

Effectiveness of Cooperation in Virtual Teams

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Article Info

Article history:

Received May 19, 2022

Revised Jun 16, 2022

Accepted Jun 30, 2022

Keywords:

Virtual teams

Effectiveness

Cooperation

Virtual organization

ABSTRACT

Technological development has led to the emergence of cooperation separately both geographically and in time zone in an organization in the form of a virtual organization. PT XYZ's Microsoft Solution and Service (DMSS) Department is one of the departments that provides digital services in the form of One-Stop-Solutions on Digital Services, both in on-premise and cloud infrastructure models with products and solutions based on Microsoft products for customers. In his service during the Covid-19 pandemic, this department implements virtual team coordination so that product development can continue as planned. However, on the other hand, the effectiveness of performance in implementing virtual organizations is still a challenge for the company. This is the focus of research to find out what factors influence the effectiveness of cooperation in the application of virtual organizations at PT XYZ in general and specifically in the Microsoft Solution and Service Department. This study conducted an analysis of seven factors by surveying 40 respondents at PT. XYZ. The results obtained are three factors consisting of depth of communication, technology, and training which have an influence on the effectiveness of the application of virtual organizations at PT. XYZ, while four other factors such as trust, shared understanding of knowledge, commitment, and leadership have no significant effect on the effectiveness of virtual organizations.

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1. INTRODUCTION

Technological advances, especially in the field of communication, are exciting. A thing that was initially impossible to do is now possible. In the era of the Covid-19 pandemic, distance is no longer a barrier for every organization to be able to communicate in doing a job without any delay. This is done by almost all organizations around the world technology advancements gave rise to a new form of collaboration to work on virtual organizations that allow collaboration between virtual teams.

In a global economy, virtual teams are a technology currently prevalent in the business world to work together to provide new services. Virtual teams allow each individual to work together separately, both geographically and in time zones [1]. One of the characteristics of implementing a virtual team is that

its members are spread across various regions without meeting in person [2], [3]. Physical location matters less than it did [4]. Borders and boundaries, ownership, and control have become less rigid [4].

The importance of virtual teams in organizations today affects increasing the effectiveness and efficiency of company work in terms of resources, time, and place. Companies can work with experts in various regions without requiring additional costs for relocation. Virtual teams also have efficiency in terms of time, that is, work can be done anywhere and anytime. This can reduce the workplace cost [1].

Seeing the rapid development of virtual teams today, it is interesting to study more deeply to understand virtual teams and the factors that affect their effectiveness. In fact, this virtual team is different from traditional teams. Therefore, several differences must be considered in managing virtual teams where this is a new challenge for human resource management, especially at PT XYZ. This study aims to analyze the effectiveness of cooperation in virtual organizations carried out at PT XYZ, in order to obtain a recommendation aimed at work efficiency, increasing productivity as a new way of improving customer service, and a more favorable environment [1]. The measurement of the effectiveness of this collaboration is carried out using a quantitative method that begins with a survey of employees who run virtual organizations at PT XYZ.

2. LITERATURE REVIEW

Explaining research chronological, including research design, research procedure (in the form of algorithms, Pseudocode or other), how to test and data acquisition [1-3]. The description of the course of research should be supported by references so that the explanation can be accepted scientifically [2, 4]. Tables and Figures are presented center, as shown in Table 1 and Figure 1, and cited in the manuscript and should appeared before it.

2.1 Virtual Organization

Shifting the use of technology in a company brings changes to the form of the organization. Various kinds of new business innovations have sprung up based on information technology. This gave birth to an organization known as the virtual organization field [5].

A virtual organization is an organization that has a flexible network using information technology to share knowledge, skills, and access expertise to other resources through cyberspace. [5]. Another definition of a virtual organization is an IT-enabled organization in which independent firms band together as nodes on an information network to achieve increases in scope and scale [4]. There are three levels in the virtual organization field [6], that is:

- The group level (group level) deals with internal work that involves a group of people in different companies connected via long distance communication.
- The organizational level is concerned with the use of information technology to coordinate organizational activities as an integration.
- The inter-organizational level relates to many organizations coordinating business activities by utilizing information technology.

Virtual organizations are of four types [7]. This is seen based on the results of the virtualization process. The following types of virtual organizations:

- Virtual teams, between members in the organization, coordinate and share knowledge through information technology.
- Virtual project, the realization of work that involves several people in the organization with a predetermined time span.
- Temporary virtual organization, involving several organizations in a certain period of time.
- Permanent virtual organization, involving several organizations with an indefinite period of time

2.2 Difference between Virtual Team and Traditional Team

Traditional teams do work side by side in the same building, while virtual teams do work in several different locations [5]. In addition, virtual teams use electronic communication to coordinate. Whereas in traditional teams, coordination is carried out directly by team members [3].

The use of information technology in virtual teams is different from traditional teams. Traditional teams use communication tools such as email, cell phones and other devices only to support their communication. Meanwhile, in virtual teams, information and communication technology is a prerequisite for teamwork activities. Team members are required to understand information and communication technology systems to connect and work together [8].

The birth of a virtual team is a form of necessity that requires work to be done virtually. Employees are required to adapt to work models through cyberspace. Of course, in working, virtual teams have different patterns, work rhythms and structures from traditional teams. Traditional teams tend to reflect a centralized, formal design, and have a hierarchy inherent in every activity, whereas the structure of virtual teams tends to be decentralized, informal, and flat. Teams or organizations that join forces are required to adapt to new processes and other innovations quickly [3].

2.3 Organization Profile

PT XYZ is a service provider company that provides solutions in the form of digital services. Since 1983, the company has been part of the PT XYZ Group, a conglomerate company in Indonesia that has 215 subsidiaries and affiliated companies with seven business fields (automotive, financial services, heavy equipment, agribusiness, information technology, infrastructure & logistics, and property). PT XYZ has a vision that is to become the preferred partner for digital services. In achieving this vision, PT XYZ has a mission to provide value in digital services.

PT XYZ's Microsoft Solution and Service (DMSS) Department is one of the departments within a company that provides digital services in the form of One-Stop-Solutions on Digital Services, both in on-premise and cloud infrastructure models with products and solutions based on Microsoft products for customers. In developing its products, this department implemented virtual team coordination during the Covid-19 pandemic. PT XYZ decided to use the virtual team concept so that product development could still run according to project schedule, cost and scope. This is due to the work from home policy that requires employees to work from home.

In addition, several projects from DMSS also require experts from abroad to assist in project development. This is because the knowledge of human resources in the company is still lacking. For this reason, it can be seen in the graph below which is one of the results of the online roll out survey conducted at Project DOS Phase 1 PT. ABC, which involved 10 companies with 66 dealers throughout Indonesia.

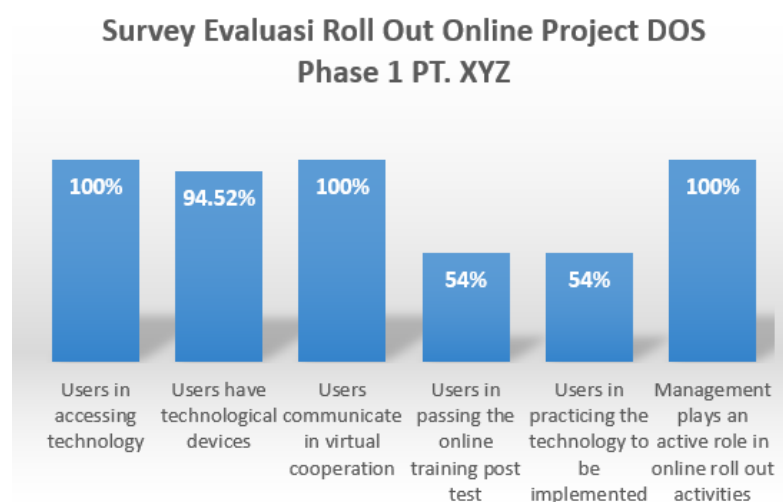


Figure 1. Data from the Evaluation Survey of Roll Out Online Project DOS Phase 1 PT. XYZ

With the survey results, the implementation of online technology project development with a virtual team is currently essential. This can affect the performance of companies with separate virtual teams[1].

2.4 Virtual Team Effectiveness

The effectiveness of the virtual team is obtained based on literature reviews obtained through several previous studies, journals, or previous conferences that are relevant to this research topic. The effectiveness of virtual teams can be seen based on several conditions to create effective collaboration, obtained by seven supporting factors, namely:

Trust as a basis for socializing and plays an essential role in the performance of an organization [9], [10], [11]. In several studies related to the performance and effectiveness of virtual teams, trust is the most popular factor[9]. Without the belief that the effectiveness of team performance will be disrupted and tend to avoid certain risks. Trust makes team members have strong confidence in other members that they can complete the job well and on time [12].

Leadership as a factor that supports the formation of trust and encourages motivation for team members to be able to complete a project [13]. Leadership is needed in a team that is geographically dispersed, has members with various cultural backgrounds, custom patterns, various languages, and different societal norms. Several studies have shown that team members have satisfaction with leaders who are able to decode messages involving long-distance relationships between teams [14], [13]. Thus, leadership in virtual teams is essential. The leader can play a central role in the way the team works, significantly to influence how the team handles challenges and how the team ultimately adapts to those challenges.

Depth of communication becomes an essential factor to avoid misunderstanding and ambiguity between virtual team members [13]. Effective communication makes it easy to complete work on various types of teams, including virtual teams [15], [16]. Effective communication is accurate, precise and simple communication that can avoid misunderstandings [17].

Shared understanding of knowledge is the sharing of understanding of knowledge to increase the effectiveness of expertise between virtual teams [1]. This is important to ensure that all team members have a clear understanding of the team's strategic direction [3]. Understanding that is shared and understood by each team member has benefits, namely 1) increasing work efficiency, 2) reducing implementation errors, and 3) reducing the occurrence of conflict [18].

Commitment is a factor that arises due to the trust of virtual team members. Without the trust that is built, commitment will never be achieved by the team [17]. Commitment has a role to maintain the continuity of project development to be completed according to plan.

Technology is the basis of the virtual team, without the virtual team technology will not be able to run business processes [12]. For this reason, technology must be able to facilitate the need for coordination, cooperation, and provision of information between the members involved [19]. Sustainability is needed which is always updated in terms of hardware and software to support the success of the virtual team.

Training is a factor needed for virtual teams to be able to use technology well. The rapid development of technology does not rule out changes in the software and hardware used by virtual teams. For this reason, training becomes a means to learn how the systems used while working in virtual teams work. Based on research conducted by Beranek and Martz found that training increases satisfaction, cohesiveness and better acceptance of a technology [19].

Based on the seven factors that have been found based on previous research, a research model can be formed of seven categories of effectiveness in virtual team PT XYZ. The research model can be used to develop a questionnaire that can be filled in by respondents at PT XYZ.

3. METHODOLOGY

3.1 Survey Data

Survey data to identify and synthesize several factors that affect the effectiveness of cooperation in virtual teams from related studies that have been carried out previously, taken from several articles (journal and conference papers) and after screening and according to research topics, 3 articles (journal and conference papers) found as a result of the filtering process, which is then used in the next step.

3.2 Instrument Making

The questionnaire consists of 34 questions are grouped into 7 parts. The first part collects general respondent information including respondent profile data such experience, age and occupation of the respondent. The second part asks respondents to rank 7 dimensions of the factors on a five-point likert scale from strongly disagree to strongly agree as follows: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree [7]. Around 31 PT XYZ employees. The questionnaire would then be revised for each item and checked for possible consistency with respondents' answers.

3.3 Data analysis

Data collected can be statistically tested and processed using Microsoft Excel using the ranking method. Data analysis was carried out after the data was processed so that factors that influence the effectiveness of cooperation in implementing virtual teams can be determined.

3.4 Result

The result is the factors that influence the effectiveness of virtual team collaboration in project development among employees at PT XYZ.

3.5 Structural Equation Modeling

The Structural Equation Modeling (SEM) is multivariate technique combining aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts with multiple variables) to estimate a series of interrelated dependence relationships simultaneously [19]. SEM method that has been used in research discussing virtual organizations. In this study, the researchers examined the effectiveness of cooperation in virtual teams. The SEM model used in this study can be seen in Figure 1.

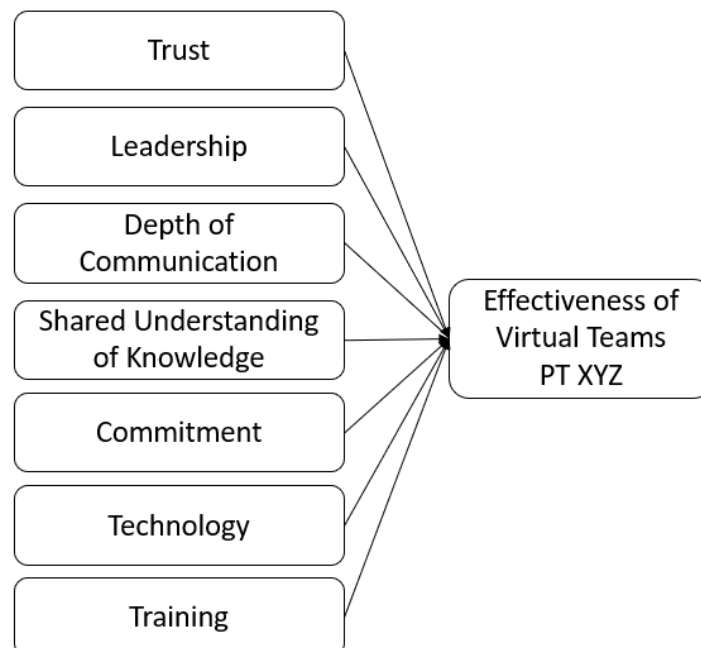


Fig. 2. SEM Model.

4. RESULTS AND DISCUSSION

The collected data consists of 40 respondents. Respondents were people applying the Virtual Teams Concept in PT XYZ. Respondents could act as the project manager, team lead, programmer, data science, business analyst, and quality assurance. The following is respondent demography.

Table 1 Demographics of Respondents

Criteria	Information	Percentage
Age	< 21 Years	2.5%
	21 – 30 Years	67.5%
	31 – 40 Years	27.5%
	> 40 Years	2.5%
Experience	< 1 Year	5%
	1- 5 Years	23%
	> 5 Year	12 %
Position	Project Manager	4%
	Team Lead	10%
	Programmer	20%
	Data Science	15%
	Business Analyst	35%
	Quality Assurance	4%

3.1. The result of the analysis

Significantly affecting variables. The SEM-PLS test results show three variables that significantly influenced the effectiveness of cooperation in virtual teams PT XYZ. These variables are technology ($t = 3.696$, $p < 0.05$), training ($t = 2.122$, $p < 0.01$), and dept of communication ($t = 2.050$, $p < 0.05$).

Non-affecting variables. The SEM-PLS test results show four remaining variables that did not influence the success of effectiveness of cooperation in virtual teams PT XYZ. These variables are trust ($t = 1.674$, $p > 1$), shared understanding of knowledge ($t = 1.108$, $p > 1$), commitment ($t = 0.967$, $p > 1$) and leadership ($t = 0.685$, $p > 1$). The PLS-SEM test results in this study are summarized in Table 2. The red color indicates that the non-affecting variables.

R² value results of the structural model. The SEM-PLS test results show that the relationship between endogenous latent variables and the effectiveness virtual teams in PT. XYZ was sufficient or moderate [20]. It was based on the R² ranged between 0.50-0.75, i.e., 0.534 or 53.4%. These results indicate an influential relationship.

Table 2 Test Results

Variables	Original Sample	T-Statistic	P-Value
Trust	-0.159	1.674	0.095
Leadership	-0.106	0.685	0.493
Depth of Communication	0.258	2.050	0.041
Shared Understanding of Knowledge	0.145	1.108	0.268
Commitment	0.145	0.967	0.334
Technology	0.344	3.696	0.000
Training	0.213	2.122	0.034

3.2. Research Discussion and Recommendation

After analyzing the results of existing processed data, the author will try to convey a model of the factors that influence the effectiveness of the virtual team based on the author's opinion which is supported by existing references, without neglecting the fact that there will be multidimensional factors that support the effectiveness of the virtual team. The following three dimensions have a significant effect on the effectiveness of the virtual team of PT XYZ:

1. Depth of Communication

Depth of Communication on the virtual team of PT XYZ consists of a variety of different backgrounds, communication styles, habit patterns, and different geographic areas to be a challenge in a virtual team. In the results of the data analysis that has been carried out, the communication dimension has a positive relationship, where the communication dimension is a dimension that has a significant effect on online project work on each virtual team.

PT XYZ considers communication to be very influential on the effectiveness of virtual teams. Changes in communication styles experienced during the pandemic make communication very crucial. This is because virtual communication with direct communication is certainly different. More effort is needed to grasp intents that are difficult to get through verbal (body language and emotional when communicating directly) [21]. In addition, in the context of decision making, face-to-face interactions are much more efficient [21]. For that, a good virtual communication adjustment is required. This is because effective communication can provide accuracy, ease of grasping the speaker's intent and reduce the problem of misunderstanding between virtual team members [17]. Recommendations related to this can be made by implementing communication standards for the use of supporting tools and software. The use of applications such as Google Meet, Zoom, Microsoft Teams and so on needs to clearly define operational standards and procedures for using them. Standards contain coordination and collaboration mechanisms, both formal and informal, by clearly stating the supporting tools or software [4]. Several other common problems were also faced by several members of the virtual team of PT XYZ, namely network instability and lack of facilities that support network speed when working at home. This hinders the communication process between team members. The recommendation for this problem is that it is necessary to implement stable network standards across virtual teams [21]. Companies can provide facilities that support a stable network, so that good and reliable communication is created [21].

2. Technology

PT XYZ has provided supporting technology according to the needs of virtual team members. Although in practice there are still deficiencies such as the provision of unsupportive facilities on the network (discussed in the communication domain). However, equipment such as laptops and supporting software for getting work done and for interacting are provided.

The problems that have occurred are related to the technology domain at PT XYZ is when the initial transition to virtual team. There are adjustments to use several applications / software and adjustments to the way of working also makes it a challenge for the team. It took about one to two months for the team to adapt. This gives a decrease in performance which has an impact on the completion of work that is getting longer. In addition, organizations are also required to be able to provide facilities that are able to accommodate this change in working methods. Therefore, for PT XYZ, the technology dimension has a very significant effect on effectiveness. This is also supported by previous research, where virtual teams have a high level of dependence on information and communication technology. For this reason, the availability and feasibility (in terms of function and renewal / not obsolete) of supporting technology need to be considered [12].

The use and mastery of the right technology tools in virtual teamwork is a determining factor in the success of a team [12]. Virtual teams would not exist today without the technological tools that currently exist [12]. As we know that this technology is at the heart of the virtual team movement. This has been proven from the results of the analysis that places technology as the dimension with the highest level of significance. In this case, it is necessary to develop a governance system and structure to ensure strong and effective operational and strategic control [4] through technology.

3. Training

In the results of data analysis, training has the second highest value, after placing technology first. Without training, technology cannot be used optimally [19]. PT XYZ has gone through a transition period of implementing virtual teams. Based on the previous dimension (technology dimension) it has been stated that the virtual team encourages the use of new technology for PT XYZ which sufficiently affects the process or the way the company works. With the handling of both the planning and the proper execution of the division leadership, it gives success to virtually adjusting new ways of working.

From the employee side, placing training as important thing because they are experiencing a transition period that requires using new applications / software. At the beginning of using the application / software, many team members needed time to understand and get used to the new system. Most of them feel very helped through the training. PT XYZ has also provided a training mechanism for each new technology. Before starting the project, each member is given training and certification to support their competency needs in the new technology. This training was conducted due to the differences in characteristics between virtual team members and traditional teams [22]. Thus, training is one of the most influential factors in supporting the success of virtual team collaboration.

Several other dimensions such as trust, shared understanding of knowledge, commitment, and leadership show results that have no effect on the effectiveness of collaboration in virtual teams. However, several previous studies provided results showing these dimensions are important for virtual team implementation [1], [3], [23]. For this reason, this dimension does not escape to be discussed in this discussion:

1. Trust

At PT XYZ, the virtual team has a mechanism that encourages them to check the results of the work with a fairly frequent intensity, each level of approval must be checked on every page of work, so that the scheduling of the project becomes longer. This indicates a lack of trust among team members. Previous research has shown that without trust, virtual teams cannot be effective, as their members are afraid to take risks [17], [18].

The recommendations that can be given are that before working on a project online, virtual team members can do the following, i.e. (1) in communicating online, they can provide their personal background before focusing on the work. It is important to build knowledge-based trusts, (2) Teams with a high level of trust make clear division of roles for each member, (3) Show signs of trust in the team as a good behavior.

2. Shared Understanding of Knowledge

Shared Understanding of Knowledge in organizations is very important, collaboration relationships have a purpose in building the effectiveness of virtual teams [1]. This factor Embraces its members to care about the whole process, not just their specific contributions, then they will become more motivated to work together and collaborate to realize a virtual relationship team. Shared understanding is more than just a general goal that all team members recognize, but ensures that each member has a clear understanding of the team's strategy direction. PT XYZ's virtual team faces several constraints related to this dimension. During the Covid-19 outbreak, the sharing of knowledge and capabilities between teams and leaders was severely lacking. Although the "Learning Hour" program has been conducted, it is only done on each person. So a lot of knowledge and capabilities are out of sync with the project being worked on which causes a lot of conflict of workmanship that is not suitable between virtual team members. Recommendations that can be given are (1) Predicting the behavior of everyone in the team, (2) Providing facilities, (3) Helping each other in reducing errors, (4) Reducing conflicts between virtual team members, so that share understanding can be well established.

3. Commitment

Commitment has a relationship with performance and satisfaction in virtual teamwork within the organization. The commitment dimension has a relationship with the trust dimension. Virtual teams are experiencing constraints related to commitment, namely a lack of trust between virtual team members, which causes good commitments will not be achieved in teamwork.

4. Leadership

The presence of leaders who can facilitate the needs of the team in the virtual team becomes an important point [12]. The problems found in the virtual team, some things are still experiencing obstacles, as discussed in the previous dimension (facilities to support the network, and still lack of knowledge sharing) make the importance of the role of leadership to overcome things like this. Recommendations that can be given to be done by leaders are: (1) Make a procedure of each information sharing in the team, (2) Facilitate resources as needed, (3) Make a rule in communicating comfortably.

5. CONCLUSION

Based on the results and analysis that has been carried out in this study involving 40 respondents from employees of PT. XYZ with ages 21 - 40 years and work experience under 5 years. The results show that the Depth of Communication factor on project work is carried out in virtual teams. In addition, there are also Technology and Training factors which also have a significant influence on the application of virtual organizations at PT XYZ. But on the other hand, there are 4 factors that do not affect the virtual organization at PT XYZ which consists of Trust, Shared Understanding of Knowledge, Commitment, and Leadership. From these results it can be seen that the depth of communication between team members, the technology used and the training carried out are several factors that can influence the implementation of virtual organizations at PT XYZ.

Based on the results obtained, it is known that there are four factors whose results do not affect the effectiveness of cooperation in virtual organizations at PT XYZ, these can be indicators that must be improved in the organizational environment to achieve maximum results in the effectiveness of cooperation. The limitation in this study is the coverage of respondents which only includes one division at PT. XYZ with limited respondents can affect the results of the analysis obtained. In addition, there is no confirmation in the form of an interview after the survey, in this case it can also affect the validity of the data obtained. The continuity of this research can be complemented by the addition of interviews with several sample respondents and it can also be complemented by expert opinions who are experts in the case of virtual organizations. In addition, application in a more complex scope can also be another consideration for further research.

REFERENCES

- [1] F. M. Horwitz, D. Bravington, and U. Silvis, "The promise of virtual teams: Identifying key factors in effectiveness and failure," *J. Eur. Ind. Train.*, vol. 30, no. 6, 2006, doi: 10.1108/03090590610688843.
- [2] K. Prasad and K. B. Akhilesh, "Global virtual teams: What impacts their design and performance?," *Team Perform. Manag. An Int. J.*, vol. 8, 2002, doi: 10.1108/13527590210442212.
- [3] L. M. Peters and C. C. Manz, "Identifying antecedents of virtual team collaboration," *Team Performance Management*, vol. 13, no. 3–4, 2007, doi: 10.1108/13527590710759865.
- [4] L. M. Applegate, R. D. Austin, and D. L. Soule, *Corporate Information Strategy and Management 8th Edition*. Colombia: The McGraw-Hill Companies, 2009.
- [5] K. Čulo, "VIRTUAL ORGANIZATION – THE FUTURE HAS ALREADY BEGUN," *Media, Cult. public relations*, vol. 7, no. 1, 2016.
- [6] G. DeSanctis and M. Roach, "Virtual Organization: Toward a Theory of Societal Transformation Stimulated by Information Technology, by A. Mowshowitz. Westport, CT: Quorum Books, 2002. xiii + 264 pp. \$49.95. ISBN 1-56720-501-1," *Inf. Soc.*, vol. 19, no. 4, 2003, doi: 10.1080/01972240309483.
- [7] J. R. Galbraith, *Designing matrix organizations that actually work*, no. 1. 2009.
- [8] P. Johnson, V. Heimann, and K. O'Neill, "The 'wonderland' of virtual teams," *J. Work. Learn.*, vol. 13, no. 1, 2001, doi: 10.1108/13665620110364745.
- [9] M. Indiramma and K. R. Anandakumar, "Behavioral analysis of team members in Virtual Organization based on Trust dimension and learning," *World Acad. Sci. Eng. Technol.*, vol. 39, 2009, doi: 10.5281/zenodo.1057505.
- [10] P. B. Lowry, D. Zhang, L. Zhou, and X. Fu, "Effects of culture, social presence, and group

- composition on trust in technology-supported decision-making groups,” *Inf. Syst. J.*, vol. 20, no. 3, 2010, doi: 10.1111/j.1365-2575.2009.00334.x.
- [11] P. Andressen, U. Konradt, and C. P. Neck, “The Relation Between Self-Leadership and Transformational Leadership: Competing Models and the Moderating Role of Virtuality,” *J. Leadersh. Organ. Stud.*, vol. 19, no. 1, 2012, doi: 10.1177/1548051811425047.
 - [12] B. J. Bergiel, E. B. Bergiel, and P. W. Balsmeier, “Nature of virtual teams: A summary of their advantages and disadvantages,” *Manag. Res. News*, vol. 31, no. 2, 2008, doi: 10.1108/01409170810846821.
 - [13] V. Garro-Abarca, P. Palos-Sanchez, and M. Aguayo-Camacho, “Virtual Teams in Times of Pandemic: Factors That Influence Performance,” *Front. Psychol.*, vol. 12, 2021, doi: 10.3389/fpsyg.2021.624637.
 - [14] L. S. Henderson, “The Impact of Project Managers’ Communication Competencies: Validation and Extension of a Research Model for Virtuality, Satisfaction, and Productivity on Project Teams,” *Proj. Manag. J.*, vol. 39, no. 2, 2008, doi: 10.1002/pmj.20044.
 - [15] G. Piccoli, A. Powell, and B. Ives, “Virtual teams: Team control structure, work processes, and team effectiveness,” *Inf. Technol. People*, vol. 17, no. 4, 2004, doi: 10.1108/09593840410570258.
 - [16] A. Powell, J. Galvin, and G. Piccoli, “Antecedents to team member commitment from near and far: A comparison between collocated and virtual teams,” *Inf. Technol. People*, vol. 19, no. 4, 2006, doi: 10.1108/09593840610718018.
 - [17] L. Lee-Kelley, A. Crossman, and A. Cannings, “A social interaction approach to managing the ‘invisibles’ of virtual teams,” *Ind. Manag. Data Syst.*, vol. 104, no. 8, 2004, doi: 10.1108/02635570410561636.
 - [18] P. J. Hinds and S. P. Weisband, “Knowledge Sharing and Shared Understanding in Virtual Teams,” in *Virtual Teams that Work*, vol. 57, no. 1, 2003.
 - [19] A. T. Chatfield, V. N. Shlemoon, W. Redublado, and G. Darbyshire, “Creating value through virtual teams: A current literature review,” *Australas. J. Inf. Syst.*, vol. 18, no. 3, 2014, doi: 10.3127/ajis.v18i3.1104.
 - [20] J. F. Hair, C. M. Ringle, and M. Sarstedt, “PLS-SEM: Indeed a silver bullet,” *J. Mark. Theory Pract.*, vol. 19, no. 2, p. 145, 2011, doi: 10.2753/MTP1069-6679190202.