

Critical Success Factors of Global Virtual Teams (GVTs): A Review of Information Technology (IT) Industry in the United Kingdom

Summary

The research study evaluated the critical Success Factors of Global Virtual Teams (GVTs) working in the Information technology industry in the UK. The study focused on determining the critical factors that influence the success of global virtual teams. The second objective focused on ranking and categorising the success factors, the factors that are critical for global virtual teams' success, and their correlation. The primary data was obtained from executives working in the IT industry and Fuzzy DEMATEL analysis was incorporated to generate results. The findings provided quite insightful perspectives on the success factors of the GVTs. The results identified that Overcoming perceived & temporal distance, Empowerment, Integrative approach, Member's competencies, and Cultural intelligence are considered to be causal variables. In contrast, effective team leadership, Trust, Commitment to task, and Communication are regarded as an effect. In terms of the degree of importance, Communication was ranked in first place. Effective team leadership and overcoming perceived & temporal distance was found to be in second and third place. Empowerment was found to be in the last position in terms of the degree of importance.

Track:

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INTRODUCTION

The global virtual team (GVT) is being recognized as an innovative concept that utilizes information and communication technologies (ICT) to create a functioning atmosphere (Zakaria and Yusof, 2020). The team members belonging to different global locations, different backgrounds and cultural heritages, scattered organizationally, and connection with the team through asynchronous and synchronous ICTs distinguish global virtual teams from regular workplace teams (Glikson and Erez, 2020; Cheng soon & Salamzadeh, 2020). The organizations that create, manage, and work with global virtual teams tend to be more flexible, have a greater scope for innovation, and tend to be more diverse and innovative in their operations due to the incorporation of members belonging to different dynamic backgrounds (Richter et al., 2021). The features bring significant, unique characteristics to the team.

According to recent statistics, more than 25% of workers worldwide are part of 100% remote work organizations that practice virtual team collaboration and allow each worker to operate in their own time zone (Gitlab, 2021). The figures, therefore, reflect that global virtual teams are gradually becoming an important aspect of modern organizations. They also tend to replace the regular teams and have also started to do so in various global firms (Tavoletti and Taras, 2022). In the United Kingdom as well, the trend of global virtual teams is on the rise, and information technology and fintech companies in London and other regions are gradually shifting towards the GVT model. Closer to 16% of the workforce is working from the comfort of their homes through different ICT technologies (Ons.gov.pk, 2022). The information, therefore, suggests that GVTs have become an important area in organizational studies and require in-depth and detailed analysis of their formation, management, and effective working.

Global virtual teams provide numerous benefits to organizations in terms of effectiveness, innovation, flexibility, and diversity; however, they are not without their own set of challenges. Technological impediments, leadership dilemmas, management approaches, language barriers, and cultural differences are some of the challenges that create serious problems in the effective working of a global virtual team (Morrison-Smith and Ruiz, 2020). When the problems are not timely addressed, they could lead to the breakdown of the teams or failure to achieve organizational objectives. Statistics suggest that the above challenges cause more than 60% of the global virtual teams in the UK information technology sector to miss their defined goals and objectives (Hoang, 2022). The current study evaluates the challenges associated with global virtual teams in the British IT sector in an in-depth manner.

A preliminary literature review suggests that different scholars have explored the formation and working of global virtual teams; however, some serious gaps have also been identified in the research. Initially, research on global virtual teams was rarely conducted in the context of the United Kingdom in general, or the IT sector in particular. Previous scholars have studied GVTs from different perspectives. Morrison-Smith and Ruiz (2020) have evaluated the GVTs from the perspective of overcoming perceived and temporal distance; Maduka et al. (2018) in the context of effective team leadership; and Hacker (2019) from the perspective of trust. A careful study of the above literature and other sources revealed that the majority of scholars have evaluated GVTs from the perspective of success factors. An important aspect that is missing from the literature is that GVTs have not been examined from a regional or national perspective. For example, the way GVTs operate in a specific location, such as the United Kingdom, has not been evaluated in the literature in a significant way. The national working dynamics of GVTs from a regional perspective therefore require more careful examination. Similarly, the literature also identified that scholars such as Shamim (2022) and

Eseryel et al. (2021) have analysed integrative approaches and functional and visionary leadership in GVTs. It was, however, important to note that they have not evaluated integrative approaches and functional and visionary leadership from an industry perspective. The gap is important as not all industries have the same working mechanisms, and approaches tend to differ from industry to industry. It could therefore be safely assumed that previous scholars have not sufficiently explored GVTs from a regional and industrial perspective, and this area needs to be explored and evaluated further. Furthermore, the scholars lack consensus on the factors that help create success factors for GVTs (Maduka et al., 2018). Finally, a preliminary literature review suggested that strategies to counter challenges associated with GVTs have not been effectively explored and researched (Hacker, et al., 2019).

The research is expected to assist managers, executives, and organizations working with GVTs to be more effective in the management and operations of their teams. With the availability of the empirical evidence, it would be significantly easier to understand the leadership styles and management techniques that could be adopted to enhance the performance of the GVTs.

The research study aims to evaluate the critical success factors important for global virtual teams (GVTs). The study therefore adopted the following as its research objectives.

- To determine the critical factors that influence the success of global virtual teams.
- To rank the factors that are critical for global virtual teams' success,
- To find the cause-and-effect relationship between the critical success factors of GVTs.

It was considered important to focus on IT industry due to three prime reasons. First, the IT industry promotes innovation and novelty. Second, the majority of the GVTs are expected to be operational in the IT industry. Lastly, the IT industry is in a constant process of evolution and development and for that reason is most ripe for the experimentation of new ideas and concepts.

LITERATURE REVIEW

Selection Process

The selection process for the literature review was based on various parameters that were designed to find the most relevant literature on the subject matter. The first parameter was the subject on which the literature was searched. To start with, the key databases used to search for the respective literature included JSTOR, Emerald, Google Scholar, Microsoft Academic Search, Refseek, and Virtual LRC. The selected databases were considered due to the need for quality resources to develop the literature review. The selected databases, based on piloting done by the researcher, proved to have sufficient sources for the subject of global virtual teams. As held by Boslaugh (2017), secondary research serves as a method of research that relies on data that has been gathered by someone else. For that reason, in the event the researcher develops a given research project based on pre-existing data, that serves as secondary research (Vartanian, 2019). Kumar (2019) noted that the majority of studies are limited due to the fact that their knowledge system is inconclusive, hence requiring more exploration and validation of judgement. With the introduction and success of the internet and online databases, research studies have become ubiquitous, and their accessibility and organisation have increased. The concept of secondary research studies has therefore been enhanced with the possibility of researching already completed papers to advance and streamline insight on a given subject. The

research literature that acts as the data for the current exploration is sampled through the use of the Boolean search strategy. The Boolean search strategy uses logical arguments to identify, streamline, or expand the spectrum of the research studies that are considered in the exploration endeavour (MacFarlane et al., 2021). The logical Boolean operators used in expanding the search spectrum include AND and the () parenthesis. The boolean operators used in streamlining the search spectrum are OR, NOT, and AND NOT. They are used alongside the key search words, which primarily involved GVT, GVTs IN THE IT INDUSTRY, GVTs IN THE UK, GVT Success Factors, GVT Leadership, etc. Moreover, the following search strategies were applied using Boolean operators: GVT and success factors; GVT and leadership impact, among others. Therefore, in the search engines of each of the identified databases, the attempt is to combine the keywords to obtain all the available resources in the form of journals. The journals were further filtered to retain the best and highest-rated literature that meets the inclusion criteria as prescribed next in the study.

Inclusion and exclusion criteria were also set for the literature review. Inclusion criteria specified that all selected literature must be no older than five years in terms of year of publication. All studies must focus on the success factors of global virtual teams and not on physical organisational teams, etc. The sources must bear the full bibliographic details of the authors, year of publication, journal title, and methodology disclosure. The exclusion criteria for the studies specified that sources that address GVT as a personal phenomenon as opposed to a workplace situation are excluded. Similarly, sources that are supported by outdated referential materials, especially older than 10 years, were also excluded.

Review of literature

Reviewing the main literature, Morrison-Smith and Ruiz (2020) argue that global virtual teams face various challenges and difficulties that are unique to the problems faced by the on-site teams. Virtual groups are bound to face multiple challenges, such as cognitive, social, and emotional ones. If the teams are able to overcome five distinct challenges such as the configuration of dispersed teams, geographical distance, diversity of workers, perceived distance, and temporal distance, by overcoming these obstacles, the team could emerge as highly productive and robust. In contrast, Maduka et al. (2018) highlight a different perspective and suggest that effective team leadership is an essential prerequisite for the success of global virtual teams. In this regard, the competencies of transformational leadership could play an important role as they are known to select high-performing teams. Consequently, unlike Morrison-Smith and Ruiz (2020), who emphasize group efforts, Maduka et al. (2018) place more emphasis on leadership qualities. In comparison, Hacker (2019) discusses the role of trust in the success of global virtual teams and argues that trust is the most important factor that is least considered in the context of GVT but holds the most importance. With the establishment of trust between the global team members, different challenges could be overcome with their combined and coordinated efforts. Small challenges, on the other hand, can lead to global team breakdowns when team members are primarily focused on operations and procedures and trust and confidence building are not prioritized. Breuer et al. (2020) also support these views and explain that trust is generally essential for organizational success, but it is essential for the success of global virtual teams as well. The greater the trust among the GVT members, the greater cooperation and collaboration could be observed.

Garro-Abarca et al. (2021) note that GVTs more specifically lack in the area of communication. Consequently, GVTs cannot overlook the factor of communication and have to ensure that a lack of communication does not lead to a difference in understanding of the team and organizational goals. Trust in leadership, cohesion, and empowerment all play important roles in team success. In agreement, Castellano et al. (2021) introduces the concept

of self- and shared leadership in the context of Global virtual teams. The self-oriented leaders who are committed to their tasks could more effectively manage the global virtual teams if they had potency. The effectiveness of teamwork can be significantly increased if trust exists in team relationships. Chamakioti et al. (2021), on the other hand, argue that the concept of GVTs is still in its early stages and that current information about GVTs may not be sufficient to determine success factors. In contrast, Shamim (2022) claims that an integrative approach by the project manager and the team members leads to a successful team. Nguyen (2014) contends that structure, member' competencies, commitment are all important factors that could be considered integral for the success of the Global virtual teams. The findings are in stark contrast to the studies that associate the success of GVTs to leadership capacity.

Eseryel et al. (2021) explored the role of functional and visionary leadership in understanding their contribution to the effectiveness of the global virtual teams. It is argued that a combination of both is required in the context of global virtual team members, even though it might seem paradoxical. Functional leadership, complemented by centralized visionary leadership, could lead to the accomplishment of the goals. Presbitero (2020) shows a different side of the picture and argues that cultural intelligence is an important element in the context of global virtual teams. This is because as the members' cultural intelligence quotient grows, they will be better able to understand and accommodate the views and opinions of their team members. In comparison, Zuofa and Ochieng (2021) contend that the ultimate responsibility for leading the team to success lies with project management. Through the use of robust technology and communication strategies, the project manager builds trust among the members of the global virtual team. As a result, they tend to be more focused on organizational objectives. Mangla (2021) shows a completely different picture and argues that managing and running a global virtual team is a major cultural and organizational shift. Both the managers and the team members may be required to re-evaluate the cultural values, as until the values are aligned, the team members may find it quite difficult to integrate and collaborate. While their individual cultures would be significantly different, the professional values of the team members must be aligned so that shared organizational objectives may be easy to obtain.

Based on the literature review, the below 9 factors were recognized as the main success factor of GVTs: Overcoming perceived and temporal distance (Morrison-Smith and Ruiz, 2020), Effective team leadership (Maduka et al., 2018), Trust (Hacker, 2019 ; Breuer et al., 2020 ; Castellano et al., 2021), Empowerment (Garro-Abarca et al., 2021), Commitment to task (Castellano et al., 2021), Integrative approach (Shamim, 2022), Member's competencies (Nguyen, 2014), Cultural intelligence (Presbitero, 2020) and Communication (Zuofa and Ochieng, 2021).

Research Gap

The extensive review of the literature validated the findings of the preliminary literature review. The critical analysis of the literature suggested that every scholar has evaluated the success factor of the GVTs from a different perspective. Maduka et al. (2018) associates it with leadership while Garro-Abarca et al. (2021) specifies it with trust and cohesion among the team members. On one side, this could be termed a significant contribution to the literature; on the other, it creates serious challenges for the teams working in the industry to build the required competencies that are essential for GVT's success. The lack of consensus, therefore, emerges as an important research gap. Nguyen (2014) notes that the current studies on the subject of GVTs have not effectively covered the IT sector. When the gap is evaluated from the context of current study, the lack of GVT studies from the perspective of British IT industry emerges as an important gap. Zakaria and Yusof (2020) point out that role of leadership in creating trust between the GVT members is another area which requires significant research. This has

therefore been identified as another research gap. The study aims to address these gaps in the current research.

METHODS

Research Design

The current study tries to answer the main research questions using a quantitative approach and collecting the opinions of the experts by a researcher designed questionnaire and performing the analysis using Fuzzy DEMATEL technique.

The population for the study consisted of the team leaders and members of the GVTs working in British information technology firms. The main reason for selecting this industry is that as per previous studies, the IT industry could be termed as one of the industries that could have the largest number of GVTs working in the United Kingdom (Glikson and Erez, 2020).

In order to develop the fuzzy DEMATEL matrix as our main part of the questionnaire, we used the 9 main success factors shared in the previous sections.

Importance of Fuzzy DEMATEL

The fuzzy DEMATEL technique was found to be the most relevant analytical technique for a variety of reasons. In many decision-making situations, the factors or criteria involved are complex and interconnected, meaning that the decisions made for one factor can have an impact on others. Fuzzy DEMATEL helps in understanding the cause-and-effect relationships among these factors and how they influence each other. Another important factor is uncertainty and subjectivity, as decision-making processes often involve these factors (Abdullah and Zulkifli, 2019). Fuzzy logic is well suited for dealing with uncertain and imprecise information. By using fuzzy sets and membership functions, fuzzy DEMATEL allows for the representation of subjective judgements and linguistic terms, providing a more comprehensive analysis. Fuzzy DEMATEL is particularly useful in multi-criteria decision analysis (MCDA), where multiple factors or criteria need to be considered simultaneously. By considering the interrelationships among these criteria, fuzzy DEMATEL helps in determining the relative importance and influence of each criterion on the overall decision (Soner, 2021). The aspect that is most important from the perspective of the current study is prioritisation and ranking. Fuzzy DEMATEL provides a systematic approach to prioritising and ranking the factors or criteria involved in decision-making. It enables decision-makers to identify the key factors that have the most significant influence on the decision's outcome, allowing for more focused and effective decision-making. Consequently, the ranking feature has also been used in the current study to rank the success factors in terms of degree of importance and degree of impact.

Application of Fuzzy DEMATEL

The Fuzzy DEMATEL technique is used to analyse the survey data. We can use the benefits of the DEMATEL approach and Fuzzy logic methods together, and by following the following steps, Fuzzy DEMATEL analysis could be performed to analyse and find the interconnection between the factors found in the literature review. This will allow us to analyse and find out how the different factors are specifically related.

Step 1 is to determine the purpose of the decision as well as the elements that will influence the objective of the investigation (Saunders et al., 2015). During this phase, it will be necessary to conduct a large number of literature reviews in order to search for and collect relevant information. A committee of experts is required to provide expert opinions on the subject. In this technique, prospective elements that influence the decision objective are

determined by taking into account both the information that was gathered through the literature review and the opinions of experts. After reaching a consensus on the criteria, the next step is to conduct a poll with an expert panel to examine the interaction between each set of parameters (Taherdoost, 2016). By following the steps outlined above, it is possible to obtain linguistic evaluations of which components have direct effects on each other.

In the second step, the expert evaluations will be combined to generate the first direct-relation matrix. Convert the language evaluations into Fuzzy integers formed from three triangles (Sharma, 2017). After that, make crisp scores based on the Fuzzy DEMATEL equations by aggregating these Fuzzy numbers using the CFCS technique. As a consequence of this, the term "A_{ij}" represents the direct influence that factor i has on component j. Because of this, the first direct-relationship matrix, denoted by the letter A, is constructed.

In the third step, a cause-effect relationship diagram and a structural model of system factors are created by following the DEMATEL methodology in the third step of the process (Ishak et al., 2014). It is possible to easily construct the total-relation matrix by making use of the primary direct-relation matrix that was generated in Step 2. After that, the importance degree and the net impact degree are computed, and the cause-effect relationship diagram is constructed; this helps to visualize the structural relationship that exists between the elements. Step four is to investigate the structure of the system factors and locate the CSFs. Consider each component of the system in light of the indices r_i , c_i , $r_i + c_i$, and $r_i - c_i$. When the position of each aspect is considered within the larger system as a whole, it becomes convenient to establish which factors have the greatest influence on the system and, if given higher priority, can considerably improve the overall effectiveness of the system (Clarke et al., 2015). These CSFs could be considered significantly important for the system.

FINDINGS

Demographic Analysis

Six out of seven experts have 9 years and above work experience in the industry and one of our experts has 6 years of management experience in the industry and therefore of an acceptable level of experience to share their opinion on the success factors of GVTs. 5 of our experts had bachelor's degree and 2 were master's degree holders. All 7 of them were familiar with GVTs and have worked in them and managed them as well (ranging from 2 to 6 years).

Fuzzy DEMATEL Analysis

Table1: The direct relation matrix

	Overcoming perceived & temporal distance	Effective team leadership	Trust	Empowerment	Commitment to task	Integrative approach	Member's competencies	Cultural intelligence	Communication
Overcoming perceived & temporal distance	(0.000,0.000 ,0.000)	(0.607,0.857 ,1.000)	(0.571,0.821 ,1.000)	(0.107,0.357 ,0.607)	(0.429,0.679 ,0.929)	(0.464,0.714 ,0.964)	(0.321,0.571 ,0.821)	(0.286,0.536 ,0.750)	(0.679,0.929 ,1.000)
Effective team leadership	(0.429,0.643 ,0.821)	(0.000,0.000 ,0.000)	(0.571,0.821 ,1.000)	(0.393,0.643 ,0.821)	(0.357,0.607 ,0.786)	(0.321,0.571 ,0.821)	(0.357,0.607 ,0.857)	(0.286,0.464 ,0.714)	(0.571,0.821 ,0.929)
Trust	(0.393,0.643 ,0.893)	(0.500,0.750 ,0.929)	(0.000,0.000 ,0.000)	(0.179,0.357 ,0.607)	(0.286,0.536 ,0.786)	(0.214,0.464 ,0.714)	(0.179,0.429 ,0.679)	(0.250,0.429 ,0.679)	(0.500,0.750 ,0.929)

Empowerment	(0.250,0.500 ,.750)	(0.393,0.643 ,.857)	(0.286,0.536 ,.786)	(0.000,0.000 ,.000)	(0.393,0.643 ,.893)	(0.286,0.536 ,.786)	(0.429,0.679 ,.929)	(0.179,0.429 ,.679)	(0.536,0.786 ,.929)
Commitment to task	(0.286,0.536 ,.786)	(0.393,0.643 ,.857)	(0.286,0.536 ,.786)	(0.321,0.571 ,.821)	(0.000,0.000 ,.000)	(0.250,0.500 ,.750)	(0.321,0.571 ,.821)	(0.286,0.536 ,.786)	(0.571,0.821 ,.929)
Integrative approach	(0.250,0.500 ,.750)	(0.536,0.786 ,.1.000)	(0.500,0.750 ,.1.000)	(0.393,0.643 ,.893)	(0.429,0.679 ,.929)	(0.000,0.000 ,.000)	(0.286,0.536 ,.786)	(0.214,0.464 ,.714)	(0.571,0.821 ,.1.000)
Member's competencies	(0.393,0.643 ,.893)	(0.429,0.679 ,.929)	(0.464,0.714 ,.893)	(0.321,0.571 ,.821)	(0.357,0.607 ,.786)	(0.357,0.607 ,.857)	(0.000,0.000 ,.000)	(0.250,0.500 ,.750)	(0.643,0.893 ,.1.000)
Cultural intelligence	(0.250,0.500 ,.750)	(0.357,0.607 ,.857)	(0.357,0.607 ,.786)	(0.286,0.536 ,.786)	(0.536,0.786 ,.964)	(0.357,0.607 ,.857)	(0.429,0.679 ,.929)	(0.000,0.000 ,.000)	(0.679,0.929 ,.1.000)
Communication	(0.500,0.750 ,.857)	(0.607,0.857 ,.929)	(0.393,0.643 ,.821)	(0.357,0.536 ,.714)	(0.393,0.643 ,.786)	(0.393,0.571 ,.750)	(0.464,0.714 ,.857)	(0.429,0.607 ,.786)	(0.000,0.000 ,.000)

Table 1 shows the first step of the analysis which is the generation of the fuzzy direct relation matrix. The table above indicates the direct relation matrix, which is the same as the pairwise comparison matrix of the experts.

Table2: The normalized fuzzy direct-relation matrix

	Overcoming perceived & temporal distance	Effective team leadership	Trust	Empowerment	Commitment to task	Integrative approach	Member's competencies	Cultural intelligence	Communication
Overcoming perceived & temporal distance	0.000,0.00 (0,0.000)	0.079,0.11 (1,0.130)	0.074,0.10 (6,0.130)	0.014,0.04 (6,0.079)	0.056,0.08 (8,0.120)	0.060,0.09 (3,0.125)	0.042,0.07 (4,0.106)	0.037,0.06 (9,0.097)	0.088,0.12 (0,0.130)
Effective team leadership	0.056,0.08 (3,0.106)	0.000,0.00 (0,0.000)	0.074,0.10 (6,0.130)	0.051,0.08 (3,0.106)	0.046,0.07 (9,0.102)	0.042,0.07 (4,0.106)	0.046,0.07 (9,0.111)	0.037,0.06 (0,0.093)	0.074,0.10 (6,0.120)
Trust	0.051,0.08 (3,0.116)	0.065,0.09 (7,0.120)	0.000,0.00 (0,0.000)	0.023,0.04 (6,0.079)	0.037,0.06 (9,0.102)	0.028,0.06 (0,0.093)	0.023,0.05 (6,0.088)	0.032,0.05 (6,0.088)	0.065,0.09 (7,0.120)
Empowerment	0.032,0.06 (5,0.097)	0.051,0.08 (3,0.111)	0.037,0.06 (9,0.102)	0.000,0.00 (0,0.000)	0.051,0.08 (3,0.116)	0.037,0.06 (9,0.102)	0.056,0.08 (8,0.120)	0.023,0.05 (6,0.088)	0.069,0.10 (2,0.120)
Commitment to task	0.037,0.06 (9,0.102)	0.051,0.08 (3,0.111)	0.037,0.06 (9,0.102)	0.042,0.07 (4,0.106)	0.000,0.00 (0,0.000)	0.032,0.06 (5,0.097)	0.042,0.07 (4,0.106)	0.037,0.06 (9,0.102)	0.074,0.10 (6,0.120)
Integrative approach	0.032,0.06 (5,0.097)	0.069,0.10 (2,0.130)	0.065,0.09 (7,0.130)	0.051,0.08 (3,0.116)	0.056,0.08 (8,0.120)	0.000,0.00 (0,0.000)	0.037,0.06 (9,0.102)	0.028,0.06 (0,0.093)	0.074,0.10 (6,0.130)
Member's competencies	0.051,0.08 (3,0.116)	0.056,0.08 (8,0.120)	0.060,0.09 (3,0.116)	0.042,0.07 (4,0.106)	0.046,0.07 (9,0.102)	0.046,0.07 (9,0.111)	0.000,0.00 (0,0.000)	0.032,0.06 (5,0.097)	0.083,0.11 (6,0.130)
Cultural intelligence	0.032,0.06 (5,0.097)	0.046,0.07 (9,0.111)	0.046,0.07 (9,0.102)	0.037,0.06 (9,0.102)	0.069,0.10 (2,0.125)	0.046,0.07 (9,0.111)	0.056,0.08 (8,0.120)	0.000,0.00 (0,0.000)	0.088,0.12 (0,0.130)
Communication	0.065,0.09 (7,0.111)	0.079,0.11 (1,0.120)	0.051,0.08 (3,0.106)	0.046,0.06 (9,0.093)	0.051,0.08 (3,0.102)	0.051,0.07 (4,0.097)	0.060,0.09 (3,0.111)	0.056,0.07 (9,0.102)	0.000,0.00 (0,0.000)

Table 2 shows the second step of the analysis which is normalizing the fuzzy direct relation matrix.

Table 3: The fuzzy total-relation matrix

	Overcoming perceived &	Effective team leadership	Trust	Empowerment	Commitment to task	Integrative approach	Member's competencies	Cultural intelligence	Communication
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	temporal distance								
Overcoming perceived & temporal distance	(0.034,0.148,0.679)	(0.119,0.278,0.872)	(0.110,0.263,0.846)	(0.043,0.175,0.708)	(0.089,0.237,0.814)	(0.088,0.225,0.785)	(0.072,0.215,0.787)	(0.063,0.189,0.705)	(0.134,0.308,0.903)
Effective team leadership	(0.084,0.217,0.746)	(0.042,0.168,0.725)	(0.107,0.253,0.815)	(0.074,0.200,0.704)	(0.078,0.221,0.769)	(0.069,0.201,0.742)	(0.075,0.212,0.762)	(0.061,0.174,0.675)	(0.119,0.286,0.862)
Trust	(0.074,0.197,0.708)	(0.094,0.233,0.782)	(0.030,0.135,0.651)	(0.043,0.150,0.638)	(0.062,0.192,0.721)	(0.050,0.171,0.685)	(0.047,0.172,0.697)	(0.051,0.154,0.630)	(0.100,0.251,0.809)
Empowerment	(0.059,0.190,0.727)	(0.084,0.232,0.812)	(0.068,0.210,0.780)	(0.023,0.115,0.597)	(0.077,0.214,0.768)	(0.060,0.188,0.727)	(0.079,0.210,0.758)	(0.044,0.162,0.661)	(0.107,0.268,0.849)
Commitment to task	(0.062,0.193,0.725)	(0.084,0.232,0.805)	(0.067,0.209,0.773)	(0.062,0.183,0.687)	(0.029,0.137,0.658)	(0.056,0.183,0.717)	(0.066,0.197,0.741)	(0.057,0.173,0.666)	(0.111,0.271,0.842)
Integrative approach	(0.062,0.201,0.766)	(0.106,0.261,0.870)	(0.097,0.245,0.844)	(0.074,0.201,0.737)	(0.085,0.229,0.812)	(0.028,0.132,0.673)	(0.065,0.204,0.782)	(0.051,0.174,0.700)	(0.117,0.286,0.901)
Member's competencies	(0.080,0.218,0.770)	(0.095,0.251,0.851)	(0.094,0.243,0.822)	(0.066,0.193,0.719)	(0.078,0.223,0.786)	(0.073,0.207,0.762)	(0.030,0.140,0.679)	(0.056,0.180,0.694)	(0.127,0.296,0.889)
Cultural intelligence	(0.063,0.203,0.755)	(0.086,0.244,0.843)	(0.081,0.232,0.810)	(0.063,0.191,0.716)	(0.100,0.244,0.805)	(0.073,0.208,0.762)	(0.084,0.223,0.787)	(0.025,0.120,0.605)	(0.131,0.301,0.889)
Communication	(0.095,0.232,0.730)	(0.119,0.273,0.810)	(0.090,0.239,0.775)	(0.073,0.192,0.674)	(0.086,0.230,0.748)	(0.080,0.206,0.715)	(0.090,0.228,0.742)	(0.079,0.194,0.664)	(0.055,0.196,0.731)

Table 3 shows the calculation of the fuzzy total-relation matrix. The inversed normalized matrix was first calculated, and then it was subtracted from matrix I. Finally, the normalized matrix has been multiplied by the resulting matrix.

Table 4: The crisp total-relation matrix

	Overcoming perceived & temporal distance	Effective team leadership	Trust	Empowerment	Commitment to task	Integrative approach	Member's competencies	Cultural intelligence	Communication
Overcoming perceived & temporal distance	0.235	0.364	0.348	0.257	0.322	0.309	0.301	0.267	0.391
Effective team leadership	0.297	0.26	0.337	0.277	0.304	0.285	0.295	0.252	0.37
Trust	0.277	0.319	0.222	0.23	0.276	0.254	0.256	0.231	0.337
Empowerment	0.274	0.322	0.299	0.196	0.299	0.273	0.294	0.24	0.355
Commitment to task	0.276	0.32	0.297	0.261	0.224	0.267	0.282	0.25	0.356
Integrative approach	0.286	0.351	0.335	0.282	0.316	0.222	0.292	0.255	0.375
Member's competencies	0.301	0.341	0.33	0.274	0.308	0.292	0.23	0.258	0.381
Cultural intelligence	0.286	0.334	0.319	0.271	0.327	0.292	0.307	0.201	0.385
Communication	0.306	0.352	0.319	0.267	0.308	0.285	0.305	0.266	0.283

Table 4 shows the CFCS method proposed by Ogricovic and Tzeng to obtain a crisp value of the total-relation matrix. The output of the CFCS algorithm is crisp values.

Table 5: The crisp total- relationships matrix by considering the threshold value

	Overcoming perceived & temporal distance	Effective team leadership	Trust	Empowerment	Commitment to task	Integrative approach	Member's competencies	Cultural intelligence	Communication
Overcoming perceived & temporal distance	0	0.364	0.348	0	0.322	0.309	0.301	0	0.391
Effective team leadership	0.297	0	0.337	0	0.304	0	0.295	0	0.37
Trust	0	0.319	0	0	0	0	0	0	0.337
Empowerment	0	0.322	0.299	0	0.299	0	0.294	0	0.355
Commitment to task	0	0.32	0.297	0	0	0	0	0	0.356
Integrative approach	0	0.351	0.335	0	0.316	0	0	0	0.375
Member's competencies	0.301	0.341	0.33	0	0.308	0	0	0	0.381
Cultural intelligence	0	0.334	0.319	0	0.327	0	0.307	0	0.385
Communication	0.306	0.352	0.319	0	0.308	0	0.305	0	0

Table 5 is based on step 5 and reflects the crisp matrix in relation to the crisp values. In this study, the threshold value is equal to 0.2940. All the values in matrix T (Table 4) which are smaller than 0.2940 are set to zero, that is, the causal relation mentioned above is not considered. The model of significant relations is presented in the following table.

Table 6: The final output

	R	D	D+R	D-R
Overcoming perceived & temporal distance	2.537	2.793	5.33	0.256
Effective team leadership	2.961	2.676	5.638	-0.285
Trust	2.805	2.401	5.206	-0.403
Empowerment	2.315	2.551	4.866	0.237
Commitment to task	2.684	2.534	5.218	-0.151
Integrative approach	2.479	2.714	5.193	0.236
Member's competencies	2.562	2.712	5.274	0.151
Cultural intelligence	2.22	2.721	4.941	0.502
Communication	3.232	2.69	5.921	-0.542

Table 6 shows the final output. On the basis of the values of the final output, a causal relation diagram has been created.

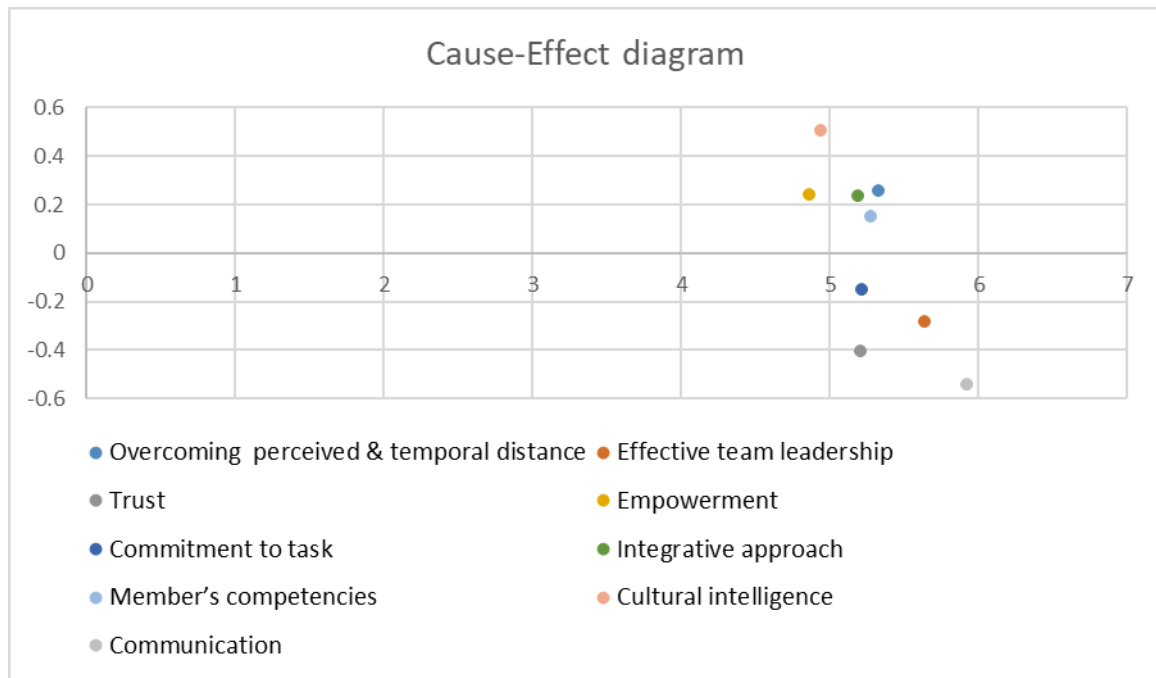


Figure1: Cause-and-Effect Diagram

Figure 1 shows the model of significant relations. This model can be represented as a diagram in which the values of (D+R) are placed on the horizontal axis and the values of (D-R) on the vertical axis. The position and interaction of each factor with a point in the coordinates (D+ R, D-R) are determined by the coordinate system. The Horizontal vector (D + R) represents the degree of importance between each factor plays in the entire system. In other words, (D + R) indicates both factor's impact on the whole system and other system factors' impact on the factor. The vertical vector (D-R) represents the degree of a factor's influence on the system. In general, the positive value of D-R represents a causal variable, and the negative value of D-R represents an effect.

DISCUSSION

Temporal Distance and role of leadership

The Fuzzy DEMATEL analysis conducted on the primary responses of the participants provided significant information on the factors responsible for the success of the Global Virtual Teams. The results showed that overcoming perceived and temporal distance was of high importance to the participants, and the analysis also termed the factor a causal factor. As a result, the factor's importance surpasses that of the effect factors. The importance of the perceived and temporal distance, therefore, validates the assertions of Morrison-Smith and Ruiz (2020), who suggested that if the teams are able to overcome five distinct challenges, they could emerge as highly productive and robust. One of the difficulties was effectively overcoming perceived and temporal distance. The results also showed that to work as an effective team, overcoming these distances is important. This could be associated with the fact that when global virtual teams are able to focus on eliminating perceived as well as temporal distances, they tend to operate more cohesively. Consequently, an atmosphere is created where the element of virtual contact vanishes, and the team members start to believe that they are working together in a unified geographical setting. The results are also in contrast to the findings of Patterson (2022) who suggested the Tuckman model of team development for effective team development. The results therefore also agree with the postulates of Bachrach and Mullins (2019), who contend that global virtual teams work in an environment that is rapidly changing. The results also showed that one way to overcome perceived and temporal

distances are to limit the factor of change so that the team members have a strong and unmovable ground to firmly stand on.

The results revealed an important perspective: the participants placed a high value on leadership. The significance was even greater than the factor mentioned in the preceding paragraph. Still, however, the nature of the factor is that of the effect, not the cause. Consequently, it could be argued that when the conditions on the positive side of the quadrant are met, the results are the effects of the negative side of the quadrant. Effective leadership is one such effect. The results, therefore, do not agree with the postulates of Maduka et al. (2018), who suggest that effective team leadership is an essential prerequisite for the success of global virtual teams. In essence, the postulate could be termed "having strong weight," and leadership has rightfully been identified as a success factor. However, the emergence of effective leadership is conditional on various factors that could be observed in the positive quadrant. Effective leadership could therefore be termed a by-product rather than the main factor, as claimed by Maduka et al. (2018). In contrast, the results are in line with the findings of Siangchokyo et al. (2020) who suggested that leaders inspire by providing freedom and autonomy. The results also tend to invalidate the findings of Breevaart and Zacher (2019) that transformational leadership is most ineffective for virtual teams. The results only suggest the contrary: when global virtual teams go through an evolutionary phase in which success factors in the positive quadrant are met, the emergence of effective leadership becomes a matter of high probability. When effective leadership takes over the GVT, it provides a stronger push for overall success and allows the team to work more efficiently. The disputes and conflicts that emerge in the team are addressed by the leader with the contribution of the team members. Consequently, leadership could be termed an important factor but not a critical one due to its being an effect factor rather than a cause.

Trust and communication

The results showed that, compared to other factors, trust was found to be of comparatively lower importance. The position on the quadrant does not mean that trust is not an essential factor; rather, as compared to others, it may have a comparatively lower effect on the success of the global virtual teams. The results, therefore, tend to partially support the findings of Hacker (2019), who argued that trust is the most important factor that is least considered in the context of GVT but holds the most importance. The results, on the other hand, show that trust has been given due importance by the participants but that it cannot supersede other success factors. Also, the nature of trust is more effective than causal. For this reason, it could be argued that the success of GVTs has a process, and once the required conditions are met, effective leadership would emerge, which would lead to the establishment of trust among different team members. The results support the findings of Hildebrandt, and Marr (2020) who suggested that conflicts may occur and be resolved based on different ideas shared by the team members. The conflict resolution could be associated with trust. The results agree with the assertions of Breuer et al. (2020) that trust is not only essential for organisational success but for the success of global virtual teams as well. The level of importance assigned to "trust" by respondents' shows that when trust is strongly established among the team members, they can deal with different challenges in a seamless manner as compared to situations where the team lacks trust. Consequently, it could be argued that while trust is an effective factor, its emergence among team members is vital. While the team may be able to work successfully without trust in normal times, in challenging times, the success of the team may shatter without trust.

The results revealed that communication was the one factor that was given the highest importance by all the participants. In the fuzzy decomposition analysis, communication was observed to be ahead of all the factors. However, as its nature was that of an "effect" rather than a cause, its importance was found to be comparatively less than that of cause factors. Still, however, communication between team members cannot be overlooked and holds significant

importance for the team's success. The results, therefore, support the argument of Garro-Abarca et al. (2021), who noted that GVTs more specifically lack in the area of communication. The fuzzy analysis also shows that GVT members are more concerned about communication than any other factor in terms of importance. Evaluating from an evolutionary perspective, it also becomes clear that when communication between the team members is effective and they can understand the views and opinions of each other without any obstacle, they can share their concerns and grievances without any hesitation, and when they can share innovative ideas regarding the team, the performance of the team reaches a new level. The results were found to be in contrast to the findings of Serenhov et al. (2021) proposing that the team members would work through their differences. The difference resolution is largely dependent on the effectiveness of the communication. The results, also, do not seem to agree with the points of Aquino et al. (2022), who argued that a team is built by following the Tuckman model of team development and is expected to achieve unexpectedly high results. The results, on the other hand, suggest that communication is the essence of effective teams and high results. When communication is not given due importance, either by the team members or the team leader, the group cannot provide exceptional performance.

Integrative approach and Members' competencies

The results showed that the integrative approach was to be in close proximity to overcoming perceived and temporal distances and was also found to be important as, unlike other factors, it is a causal factor, which means that the success of the GVTs is fundamentally based on it. When an integrative approach is adopted, the success of the team is expected to be greater. The situation arises because an integrative approach could be termed a two-way street. The leader is responsible for proposing the approach, but the team members are responsible for actually implementing it and integrating it effectively into the projects that are in process. For integration, the leader or the managers must be aware of the competencies of the members, while the members themselves should also be aware of the tasks and operations that they could perform more effectively. The collaboration of both leads to integration, which in turn leads to team success. The results validated the findings of Mui et al. (2022) who suggested that Tuckman model is not the ultimate team building model. Data shows that integration overlooked by Tuckman is an integral factor. The results, therefore, seem to validate Shamim's (2022) assertions that an integrative approach by the project manager and the team members leads to a successful team. The results, on the contrary, invalidate the assertion of Lartey (2020), who argued that the contingency theory of team management emphasises that effective management largely depends on the particular condition and underlying situation. The results, on the contrary, show a different situation, and it could be observed that effective management and the success of the team are not random but rather require a number of factors. Those factors have been mentioned on the positive side of the quadrant in figure 2. Consequently, the logic of contingency does not seem to apply to at least the virtual teams.

The results indicated that members' competencies are also one of the important factors that lead to the success of the GVTs. The results are understandable, as a team cannot effectively perform until the members are qualified enough to perform the jobs that are assigned to them. Competency is thus related to factors other than skills, such as educational qualifications, experience, and work approach, all of which contribute to competency. Consequently, if members are competent enough, there will be less conflict among the members; on the contrary, if members are not qualified, a higher level of conflicts and complaints could be expected from the team. Most importantly, the competency of the members enables a less hostile environment. The results therefore show that Solomon's (2020) validation is correct and team development could not be specified to specific phases. The results, therefore, tend to agree with the postulates of Nguyen (2014), who emphasised that structure, member competencies, and commitment are all important factors that could be

considered integral to the success of global virtual teams. The results also show that global virtual teams should have the minimum qualifications to work smoothly and without any hassle. The results, therefore, do not agree with the findings of Castellano et al. (2021), who focused on shared leadership as the only factor for the success of the GVT. The findings, on the other hand, suggest that, while leadership is important, the entire group must work together to make the project a success. Leadership alone cannot be held responsible for the outcome. If the team members are not competent enough, leadership alone may not be able to fulfill the objective of team success.

Cultural intelligence and empowerment

The results showed that empowerment and cultural intelligence were the least important of all the factors in terms of the degree of importance but were found to be highest in terms of the degree of impact. Both the elements were on the positive side of the quadrant, which therefore indicated that there were cause and effect factors. Consequently, having them was essential for the success of the teams. Empowerment could be expected from both the team members and the leader. If either of the stakeholders is not empowered, this could lead to challenges and obstacles, which may impact the performance of the group overall. The results therefore invalidate McAdam et al.'s (2019) view that GVT success is based on contingency. In contrast, the results were found to support the findings of Garro-Abarca et al. (2021), who identified that trust in leadership, cohesion, and empowerment all play important roles in team success. The higher position of empowerment in terms of the degree of impact reveals that higher empowerment has a greater impact on team success than any other factor. The fuzzy analysis revealed that cultural intelligence also has a significantly higher impact on the GVT's success. This is because, with higher cultural intelligence, the team members are able to better understand their teammates. They can accommodate their cultural values and understand their challenges and problems. Consequently, the cohesion between the members becomes stronger, which ultimately leads to a strong and coherent team. The results were found to be in line with the findings of Presbitero (2020), who suggested that cultural intelligence is an important element in the context of global virtual teams. The results also show that when cultural intelligence takes precedence, the team emerges more successful and coherent.

The results and discussion, therefore, show that based on the ranking and categorization, cultural intelligence, overcoming perceived and temporal distance, empowerment, integrative approach, members' competencies, commitment to the task, effective team leadership, trust, and communication are the factors that are important in terms of the degree of impact. The first five are fundamental to the success of the GVT, while the last four are important success factors but are effects and could only occur once the conditions for the first five are met. In terms of the degree of importance, communication, effective team leadership, overcoming perceived and temporal distance, members' competencies, commitment to the task, trust, an integrative approach, cultural intelligence, and empowerment are ranked in sequential order.

Theoretical and practical contributions

The practical and theoretical contributions of the study are based on the following recommendations designed on the basis of results obtained. At first, the cultural intelligence test or simulations should be designed by IT firms in the United Kingdom. Considering their prior expertise in information technology, the task is not expected to be challenging for them. A period of 4 to 5 months could be invested in developing the simulation or survey that could be used to separate culturally intelligent people from non-intelligent people. The purpose of the test is to ensure that people who are unable to accommodate and support other cultures are not accepted into the team. IT companies could collaborate with psychologists and cultural experts to create simulations or tests for them. The next step is to focus on the empowerment

of the team members. In this regard, it is proposed that the strategic management of the organisation consider the extent of power they are willing to provide to the GVT members. This is more of a strategic decision than an operational one. Once this has been decided by the strategic management, it is suggested that such a strategic plan be converted into operational milestones, roles, and responsibilities by the human resources departments of such organisations. The exercise could take six to eight months for framework creation, policy formulation, and implementation. The task could be completed with the help of upper management at the organisation and the human resources department.

Recommendations for future research

Future researchers are recommended to work in three areas. They should evaluate the possibility of a qualitative study so that more thoughtful and in-depth insights can be obtained. By employing qualitative research methods such as interviews, observations, and focus groups, researchers can gain a deeper understanding of the subject matter at hand, allowing for a more comprehensive analysis of various factors and perspectives. The role of leadership and its impact on GVT need more research in the context of current findings. By examining different leadership styles, behaviours, and approaches within the context of GVTs, researchers can provide valuable insights to guide organisations in cultivating strong leadership in virtual team environments. Finally, the researchers are recommended to evaluate other industries and regions to explore their success factors for their GVTs. By examining industries and regions beyond the current focus, researchers can uncover unique practises, cultural nuances, and contextual elements that may influence the effectiveness and efficiency of GVTs.

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