COMPARATIVE STUDY OF TRADITIONAL AND VIRTUAL TEAMS

BEATA KRAWCZYK-BRYŁKA

Faculty of Management and Economics
Gdansk University of Technology
Narutowicza 11/12, 80-233 Gdansk, Poland

(received: 15 August 2017; revised: 15 September 2017;
accepted: 22 September 2017; published online: 9 October 2017)

Abstract: The paper presents two kinds of cooperating teams: traditional and virtual, and proposes a new measure of the team virtuality level. Some representative teamwork characteristics, such as team member competencies, team diversity, leadership, and team decision-making are analyzed and compared depending on the degree of virtuality. Moreover, the team climate as one of the team performance measures is also analyzed and compared in virtual and traditional teamwork conditions. The considerations show that the virtuality level is crucial for virtual and face-to-face team comparison, virtual and hybrid team analysis and answering the question how to improve online collaboration processes and performance.

Keywords: teamwork, virtual teams, traditional teams, team virtuality, team management, team decisions

DOI: https://doi.org/10.17466/tq2017/21.3/o

1. Introduction – traditional and virtual teams

A team is a group of people with complementary skills, who are mutually accountable for a common purpose, and whose tasks are well defined, divided and interdependent. Team members establish relationships, know their team roles, share responsibility and operate according to shared rules [1, 2]. Katzenbach and Smith [3] have specified the characteristics of high-performance teams:

- Strong personal commitment to each other's growth and success;
- Deep sense of purpose;
- Ambitious performance goals;
- Complete approaches;
- Full mutual accountability;
- Interchangeable and complementary skills;
- Shared leadership and member empowerment;

- Self-sufficiency;
- Having fun and an aura of excitement.

Cooc [4] completes this list with other attributes like:

- Clear and commonly shared purpose;
- Clear roles and responsibilities;
- Open and frequent communication channel;
- Supporting and challenging the leader;
- Co-operative climate;
- Mutual trust and respect; and
- Conflict management.

These rules refer to traditional teams, communicating face to face (FtF). Nowadays teams are more and more used to rely on computer-mediated communication, and use information technology in their collaboration process. The characteristics of a high-performing virtual team (VT) include additionally requirements like [5]:

- Global mindset of team members;
- Access and utilization of technology to the benefit of the team;
- Supporting the information flow with different media;
- Virtual conflict management;

and

- Dealing with time and spatial distance challenges.

The mentioned rules suggest that technology and distance are the main features of virtual teams distinguishing them from traditional teams. The purpose of the article is to clarify the differences between FtF and virtual teams by analyzing the virtuality concept and by presenting virtuality consequences for the team performance. Section 2 discusses the virtuality dimensions and presents the multilevel virtuality concept. The main characteristics of virtual team collaboration and performance are described in Section 3. Section 4 is dedicated to a hybrid team model, where a virtuality degree formula is proposed and three examples of teams with different degrees of virtuality are presented.

2. Virtual team and virtuality concept

Gibson and Cohen's [6] definition of a virtual team is close to the traditional team definition: a virtual team is a group of interdependent persons who are together responsible for the team outcomes, interact, and have the feeling to be an intact social unit but function across organizational boundaries, are geographically dispersed and need to rely on ICT to communicate. Team virtuality is a continuous variable and can be in the range from slightly to extremely. IT depends on two factors: dependence of electronically mediated communication and the degree of geographical dispersion.

Großer and Baumöl [7] define a virtual team as a team that work together asynchronously (the same locations and different schedules or different locations

and time zones) and geographically dispersed (team member distance). They propose two main virtuality criteria: asynchrony and geographical dispersion, but the proportion of time performed virtually, and the proportion of team members working virtually, are also important to assess the team's virtuality. A team is totally traditional when the synchrony is full, and all the members are collocated. A totally virtual team consists of all members working in different locations and their communication is fully asynchronous. The same criteria are pointed out in Zofi's definition: a virtual team "is a team whose members simultaneously work together to a common purpose, while physically apart" [5].

Mihhalova's [8] approach is similar but a bit deeper: she understands virtuality as the continuum from low (100% ordinary teams, only FtF meetings) to high (100% virtual team, only ICT mediated communication). The main measure of virtuality is the ICT usage in team communication described by three factors: time spent on communication, frequency of communication and media richness. A virtual team is defined as a group of members with unique skills who are located in different places and need to use ICT to deal with spatial and temporal boundaries. The three dimensions virtuality model lets one describe different kinds of virtual teams, and assess the degree of their virtuality.

The communication process is also important in the model of virtuality of Hosseini, Zuo, Chileshe and Baroudi [9]. They call virtual teams by their features: geographical dispersion, asynchrony, reliance on information communication technologies, boundary-spanning, temporality and member shared responsibility for a common goal. Due to the links between the quality of team communication and virtuality, virtual teams are the ones where discontinuities resulting from information technology affect the quality of communication, and the disruption in teamwork often occures. Virtuality affects many factors influencing the team communication quality, such as: team size, team member competencies, team tenure, distance between team members, cultural diversity, team configuration, time allocation, differences in context between team members, temporal dispersion and nature of the task. All the factors are linked with virtuality, and their influence on team communication determines the degree of virtuality.

The next definitions show some other virtual team specification. Virtual teams are dynamic, adaptive and complex systems influenced by the social, task, technology and setting context. They are mobile, multilocational and usually short-term oriented. The virtuality measures can be the distance (in kilometers or the number of people working in different locations) or the proportion of online communication multiplied by media richness [10]. Virtual teams are also presented in the organization context: "a form of organization that allows teams to be composed according to qualifications and expertise without limitations of time, space, and the costs and disruptions of relocation" [11]. Virtual teams are also the basic element of virtual organizations and have the same main features: geographic dispersion, management by empowerment, interdependence and flexibility to changes. In the collaboration process the most sophisticated

(rather than typical like e-mails, chats or workflow management systems) IT tools are used [12].

The presented definitions let us find some common elements for both types of teams: traditional and virtual, like a common goal, team members and task interdependence, complementary skills and internal relationship. They also help to specify some features distinguishing virtual teams, connected to virtuality – the multidimensional, continuum factor described by many attributes shown in Figure 1.

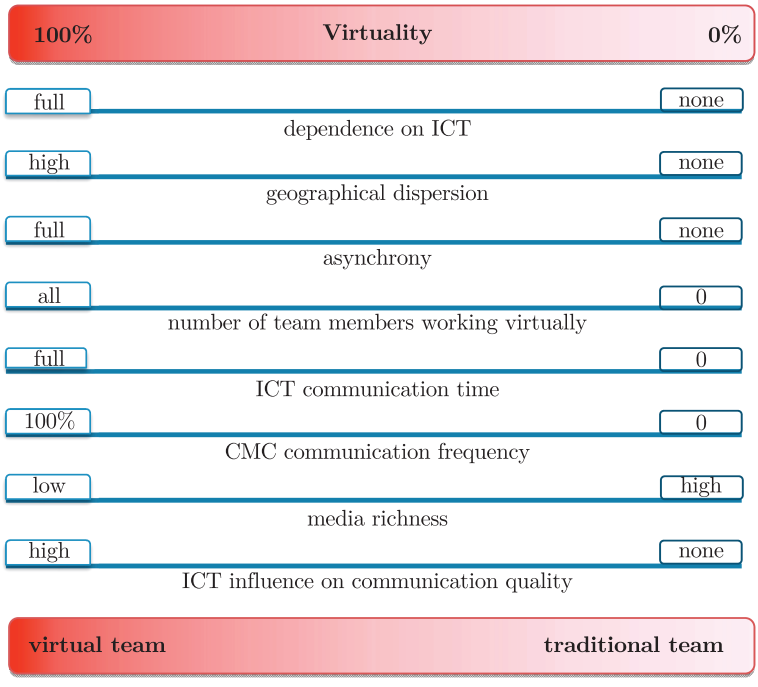


Figure 1. Virtuality dimensions

The teams whose members are partially co-located, and who communicate face-to-face, as well as with ICT mediation, are called hybrid teams [13, 14]. The next chapter presents the main differences in FtF and VT operations, and processes that are influenced by the degree of virtuality.

3. Differences between traditional and virtual teams

There are some factors critical to the virtual team performance: team formation, trust and collaboration, and team communication [15]. They can be also used to present fundamental differences between FtF and virtual teams. The team formation refers to: virtual team member competencies, team diversity or team roles; trust and collaboration process are linked to: team climate, decision-making process and leadership; communication includes challenges and rules important for information sharing in the virtual environment, and conflict resolution. Some

of these processes are presented more precisely in this chapter, to point out the virtuality consequences for virtual collaboration and its performance.

3.1. Virtual team member competencies

Hertel, Konradt and Voss's [16] model of virtual team member competencies relies on a tri-factorial competence model called KSA: knowledge, skills and attitudes. It consists of five main groups of competencies: professional expertise, cognitive abilities, task-work related KSA, teamwork-related KSA and telecooperation-related KSA. The last element distinguishes a virtual team from traditional ones, and refers to: persistence, willingness to learn, creativity, independence, interpersonal trust, and intercultural skills. The authors have confirmed the importance of loyalty (task-related KSA) and cooperativeness (team related KSA) for virtual team performance, but they have also observed a correlation between telecooperation-related KSA (*e.g.* self-management) and team effectiveness. Another model [17] stresses the importance of individual and team KSA for virtual team success. The individual KSA are: self-management (setting personal agendas and motivating themselves), communication KSA (seeking feedback, clarifying misunderstandings, overcoming language and cultural barriers), cultural sensitivity, trust KSA (responsiveness, commitment demonstrating, active and frequent participation) and comfort with technology and technological change KSAs. Team-level KSA includes establishing clear goals and well-defined member roles, ability to fix and respect team standards concerning team interactions, solving complex problems and conflict management KSA. Krawczyk-Bryłka [18] proposes a quadri-factorial model of virtual competencies shown in Figure 2. Most of the competencies mentioned above are common for traditional and virtual teams. The question of how the virtuality level influences the team member competencies requirements is still not explored.

3.2. Virtual team diversity

The virtual team definition suggests that virtual teams are diverse on many dimensions: cultural, national, organizational, spatial and competence. Diversity of talent, skills and experience is said to be an imperative of the global virtual team member recruitment that lets them suit the global market requirements [19]. One of the VT diversity models indicates two groups of diversity dimensions: formal (age, gender, nationality, education level, language proficiency, or belonging to minority groups) and non-formal (analytical, creative and practical intelligence, learning style, adaptability, expertise level, experience and acceptance of work in global virtual teams). In software teams, which are more and more often virtual, there are three groups of diversity dimensions pointed out [20]: knowledge diversity (differences in education, position in the firm, level of education or tenure), social diversity (ethnicity, nationality, gender, age and income) and value diversity (differences in members' perception of the task, goal, target, or team mission). The virtual software team diversity refers not only to team members, but also to team tasks [19] that can be: coordinative (*e.g.* team strategy, change

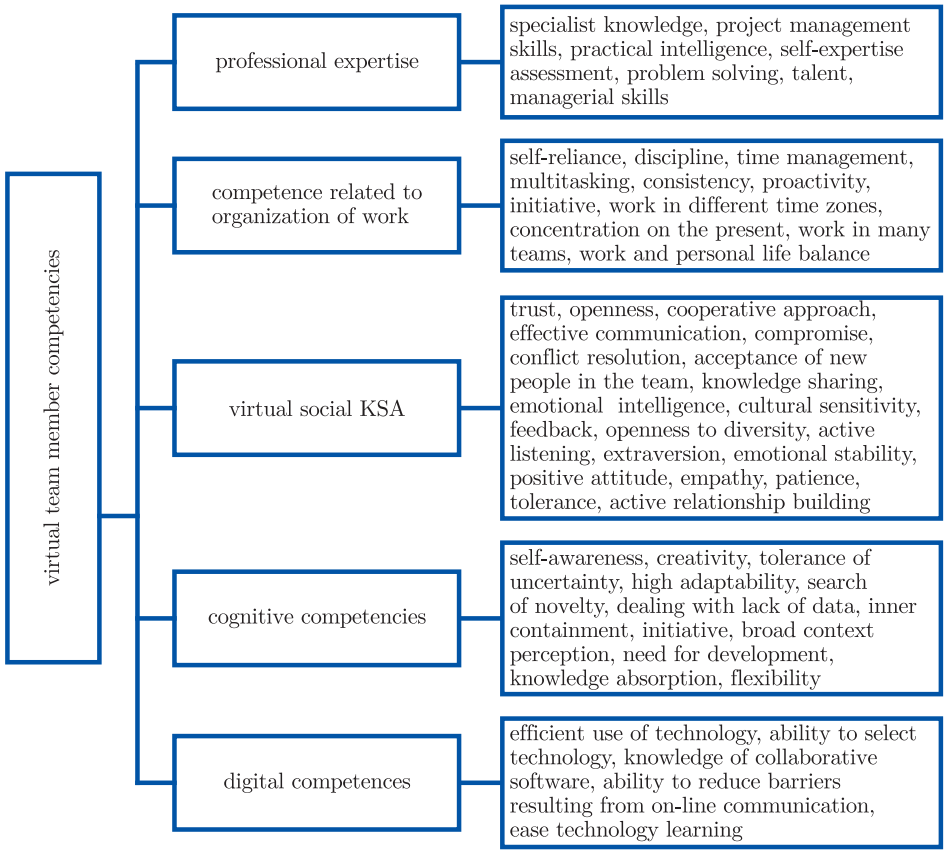


Figure 2. Virtual team member competence model

management), creative (problem solving) or computing (software development). Each task can be on different levels of difficulty and complexity, which makes the task diversity a multidimensional variable.

The research conducted in Polish software virtual teams has proved that subjective diversity is much more significant than real diversity [21], however, virtual team members seem to be much more resistant to personal diversity consequences and some diversity dimensions like attitudes, personality or intelligence are not visible at all. Some dimensions like gender or position in the organization influence the team member perception of the traditional team climate but it does not matter so much in a virtual team. The impact of diversity dimensions can be associated with the virtuality level but it has not been explored so far.

3.3. Intercultural diversity in virtual teams

Virtual team internationalism and interculturality are the most often studied diversity dimensions. The most important aspects of global virtual collaboration that influence team processes and effectiveness are: lack of non-verbal communication, physical isolation, cultural differences based on cultural dimen-

sions and necessity to use English as a foreign language [22]. All of them influence the member perception, communication and team identification (*e.g.* task priorities) and are also connected with the occurrence of subgroups. Intercultural virtual team challenges refer to differences in cultural dimensions discussed on the basis of Hofstede's dimensions [23]. They influence the working style, time orientation, collaboration approach, organizational identification and can be the source of team member isolation as well as a competitive advantage of the team. The important role of synchronicity, and richness of communication media is often stressed, as technical aspects influence the global virtual team integration and coordination [22, 23]. The choice of the media has a decisive influence on the team's ability to fill the gap of the shared context related to time, place, and culture values.

Software virtual team members complain about the time zone differences and language barriers (other team members' language skills are too poor, or not fitted to the intercultural environment) and pay particular attention to the strong need of time coordination, which can be also a benefit – it allows permanent collaboration [24].

3.4. Virtual team climate

The team climate is the shared perception of team processes, practices and behavior that have an impact on the team's effectiveness, team member satisfaction, team cohesion, and viability [25]. The main team climate dimensions are vision, participative safety, task-orientation, support for innovation, active conflict management, commitment, shared responsibility and trust. They are not only crucial for virtual team creativity, but also decide about the team's compromise approach and ability to overcome challenges like misunderstandings, diversity and isolation [26].

The importance of each dimension is a bit different in virtual teams comparing to FtF ones. Safety and engagement seem to be less significant in virtual collaboration conditions, where the vision containing clear goals and final expectations plays a crucial role. Trust is the most important factor for traditional as well as virtual teams, but it is much more difficult to implement in virtual teamwork [27]. The hierarchy of team climate factors in two kinds of teams is shown in Figure 3.

3.5. Leadership in virtual teams

The virtual team climate creation and the team coordination are the team leader's challenge. The most important factors influencing the virtual team performance are said to be: clear mission and goals, engagement and identification of team members, roles and responsibility division, monitoring and empowering [28, 29], supporting mutual trust by promoting open communication, integration, team culture and communication rules [30]. Brake's catalogue for virtual team leaders' recommendation adds proactiveness, transparency, accessibility and people-orientation mixed with task-orientation [31]. It is required in

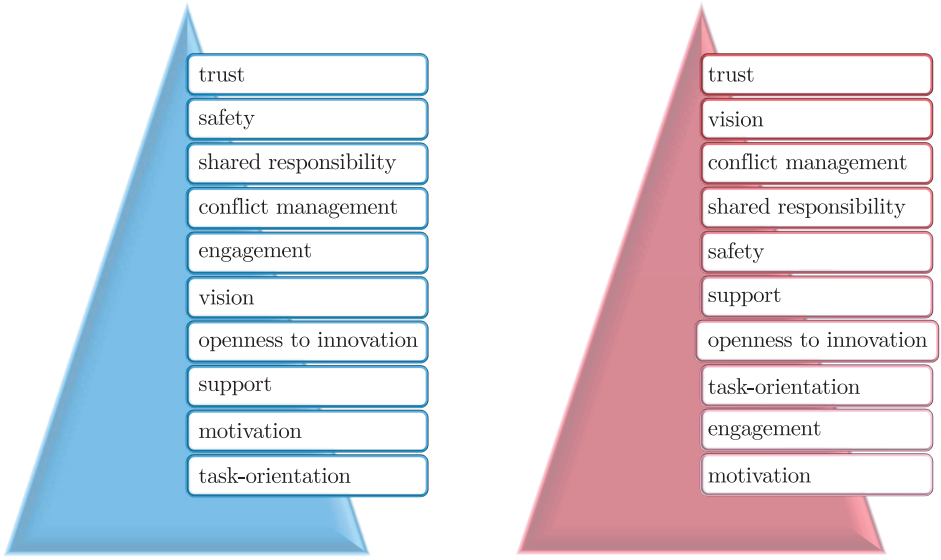


Figure 3. Team climate in traditional (blue) and virtual (red) teams

a low task complexity environment, high task complexity and high task interdependence which are characteristic for virtual teams [32]. Geographic dispersion and a low level of swift trust in virtual collaboration is the reason why virtual leaders need to focus on preventing and resolving different types of conflicts, bridging team members, and facilitating the development of share mental models. Liao [32] proposes the point "the effect of leader behavior on the team and individual processes and outcomes are stronger in teams with high virtuality than in less virtual teams", however, no research has been conducted to prove it. The most effective virtual leadership model seems to be the one based on structural support, non-hierarchical and shared leadership that supplement traditional or formal leadership. Another model, prepared on the basis of virtual team members' expectations towards their leaders [33], suggests three pillars crucial for virtual team management: collaboration transparency (clear vision, goals, rules), team cohesion management (integration, motivation, trust), and empowerment (shared responsibility, emergent leadership).

3.6. Team decision – making

The decision paths are influenced by two main factors: task characteristics and group internal structures that define work relationships in the team [34]. By reason of the virtual team specificity, it seems probable that the way of making a final decision also differs in ftf and virtual teams. The collaboration technology used by a virtual team can encourage users to categorize information, to judge its importance, and leads to better quality decisions. When asynchronous communication ICT is used, team members have much more independence in developing and testing their own solutions, before sharing them with other

members. At the same time they are less tended to discuss all of their ideas of problem solutions [34]. The virtual collaboration process structure supported by a communication channel leads to equal information voicing in the team, which stimulates the negotiation process and focus on analyzed alternatives, not on personal preferences [35]. On the other hand, the research concerning virtual and traditional software team member preferences in decision-making methods [36] has revealed that the virtual environment stimulates teams to rely on leaders' opinions more than on discussion and compromise. When the leadership emerges throughout a virtual team lifecycle, based on leaders' expertise, and collaborative member strengths and competencies can be used to generate creative resolutions [37]. Geographical dispersion, isolation, and subgroups inhibit virtual team creativity. ICT mediated communication (synchronous or asynchronous, rich media or lean media) influences virtual team communication that can both reduce and increase the team's creativity – it depends on how the team members use it. Hence, the virtuality level seems to be an important factor influencing the virtual team decision-making process.

3.7. Hybrid team model

An analysis of virtuality definitions and dimensions and an overview of main factors influencing the virtual team performance make it clear that a standardized measure of the degree of team virtuality (tv) is necessary to research deeply regression or correlations. We propose the formula:

$$tv = \frac{\sum_i^d vf_i}{d} \tag{1}$$

where:

d – is the number of virtuality dimensions;
vf_i – is the normalized i^{th} virtuality dimension (factor), $vf_i \in \langle 0,1 \rangle$, $i = 1,2,...d$;
tv – is the mean value of all virtuality dimensions $tv \in \langle 0,1 \rangle$.

Taking into account the degree of virtuality there are at least four types of teams that can be taken under consideration:

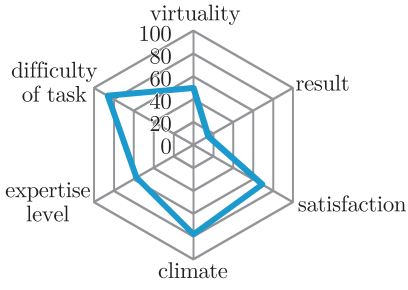
(2) traditional teams, where the degree of virtuality is 0, $tv \approx 0$;
(3) teams with a low virtuality level, where the degree of virtuality is: $tv \approx 0 \pm 10\%$;
(4) hybrid teams, where the degree of virtuality is: $tv \approx 50\% \pm 10\%$;
(5) virtual teams with a high level of virtuality, where the degree of virtuality is: $tv \approx 100\% \pm 10\%$.

Having the degree of virtuality we can look for functions that describe main measures of team performance: team result, team member satisfaction and team climate:

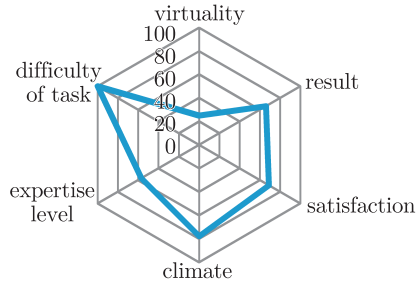
$$\begin{aligned} tr &= \psi(tv, \text{ others}) \\ ts &= \beta(tv, \text{ others}) \\ tc &= \varphi(tv, \text{ others}) \end{aligned} \tag{2}$$

where others are the factors influencing the team performance like team roles, team communications, team members' competencies, conflict resolutions and others described in Section 3.

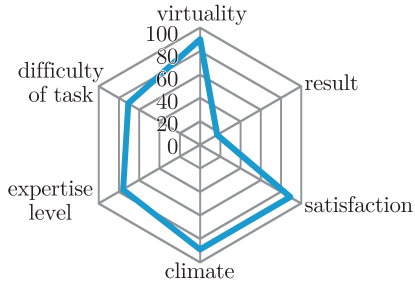
In Figure 4 there are three examples of hybrid teams presented to illustrate the relationship of the team's degree of virtuality with the three main team performance measures. Three kinds of teams are presented: a team with low virtuality (a), a hybrid team (b), and a team with a high virtuality level (c). All the teams worked over the same software task, consisted of three IT specialists, and used the same tools. Two additional factors are added to stress the model complexity: the level of the team members' expertise (based on self-assessment) and the task difficulty (in the team members' perception). Each factor was standardized to a 0–100% scale. The presented graphs are only a simplified illustration of possible variations of factors relevant for a virtual team's performance.



(a) team with low virtuality



(b) hybrid team



(c) team with high virtuality

Figure 4. Examples of virtual teams – complex model of team virtuality influence on team performance

The degree of virtuality measured by the formula presented above can complement the model and lets analyze precisely the possible correlations and mediation effects.

4. Conclusions

The differences between traditional and virtual teams are well known and have been analyzed from different perspectives. It is also clear that virtual teams

may differ from one another by the degree of virtuality, which is a multidimensional factor. The issues of the degree of virtuality influences team processes and team performance is still poorly understood. The proposed formula to assess and standardize the team virtuality lets it to be used as a variable in the research concerning different factors crucial for virtual, or rather hybrid, collaboration. Hybrid teams defined as those that meet the virtuality criteria on the middle level seem to be even more challenging for members and leaders than fully virtual teams [14]. They require combining the knowledge and the rules referring to the FtF teamwork as well as virtual teams. By analyzing the influence of virtuality on team processes and performance we can estimate the virtuality boundary, where the ICT usage, communication asynchrony, media richness, and team member distance change the team for better or for worse. It would also make it possible to prepare a recommendation for members and leaders working in hybrid and virtual teams on a different degree of virtuality, like:

- whether the team specification is closer to a virtual, hybrid or traditional team;
- which member competencies are crucial for such team performance;
- what is the best leadership model for the team because of the team's level of virtuality;
- how much the virtuality causes the diversity perception to be influential;

or

- what decision-making methods should be promoted to increase the team performance or innovativeness.

There are just some factors discussed in the model presented, but the algorithm covering all variables relevant to virtual and hybrid team collaboration, including the team virtuality level is much more complicated and requires high power computer support. Analysis of the multidimensional virtuality and virtual or hybrid teams seems to be a scientific challenge, but it can be also beneficial for practitioners working in modern companies relaying on ICT solutions.

References

[1] Markowska E 2012 *Team building, [in:] Team behavior organization* Rutka R and Wróbel P (ed.), Polish Economic Publishing House (in Polish)
[2] Kossowska M and Sołtysińska I 2006 *Team Building. Training Materials – Exercises, Forms, Tips for Facilitator*, Economic Publishing House (in Polish)
[3] Katzenbach J R and Smith D K 2015 *High-Performance Teams: Creating the High-Performance Organization*, Harvard Business Review Press
[4] Cook S 2009 *Building a High Performance Team: Proven Techniques for Effective Team Working*, IT Governance Publishing
[5] Zofi Y S 2012 *A manager's guide to Virtual Teams*, American Management Association
[6] Gibson C B and Cohen S G 2003 *Virtual teams that work: Creating conditions for virtual team effectiveness*, Jossey-Bass
[7] Großer B and Baumöl U 2017 *Organizational Structures for an Implementation of Virtual Teamwork – A Case Study Analysis*, *Perspectives of Business Informatics Research, Proceedings of 16th International Conference* 268

[8] Mihhalova G 2006 *From Ordinary to Virtual Teams: a Model for Measuring the Virtuality of Teamwork, Frontiers of e-business Research* [Online] available at: `http://iceb.nccu.edu.tw/proceedings/2006/defevent/papers/cr1079.pdf`
[9] Hosseini M R, Zuo J, Chileshe N and Baroudi B 2015 *Technology Analysis & Strategic Management* **27** (4) 385
[10] Gilson L L, Young M T, Vartiainen M and Hakonen M 2014 *Journal of Managemenet* **41** (5) 1313
[11] Schweitzer L and Duxbury L 2010 *Info Systems Journal* **20** 267
[12] Alexander P M 2002 *Towards reconstructing meaning when text is communicated electronically* [Online] available at: `https://repository.up.ac.za/bitstream/handle/2263/27367/00front.pdf?sequence=1&isAllowed=y`, University of Pretoria
[13] Oshri I, Kotlarsky J and Willcocks L 2008 *Exploring Virtuality Within and Beyond Organizations: Social, Global and Local Dimensions* Panteli N and Chiasson (ed.), Polgave McMilan
[14] Lee M R 2014 *Leading Virtual Project Teams: Adapting Leadership Theories and Communication Techniques to 21st Century Organizations*, CRC Press
[15] Goodbod J 2005 *Strategic Communication Management* **9** (2) 18
[16] Hertel G, Konradt U and Voss K 2006 *European Journal of Work and Organizational Psychology* **15** (4) 477
[17] Blackburn R, Furst S and Rosen B 2003 *Virtual Teams That Work. Creating Conditions for Virtual Team Effectiveness* Gibson C B and Cohen S G (ed.), John Wiley & Son
[18] Krawczyk-Bryłka B 2017 *Studies and Works of the Faculty of Economic Sciences and Management, University of Szczecin* **48** (2) 33 (in Polish)
[19] Harvey M, Novicevic M M and Garrison G 2004 *Human Resource Management Review* **14** 275
[20] Liang T P, Liu Ch Ch, Lin T M and Lin B 2007 *Industrial Management & Data* **107** (5) 636
[21] Krawczyk-Bryłka B 2017 *Diversity in virtual teams* (under review)
[22] Hung Y-T C and Nguyen M T T D 2008 *The impact of Cultural Diversity on Global Virtual Team Collaboration – A Social Identity Perspective*, *Proceedings of the 4th Hawaii International Conference on Systems Science* 1
[23] Mukherjee D and Hanlon S C 2011 *Cross Cultural Management* **19** (4) 526
[24] Krawczyk-Bryłka B 2016 *Journal of Intercultural Management* **8** (3) 69
[25] West M A and Richter A W 2011 *Team Climate and Effectiveness Outcomes*, *The Handbook of Organizational Culture and Climate* Ashkanasy N M, Wilderom C P M and Peterson M F (ed.), SAGE Publications, Inc.
[26] Pangil F and Chan J M 2014 *Journal of Knowledge Management* **18** (1) ???
[27] Krawczyk-Bryłka B 2015 *Climate of Virtual Team's Work*, *[in:] Information Technology in Information Society* Chmielarz W, Kisielnicki J and Parys T (ed.), Scientific Publishers of the Faculty of Management, University of Warsaw 175 (in Polish)
[28] Lepsinger R and DeRosa D M 2010 *Virtual Team Success: A Practical Guide for Working and Learning from Distance*, John Wiley & Sons, Inc.
[29] Mortensen M O'Leary M 2012 *Managing a Virtual Team* [Online] available at: `https://hbr.org/2012/04/` how-to-manage-a-virtual-team [Accessed: 15-Jul-2015]
[30] Scannell M, Abrams M and Mulvihill M 2014 *The Big Book of Virtual Team Building Games*, Wolters Kluwer ABC (in Polish)
[31] Brake T 2006 *Industrial and Commercial Training* **38** (3)
[32] Liao Ch. 2017 *Human Resource Management Review* **27** 648
[33] Krawczyk-Bryłka B 2016 *Virtual team management – team leaders' challenges*, *[in:] Status and Prospects of Development of Management Sciences: Selected Issues* Zakrzewska-Bielawska A (ed.), TNOIK (in Polish)

[34] Wei K, Heckmann R, Crowston K and Li Q 2011 *Decision-Making Processes and Team Performance in Self-Organizing Virtual Teams: The Case of Free/Libre Open Source Software Development Teams* [Online] available at: `https://crowston.syr.edu/sites/crowston.syr.edu/files/decision%20making%20paper_final.pdf`
[35] 2016 *Knowledge Management & E-Learning* **8** (4) 602
[36] Krawczyk-Bryłka B and Krawczyk H 2017 *Decision-making in virtual software teams using cloud platforms*, *[in:] 1st International Conference Decision Making in Manufacturing and Services & XX Jubilee Symposium Applications of Systems Theory* Sawik T (ed.), AGH-UST 41
[37] Chemiakiotis P, Dekonick E A and Panteli N 2013 *Creativity and Innovation Management* **22** (3) 265