Analyzing Cost Efficiency Elements in Virtual Teams Application : A Systematic Review

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Abstract
Purpose: This study aims to understand the critical elements influencing the cost-effectiveness of virtual teams and their strategic application in enterprises.
Research methodology: The research uses a literature review to assess the organizational dynamics, money allocation, and efficiency of virtual teams.
Results: The study finds that cost efficiency drivers have significant consequences for virtual teams and point to a strategic change in how companies do business, also investing in technology, especially communication platforms, is crucial. Savings are identified in team development, office space, travel costs, and communication expenses.
Limitations: The research relies heavily on prior studies, limiting its generalizability and requiring adaptation to rapid technological changes.
Contribution: This study is relevant to business management, particularly in promoting flexible work models that combine in-person and virtual components.
Keywords: *Virtual team, cost efficiency, cost saving, digital collaboration.*
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1. Introduction

The limitations of distance have been successfully removed in the ever-changing environment of modern communication, ushering in an era when verbal conversation may take place in real-time without substantial delays. This revolution in communication is multimodal—it spans both visual and aural modalities and is geographically transnational, enabling people to interact with one other in a seamless manner. As a result of this revolutionary change, virtual teams have emerged, whose members are distributed throughout various geographical areas (Santoso, 2023). Within conventional team arrangements, direct team member participation is frequently used to ease task coordination. But the rise of virtual teams, which primarily rely on electronic communication instead of face-to-face (FTF) interactions as common in traditional teams, has required a higher level of organizational structure .

Virtual teams see a shift in organizational dynamics as they adopt a decentralized, informal, and flat structure that requires quick adaptation to new procedures and tovations (Abarca et al., 2020). As virtual teams grow more commonplace in the commercial world, it becomes increasingly obvious how different their work habits, rhythms, and organizational structures are from those of traditional teams (Garro-Abarca et al., 2021a). Notably, virtual teams embrace a boundaryless environment with a flat structure, whereas traditional teams have a hierarchical, centralized, and formal architecture. Collaboration amongst team members who are spread geographically must be facilitated by this paradigm shift in organizational structure (Masood & Sonntag, 2020). The emergence of virtual teams is not just a fad; rather, it is a revolutionary force reshaping the modern corporate landscape. Study conducted by Davidavičienė et al. (2020) demonstrates the rapid rise of virtual teams in international industry, where members work together across time zones and geographical boundaries

Developments in communication technology allow for instantaneous long-distance communication in written and spoken forms in both audio and visual formats, which makes this cooperation feasible. Virtual teams, by definition, are devoid of in-person contacts between team members and rely mostly on technology for communication (Masood et al., 2020). This creates a boundaryless atmosphere. Leading companies in a variety of sectors, including Verifone, Microsoft, CompuCo2, Hewlett-Packard, IBM, Whirlpool, Johnson & Johnson, and Ford Motor Company, are prime examples of the broad use of virtual teams. For example, since 1981, Verifone, a global company that specializes in credit card scanning devices, has deliberately used virtual teams. This strategy approach removes the need for physical relocation by enabling its 3,000 workers, who are spread across various geographic zones, to conduct activities, interact, and connect inside the digital arena (Masood et al., 2020).

The value of virtual teams is found in their capacity to give businesses access to a highly qualified workforce without being constrained by physical boundaries. Virtual teams are used by over two-thirds of US firms to carry out business strategies efficiently (Davidavičienė et al., 2020). The demand for a qualified workforce and the efficiency that virtual teams provide to work processes are driving forces behind the trend toward virtual teams. Because virtual teams are geographically scattered, they allow firms to access specialized skills without having to pay additional moving costs (Butler, 2020). By enabling companies to tap into a global talent pool without incurring relocation expenses, virtual teams help achieve allocative efficiency, as firms can allocate their resources more strategically. Additionally, the use of digital tools and platforms in virtual teamwork increases technological efficiency, as these teams can deliver high output with minimal physical infrastructure. Thus, the reduced costs associated with virtual teams directly support both allocative and technological efficiency, making them an essential component of modern business strategies (Nosike et al., 2024). In the modern corporate environment, efficiency—a key performance indicator of organizational success—is essential (Alam et al., 2019). There are two types of efficiency: allocative efficiency and technological efficiency. While allocative efficiency is concerned with efficiently allocating and using resources in accordance with current pricing structures and technological considerations, technical efficiency is concerned with attaining the maximum output levels with a given amount of input. The combination of these efficiencies results in economic efficiency, which is the capacity of an organization to reduce production costs in order to accomplish particular outputs while taking market pricing and technological advancements into account (Alam et al., 2019). As a technology breakthrough, virtual teams allow for efficient human resource coordination, which helps organizations operate at the lowest possible cost.

Previous research by (Glikson & Erez, 2020) examined computer-mediated communication processes within global virtual teams at a multinational corporation. The study's findings indicate that global virtual teams face challenges in exercising control functions, experience misunderstandings due to cultural and language differences, encounter limited emotional closeness, and face barriers to idea generation. Subsequently, Study by Cabral & van Winden (2022) showed that teams engaging in mixed virtual interactions—combining formal and informal virtual interactions—can help startups endure during the pandemic. Informal virtual interactions, such as casual chats or non-formal discussions, can enhance team cohesiveness and support startup sustainability during crises. Although much research on virtual teams exists, several studies only broadly discuss cost efficiency without mapping out the specific elements contributing to it. This includes aspects such as operational costs, technology management, and time factors, which are rarely analyzed in depth. Prior research has mostly examined how cost- saving virtual teams are (Tan et al., 2019); additionally, other studies have acknowledged that virtual teams may also help reduce costs and improve coordination effectiveness (Morrison-Smith & Ruiz, 2020). Nonetheless, there is no scholarly inquiry concerning the diverse variables impacting reduction of cost and the effectiveness of virtual teams accomplishing desired output.

By examining the factors that contribute to cost efficiency among virtual teams, this research aims to close this knowledge gap. The goal of the study is to shed light on how virtual teams are used by analyzing how well they can manage expenses to achieve optimal effectiveness. To achieve this, a literature review is conducted to examine factors such as communication tools, team dynamics, and technological infrastructure that contribute to the cost-efficiency of virtual teams. By means of an

extensive examination, this study aims to provide useful insights to businesses that are thinking about deploying remote teams to improve operational efficiency at a lower cost.

2. Research Method

To conduct a thorough investigation of the variables affecting cost effectiveness in virtual teams, we utilized a systematic literature review (SLR) approach as seen in figure 1. In the SLR process, a thorough investigation is carried out with the aim of achieving many goals, including locating, analyzing, assessing, and interpreting all previous research in an intriguing field of study, with a particular emphasis on pertinent research questions (Xiao & Watson, 2019).
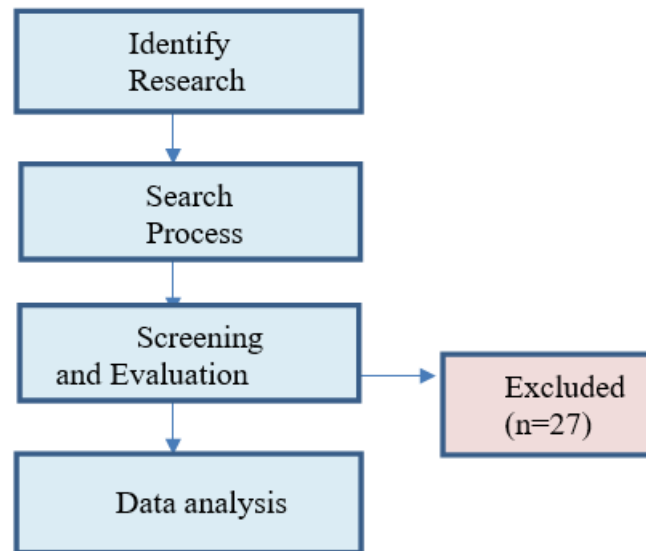

Figure 1. Steps in the SLR Process
Source: Researchers

This systematic literature evaluation is guided by the research question, "What are the key factors influencing cost efficiency within virtual teams?". We searched for a wide range of academic publications. Sixty journals made up the first pool; they were selected with great care based on the journal's impact factor, notoriety, and relevance to the study issue. The selection of articles is carried out based on specific criteria that ascertain whether a study is appropriate for inclusion or not. The article inclusion criteria are displayed in table 1.

Table 1. Article inclusion Criteria

Criteria	Description
Type of article	Research-based articles
Source	Scopus and SCImago Database
Time frame	2018-2023
Language	English and Bahasa Indonesia
Keywords	Virtual team, cost-efficiency, cost saving , digital collaboration

Source: Researchers

Figure 2 presents a conceptual framework outlining cost efficiency factors in virtual teams. This framework categorizes expenses into four main types that influence cost efficiency in virtual teams: (1) Communication Cost, includes expenses related to online information and communication technology and integrated internal communication platforms. These costs cover the tools and systems necessary to facilitate seamless communication among team members in a virtual setting, (2) Infrastructure and Office Space Cost, includes office and maintenance expenses and administrative and data storage

expenses. Even in a virtual environment, some infrastructure costs may still be required for data storage, server maintenance, and, in certain cases, office-related expenses, (3) Team Building and Development Cost, which require online and virtual team building and development activities, along with software and technology team building and development. These costs relate to tools, programs, and activities that foster team cohesion and skill development to ensure effective collaboration and productivity, (4) Travel and Transportation Cost, means despite operating virtually, occasional meetings or business travel may be necessary, as well as costs associated with recruitment and relocation. These expenses are minimized in virtual teams but can still impact the overall cost efficiency depending on the team's needs.
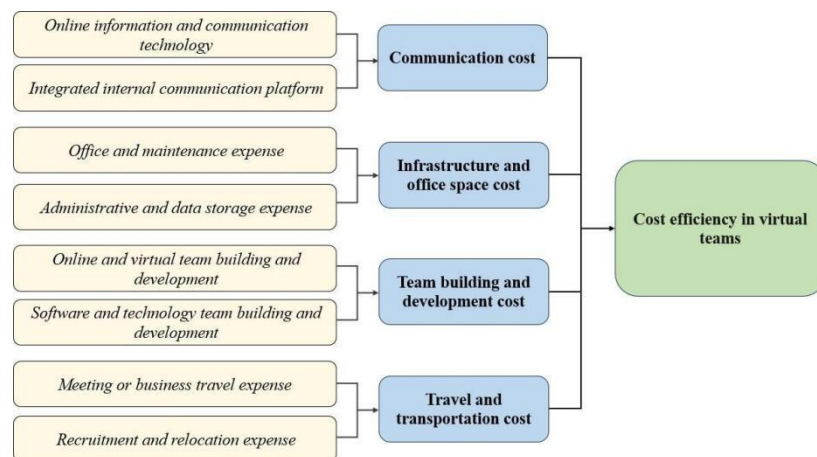

Figure 2. Conceptual framework cost efficiency factors in virtual teams.
Source: Researchers

After the selection process 33 journals were chosen as references for the systematic review following an initial screening. The incorporation of registered journals with SCImago and SCOPUS guarantees a comprehensive comprehension of the subject matter, including an array of viewpoints and approaches.

Table 2. Literature review table of sources journal.

Category	Authors	Key Findings	Implications
Communication Cost	Szkudlarek et al. (2020), Newnam & Goode (2019), Chatti & Majeed (2022), Loyless (2023), Cimperman (2023)	Online communication tools enhance collaboration and reduce communicationcosts for virtual teams.	Digital communication platforms reduce dependency on physical presence, increasing cost-efficiency and responsiveness.
Integrated Internal Communication Platform	Sandberg et al. (2020), Hijazi et al. (2023), Men et al. (2023)	Centralized communication platforms improve transparency, reduce the need for multiple tools, and lower administrative costs.	Integrated systems streamline communication, enhancing productivity and enabling better resource allocation for technology investments.
Infrastructure and Office Space Cost	Robertson et al. (2022), Schuster (2022), Swartz & Shrivastava (2022)	Virtual teams save significantly on office-related costs, and the savings can be invested in technologyand training.	Shifting to virtual work allows firms to reinvest savings from office space and infrastructure into innovation and staff development.

Category	Authors	Key Findings	Implications
Office and Maintenance Expense	Plebankewicz et al. (2022), Batirlik et al. (2022), Bernat etal. (2023), Bharathi et al. (2019)	Virtual teams experience major reductions in office and maintenance expenses, enabling access to a global talent pool at lower operational costs.	Companies can focus resources on accessing global talent and improving employee work-life balance through flexible work environments.
Administrative and Data Storage Expense	Noto et al. (2023), Shaik & Makhecha (2019), Broccardo et al. (2023)	Cloud-based systems reduce the cost of physical data storage, optimize data management, and enhance cost efficiency.	Cloud-based solutions reduce overhead and enhance scalability, contributing to long- term operational efficiency and cost savings.
Team Building and Development Cost	Smeltzer (2020), Feitosa & Salas (2021)	Virtual teams reduce the costs associated with in-person team-building activities through the use of digital tools for collaboration and development.	Virtual team-building methods foster team cohesion without physical costs, enabling companies to allocate funds toward strategic growth.
Online and Virtual Team Building and Development	Alward & Phelps (2019), Caliguri et al. (2022)	Online team-building activities lower travel and logistical costs while fostering inclusivity and cohesion among team members.	Virtual team-building encourages diversity and inclusivity, enhancing engagement while reducing logisticalcosts.
Software and Technology Team Building	Garro et al. (2021), Walker et al. (2021), Dudian et al. (2022)	Investment in technology for training and collaboration improves long-term efficiency and reduces overall team-building costs.	Investing in scalable training platforms lowers long-term costs and increases employee skills, improving overallteam performance.
Travel and Transportation Cost	Rehman et al. (2020), Morrison- Smith & Ruiz (2020), Greer (2021)	Virtual teams minimize travel and transportation expenses by relying on digital communication tools for meetings.	Virtual teams enable companies to save on travel and logistics, allowing funds to be redirected to innovation and strategic initiatives.
Meeting or Business Travel Expense	Silsand et al. (2021), Smeltzer (2020), Kupa (2020)	Digital platforms reduce costs associatedwith travel, accommodation, and meeting logistics, offering greater flexibility.	Reduced travel leads to significant cost savings and operational agility, allowing more frequent and productive meetings.

Category	Authors	Key Findings	Implications
Recruitment and Relocation Expense	McGraw & Stewart Deepwell (2022)	Virtual teams lower recruitment and relocation costs by eliminating geographical constraints and using remote onboarding processes.	Remote recruitment and onboarding broaden the talent pool and reduce costs, enhancing the firm's ability to hire diverse global talent.

Source: Researchers

The chosen journals were carefully examined, and pertinent information was retrieved, including important conclusions, techniques, and suggestions. Every article was evaluated based on how well it added to our knowledge of the variables affecting cost effectiveness in virtual teams. The retrieved information was combined to find recurring themes, trends, and differences. The objective was to have a comprehensive grasp of the elements that support or impede cost effectiveness in virtual teams. A thorough examination and explanation of the combined results constituted the last phase. This stage concentrated on responding to the study question and offering insightful information on the variables affecting cost effectiveness in virtual teams. Through the rigorous application of these criteria, the researchers aim to assemble a relevant and comprehensive set of studies that align with the objectives of the systematic literature review.

3. Results and Discussions

3.1 Communication Cost

Communication is important in daily life as well in business (Szkudlarek et al., 2020). Communication in conventional or co-located teams is mostly dependent on in-person contacts, frequent team meetings, and physical closeness because team members shared workstation facilitates (Newnam & Goode, 2019). Communication undergoes a fundamental shift as teams move from traditional to virtual. Due to the widespread use of digital communication channels team members are no longer restricted by physical proximity (Chatti & Majeed, 2022). Cultural quirks, and the lack of non-verbal indications are just a few of the difficulties associated with virtual communication hurdles that arise with this transition, even if it also makes the workforce more varied and flexible (Loyless, 2023).

The ability for virtual teams to communicate more economically is one of their main benefits. Technological improvements provide smooth communication despite geographical separation, hence improving collaboration. Because of its greater flexibility and quick information exchange, it may even improve it (Cimperman, 2023). Numerous businesses have effectively instituted virtual teams, showcasing the viability of economical communication in the digital age. The business that created WordPress, Automattic, is one such example. Automattic relies on virtual communication solutions to enable smooth cooperation among its globally dispersed staff and the company's production has increased as a result of the switch to a virtual model, which has also decreased operating expenses.

Two recurring themes were found using the systematic literature review methodology: online information and communication technology and integrated internal communication platform. These two situational variables were combined into one factor called "Communication Cost," which exposed a critical component impacting the cost effectiveness of virtual teams.

3.1.1 Online Information and Communication Technology

Many tools and platforms are available through online information and communication technology that are intended to help team members who are separated by distance. A few examples of how technology helps with communication in remote teams are video conferencing, email, social media and instant messaging (Nguyen et al., 2022). Team members may communicate in real time, no matter where they are physically located, thanks to these technologies. Face-to-face communication is made possible by video conferencing, for example, and is essential for establishing the kind of understanding and connection needed for productive teamwork (P. Kumar et al., 2023).

Online ICT has several benefits over traditional communication methods in both co- located and virtual teams. The flexibility it offers is one of its main advantages. Regardless of time zones, team members can interact and communicate in real-time, which increases responsiveness and productivity (Taştan & Gönel, 2020). In addition to allowing for a variety of working styles, this flexibility helps team members more successfully manage their personal and professional obligations (Kusairi et al., 2021). When it comes to promoting cost efficiency in virtual teams, online ICT is essential. Conventional communication techniques, like in- person meetings and travel for in-person conversations, can be very expensive. Online ICT used by virtual teams can lower or even eliminate these expenses, additionally online communication tools' scalability and accessibility add to their cost-effectivenes (Zhu et al., 2021). By utilizing online ICT such as email, instant messaging, audio and video conference teams can communicate even more quickly than with traditional methods and finally help improve performance (Cheng et al., 2021).

3.1.2 Integrated Internal Communication Platform

Platforms for integrated internal communication act as central locations for team members to communicate, exchange information, and plan tasks. These platforms frequently combine functions like task management, file sharing, instant messaging, and document collaboration to provide an all-inclusive virtual team communication solution (Sandberg et al., 2020). Integrated internal communication platforms are superior to traditional communication methods in many ways. Consolidating communication channels is a major advantage. Team members can access all essential communication features within a single, integrated platform, saving them the trouble of juggling multiple tools and platforms and efficiency is also increased by the smooth integration of diverse communication tools because switching between them is eliminated (Hijazi et al., 2023).

According to Song (2022) and Muchsinati et al. (2024), integrated internal communication platform can also help management to monitored the employee work and productivity more objective than traditional way. Also, by reducing the possibility of information silos and promoting transparency this consolidation makes sure that everyone in the team is on the same page (Men et al., 2023). Integrated platforms for internal communication simplify workflows and minimize the need for disparate tools, which helps virtual teams operate more economically. Conventional communication techniques frequently require the use of various platforms and tools, which raises the cost of training and maintenance. These platforms' centralized design reduces the need for intensive IT support, which lowers overall costs even more (Cardon et al., 2019). In summary, integrated internal communication platforms are essential for maximizing communication in virtual teams because they provide substantial cost savings over conventional communication techniques in addition to improved collaboration (Song, 2022).

Previous research has shown the importance of communication in everyday life and business, especially in the context of conventional and virtual teams. Conventional teams rely on face-to-face interaction, physical proximity, and regular meetings, while the shift to virtual teams brings fundamental changes, as the use of digital technology allows for long-distance communication without the constraints of physical location. However, virtual teams also face challenges, such as cultural differences and limitations in non-verbal communication, despite offering greater flexibility and diversity.

3.2 Infrastructure and Office Space Cost

Teams in using traditional or co located office were frequently housed in actual office buildings, necessitating large expenditures for utilities, office furniture, infrastructure, and upkeep. Businesses would set aside a sizeable amount of their cash to provide a productive and cozy workplace. This method was quite expensive, but it made face-to-face communication and teamwork easier (Kropman et al., 2023). With employees dispersed among several places, businesses are no longer constrained by the limitations of physical office premises, the way firms perceive the expenses of infrastructure and office space has changed as a result of this shift (Robertson et al., 2022).

The substantial savings on infrastructure and office space is one of the main benefits of virtual teams. Businesses can use the money they would have spent on maintenance, utilities, and rent to pay staff

training programs, strategic projects, or technology improvements that can help improve employee productivity (Ichdan, 2024). Virtual teams frequently enjoy the same or higher levels of productivity, thus the cost savings don't always transfer into a loss in output (Schuster, 2022). Businesses may now take an approach to operations that is more scalable and agile thanks to the transition to virtual teams (Swartz & Shrivastava, 2022). The ability for workers to work from anywhere encourages a better work-life balance, increased job satisfaction often created outcomes of greater freedom, which boosts overall productivity (Eladira et all., 2024).

We found two converging scenarios about cost efficiency in virtual teams after using the systematic literature review (SLR) approach to examine the literature. They fell under the headings of "Office and Maintenance Expense and Administrative" and "Data Storage Expense." We then combined these two scenarios under the general variable called "Cost of Office Space and Infrastructure." This single variable captures the combined impact of office- related expenses and data storage costs on virtual teams overall cost effectiveness.

3.2.1 Office and Maintenance Expense

The management of office and maintenance expenses plays a critical role in influencing the efficiency of virtual teams. This, in turn, directly affects the costs associated with infrastructure and office space. Office and maintenance costs include a range of costs, including utilities, rent, and equipment maintenance (Plebankiewicz et al., 2022). These costs are reduced in virtual team setups, where remote work environments take the place of physical office spaces (Batırlık et al., 2022). Costs are greatly reduced because substantial office space and infrastructure are not required. By utilizing digital communication tools, virtual teams can reduce traditional office maintenance costs and optimize resource allocation.

Virtual teams enjoy significant cost reductions on infrastructure and office space as compared to traditional teams. Team members can work remotely thanks to virtual collaboration technologies. Because of this flexibility, there is less of a need for large office buildings, which lowers the cost of assets related to office space (Bernat, et al., 2023). When it comes to office space and infrastructure, virtual teams are known for their cost-effectiveness. Companies may redirect money that would otherwise be used for upkeep of physical buildings into strategic goals by adopting a remote work model (Bharathi et al., 2019). Without the limitations of a centralized office, virtual teams may access a global talent pool, fostering diversity and cutting total operating expenses (Kiely et al., 2022; Swartz & Shrivastava, 2022). Because virtual teams are flexible by nature, they may create a dynamic work environment that changes to meet the demands of the team and increase output and efficiency (Lauring et al., 2022).

3.2.2 Administrative and Data Storage Expense

Expenses for administration and data storage are essential parts of a company's operating budget in the digital age. Virtual teams provide a different way to handle these costs because of their emphasis on distant cooperation. Digital solutions help virtual teams expedite administrative duties including data administration, record-keeping, and paperwork (Noto et al., 2023). More money may be allocated to reliable data storage solutions and effective administrative systems as a result of lower office and maintenance costs. For example, cloud- based storage systems provide scalable and secure alternatives that do not require large physical storage areas, which lowers the expenses associated with administration and data storage (Shaik & Makhecha, 2019).

Virtual teams use technology to save costs associated with data storage and administrative overhead. The use of cloud-based systems reduces the demand for physical paperwork by enabling collaborative document generation and administration. This lowers expenses related to conventional administrative procedures while simultaneously increasing efficiency. In addition, scalable data storage options guarantee that virtual teams only pay for the resources they really utilize, making them a more affordable option than conventional office-based arrangements. Virtual teams are more cost-effective when it comes to administrative and data storage costs in addition to infrastructure. Through the

utilization of digital technologies and cloud-based solutions, virtual teams may function with more responsiveness and agility (V. Kumar et al., 2023). Remote data access and management facilitates more efficient workflow by eliminating the need for large administrative staff and physical storage infrastructure. Consequently, this establishes an economical framework that enables companies to allocate resources towards key projects and new technology, thereby propelling sustained expansion (Broccardo et al., 2023).

The research in this section examines the cost-efficiency of virtual teams compared to co-located teams in a physical office. In a traditional office setting, companies spend heavily on utilities, furniture, infrastructure, and maintenance to create a productive work environment. However, the shift to virtual teams changes the way companies view infrastructure and office space costs. Virtual teams reduce the need for physical space, allowing companies to allocate budgets for training programs, strategic projects, or technology upgrades. Additionally, the flexibility of remote work contributes to work-life balance, job satisfaction, and employee retention, which increases productivity (Onyekwelu et al.,2022; Swartz & Shrivastava, 2022). The shift to virtual teams offers significant cost-efficiency benefits, primarily through reduced office and administrative costs. Digital solutions and cloud-based technologies increase efficiency and flexibility, allowing for more effective allocation of resources for strategic projects and company growth.

3.3 Team Building and Development Cost
In the past, team development and building have been closely associated with physical closeness, with teams occupying adjacent workspaces in offices. Businesses spent money on team-building exercises, on-site training courses, and other initiatives that promote unity among team members, work motivation and performance (Alam et al., 2019b). Regular in-person meetings and face-to-face contacts were thought to be essential for productive teamwork and the creation of a strong team culture. Organizations are being forced to reconsider how they handle team relationships in light of the new era of work brought about by the digital age. The shift from co-located to virtual teams is becoming more and more common, giving businesses access to a worldwide talent pool and giving workers the freedom to work from anywhere (Chamakiotis et al., 2021). Conventional methods of team building have been supplanted by virtual efforts that use online training courses, video conferencing, and collaboration technologies to overcome geographical distances between team members.

The potential for cost reduction is one of the most prominent benefits of virtual teams. The move to remote work reduces costs associated with rent, utilities, and office supplies since it does away with the requirement for real office space. Businesses can also cut back on the expenses of traveling for team meetings and training sessions (Feitosa & Salas, 2021). Setting up virtual infrastructure and giving staff the tools they need may involve early investments, but overall cost savings usually offset these out-of-pocket costs. Virtual teams have been shown to sustain or even increase production in spite of the decrease in traditional overhead expenditures. Regardless of their physical locations, team members can work together easily, communicate information effectively, and keep in touch with each other when the proper technology and communication tools are in place (Lechner & Tobias Mortlock, 2022) Though they differ from their in-person counterparts, virtual team building exercises help create a strong team culture by encouraging involvement and a sense of belonging among team members.

We identified similar elements in two contexts—online and virtual team building and development and software and technology team building and development—by performing an extensive literature study. These variables were combined to establish factor that affect how cost-effective virtual teams is which is team development and building costs.

3.3.1 Online and Virtual Team Building and Development
Virtual team growth is greatly aided by online team-building activities. Conventional team-building exercises like seminars and getaways can be expensive and logistically difficult for remote teams operating in various areas. Online team building exercises, on the other hand, make use of digital platforms to let members of the team communicate and work together regardless of where they are physically located. This lowers travel costs and makes it possible to do more regular and focused team-

building activities, which eventually has a favorable impact on development costs. When it comes to online team creation, virtual teams are clearly superior to traditional or co-located teams. Team members may work together on an even playing field regardless of where they are physically located thanks to the virtual environment. This encourages equality of participation and inclusion, strengthening the bond between team members (Alward & Phelps, 2019). Virtual teams also gain from a wide talent pool that unites people with a range of backgrounds and viewpoints (Caligiuri et al., 2022). Because of this diversity, online team building activities are richer and the team culture is strengthened.

Cost efficiencies that are not possible in traditional or co-located teams are introduced via online team building for virtual teams (Caligiuri et al., 2022). Organizations may organize frequent team-building exercises without having to pay for travel, lodging, and venue reservations by utilizing digital platforms. Additionally, teams may participate in events during established work hours thanks to the flexibility of online team building, which minimizes interruptions to regular operations. The transition to a more economical method of team creation helps virtual teams save money overall on development expenses.

3.3.2 Software and Technology Team Building and Development
The effectiveness of virtual teams is heavily dependent on software development and training, which affects both individual and group capabilities. Specialized software and tools are frequently used by virtual teams to support project management, communication, and cooperation (Garro-Abarca et al., 2021). In addition to increasing team productivity, proper training with these technologies helps members advance their skill sets. Even though the initial cost of software training may seem high, it may end up saving money in the long run thanks to improved teamwork and efficiency. Virtual teams have clear benefits when it comes to software development and training. The smooth integration of training modules into the team's workflow is made possible by the digital nature of virtual cooperation. The provision of training resources to team members at their convenience fosters a self-paced learning atmosphere. Furthermore, virtual teams can use online collaboration technologies to facilitate peer-to-peer learning and real-time problem-solving, resulting in a dynamic and effective training environment (Walker et al., 2021). When software development and training are implemented in virtual teams instead of traditional or co-located teams, financial savings are realized (Dudian et al., 2022). Conventional training approaches can incur additional costs due to on-site workshops, travel expenditures, and printed materials. By utilizing online training platforms, virtual teams may do away with the requirement for physical resources and travel-related expenses. Long-term cost effectiveness in team development is further enhanced by the scalability of virtual training, which enables firms to reach a larger audience without seeing proportionate increases in cost.

Previous research in this section discusses the transformation in team building and development caused by the shift from conventional teams in the same physical location to virtual teams. In the traditional context, companies spend a lot of money to build team relationships through on-the-job activities, face-to-face training, and regular meetings, which are considered important for increasing motivation and work performance. However, the digital era has encouraged companies to use virtual team building methods by utilizing online courses, video conferencing, and collaboration technologies. This change allows access to global talent and provides work flexibility for employees, while reducing physical infrastructure costs, such as rent and utilities (Chamakiotis et al., 2021). Virtual team building and development offers significant cost savings by using online methods and digital technologies. Virtual team building activities and software training provide flexibility and efficiency that conventional teams do not have, allowing for reduced infrastructure costs and efficient improvement of team culture and skills.

3.4 Travel and Transportation Cost
There are always going to be travel and transportation expenses in a conventional or co-located team environment (Rehman et al., 2020). Team members frequently have to travel to other places for meetings, conferences, or client engagements in addition to making the daily commute to a central office. These charges include travel, lodging, ground transportation, and other related fees. Meetings in person have long been seen to be crucial for fostering relationships, maintaining team cohesiveness, and improving communication. Nevertheless, these advantages come with a price, as businesses set

aside large budgets to pay for travel expenditures. Although this paradigm works well in some situations, it is not very flexible, scalable, or cost-effective. The workplace has undergone a transformation thanks to the introduction of cutting-edge communication technology and the growth of virtual teams. To link team members who are spread out across different geographic regions, virtual teams make use of digital technologies, video conferencing, and collaboration platforms (Morrison-Smith & Ruiz, 2020). The need for lengthy travel and in-person meetings has been reevaluated as a result of this change. Travel becomes the exception rather than the rule while working in virtual teams, as there is no longer a necessity for everyday commutes. Businesses should target their efforts toward virtual collaboration tools and technology rather than actual office space investments.

The possibility of large cost reductions is one of the main benefits of switching to virtual teams. Businesses see a significant decrease in overhead associated with their offices as well as in travel and transportation costs. The move to virtual cooperation reduces expenses directly while also providing non-tangible advantages like better work-life balance, more flexibility, and access to a larger talent pool (Greer, 2021). With efficient technologies for collaboration and communication, virtual teams may maintain or even boost production even in situations when conventional expenses have decreased. Despite geographical boundaries, team members may remain involved and connected thanks to instant messaging, project management software, and video conferencing tools (Morrison-Smith & Ruiz, 2020). This helps the group feel more cohesive. Meeting or Business Travel Expense and Recruitment and Relocation Expense were the two recurrent issues that emerged from the literature after a thorough study. Together, they were combined into a single variable called "Travel and Transportation Cost," which was found to be a significant factor affecting virtual teams' cost effectiveness.

3.4.1 Meeting or Business Travel Expense

Conventional teams frequently have to pay high costs for business travel, such as airfare, lodging, and transportation. Virtual teams, on the other hand, make use of online communication resources to minimize the need for in-person meetings. Team members may attend meetings from their separate locations, which results in considerable travel and transportation expense reductions (Silsand et al., 2021). Virtual teams are transforming company meetings into new and innovative formats. There is no need for actual travel thanks to video conferencing, collaboration platforms, and instant messaging solutions that facilitate smooth communication (Morrison-Smith & Ruiz , 2020). Team members benefit from increased flexibility as well as the ability to attend meetings without having to pay for standard travel fees. Therefore, compared to co-located teams, virtual teams have a clear benefit in terms of meeting-related travel expenditures (Chamakiotis et al., 2021). The use of virtual communication in place of traditional means during meetings is more economical. By saving money on travel, lodging, and ground transportation, virtual teams can reduce costs. Additionally, by streamlining the decision-making process, virtual meetings cut down on the time and expenses associated with travel. When compared to the conventional method used by co-located teams, the efficiency advantages from virtual communication greatly increase the total cost efficiency in virtual teams (Kupa, 2020).

3.4.2 Recruitment and Relocation Expense

Any firm must take recruitment and relocation costs into account, and virtual teams have brought creative ways to effectively manage these charges. Significant travel and onboarding costs are frequently incurred throughout the hiring process. Conventional teams could have to move staff members, which would mean paying more for accommodation, transportation, and other associated expenses. However, with virtual teams, there is less need for long distance moving and travel because the hiring and onboarding procedures may be completed remotely (McGraw & Stewart, 2020). One clear benefit of virtual teams is their ability to manage hiring and moving costs. The recruiting process becomes more accessible and economical when candidates and workers don't have to travel to a real site for virtual interviews and onboarding procedures. Due to the large reduction of geographical limits, this strategy also broadens the pool of possible applicants (Deepwell, 2022).

Previous research in this section describes the cost efficiencies gained from reduced travel and transportation requirements in virtual teams compared to teams located in physical offices. In traditional teams, travel for meetings, conferences, and client visits, as well as daily commuting, generate

significant travel, accommodation, and ground transportation costs. While face-to-face meetings support work relationships and communication, the high cost and limited flexibility make this approach less effective for many companies. With advances in communication technology, virtual teams can now work together without the need to travel, allowing companies to focus more on investing in digital collaboration tools (Morrison-Smith & Ruiz, 2020). By replacing physical travel with online communication tools, virtual teams offer significant cost efficiencies in terms of business travel and recruitment. These cost savings allow companies to allocate resources to strategic projects while leveraging technology to strengthen team connectivity and productivity without geographic boundaries.

4. Conclusion

The study uncovered a number of important factors that support virtual teams' cost effectiveness. First, the expense of communication was looked at. Advanced online information and communication technologies help virtual teams by enabling real-time, affordable communication across geographic borders. By combining key communication components, the integration of internal communication systems improves efficiency even further. The expenses of office space and infrastructure were shown to be important factors in determining how cost-effective virtual teams are. Businesses may now reallocate cash from infrastructure upkeep to strategic initiatives or technological advancements by moving away from traditional office environments. The usage of digital solutions also reduces administrative and data storage costs, which adds to total cost reductions.

The topic of team building and development expenses was examined, with a focus on the shift from conventional face-to-face events to online substitutes. Team-building exercises that take place online or virtually provide more affordable options by eliminating the need for travel and venue costs. Similar to this, team-building and development techniques based on software and technology save money over time by increasing productivity and scalability. Lastly, the study looked at virtual teams' travel and transportation expenses. The use of digital platforms for cooperation and communication reduces the necessity for face-to-face meetings, which results in significant savings on travel costs. Due to the fact that virtual teams make the recruiting and onboarding procedures more efficient and affordable, they also reduce the need for recruitment and relocation expenses.

Finally, virtual teams have shown to be a more affordable option than conventional team structures. Through the utilization of cutting-edge communication technologies, efficient utilization of infrastructure, and implementation of virtual team-building tactics, establishments can attain noteworthy financial benefits without compromising or surpassing overall productivity. Based on the study's findings, recommendations for the company especially those working in the technology or digital sector, can reallocate resources from physical infrastructure to technology. By adopting a virtual team structure, organizations can significantly reduce office space and infrastructure costs. Redirect these savings toward strategic initiatives or technological advancements that support long-term growth and competitive advantage. This shift allows companies to maintain flexibility and adapt to changing market conditions without the burden of fixed physical costs.

Limitations and future studies

The study underscores the importance of cost efficiency drivers for virtual teams, signaling a strategic shift in business operations. By adopting virtual teams, companies can redirect funds from traditional expenses—like team-building, travel, and office infrastructure—toward employee development, innovation, and technology. This reallocation can fuel growth and help companies stay competitive in a rapidly evolving market. Investing in technology is crucial for cost efficiency in virtual teams. Allocating resources to modern communication platforms enables smooth collaboration and reduces the need for physical presence, creating a cohesive and adaptable virtual environment. The study also emphasizes the benefits of flexible work models. Virtual teams enable companies to explore hybrid arrangements, blending virtual and in-person work to cut costs, enhance efficiency, and support work-life balance. However, the study's reliance on existing literature may limit the generalizability of its findings. Results might vary across industries, and rapid technological advancements since the literature review could impact the relevance of these strategies.

Future research should conduct broader empirical studies across industries to test the relevance and effectiveness of cost-efficiency strategies in virtual teams. This can provide a more comprehensive picture of how cost-efficiency is implemented and adapted in different contexts. With the growing acceptance of flexible work models, future research could focus on how hybrid models that combine virtual and face-to-face components affect work-life balance, employee satisfaction, and team productivity.

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