levels and to discern inter-level conceptual relationships.

4 Result and Discussion

4.1 Key Concepts in Leading Virtual Teams

A synthesis of the literature reveals that the effectiveness of virtual organizations is predominantly influenced by advancements in Information and Communication Technology (ICT) and the digitalization process [12–16]. Furthermore, trust, participatory leadership, and cooperative dynamics are consistently identified as essential factors bolstering the performance of these entities [17–20]. A deeper probe into these studies also suggests the pivotal role of interpersonal, psychological, and social factors in determining the efficacy of virtual organizations [12, 21].

a) Information and Communication Technology (ICT): Rapid advancements in ICT have been found to dynamically alter organizational operational landscapes [13, 15]. Such evolutions have led to increasingly globalized and competitive business spheres. Global virtual teams, as identified in the literature, predominantly rely on ICT for communication and collaboration [1, 14, 21].

b) Trust: A correlation has been observed between the perceptions of virtual team members regarding their leadership and the performance outcomes of these teams [17]. An enhancement in team performance is noted when trust is fostered between team members and leadership.

c) Shared Leadership: Hoch and Kozlowski [18] unveiled significant associations between shared leadership, structural support, and team performance through empirical evaluations.

d) Virtual Interaction: A study by Wilson et al. [22] elucidates that frequent virtual interactions tend to bolster team performance.

e) Digital Culture and Globalization: The proliferation of globalization, the internet, and ICT has been linked with the evolution of virtual teams [15]. Martins and Schilpzand [12] highlight that these global teams harness ICT and are influenced by myriad technological, social, and psychological dynamics.

f) Interpersonal Characteristics: According to Clark and Marnewick [21], virtual teams exhibit a higher failure rate compared to their non-virtual counterparts. Positive interpersonal attributes, such as empathy and trust, have been identified as significant contributors to enhanced team performance, while geographic dispersion and cultural variances act as potential hindrances.

g) Learning and Cooperation: Miller et al. [20] and Luther and Bruckman [23] highlighted the importance of learning and cooperation within virtual teams, emphasizing the role of collaborative networks in fostering organizational growth. Leaders have been noted to play an instrumental role in facilitating cohesion, knowledge sharing, and motivational dynamics within teams [16, 19] (Table 2).

Table 2. Factors bolstering virtual team leadership

Common Dimensions	Count Result
Communication Technology	14
Trust	13
Intra-Team Relationships	11
Leadership Quality	11
Leadership Structure	9
Interpersonal Characteristics	9
Communication Structure / Guidelines	8
Empowerment/Autonomy	8
Leader Qualities	8
Knowledge Transfer	7
Commitment	6
Collaboration	6
Task Structure / Guidelines	5
Communication Characteristics	5
Team Characteristics	4
Intercultural	3
Leadership Training	3

Source: Count results from selected studies, 2022

A review of the aforementioned studies reveals that ICT, trust, intra-team dynamics, and leadership quality are dominant variables contributing to effective virtual team leadership (Table 3).

Table 3. Challenges confronting virtual team leadership

Common Dimensions	Count Result
Dispersion	21
Cultural Diversity	17
Poor Leadership Qualities	13
Poor Technology	7
Poor Communication	6
Cultural Characteristics	4
Bias on the Behalf of the Leader	4
The Difference in the Ruling/Regulation System	4

Source: Own count results from selected studies, 2022

The primary challenges associated with leading virtual teams encompass geographic dispersion, cultural variances, and leadership inadequacies. An additional layer of complexity arises from the need to balance professional

responsibilities with personal obligations, especially in remote work settings [24, 25]. Effective communication within these teams is often hampered by time zone differences, diverse nationalities, varied working styles, and language barriers. Overcoming these challenges is posited as a core responsibility of virtual team leaders.

4.2 System Thinking Perspectives in Leading Virtual Teams

Systems thinking, as argued by various researchers such as Godin and Pridmore [26] and Flood [4], provides an interconnected perspective on environmental factors. This approach fosters an understanding of the whole beyond its individual parts and positions the parts within the broader context. Green et al. [27] and Skaržauskienė [28] contended that this method is versatile, lending itself to application across various managerial levels to bolster organizational performance, address challenges, and function as a foundational competency.

The ensuing section delineates the perspectives of systems thinking pertinent to virtual team leadership:

a. Higher-order Thinking:

The desirability of employees possessing robust higher-order thinking skills in diverse work settings is underscored by Godin and Pridmore [26] and Flood [4]. Such competencies have been posited as pivotal within virtual organizational contexts.

b. Network of Relationships:

Tani et al. [29] have emphasized that enterprises, being part of intricate relationship networks, need not confine their activities to isolated domains. For a virtual team's system to extract insights from its environment, it must be receptive and interactive, as noted by Powell [30] and Mann et al. [31].

c. A Synergistic Analytic Skill Set:

Arnold and Wade [3] described systems thinking as a cohesive skill set instrumental in enhancing systemic understanding and capabilities.

d. Holistic Perspective:

Shaked and Schechter [32] defined systems thinking as an aptitude to comprehend the entirety beyond individual components and to contextualize these components within the whole. Such a perspective, when embraced by leaders, facilitates a comprehensive management approach, whereas a narrow focus on isolated parts often neglects the intricate interactions inherent within systems, as emphasized by Green et al. [27].

e. Augmented Organizational Performance:

Research conducted by Skaržauskienė [28] delved into the relationship between systems thinking and business outcomes, concluding a significant positive correlation between the two.

f. Applicability Across Managerial Levels:

A lack of systems thinking capabilities often culminates in business failures, as observed by Monat et al. [33]. It has been suggested that systems thinking, embodying a mindset, toolset, and linguistic framework, proves invaluable for understanding and optimizing systemic behavior across managerial strata.

g. Problem-Solving Prowess:

Rather than resorting to transient solutions, Galli [34] recommends addressing challenges at their root. By embracing a holistic approach and examining the interplay between system components, more expansive solutions become attainable. Wilden et al. [35] highlighted the utility of systems thinking in comprehending intricate challenges. Furthermore, Kourayem and Ghadim [36] and Patel and Mehta [37] asserted the combined potential of design thinking, entrepreneurial reasoning, and systems thinking in addressing multifaceted organizational dilemmas.

5 Conclusion and Further Research Directions

The rapid proliferation of virtual integration has been attributed to the swift advancements in information communication technologies. It has been recognized that effective leadership within virtual teams necessitates adeptness in virtual communication, instrumental in fostering robust intra-team relationships. Distinct from traditional leadership paradigms, the leadership of virtual teams offers flexibility but demands an understanding rooted in systems thinking.

A noticeable trend over the past decade has been observed, revealing an augmented focus on the subjects of leading virtual teams and systems thinking. Analysis indicated a predominance of empirical studies, with the business sector emerging as the primary contributor. Journal articles have been identified as the predominant publication format. Challenges confronting virtual organizational performance, such as dispersion, cultural diversity, and suboptimal leadership caliber, have been documented. To mitigate these impediments, recommendations have been posited, emphasizing the importance of both formal training and informal exposure concerning communication, cultural nuances, and linguistic facets. Enhancing virtual team leadership effectiveness, it is suggested, hinges on factors including state-of-the-art communication technology, trust cultivation, intra-team relationship strengthening, and superior leadership quality. The utility of systems thinking perspectives, it has been noted, offers virtual team leaders an expanded horizon.

However, a discernible gap remains. Limited empirical evidence concerning the interrelationship between systems thinking and the leadership of virtual teams has been encountered. Thus, a pressing need exists for research endeavors that delve deeper into understanding this association.

This systematic review possesses inherent limitations. Chiefly, the review encompasses studies published between 2010 and 2021, neglecting seminal contributions prior to this timeframe. Additionally, a restriction to a mere seven databases might have inadvertently excluded significant works. Furthermore, the reliance on a keyword-centric approach for article identification may have constrained the scope of the data collated.

Despite these constraints, it is contended that this review holds seminal importance in the realms of virtual team leadership and systems thinking, potentially serving as a catalyst for subsequent scholarly investigations.

As for avenues of future research, the nexus between systems thinking and leadership modalities in virtual teams remains underexplored. An imperative exists for subsequent research efforts to ascertain how systems thinking might elevate the efficacy of virtual team leadership. It is also suggested that ensuing studies adopt a broader research framework, encompassing a more diverse range of databases, linguistic parameters, and chronological spans, ensuring richer and more holistic insights.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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