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Do Virtual and the Face-to-face Ways of Working Have an Impact on the Effectiveness of Teams? An Empirical Study in the Context of Multicultural IT Teams

Elena Cizmas[1], Emoke-Szidonia Feder[2*], Madalina-Dumitrita Maticiuc[3]

[1, 2, 3]Faculty of Economics and Business Administration, West University of Timisoara*
Johann Heinrich Pestalozzi st. 16, 300115, Timisoara, Romania
E-mail: elena.cizmas@e-uvt.ro; emoke.feder@e-uvt.ro; (Corresponding author); madalina.maticiuc@e-uvt.ro*

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This paper pursued to identify whether there are differences between virtual and face-to-face teams concerning their ability to develop a natural and incremental chain of linkages between individual, team and organization level effectiveness, in the context of interactions between their multicultural members and of interdependence that teamwork entails. The novelty and relevance of the research consist in empirically testing the above chain, along with the differences and similarities between virtual and co-located teams, on a sample of 159 respondents working in multicultural IT project teams from Romania and the Czech Republic. Structural equation modelling based empirical findings show statistically insignificant differences regarding the construction of the chain of effectiveness between virtual and co-located multicultural teams. Complementary, in terms of average values for all three levels of results, the face-to-face multicultural teams are superior to virtual multicultural ones, limited by the exclusion of team reaction time and lifespan from the research model.

Keywords: *Multilevel Effectiveness; Chain of Effectiveness; Multicultural IT Teams; Virtual Teams; Face-to-face Teams; Market Adaptability.*

Introduction

The external environment in which most of the companies operate today has become increasingly complex and dynamic (Revutska & Antlova, 2022). On the one hand, in order to respond to complexity, one of the paths companies followed was to organize their work in teams, as they have a higher expertise and innovation potential as a result of the proper combination of knowledge, skills and ideas produced by their members, thus being able to generate differentiated products and services.

On the other hand, globalization, distributed expertise, the fast development of networking, cooperation and sharing technologies that support e-collaboration, as well as the rapidly changing business context required companies to develop virtual teams, in order to be able to assure high levels of organizational flexibility and responsiveness (Chang *et al.*, 2023; Dulebohn & Hoch, 2017; Gera, 2013; Caya *et al.*, 2013; Nader *et al.*, 2009; Webster & Staples, 2006).

Work teams, whether they function face-to-face or they are geographically dispersed operating through different information and communications technologies (ICT), are characterized by common goals, interdependency of roles, complementarities in competences and working approach for which members hold themselves mutually accountable (Krawczyk-Brylka, 2017; Gera, 2013; Saratean, 2008; Zenun *et al.*, 2007).

Regarding virtual teams, Townsend *et al.* (1998, p. 17) defines them as "groups of geographically and/or organizationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task". Nader *et al.* (2009) define virtual teams similarly, but also introduce the idea of temporal dispersion, while Dulebohn and Hoch (2017) point out that the concept of members' dispersion incorporates several dimensions: spatial distance (geographic), temporal (time-zone differences), and configuration (sites, isolation and imbalance).

Looking at the performance of virtual work teams in relation to those that work face-to-face, previous research identified contradictory results. Chudoba *et al.* (2005) argues that since in virtual teams there is a variety of work practices due to geographically dispersed members, as well as employee mobility, there is limited performance in virtual teams. In opposition, other studies found that virtual teams are superior in performance compared to face-to-face ones due to the beneficial effects of using collaborative technologies (Staples & Zhao, 2006; Hambley *et al.*, 2007), or to the strongly structured nature of work and the adoption of formal procedures within the virtual teams (Rice *et al.*, 2007), or even to the fact that in virtual teams the pressure to conform to the group is reduced and there is more time for reflection when using asynchronous communication (Cummings & Teng, 2003). Concerning the team's life cycle, Warkentin *et al.* (1997) state that when virtual teams have enough time to develop strong intragroup relationships and to adapt to the communication medium, they end up communicating as effectively and having the same level of performance as face-to-face groups. Recent research, like Morrison-Smith and Ruiz (2020), is more nuanced and specify that virtual heterogeneous teams characterized by high temporal stability will exceed the performance of culturally homogeneous teams only in the last part of the project life cycle, as a result of their homogenization over time in terms of shared team values and when more pronounced results such as adaptation, learning, innovation, satisfaction, and identification with the team appears.

Morrison-Smith and Ruiz (2020) above mentioned research focuses on a common characteristic of virtual work teams, which is also fervently found in today's face-to-face teams, namely their cultural diversity, a factor with both positive and negative impact on the results achieved by these teams. The positive effects of cultural diversity in work teams are presented in numerous studies (see section A Perspective on the Multilevel Approach of Effectiveness regarding Multicultural Face-to-face and Virtual Teams in the present article). Some of these effects have been previously tested within another published empirical research paper (Cizmaș *et al.*, 2020). Consulting the literature allowed to observe that the positive effects of cultural diversity in work teams appeared within these studies as a list or enumeration of results generated by the interaction between their culturally diverse members.

Based on the above, the following research questions have been raised:

- Can the effectiveness outcomes of multicultural teams be approached as a chain effect, starting from the individual level of team members, to the team level and then to the organizational level? The question is inspired by the logic of existing models in the field of human resource management, those combining competence-based approach with organizational learning processes in order to develop distinctive competencies at company level by aggregating individual, collective and organizational competence levels (Saha *et al.*, 2016; Athey & Orth, 1999);

- Does the way teams work, particularly face-to-face or remote-virtual work, influence these outcomes?

Thus, starting from these concerns, from the contradictory results on the performance of virtual teams compared to co-located teams presented by studies in the field, but also from the recent apprehensions of companies after the Covid-19 pandemic related to the dilemma whether they should return employees to the office or keep them in remote work mode, we define the following research objective: considering the context of cultural diversity of teams and of interdependence of the tasks involved in teamwork, we intend to explore whether there are differences between virtual and face-to-face teams in terms of their ability to develop a chain of effectiveness, from the individual level of members to the team level and then to company level. At this last level, the outcome whose potential development we will study is the market adaptability of the company.

Within the current study, the empirical research will be conducted on face-to-face and virtual multicultural teams working on projects in the IT industry. Our focus on this field is justified by the fact that we expect to find, within the companies from the mentioned sector, high levels of cultural diversity and organization of work in teams, both traditional and especially the ones with different degrees of virtuality. Another argument regards that teamwork on projects involves significant interdependence and interaction between members, which can promote mutual learning, the development of individual competences, the creation of synergies, and the development of collective competencies (Rezvani *et al.*, 2019), aspects that team members can evaluate. On the other hand, team members acting in the IT industry work closely with their clients and customers, and therefore are able to appreciate the company's adaptability to their requirements.

The paper is structured in five main parts, presenting the introductory part, the theoretical background, the methodological framework and empirical findings of the study, while the final part includes discussions on empirical findings and key conclusions, along with the presentation of research limitations and future directions of interest.

Literature Review, Conceptual Model and Research Hypothesis

Comparisons between Traditional and Virtual Teams

Comparing traditional teams with virtual ones, Bhat *et al.* (2017) and Nader *et al.* (2009) emphasize that virtual teams are temporary, offers opportunities for collaboration across time, space, and organizational boundaries, use technologies in different degrees when working across locations, having team task so highly structured that coordination between team members is rarely necessary, and team members are more likely to treat one another more formally. Communication in virtual teams can be done synchronously or asynchronous, with different interaction times. Virtual teams can operate in a twenty-four hour cycle (Dulebohn & Hoch, 2017; Gera, 2013); record a costs reduction (Morrison-Smith & Ruiz, 2020; Gera, 2013; Nader *et al.*, 2009); discourage racial discrimination between employees (Gera, 2013); reduce rates of stress and turnover intentions (Contreras *et al.*, 2020); when using asynchronous communication, it allows members time to reflect before responding to each other, which also reduces language barriers that arise in the case of different socio-cultural or work backgrounds (Morrison-Smith & Ruiz, 2020).

In their case, has been also find a low level of social interaction (Bhat *et al.*, 2017; Cascio, 2000); lack of physical interaction (Nader *et al.*, 2009); loss of face-to-face synergies (Cascio, 2000) due to information sharing and co-learning problems (Contreras *et al.*, 2020; Morrison-Smith & Ruiz, 2020). These teams can also face difficulties in coordinating and controlling activities (Morrison-Smith & Ruiz, 2020), or problems related either to the use of communication technologies, or to the misunderstanding of some messages and longer response time, in the case of asynchronous communication (Nader *et al.*, 2009).

In contrast, traditional teams differ by close physical proximity of members, higher quality of interactions due to the opportunity to use hints from verbal and nonverbal communication, immediate feedback (Gera, 2013), although their work does not exclude the use of ICT (Dulebohn & Hoch, 2017) and by the fact that members coordinate team tasks together, in mutual adjustment (Gera, 2013; Nader *et al.*, 2009). As a result of the above, these teams are characterized by more support and constructive encouragement between members (Branson *et al.*, 2008), a higher degree of cohesion and increased satisfaction for the members (Warkentin *et al.*, 1997).

Also, in virtual teams there are more conflicts compared to co-located teams (Gera, 2013; Wakefield *et al.*, 2008; Staples & Zhao, 2006), further accentuated by the socio-cultural distance between members (Morrison-Smith &

Ruiz, 2020). Moreover, in virtual teams there is less cohesion than in traditional teams (Morrison-Smith & Ruiz, 2020; Staples & Zhao, 2006; Warkentin *et al.*, 1997), although Hambley *et al.* (2007) find that this difference in cohesion is not so substantial between face-to-face and videoconference teams. Also, trust is much more difficult to implement in virtual teamwork (Morrison-Smith & Ruiz, 2020; Bhat *et al.*, 2017; Casey, 2010; Cascio, 2000) than in traditional teams (Krawczyk-Bryłka, 2017).

A Perspective on the Multilevel Approach of Effectiveness regarding Multicultural Face-to-face and Virtual Teams

As mentioned previously, nowadays, face-to-face and virtual teams must face an increased level of cultural diversity. Cultural diversity includes differentiation factors, such as ethnicity or country-of-origin (at surface-level) and differences in personal characteristics such as attitudes, beliefs, and values (at deep-level) (Morrison-Smith & Ruiz, 2020; Stahl *et al.*, 2010b). Despite the fact that team members' cultural diversity can generate an increased risk of conflicts or problems in communication and cohesion (Leifels & Zhang, 2023; Misoc, 2017; Staples & Zhao, 2006; Kozlowski & Bell, 2003), an important number of researchers have identified, either through empirical studies or from literature reviews, the following main positive effects of cultural diversity within teams and organizations: a better organizational ability to adapt to changes and to complex environments (Meier, 2013; Amaram, 2007; Trefry & Vaillant, 2002; Cox & Blake, 1991), as well as a better understanding and adaptation to different local clientele and contexts (Meier, 2013; Amaram, 2007; Cox & Blake, 1991) due to the diversity of knowledge and information held by culturally diverse members; creativity and innovation, as a result of interactions and combination of different points of view, knowledge and perspectives (Meier, 2013; Stahl *et al.*, 2010a; Stahl *et al.*, 2010b; Cox & Blake, 1991); increased problem-solving capability due to the diversity of skills and competencies (Meier, 2013; Amaram, 2007; Barthorpe *et al.*, 2000; Cox & Blake, 1991) development of members' competencies as a result of teamwork (Bantel, 1994) such as an enlargement of the general culture, developing openness to other people, a better understanding of the practices of other interlocutors, a better self-understanding, professional development and enhanced practice of foreign languages (Meier, 2013); team learning, as the ability of a team to learn collectively (Stahl *et al.*, 2010a); higher team satisfaction than in the case of monocultural teams (Stahl *et al.*, 2010b); attracting and retaining high-potential employees through interesting career opportunities (Meier, 2013; Amaram, 2007; Cox & Blake, 1991); improved productivity (Stahl *et al.*, 2010b).

In general, performance is perceived as a measure of achieving the planned goals, being expressed through different indicators of efficiency (effort-related effects), and effectiveness (Bibu *et al.*, 2008). In the current paper we focus on team's effectiveness or team's abilities to perform the task. Team effectiveness is correlated with important teamwork related individual skills, interpersonal communication, problem solving and conflict resolution competencies (Tasa *et al.*, 2007), as well as with certain team behaviors as supporting and helping others, communication, and coordination among employees engaged in interdependent tasks (Yang, 2016).

Referring to the above listed positive effects of cultural diversity, it is noticeable that the majority are of effectiveness type results in the form of competencies, capabilities and attitudes. They can be approached on three levels: individual, team and organizational level. Teamwork implies interactions between members of the multicultural team, creating thus the conditions for learning experiences (Yang, 2016), as a result of sharing information and knowledge, which can generate the development of important personal and interpersonal skills to perform the task. Within the present study we include in this category the next: development of professional competencies for team members, development of members' language competencies, improvement of members' communication competencies, enhancement of team members' empathy, and the development of tolerance and openness towards other cultures. Additionally, by taking into account prior research, Stahl *et al.* (2010a) indicated that one potential positive effect of cultural diversity at team level is the ability of a team to learn collectively, meaning an improvement of group processes and of team capability. As process gains at team level, among the positive effects of cultural diversity, we focus on the followings: manifestation of creativity and innovation, analyzing problems from multiple cultural perspectives and making better decisions consequently, improved problem-solving capability, increased team satisfaction. As a result of the cultural diversity at organizational level, in the present study we retained as positive effect the increase of the company's market adaptability, this outcome being important in the conditions of a dynamic and competitive external environment that companies have to face presently.

Development of the Conceptual Model and Research Hypotheses

In the present paper we started with the presumption that cultural diversity and the interaction involved in working within IT project teams can facilitate the development of an effectiveness chain, from the individual-level of members, to the team-level, and then to the organizational level. Therefore, we aim to identify whether there are significant differences in effectiveness in the multicultural project teams in the IT industry between those who work face-to-face and the virtual ones in terms of their capacity to develop this chain.

If cultural diversity can affect both virtual and face-to-face teams, relational links, interaction and communication do not have the same quality in both types of teams, which can make that some competencies, capabilities and attitudes are not developed similarly or may develop later with delay. Walther and Burgoon (1992) argue that stronger relational links in groups have been associated with higher performance, because enhanced creativity and motivation, increased morale, generate better decisions, and fewer process losses. Consequently, regarding the connection between the development of the individual competencies of the members and the development of collective outcomes we retained, as a result of the interactions that work in IT

project teams implies, we formulate the following hypothesis:

Hypothesis 1 (H1). There are significant differences between virtual and face-to-face multicultural teams in terms of developing their collective team-level effectiveness outcomes as a result of co-workers' individual competencies development and combination.

The above hypothesis will be broken down into four sub-hypotheses, corresponding to the four collective outcomes that were considered in this article.

- Ability to Solve Complex Problems

In any team, members possess different information, knowledge and skills. In general, teamwork facilitates the sharing of information and knowledge between members. Despite the fact that virtual teams facilitate talent and knowledge captures, Bhat *et al.* (2017) along with Morrison-Smith and Ruiz (2020) argue that mutual learning or knowledge sharing between members is more difficult in virtual teams than in traditional teams. Complementary, concerning information sharing in virtual teams, Davidaviciene *et al.* (2020) emphasize that team members tend to limit their discussion to relevant and common aspects while neglecting unique information, which affects the completeness of information. Nader *et al.* (2009) also notes that face-to-face collaboration, which exists in traditional teams, seems to be better in developing the conceptual understanding of a problem. Or, problem understanding, knowledge sharing, as well as information exchange, are all necessary for virtual teams to be able to solve complex problems (Bond-Barnard *et al.*, 2018).

Taking into account the above, in the context of working in project teams within the IT field, we propose to verify the following hypothesis:

Hypothesis 1a (H1a). There are significant differences between virtual and face-to-face multicultural teams in terms of developing their ability to solve complex problems as a result of co-workers' individual competencies development and combination.

- Ability to Make Decisions

Decision making in virtual teams compared to face-to-face ones is discussed in the literature especially in terms of quality of decisions, the time required to make them, the preferred style of decision making and the factors that may influence decision making. Wei *et al.* (2011), based on an extended literature review, highlighted the advantages and disadvantages in decision making specific for virtual teams. Thus, resulting from the ICT usage, as advantages are mentioned: increased accessibility to information of team members, more equal participation because members feel freer to express ideas, flexibility over time and distance, additional time for reflection, and archived discussions in the case of asynchronous communication compared to the face-to-face one. Similar arguments are also used by Krawczyk-Bryłka (2017) to emphasize that in virtual teams there are conditions for better and more qualitative decisions.

As disadvantages, Wei *et al.* (2011) note from the literature that geographical, temporal, and organizational dispersion, as well as cultural diversity of virtual teams can hinder information sharing among team members, that are hard to overcome with any type of ICT; also that information not widely shared may be ignored, which negatively affects the quality of decisions. In the same vein, Davidaviciene *et al.* (2020) retain from the literature review that virtual teams still make poor decisions compared to face-to-face teams due to the following factors: language differences; lower level of trust in other team members; the improper use of the ICT tools that do not allow the complete transmission of the richness of the message, as well as withholding information due to the absence of physical interactions. Including their empirical research on teams from the IT industry conducted in the United Arab Emirates, confirms the importance of the above factors, excepting for the influence of language differences on the quality of the decision.

Wei *et al.* (2011), based on their own empirical research on self-organizing virtual teams, found that successful virtual teams seemed to take longer time to make decisions, a finding contradicting the benefit emphasized within the literature review of Nader *et al.* (2009), who argue that virtual teams are more effective and rapid in taking decisions. Most likely this contradiction can be explained by the type of communication used by and within the virtual teams: synchronous or asynchronous.

Krawczyk-Bryłka and Krawczyk (2019) compared virtual IT teams with face-to-face ones in terms of decision-making style. Their empirical findings highlighted that in traditional teams, members prefer the compromiser style in decision making. In virtual teams, finding solutions based on compromise is common too, only to a lesser extent than in face-to-face teams, this decision style being followed by the leader's suggestions and approach.

Given the above, it is not yet very clear whether virtual multicultural teams make better decisions than traditional multicultural ones. To verify this, we formulate the following hypothesis regarding IT project teams:

Hypothesis 1b (H1b). There are significant differences between virtual and face-to-face multicultural teams in terms of their ability to make decisions as a result of co-workers' individual competencies development and combination.

- Creativity and Innovation Related Abilities

Regarding the creative capabilities of culturally diverse virtual and traditional teams, the analyzed literature offers the following perspectives: Gera (2013), based on own literature review, argued that in face-to-face multicultural teams there is a more constructive interaction, which facilitates creative and innovative solutions; and also sustained that in virtual teams the cultural and functional diversity of members leads to differences in their thinking processes, which allows for creativity, innovativeness, and originality among team members, an aspect also highlighted by Nader *et al.* (2009). In contrast, Krawczyk-Bryłka (2017) argues that geographical dispersion, isolation, and subgroups can inhibit virtual team creativity, and that ICT mediated communication (synchronous or asynchronous) can both reduce or increase team creativity depending on how the team members use it.

Beginning with the previous observations and divergent points of view, in the context of the present study we propose to verify the following hypothesis:

Hypothesis 1c (H1c). There are significant differences between virtual and face-to-face multicultural teams in terms of the manifestation of creativity and innovation as a result of co-workers' individual competencies development and combination.

- Manifestation of Team Satisfaction

Regarding the general satisfaction of multicultural virtual and traditional teams, Staples and Zhao (2006) along with Morrison-Smith and Ruiz (2020) note from the literature review that in face-to-face teams there is more satisfaction, while the empirical research conducted by Warkentin *et al.* (1997) show that satisfaction is higher in traditional teams especially in relation to virtual teams that used asynchronous communication. However, other studies delimit the satisfaction related to the work-process from the one related to the team's results. Thus, empirical studies conducted by Cicei (2012) and Warkentin *et al.* (1997) on teams of students, point out that in terms of work-process satisfaction, fulfilment was higher in face-to-face teams than in virtual teams, due to the higher quality of the interaction in co-located teams. In contrast, in terms of team satisfaction, the two research contradict each other, Cicei (2012) found no differences between the two types of teams, both registering an average level of satisfaction, while Warkentin *et al.* (1997) identified that face-to-face groups were more satisfied with the team's outcome.

In the context of working in IT project teams, we formulate the following hypothesis:

Hypothesis 1d (H1d). There are significant differences between virtual and face-to-face multicultural teams in terms of team satisfaction as a result of co-workers' individual competencies development and combination.

As mentioned previously, cultural diversity, as in terms of knowledge and abilities about customers and business exists both in virtual and traditional multicultural teams (Gera, 2013), this diversity generating a better adaptation to different local contexts and sustainable entry into new markets (Meier, 2013; Amaram, 2007; Cox & Blake, 1991). Although, the increased dynamics of the external environment is one of the factors that generated the development of virtual teams, which give organizations an increased level of responsiveness. Nader *et al.* (2009) note that virtual teams have rapid responses to the requirements of the global market by being less resistant to change regarding the implementation of assigned tasks, and by the online availability of all team communication and work reports. So, both types of teams facilitate the adaptation to the global market, while virtual ones have the potential to do so in a shorter time-span.

In our study of IT project teams, we postulate the following hypothesis to be verified:

Hypothesis 2 (H2). There are significant differences between virtual and face-to-face multicultural teams in terms of the impact of teams' collective effectiveness outcomes on the market adaptability of a company.

The proposed main research model, is build-up of the sequential linkages between individual, collective and organizational outcomes, constructs specific for the chain of effectiveness. The model presents specific outcomes from each of the three levels that are part of the effectiveness' chain to be assessed, including the research hypotheses presented in this section (Figure 1). Within the research model we propose to test a bottom-up approach, which occurs naturally as a result of the interactions and interdependence that teamwork entails, starting from the perception of multicultural team members (including managers of these teams) regarding the development of the chain of effectiveness on the three levels. Additionally, the model is completed with a proposed moderator, the team-type, in order to search for virtual and face-to-face multicultural team specific particularities.

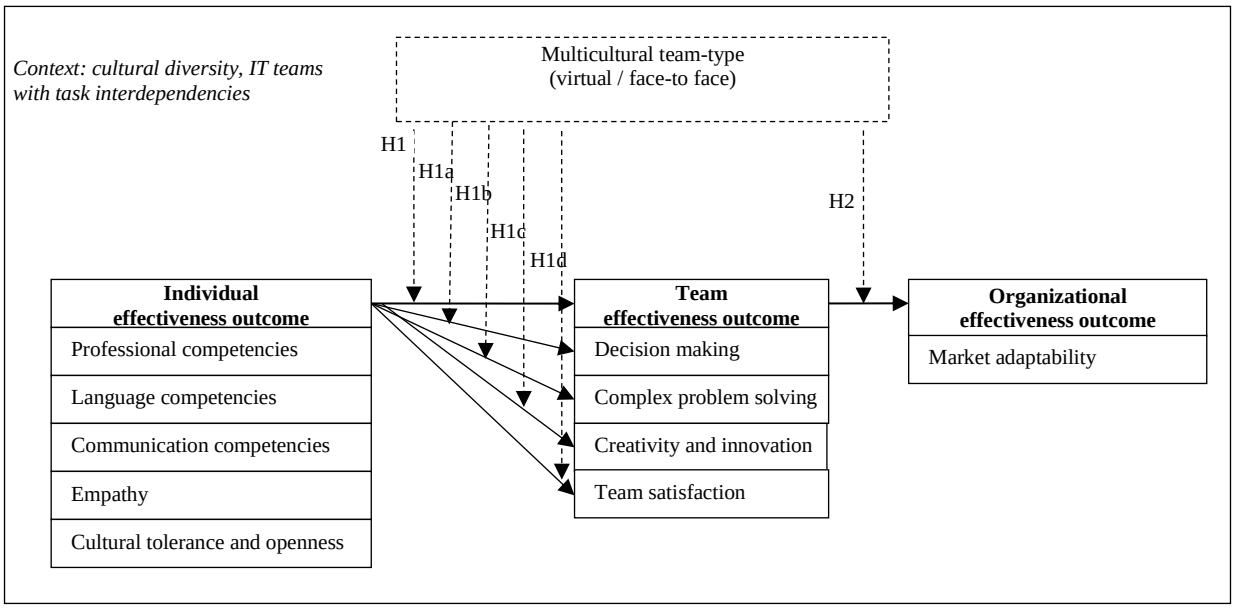

Figure 1. Research Model of Chain of Effectiveness in the Case of Virtual and Face-to-face Multicultural Teams

Methodology

Data Collection and Sample

In order to test the research model and propositions, a quantitative data based positive approach was considered suitable. Due to lacking secondary data for individual and team level effectiveness, for primary data collection purposes a research instrument was built in the form of an online questionnaire, based on previously considered and tested measurement scales (Cizmas *et al.*, 2020). To assure comparability in responses and common understanding, the questionnaire was set up in English and sent to 32 units of IT multinational corporations implanted within the Czech Republic and Romania.

The study sampled subsidiaries of multinational companies considering their high dependency on the global market, being exposed to the fluctuations of the global business environment and vulnerable to the changing preferences of clients from multiple national markets. Furthermore, large multinational corporations with more than 250 employees were selected in order to fulfill the team multiculturality criterion.

Within the selected two Central-Eastern European countries, we concentrated on the IT sector due to its' vital role and sustainable growth engine function in the European economy in general, and for the Czech and Romanian national economies in particular (Cizmaș *et al.*, 2020).

Primary data were collected via single-informant online questionnaires. From the 32 contacted companies, only 14 responded positively to participate in the study and 18 invoked confidentiality and business secrecy policies. Within each retained company, a contact person distributed the online questionnaire and transmitted a reminder later. From each team, both IT leaders and at least 3 members were requested to voluntary complete the questionnaires by self-reporting on the incorporated statements. Following Rezvani *et al.* (2019), after accounting for and excluding incomplete questionnaires because of significantly missing data, and those belonging to a team with limited participants (less than 3 members), 159 exploitable questionnaires were retained from 23 teams, being comparable in sample size with other studies in the field (Misoc, 2017). Concerning the localization of participants in the study, slightly more respondents were from companies situated in the Czech Republic (59.74 %) than from those in Romania (40.26 %).

The final sample can be characterized with the following structure from the team demographics perspective: respondents from the 23 teams, in majority were part of medium and large sized collectives, with over 15 members (33.96 %), between 5 and 8 members (32.70 %), between 9 and 15 members (27.67 %), and a few with less than 5 members (5.66 %). Regarding team setup, 92.45 % of the respondents were included in permanent teams, while 7.55 % in flexible settings of temporary project teams. Considering team types, 55.35 % of the respondents were in face-to-face multicultural teams, and the rest of 44.65 % were part of virtual multicultural teams.

Referring to the individual demographic aspects, among all respondents, 14.47 % were IT managers or team-leaders, and 85.53 % were team-members with executive attributions. As for the experience within the company, 72.33 % of the employees had more than 1 year within the company, 21.38 % between 6 months and 1 year, while 6.29 % had below 6 months of joint activity in the analyzed IT project teams. Regarding the multiculturalism of teams, respondents belonged to a number of 15 cultures, largely spread from the perspective of their origin countries and cultures: Romania (46.54 %), Czech Republic (32.08 %), Slovakia (6.92 %), Russia (3.77 %), Moldavia (2.52 %), Belarus (1.89 %), India (1.26 %), as well as Belgium, Germany, Hungary, Poland, Serbia, Spain, Switzerland, and Ukraine (0.63 % each). Furthermore, based on the roles of IT experts emphasized by Gellweiler (2020), the sample included several categories: business/ enterprise, technology/ infrastructure/ solution, and application/ software specialists.

Subsequent to sample profiling, non-response bias was tested by comparing early and late respondents, those who answered before and after the reminder, as an option indicated by Hendra and Hill (2019). Mean difference based comparisons in IBM SPSS showed no statistically significant differences between the two waves of responses.

Results obtained reflect exclusively the perception of employees, team members and team leaders, without correlating the respondents' role within the organization with the three levels of effectiveness. Caya *et al.* (2013), in their extensive review, highlighted that the majority of studies in the field are based on single respondent research and regards team and/or individual levels of analysis.

It is widely accepted that at individual and team levels, team members and team leaders may have a closer perception of reality regarding the results obtained, while their visibility on the results at company level may be different as of the top managers. However, members of IT project teams, generally, work closely and in arm-length type relations with the clients, creating products adapted to their specific needs, knowing if it's a new account, or if the client is satisfied, therefore they can and they are able to appreciate this side of company adaptability.

Measures and Measurement Model

Measurement scales of the constructs composing the research model, have been compiled from the extant literature, and were previously tested in detail and validated by Cizmaș *et al.* (2020). In this sense, the present research is a continuation of our previous scientific endeavor, where individual and team performance positively contributed to organizational performance and was significantly moderated by cultural diversity.

Each item composing the three effectiveness levels have been formulated based on the question of "To which extent the following positive effects have been recorded as a result of your team cultural diversity?" and evaluated on 5-point Likert scales.

In order to measure individual effectiveness outcomes, five items were regarded: development of professional competencies for team members (labeled IND_PROF, sourced from Cizmas *et al.*, 2020; Cummings & Teng, 2003), development of members' language competencies (IND_LANG, sourced from Cizmas *et al.*, 2020; Davidaviciene *et al.*, 2020), development of members' communication competencies (IND_COM, sourced from Cizmaș *et al.*, 2020; Bhat *et al.*, 2017; Stahl *et al.*, 2010b), empathy development of team members (IND_EMPAT, sourced from Cizmaș *et al.*,

2020; Wang *et al.*, 2003), development of tolerance and openness to other cultures (IND_TOL&OPN, sourced from Cizmas *et al.*, 2020; Caligiuri *et al.*, 2000).

Concerning collective effectiveness outcomes, four items were included for measurement purposes: analyzing problems from several cultural perspectives and consequent decision making (labeled COL_DEC, sourced from Cizmaș *et al.*, 2020; Davidaviciene *et al.*, 2020), increased ability to solve complex problems (COL_PROB, sourced from Cizmas *et al.*, 2020; Dorner & Funke, 2017), the manifestation of creativity and innovation (COL_CRE&IN, sourced from Cizmaș *et al.*, 2020; Bouncken *et al.*, 2016), team satisfaction (COL_SATIS, sourced from Cizmas *et al.*, 2020; Cicei, 2012; Staples & Zhao, 2006).

Market adaptability (labeled ORG_ADAPT, sourced from Cizmas *et al.*, 2020) was the particular outcome considered for measuring organizational effectiveness, defined as the specific capability of a company to recognize the need for change and seize opportunities in diverse dynamic environments or adaptive spaces (Schulze & Pinkow, 2020).

Complementary, multicultural team-type based on communication mode, as moderating factor, was added in the form of a dichotomous categorical variable with two levels, delimiting virtual and face-to-face teams.

For statistical analysis purposes, the collected data have been evaluated and processed with IBM SPSS 22 and IBM SPSS AMOS software. Structural equation modeling (SEM), as data analysis technique, permitted a sequential evaluation of the measurement model and of the structural model (Hair *et al.*, 2019). Concerning the measurement model confirmation, convergent and discriminant validity, construct reliability, global goodness-of-fit indices have been evaluated.

First, in order to assess convergent validity, an exploratory factor analysis was performed. The factor loadings (Table 1) for items measuring the same construct were above 0.45, considering the indications of Hair *et al.* (2019) regarding factor loadings correlated with the sample size for practical significance. Furthermore, based on confirmatory factor analysis, the standardized regression weights for the structure of constructs specific to the measurement model were obtained. These indicate mainly above 0.7 (Hair *et al.*, 2019) and in one case above 0.6 values, confirming appropriate configurations of the considered constructs for the different levels of competencies.

Table 1

Constructs, Items, Coding and Factor Loadings

Construct	Item	Coding	Factor loading	Standardized regression weight
Individual effectiveness outcomes	Professional competencies	IND_PROF	0.780	0.787
	Language competencies	IND_LANG	0.832	0.753
	Communication competencies	IND_COM	0.831	0.759
	Empathy	IND_EMPAT	0.809	0.724
	Tolerance and openness to other cultures	IND_TOL&OPN	0.690	0.605
Collective effectiveness outcomes	Making decisions	COL_DEC	0.846	0.811
	Solve complex problems	COL_PROB	0.812	0.727
	Creativity and innovation	COL_CRE&IN	0.857	0.775
	Team satisfaction growth	COL_SATIS	0.823	0.765
Organizational effectiveness outcome	Market adaptability	ORG_ADAPT	-	-

Secondly, to validate the measurement model, we established the construct reliability by calculating both the Cronbach's Alpha (α) and the Composite Reliability (CR). Based on results in Table 2, reliability indicators emphasized values above the threshold of 0.7 for each considered construct (Hair *et al.*, 2019). Using confirmatory factor analysis, the average variance extracted (AVE) was obtained for each construct (Table 2), which were higher than the recommended cut-off level of 0.5 (Fornell & Larcker, 1981; Hair *et al.*, 2019).

Table 2

The Measurement Model Results: Reliability and Convergent Validity

Construct	Items in structure	Cronbach's Alpha	CR	AVE
Individual effectiveness outcomes	5	0.848	0.936	0.788
Collective effectiveness outcomes	4	0.854	0.944	0.835
Organizational effectiveness outcome	1	-	-	-

Scale reliability is assured both in the case of individual effectiveness, with significant levels for Cronbach's Alpha ($\alpha=0.848>0.7$) and Composite Reliability ($CR=0.936>0.7$), as well as in the case of collective effectiveness, via the higher level of Cronbach's Alpha ($\alpha=0.854>0.7$) and Composite Reliability ($CR=0.944>0.7$).

Convergent validity of the scales is assured due to sufficient levels of Average Variance Explained for individual effectiveness ($AVE=0.788>0.5$) and teams' collective effectiveness ($AVE=0.835>0.5$). Therefore, in the case of individual competencies, construct explains 78.8 % of the variance of its five items, while in the case of collective effectiveness the construct explains 83.5 % of the variance of its four items.

Thirdly, discriminant validity was tested using the classical Fornell–Larcker metric (Fornell & Larcker, 1981), by comparing the square root of AVE for each modeled construct to its correlation with other constructs.

Considering the obtained results in Table 3, the Fornell–Larcker criterion was fulfilled, as the square-root value of AVE was higher than the correlation coefficients of the considered construct with all the other constructs. Thus, the empirical analysis confirms strong discriminant validity for the modeled constructs.

Table 3

Discriminant Validity

Constructs	Individual effectiveness outcomes	Team effectiveness outcomes	Organizational effectiveness outcome
Individual effectiveness outcomes	0.888		
Team effectiveness outcomes	0.794**	0.914	
Organizational effectiveness outcome	0.710**	0.737**	-

*Note: The values on the diagonal represent the square root of the AVE. All the other values represent Pearson correlations between constructs, ** reflects significant at p<0.001 level (two-tailed).*

Fourthly, the overall model fit was also verified with a series of global goodness-of-fit indices, which were compared to their threshold values (Kline, 2016). In this sense, the Comparative Fit Index (CFI=0.902) and the Incremental Fit Index (IFI=0.904) exceeds the predefined limit of 0.9, as well the Root Mean Square Error of Approximation (RMSEA=0.075) is below the indicated value of 0.08, while the Bentler Normed Fit Index (NFI=0.857), Tucker-Lewis Index (TLI=0.850) and Relative Fit Index (RFI=0.811), are slightly below the standard threshold values (Table 4). Consequently, the measurement model shows acceptable goodness-of-fit.

Table 4

Model Goodness-of-fit Measurement Indices

χ^2/df (p)	NFI	RFI	IFI	TLI	CFI	RMSEA
2.782 (0.000)	0.857	0.811	0.904	0.850	0.902	0.075

Data Analysis Methods and Techniques

In the following section, the particularities of the SEM specific structural model will be assessed and discussed in detail. In the first part of the data analysis, descriptive statistics with means and standard deviations are reported, as part of normal distribution evaluation (Hair *et al.*, 2019). Additionally, association statistics in the form of Pearson type bivariate correlations are presented.

The data analysis approach opted for is the common variance based structural equation modeling (SEM), regarded as appropriate and efficient multivariate estimation and analysis technique for a series of multiple causal relations estimated simultaneously in the form of set of equations (Hair *et al.*, 2019; Kline, 2016), as well as one of the dominant methods for analyzing complex interrelations between different types of variables (Hair *et al.*, 2019). Several empirical study (Davidaviciene *et al.*, 2020; Cizmaș *et al.*, 2020; Bond-Barnard *et al.*, 2018; Bhat *et al.*, 2017) from the considered research field applied SEM as preferred multivariate data analysis approach.

The IBM SPSS AMOS software was used for the structural model assessment, analysis and reporting, path estimations for regression weights and total effects for explanatory power have been considered.

Structural equations were constructed first for testing the linkages within the chain of effectiveness by considering only the higher order constructs (particular for hypothesis H1 and H2) and afterwards these relations have been detailed and break-down, by creating another model by including separately the four components of the team-level collective effectiveness outcomes (particular for hypothesis H1a, H1b, H1c and H1d). This approach was necessary in order to avoid the creation of a recursive model and obtain false results.

For structural model assessment, similar to other empirical studies (Davidaviciene *et al.*, 2020; Bond-Barnard *et al.*, 2018), the Maximum Likelihood (ML) estimation technique was applied to estimate and identify the most probable parameter values in order to obtain best model fit. Hair *et al.* (2019) considers the ML estimation method a more efficient, flexible and unbiased, if data are measured on a continuous scale and multivariate normal distribution is achieved, which is the case in the present research.

Furthermore, the above models were completed with the multicultural team-type variable as moderator, by creating two groups related to the face-to-face and to the virtual teams. Afterwards, structural model was tested for the two groups and results of sequential relations were compared, considering the standardized regression weights or coefficients (β) and coefficients of determination (R^2) for each group.

In order to assess and statistically test the differences or similarities between face-to-face and virtual multicultural teams and to evaluate the proposed hypotheses (H1, H1a-d, H2), a combination of first and second generation techniques was used (Lowry & Gaskin, 2014). In this sense, we tested in IBM SPSS for between group statistics, in the form of one-way ANOVA, univariate General Linear Model (GLM), F test, Welch and Brown-Forsythe robustness tests (Delacre *et al.*, 2019) and Eta squared, in order to delimit the extent to which the respondents' membership in a team type accounts for the variance of the result variables. Then, differences between face-to-face and virtual multicultural teams have been tested based on the second generation comparison technique indicated by Lowry and Gaskin (2014), a multiple group comparison technique specific for the structural equation based more complex relationships. Considering the recommended technique, z-scores and statistical

significance for group disparities are calculated, using the IBM SPSS AMOS output to provide the necessary critical ratios matrix, unstandardized regression weights and statistical significance levels, as input data.

Research Results

The first part of the empirical findings refers separately to the levels and linkages regarding the individual, collective and organizational effectiveness perceived by respondents from virtual and face-to-face IT multicultural team samples. Thus, the next two tables (5 and 6) provide descriptive statistics, in the form of means (M) and standard deviations (SD), along with Pearson correlations for association statistics regarding all the variables considered and modeled within the study.

As statistics show in Table 5, in the case of virtual multicultural teams, at aggregate level the mean value for individual competencies is 3.63, for collective outcomes is 3.52, and for the organizational outcome, respectively for the market adaptability is 3.38. Separately, in the case of each item included in the structure of the previously considered constructs, the mean values of items are between 3.38 and 3.73, having standard deviations between 0.68 and 1.06, just slightly above the threshold value of 1. Association statistics, in the form of bivariate Pearson correlation coefficients and significance level, show that all two-tailed correlations were positive and significant at 0.01 level. Thus, significantly high levels of correlations were found between individual and collective outcomes (r=0.823), respectively between collective and organizational outcomes (r=0.708).

Table 5

Means, Standard Deviations, and Correlations for the Virtual Multicultural Team Sample

Label	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mean	3.63	3.51	3.73	3.70	3.46	3.72	3.52	3.61	3.58	3.44	3.46	3.38
Standard deviation	0.68	0.92	0.81	0.80	0.89	0.83	0.80	0.98	0.92	0.86	1.03	1.06
IND (1)	1											
IND_PROF (2)	0.784	1										
IND_LANG (3)	0.827	0.547	1									
IND_COM (4)	0.791	0.438	0.736	1								
IND_EMPAT (5)	0.856	0.629	0.590	0.596	1							
IND_TOL&OPN (6)	0.735	0.468	0.459	0.432	0.584	1						
COL (7)	0.823	0.799	0.602	0.605	0.690	0.571	1					
COL_DEC (8)	0.758	0.604	0.658	0.634	0.606	0.529	0.839	1				
COL_PROB (9)	0.683	0.776	0.478	0.429	0.556	0.458	0.829	0.542	1			
COL_CRE&IN (10)	0.686	0.726	0.438	0.587	0.590	0.375	0.863	0.634	0.690	1		
COL_SATIS (11)	0.667	0.622	0.461	0.414	0.588	0.558	0.864	0.655	0.604	0.643	1	
ORG_ADAPT (12)	0.727	0.588	0.569	0.572	0.596	0.577	0.708	0.670	0.547	0.506	0.662	1

Note: All Pearson correlations are significant at the 0.01 level (2-tailed).

As statistics indicate in Table 6, in the case of face-to-face multicultural teams, at aggregate level the mean value for individual competencies is 3.93, for collective outcomes is 3.91, and for the organizational outcome concerning the market adaptability is 3.91. Separately, in the case of each item included in the structure of the previously considered constructs, the mean values of items are between 3.78 and 4.08, having standard deviations between 0.66 and 0.94, below the threshold value of 1.

Table 6

Means, Standard Deviations, and Correlations for the Face-to-face Multicultural Team Sample

Label	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mean	3.93	3.92	3.99	3.88	3.78	4.08	3.91	3.90	3.91	3.86	3.95	3.91
Standard deviation	0.66	0.91	0.90	0.87	0.86	0.75	0.74	0.87	0.93	0.94	0.90	0.92
IND (1)	1											
IND_PROF (2)	0.778	1										
IND_LANG (3)	0.817	0.557	1									
IND_COM (4)	0.844	0.567	0.716	1								
IND_EMPAT (5)	0.757	0.430	0.454	0.592	1							
IND_TOL&OPN (6)	0.639	0.398	0.377	0.335	0.437	1						
COL (7)	0.746	0.704	0.552	0.652	0.511	0.433	1					
COL_DEC (8)	0.625	0.539	0.553	0.530	0.413	0.348	0.841	1				
COL_PROB (9)	0.579	0.601	0.395	0.526	0.376	0.309	0.790	0.527	1			
COL_CRE&IN (10)	0.629	0.579	0.487	0.600	0.418	0.312	0.832	0.602	0.592	1		
COL_SATIS (11)	0.583	0.558	0.354	0.451	0.448	0.435	0.774	0.612	0.423	0.486	1	
ORG_ADAPT (12)	0.663	0.623	0.595	0.490	0.424	0.397	0.732	0.649	0.529	0.574	0.624	1

Note: All Pearson correlations are significant at the 0.01 level (2-tailed).

Association statistics, in the form of bivariate Pearson correlation coefficients and significance level, show that all two-tailed correlations were positive and significant at 0.01 level. Thus, high levels of correlations were found between individual and collective outcomes (r=0.746), along with the linkages between collective and organizational outcomes (r=0.732).

The descriptive and association statistics suggest that respondents from both virtual and face-to-face multicultural IT project teams perceived above average levels of outcomes evaluated within the current study, the highest mean value being registered for individual competencies outcomes, followed by collective and then by organizational outcomes, from the perspective of the higher order constructs. The presented findings support the authors decision to investigate the formation of the effectiveness' chain in the given research context. Moreover, mean values of all three types of effectiveness outcomes are higher for face-to-face multicultural teams than as perceived by virtual multicultural teams, although when it comes to association statistics, correlations between the three level of effectiveness are superior for culturally diverse virtual teams in contrast to the face-to-face multicultural teams included in the research sample.

The proposed set of research hypotheses seeks to evaluate the existence of significant differences or similarities between face-to-face and virtual multicultural IT teams. In this sense, the sample has been divided into two main groups based on team-type as grouping variable, respondents from co-located teams comprising 88 cases and from virtual teams including 71 cases were assigned to the two clusters, in order to assess separately the causal relations and structural models.

In the second part of the empirical research, structural equation modeling was used to create the two structural models to avoid recursion. One model in order to test separately for the group of face-to-face multicultural teams and for the group of virtual multicultural teams the main linkages within the chain of effectiveness, specific to hypothesis H1 and H2. Another one was created by detailing the components of collective effectiveness to test the influence of individual competencies on them, specific to hypothesis H1a, H1b, H1c, H1d.

Both for face-to-face and virtual multicultural teams, the structural model (Table 7) included statistically significant ($p<0.01$) causal relationships for individual competencies determining collective team level outcomes, respectively improved collective decisions, complex problem solving, creativity and innovation, and team satisfaction; respectively for collective outcomes determining the organizational market adaptability. For the first five relations indicating the influence of individual competencies on collective competencies, both considered aggregated and break-down on component level, the standardized regression weights for face-to-face multicultural teams (f2f) are slightly lower than for virtual multicultural teams (virt): for the aggregated collective effectiveness outcomes: $\beta_{f2f}=0.884 < \beta_{virt}=0.974$; for complex problem solving: $\beta_{f2f}=0.400 < \beta_{virt}=0.657$; for improved collective decisions: $\beta_{f2f}=0.485 < \beta_{virt}=0.788$; for creativity and innovation: $\beta_{f2f}=0.551 < \beta_{virt}=0.831$; and for team satisfaction growth: $\beta_{f2f}=0.288 < \beta_{virt}=0.596$. In the case of the last causal relation regarding the effect of collective outcomes on the market adaptability of organizations, standardized regression weights for face-to-face culturally diverse teams are higher than for virtual multicultural teams ($\beta_{f2f}=0.804 > \beta_{virt}=0.777$).

Table 7

The Structural Model Results Regarding the Chain of Effectiveness Outcomes for Face-to-face and Virtual Multicultural Teams

Hypothesis	Relationship / Path	Face-to-face teams		Virtual teams	
		β_{f2f}	p	β_{virt}	p
H1	IND → COL	0.884	0.000	0.974	0.000
H1a	IND → COL_PROB	0.400	0.000	0.657	0.000
H1b	IND → COL_DEC	0.485	0.000	0.788	0.000
H1c	IND → COL_CRE&IN	0.551	0.000	0.831	0.000
H1d	IND → COL_SATIS	0.288	0.004	0.596	0.000
H2	COL → ORG_ADAPT	0.804	0.000	0.777	0.000

Note: β reflects regression weight or path coefficient, while p regards statistical significance.

Regarding the explanatory power of the model, in the case of face-to-face multicultural teams, standardized total effects (R^2) show that 88.4 % of the collective effectiveness outcomes' variance can be explained via the individual competencies, respectively 80.4 % of the organizational market adaptability' variance is determined by collective team-level outcomes. Comparatively, in the case of virtual multicultural teams, standardized total effects (R^2) emphasize that 97.4 % of the collective outcomes' variance can be explained via the individual competencies, respectively 77.7 % of the organizational market adaptability' variance is determined by collective team-level effectiveness outcomes.

Thirdly, in order to statistically test the differences between face-to-face and virtual multicultural teams, we considered both the first generation between group statistics (ANOVA, F test, Welch test, Brown- Forsythe tests, eta), and afterwards the SEM based second generation techniques (z-scores and statistical significance).

Table 8

ANOVA between Group Statistics and Robustness Tests

Dependent variable	Sum of squared	F test (sig.)	Welch & Brown- Forsythe tests (sig.)	Eta squared (η^2)
COL_PROB	4.322	5.041 (0.026)	5.052 (0.026)	0.031
COL_DEC	3.353	3.957 (0.048)	3.860 (0.051)	0.025
COL_CRE&IN	7.165	8.800 (0.003)	8.969 (0.003)	0.053
COL_SATIS	9.426	10.314 (0.002)	10.019 (0.002)	0.062
ORG	10.989	11.350 (0.001)	11.004 (0.001)	0.067

First generation techniques were applied to test and delimit the extent to which the respondents' membership in one of the two types of team accounts for the variance of the result variables. Based on one-way ANOVA and univariate GLM regarding the influence of respondents' team type specificity on the predicted effectiveness outcomes, results (in Table 8) of the significant F test, seconded by significant Welch and Brown-Forsythe robustness tests (Delacre *et al.*, 2019), demonstrates some potential differences in predicted effectiveness outcomes based on the membership in co-located or virtual culturally diverse teams. However, Eta squared shows that only 3.1 % of the variance of complex problem solving ability, 2.5 % of the variability in decision making, 5.3 % of the variance of creativity and innovation, 6.2 % of the variance of team satisfaction growth and 6.7 % of the variance of market adaptability of the company is accounted for respondents' membership in face-to-face or virtual multicultural teams. All the above variances attributable to team types are of limited values.

Complementary to the above, the superior second generation multiple group comparisons technique specific for the more complex causal modeling and SEM based relations (Lowry & Gaskin, 2014) were applied. Results presented in Table 9, emphasize mainly statistically non-significant differences between face-to-face and virtual culturally diverse teams, except for the case of individual competencies effect on team satisfaction.

Regarding the influence of individual competencies on collective team-level effectiveness outcomes, group differences show a statistically insignificant and negative z-score (z= -0.832), therefore hypothesis H1 is not supported.

Table 9

Results of Differences between Face-to-face and Virtual Multicultural Teams Regarding the Chain of Effectiveness

Hypothesis	Relationship / Path	z-score	sig.	Results
H1	IND → COL	-0.832	ns	Invalid
H1a	IND → COL_PROB	-1.437	ns	Invalid
H1b	IND → COL_DEC	-1.435	ns	Invalid
H1c	IND → COL_CRE&IN	-1.117	ns	Invalid
H1d	IND → COL_SATIS	-1.806	<0.10	Valid
H2	COL → ORG_ADAPT	0.179	ns	Invalid

Note: Negative z-scores are in the favor of virtual multicultural teams; positive z-score is in the favor of face-to-face multicultural teams.

Concerning the influence of individual competencies on different types of collective team-level outcomes, group differences show a statistically insignificant and negative z-score (z= -1.437) for complex problem solving team ability, a statistically insignificant and negative z-score (z= -1.435) for making decisions at collective level, a statistically insignificant and negative z-score (z= -1.117) for creativity and innovation, a statistically significant (p<0.01) and negative z-score (z= -1.806) for team satisfaction growth. Thus, hypotheses H1a, H1b and H1c are not supported, while hypothesis H1d is supported. In the case of the last hypothesis (H1d) there is a statistically significant difference in the favor of virtual multicultural teams, where the influence of individual competencies is superior on the perceived overall team satisfaction, compared to the face-to-face multicultural teams.

Finally, concerning the influence of collective team-level outcomes on the market adaptability of the organization, group differences show a statistically insignificant and negative z-score (z= -0.179), therefore hypothesis H2 is not supported.

Discussion and Conclusions

The present research took into account those abilities, competencies, capabilities and attitudes that the majority of studies frequently identified as results of work in culturally diverse contexts, including face-to-face and virtual multicultural teams. These outcomes have been divided by us into three categories: individual ones - at the level of culturally diverse team-members, collective ones - at the level of multicultural teams, and at the company level - where we placed the adaptive capacity towards various markets.

Our empirical study, conducted on multicultural virtual and face-to-face teams working on projects in the IT field, aimed to identify whether there are differences between the two types of teams concerning their ability to develop a chain of effectiveness, which connects the three categories of effectiveness outcomes mentioned above, as a result of teamwork.

The results we have found revealed that hypotheses H1 and H2 were not supported. Consequently, both types of teams, have the capacity to develop and combine co-workers' individual competencies and so to produce

collective abilities and attitudes which, in turn, generate a better adaptability of the company towards different markets.

The most obvious explanation of this mutual result is that despite the different ways of working (face-to-face versus virtual), both types of culturally diverse teams generate the chain effectiveness outcomes we proposed to investigate, as results of confrontation and combination of multiple perspectives, differences in their thinking processes and culturally different workstyles.

However, the explanation can be more nuanced. Thus, we believe that although, in general, the face-to-face working mode facilitates constructive interactions along with information and knowledge sharing more than in the case of the virtual working mode, as supported by the extant research (Morrison-Smith & Ruiz, 2020; Gera, 2013), however in the particular case of project teams in the IT field, the interdependence implied by the realization of the joint projects favors the moral and satisfaction of team members (Jehn *et al.*, 1999), and we consider that it determines frequent interactions also between virtual team members. These are often done through synchronous communication and from time to time even in a traditional way, which greatly mitigates the shortcomings that remote work entails. The above, we believe is another explanation for the fact that we did not find statistically significant differences between face-to-face and virtual IT multicultural project teams in terms of incremental building of the tested effectiveness chain.

Regarding the sub- hypotheses related to hypothesis H1, the obtained results show the following:

a) Hypotheses H1a, H1b and H1c were not supported. Thus, both virtual and face-to-face culturally diverse teams working on IT projects have the capacity to develop the abilities to solve complex problems, to make good decisions and to generate creativity and innovation, as a result of the development and combination of co-workers' individual competencies, with no statistically significant differences between the two types of teams;

b) Hypothesis H1d was supported. This result shows that although both types of culturally diverse teams are satisfied as a result of the development of individual members' competencies, there are statistically valid differences between them in favor of the virtual teams. Consequently, this reflects that virtual teams value more than face-to-face teams the development of individual competencies, produced as a result of contact and interactions across space and time between culturally diverse members. On the other hand, if we compare the average values for the level of general satisfaction felt by the members of the two types of teams (Table 5 and Table 9, column 11), we notice that satisfaction is higher in face-to-face teams than in virtual ones, which is in agreement with the research findings presented by Staples and Zhao (2006), Morrison-Smith and Ruiz (2020). This aspect, corroborated with the validation of hypothesis H1d, suggests that for face-to-face team members there are other factors than the development of individual competencies, which are more important in generating satisfaction compared to the case of virtual teams. As stated by Cicei (2012) Warkentin *et al.* (1997), in face-to-face teams the satisfaction is higher than in the case of virtual teams due to the higher quality of interaction between members, which, in our opinion, can have a positive impact on team cohesion and on work climate - aspects which, together with the development of the individual competencies of the members, explain the higher level of felt satisfaction.

Complementary to the pursued main objective regarding to linkages determined between the individual, collective and organizational levels of the chain of effectiveness included within the study, the present research revealed that between multicultural co-located and virtual IT teams there are still some similarities and differences regarding the level of obtained developed outcomes, expressed by averaging the scores with which respondents assessed the advancement of different analyzed effectiveness outcomes (Table 5 and Table 6). However, we will not take into account the minor differences between the average values recorded in favor of face-to-face teams, as they may be generated by the slightly larger sample in their case compared to the virtual teams. The most important results obtained from this point of view are:

a) for virtual multicultural teams, the highest mean values were registered at the individual level of effectiveness, followed by the team level, and finally by the organizational level of effectiveness. In contrast, for face-to-face multicultural teams, the average scores for the three major analyzed outcomes categories are almost similar and overall are higher than in the case of virtual teams;

b) the biggest differences in favor of face-to-face multicultural teams are found at the organizational level, respectively of market adaptability. In our research, however, we took into account market adaptability in general, without highlighting the reaction time to market opportunities and overcome challenges, which, in the opinion of Nader *et al.* (2009), would ensure more responsiveness in the case of virtual teams;

c) other important differences in favor of culturally diverse face-to-face teams concern: the level of satisfaction registered - aspect discussed above; the level of creative and innovative abilities, as well as the level of individual professional competencies;

d) the competencies for which the highest average scores were registered, both for virtual and face-to-face multicultural teams, without substantial differences between the two types of teams, are those of tolerance and cultural openness, along with linguistic competencies.

The better results in terms mean values recorded by the face-to-face multicultural teams obtained in our study are probably due to other factors, such as those invoked in the literature review section: knowledge sharing (Bhat *et al.*, 2017); information sharing (Davidaviciene *et al.*, 2020); a better conceptual understanding of a problem (Nader *et al.*, 2009), all with positive effects on decision making and problem solving; stronger relational links within groups (Walther and Burgoon, 1992) and more constructive interaction between members, which generates more creativity (Gera, 2013; Walther & Burgoon, 1992) and satisfaction (Warkentin *et al.*, 1997; Cicei, 2012). On the other hand, even if about 70 % of the members of the analyzed teams have been part of these groups for over a year, it seems that in the case of sampled virtual teams, this time was not enough to enhance the effectiveness of these teams, in order to match or surpass the effectiveness of face-to-face teams. Research already mentioned in the paper (Warkentin *et al.*, 1997; Morrison-Smith & Ruiz, 2020) claim that in virtual

teams, learning, innovation, satisfaction, communication and performance are depending on their lifespan.

In conclusion, in the situation of the analyzed face-to-face and virtual multicultural IT teams, it was demonstrated that teamwork, characterized by interdependence and interaction necessary to carry out projects, leads to the natural development of an effectiveness' chain, which combines the individual level with the collective level of teams in order to generate, at organizational level, a better adaptability to various expectations manifested within different markets. Therefore, in terms of the capacity to produce the chain of effectiveness, there are no significant differences between face-to-face and virtual multicultural IT teams. Conversely, in terms of the level of developed outcomes, multicultural teams who work face-to-face are more effective than culturally diverse virtual teams, the biggest differences in the favor of face-to-face teams being in terms of market adaptability.

As implications, from a theoretical perspective, the results of the present research extend and differentiate from existing research in the literature on the effectiveness of face-to-face and virtual multicultural teams by highlighting the impact of individual competencies on team members' collective effectiveness outcomes, as well as of team outcomes over market adaptability of the company.

Also, these results are important in practice. First, given that the current study showed that face-to-face teams develop higher levels of effectiveness; in order to increase the effectiveness of virtual teams it would be important for team members to have the opportunity to interact face-to-face, traditionally or by using to a large extent the means of synchronous communication. Secondly, also for the increase of virtual team effectiveness, we believe that organizing the tasks in a manner to create high interdependency between members, would favor knowledge sharing and the development of individual and group learning. Thirdly, taking into account the fact that although both types of considered teams are able to generate the studied effectiveness chain, multicultural face-to-face teams were superior to multicultural virtual teams in terms of the level of achieved results, therefore we appreciate that companies that still ask themselves whether they should return employees to the office or keep them in remote work mode must find the optimal balance between face-to-face and virtual work. Thus, taking into account the research evoked in the literature review section on the responsiveness of virtual teams (Nader *et al.*, 2009), we estimate that when both the response time to changes in the environment is not pressing and the cost-benefit ratio is favorable, the traditional way of working should be embraced. Conversely, when both a short response time to external environmental challenges is required and when the costs involved in face-to-face work exceed those associated with the remote work mode, the second one (remote work) should be considered. Finally, from the point of view of the strategic management of companies, the achievement of objectives related to gaining new markets depends on building of internal mechanisms to support and intensify the competence development process (naturally facilitated by the interaction and interdependence that teamwork involves), from the individual level of the members, to the team level and then to the organizational level.

The current research has some limitations too. Our results regarding the three levels of the analyzed chain of effectiveness are based on the members' perception of virtual and face-to-face multicultural teams working on projects in the IT field. Thus, in assessing, at organizational level, the market adaptability of IT companies, we consider that their top managers should be surveyed as well, because they can provide complementary perspectives to the perception of project team members in direct contact with their clients. Also, in obtaining the results, we did not take into account factors such as the size of the analyzed teams and the time length of team-members operating together, or in the case of market adaptability, the time to response. It is true that the investigated sample composed mostly members from teams of medium size (between 5 and 15 members) and large size (over 15 members) and who worked in the same team for a longer time. However, we wonder if the development of the chain of effectiveness is also manifested in smaller teams that operate for a shorter time-span, and if so, which of the individual and collective outcomes develop mostly. Also, how would these factors, especially the team longevity and duration of service, affect the development of the chain of effectiveness in the case of virtual teams? Other factors that we did not take into account in the case of virtual teams refer to the degree of their virtuality, but also to the type of communication (synchronous/ asynchronous) they prefer to use. For example, as mentioned in the opening section of the paper, Hambley *et al.* (2007) identified that synchronous communication, via videoconference, favor the development of relationships and cohesion in virtual teams, therefore we can deduce that the type of communication can affect the development of certain competencies within these teams.

The limitations listed above reflect concerns that we intend to address in our future research. Also, we consider that it would be interesting to extend the study to different fields of activity in which multicultural teams operate.

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Authors' Biographies

Elena Cizmaș is an associate professor at the West University of Timișoara, Faculty of Economics and Business Administration, Department of Management and Entrepreneurship. She holds a PhD in Management at the West University of Timișoara and an MBA from the Business Administration Institute, Orleans University. In her teaching activities and scientific work, she focuses on organizational behaviour, management, human resource management and international human resource management.

Emőke-Szidónia Feder is an associate professor at the West University of Timișoara, Faculty of Economics and Business Administration, Department of Marketing and International Economic Relations. She obtained the scientific title of PhD in Marketing at the West University of Timișoara, then she followed post-doctoral studies at the Bucharest University of Economic Studies in the field of comparative international entrepreneurship. Her main research interests and teaching activities encompass topics specific to international management, global business development, and international entrepreneurship.

Mădălina-Dumitrița Maticiuc is a lecturer at the West University of Timisoara, Faculty of Economics and Business Administration, Department of Management and Entrepreneurship. She was a post-doctoral research fellow at the same university, where she studied entrepreneurship and business clusters. Her main research interests revolve around areas such as organizational behaviour, intercultural management, strategic management, and innovation.

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