

# Modelling the Success Factors of Virtual Team

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## Abstract

**Objectives:** The purpose of the study is to determine the critical success variables of virtual teams and design a model by identifying the interrelationships among the virtual team variables. MICMAC analysis is done to identify the driving and the dependence power. **Method/Statistical Analysis:** Interpretive Structural Modelling (ISM) is used to identify the relationship among the variables. It is prominent as it identifies the influence of one variable on the other. To obtain a correlation matrix for virtual team variables, questionnaire was sent to 120 employees (working in virtual teams), 96 usable responses were identified. The response rate is 80%. Cronbach alpha related to the questionnaire is 0.76. MICMAC analysis was conducted to identify the driving power and the dependence power towards virtual team success. **Findings:** Influence of variables like leadership, organizational culture on team formation, availability of technology, team objective was found. Further, influence of these variables on effective HR policies, support from top management was identified. Sound HR policies have an influence on technology training, communication and building trust. All these variables have an influence on team performance, reduced conflict and work quality. Some variables were further classified as having strong driver power and some as having strong dependency variables. **Application:** Top management and managers can understand the influence of the certain important variables for virtual team success.

**Keywords:** Communication, Conflict, HR Policies, Performance, Team Success, Virtual Teams

## 1. Introduction

Virtual teams are growing in popularity and have responded well in the dynamic market. Globalization has opened new market avenues. It has helped in breaking the geographical boundaries and stepping towards a new way of doing business. The major emphasis of the organizations today is to create a digital workspace which is more or less achieved. Digital workspace has created virtual teams. It helps in creating a boundary-less workspace with no resource constraint.

Organizations are getting virtual for various reasons like availability of technology, increase in the resource requirements, customer preferences, becoming global, developing products for a diverse set of customers, product and service delivery, handling a wide pool of employees spread geographically. Developing virtual

teams helps in operating without any time or boundary constraints. Increasing use of virtual teams is not concomitant with the study done so far on virtual teams. It is a major requirement of the global economy to work across the intra and inter organizational boundaries<sup>1,2</sup>. Relatively for business growth organizations undertake projects which are not in the local area which creates a need for virtuality.

### 1.1 Virtual Teams: Defined

### 1.2 Virtual Team: Types

There are numerous benefits of working in virtual teams like easy communication, quick decision making, global connectivity but it is not free from challenges. There is variety of virtual teams. <sup>1,2</sup>Virtual project team members, knowledge and workplaces are dispersed<sup>3</sup>

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Network team members team up together to achieve a common goal. The membership is uncertain as the members keep rotating on and off. These teams are often found in consulting firms, IT organizations etc. Parallel teams are special task force teams created to handle special assignments. Parallel teams are becoming a scintillating fact that global organizations need to make recommendations about worldwide processes with a global perspective.

Virtual work teams are reverse of parallel and project teams as they are formed to monitor and perform routine tasks. They have a defined membership, set of roles and process clarity. Service teams on the other hand are customer centric. They perform the role of problem solvers for customers and are set up at diverse locations. Management teams are formed to achieve the organizational goals and objectives and resolve other management related issues. These teams often cross national boundaries but never break the organizational boundaries as they have a common goal<sup>4</sup>.

Action teams as the name suggests are action oriented formed to resolve a crisis. They are different in comparison to other teams as they are temporary and only formed if any emergency persist in Figure 1.

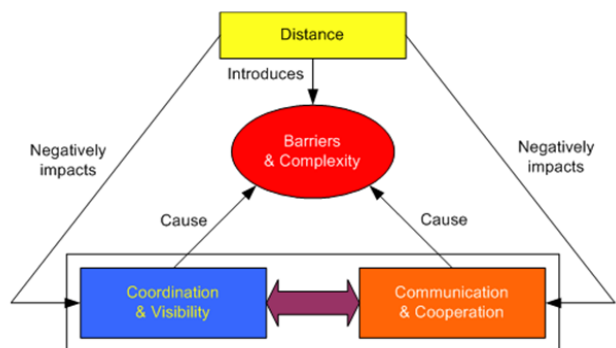


Figure 1. Virtual Team Environment<sup>8</sup>.

### 1.3 Virtual Team: Challenges and Good Practices

The major challenge associated with virtual teams is lack of physical interaction. This leads to multiple other challenges like building trust. “Lack of trust can weaken every other safety measure taken to ensure booming virtual work arrangements.” Face to face teams have multiple advantages as compared to virtual teams<sup>4,5</sup>. There are multiple other challenges like leadership, support, building trust, formation of team, goal and role clarity are important for creating successful virtual teams.

The virtual team challenges explained<sup>6-8</sup>are communication and coordination among the team members. Communication must not be a barrier in virtual teams as all must speak one language, here language indicates common goal.

## 2. Proposed Work

### 2.1 Research Model: Identification of Virtual Team Variables

In order to identify the success factors of virtual teams brainstorming sessions were conducted with the experts working in virtual teams in IT companies. Literature related to virtual teams was also explored to identify the variables contributing to the success of the virtual teams. After the identification of variables a questionnaire was sent to the team members to understand their perspective. A total of 15 variables were presented in the questionnaire through the literature review. Experts were invited again for a brainstorming session to identify mutual relationship among the virtual team variables. A total of 13 variables were identified to develop a framework for virtual team success.

### 2.2 Team Formation (TF)

Authors state that managing a successful virtual company requires 90% people and 10% technology<sup>2</sup>. The most important characteristic that leads to virtual team success is the way it is formed. Members with diverse skills make a good pack is shown in Table 1.

Table 1. Definition of virtual teams

S. No	Authors	Definition of Virtual Teams
1.	In	Global virtual team to be temporary, culturally diverse, geographically dispersed, electronically communicating work group.
2.	In	A group of people and sub-teams who interact through interdependent tasks guided by common purpose and work across links strengthened by information, communication, and transport technologies.
3.	In	Groups of people who work together although they are often dispersed across space, time, and/or organizational boundaries.

Author’s definition: “Virtual team is a boundary less concept of bridging the gap between different geographical locations through communication and information technology”.

### 2.3 Effective HR Practices (HRP)

Global organization deploying virtual teams must adopt a sound global human resources strategy with major emphasis on recruiting, hiring, and training virtual work teams. Prior to creating a virtual team, critical skills must be identified. In addition to self-motivation, self-reliant, and ability to tolerate vagueness, virtual teams must also focus on communication. Many of these skills can also be enhanced through continuous training.

Effective virtual team leaders most often communicate progress of a project through balanced scorecard measurements<sup>10-13</sup>. Before the formation of a virtual team HR must identify the technology which is being used and train the employees on the usage of technology. There is a dire need for human resource policies to recognize, support, and reward virtual team members and leaders<sup>14</sup>.

### 2.4 Top Management Support (TMS)

The top management of the organization must support virtual teams by providing autonomy, flexibility and decision making capacity. Virtual teams perform in an environment where there is a non bureaucratic work culture. The requirements for human resource policies to recognize, support, and reward virtual team members and leaders, training, a conducive organizational

culture, continued management support, the provision of adequate support organizations, and experience in collaboration technology<sup>15,16</sup>.

### 2.5 Availability of Technology (TECH)

Technology is the key to a successful virtual team. Team members can be in a widely diversified geographical locations and availability of technology that supports communication will help in running the process smooth. Supply chain provides a scintillating environment. Technology advancements smooth the progress of communication<sup>17</sup>. This in return reduces product development time, increases the organizational performance and employee participation in Table 2.<sup>18,19</sup>

### 2.6 Communication (COM)

Higher the quality of the communication technology, better will be virtual team interaction<sup>20</sup>. Improving means of communication reduces time and improves team member's efficiency<sup>21</sup>.

### 2.7 Team Purpose (TP)

Team clarity is very important to move in one direction. It was found that creating a state of shared understanding

**Table 2.** Structural self-interaction matrix

Elements	13	12	11	10	9	8	7	6	5	4	3	2
1	V	V	V	A	A	A	A	A	V	X	A	V
2	V	V	V	A	V	A	A	X	V	A	X	
3	V	X	V	X	A	A	A	X	V	X		
4	V	V	V	X	V	X	A	A	O			
5	V	X	X	X	A	A	A	A				
6	X	X	X	X	X	X	X					
7	V	V	V	X	V	V						
8	V	V	V	X	V							
9	V	V	V	X								
10	V	V	V									
11	A	X										
12	A											

(Relationship between the variables has been drawn using VAXO)

Four symbols depict

V: variable i will help to achieve j

A: variable j will help to achieve i

X: variables I and j will help achieve each other

O: variables j and I are unrelated

about goals and objectives, task requirements and interdependencies, role clarity and expertise have a positive impact on output quality<sup>22</sup>.

## 2.8 Leadership (LDS)

A leader can make a weak group strong and vice versa is applicable too. Leadership style plays an important role in team success<sup>23</sup>. Transformational leadership designs a strategic vision and then communicates that vision so that followers are motivated to work toward achieving the goals associated with it<sup>24</sup>.

## 2.9 Organizational Culture (OCU)

To establish a successful environment that supports virtual teams there must be opportunities for interaction as in traditional teams, visibility action for work, providing support to different modes of work; and providing a culture that operates as an integrated service, as it supports many people engaged in critical activities<sup>22</sup>.

## 2.10 Training (TRG)

The importance of training was identified while investigating a cross cultural project. They highlighted that training is necessary for new members of project teams working on different continents, to help reduce potential distrust, and allow teams to get more quickly and work together efficiently<sup>25</sup>.

## 2.11 Trust (TRST)

Trust is an important factor to bridge the gap. Trust is important to increase work effectiveness<sup>26</sup>. Trust is a critical factor especially for virtual teams because they lack personal interaction<sup>27</sup>.

## 2.12 Work quality (WQUAL)

Improved communication leads to better work quality<sup>28</sup>. Work quality is highly dependent on leadership, support from top management, training, team formation policies and trust.

## 2.13 Performance (PERF)

A positive correlation was reported between empowerment and virtual team performance. High-performance teams are distinguished by passionate dedication to goals, identification and emotional bonding among team

members, and a balance between unity and respect for individual differences<sup>29</sup>.

## 2.14 Conflict (CONF)

Conflict in virtual teams take place due to delay in communication process, differences in time zones and no face to face contact<sup>30</sup>. Poor management of conflict can lead to decrease in the performance<sup>31</sup>.

## 2.15 Research Methodology

Interpretive Structural Modelling is used to identify the relationship among the variables. It is prominent as it identifies the influence of one variable on the other. To obtain a correlation matrix for virtual team variables, questionnaire was sent to 120 employees (working in virtual teams), 96 usable responses were identified. The response rate is 80%. Cronbach alpha related to the questionnaire is 0.76.

### Objective

- To identify the critical success variables of virtual teams
- To design a model by identifying the interrelationships among the virtual team variables
- To identify and analyze the variables according to their driving power and dependence power towards virtual teams.

## 2.16 Analysis

### 2.16.1 Structural Self-Interaction Matrix

Variables of virtual teams are presented above team formation (1), effective HR practices(2), top management support (3), availability of technology(4), communication (5), team purpose(6), leadership(7), organizational culture (8), training (9), trust (10), performance(11), quality (12), less conflict (13).

### 2.16.2 Reachability Matrix

The SSIM format is transformed into reachability matrix using the following method in Table 3.

### 2.16.3 Partitioning the reachability matrix

Variables are classified into three parameters: Strategic, Operational and Performance. After transitivity analysis the intersection of these sets are derived from all the

elements. Once the top level elements are achieved it is separated from all other elements as these elements do not help in achieving others. The same process is repeated to find the next levels. Iterations are drawn to find the levels. Later, these levels help in building the diagraph in Tables 4,5 and6.

### 2.16.4 Developing Conical matrix

The conical matrix is used further for MICMAC analysis. Refer Table 6 Driving Power and dependence in reachability matrix.

### 2.17 Development of Diagraph

After designing the conical matrix the initial diagraph including transitivity links is obtained. Later, the links are removed and the final diagraph is obtained in ISM based model in Figure 2.

It can be observed that Leadership (7) and Organizational Culture (8) play significant driving role in increasing the success rate of the virtual teams in Figure 3. They become the base of the ISM hierarchy. Performance (11), less conflict (12), work quality (13) are dependent variables for virtual team success. Top Management Support (3) and Team Purpose (6) provide a support to the other variables like Team Formation (1)

and Availability of Technology (4). There should be a clear objective for team formation and should be supported by top management. Later variables like Effective HR Practices (2) helps in proper training mechanisms (9), effective communication (5) and all of this helps in building trust(10) which is the key driver for virtual team success. A nurturing virtual environment is necessary and can be achieved through the variables discussed in the ISM model.

## 3. MIC MAC Analysis

MIC MAC analysis is used to identify the driving power and the dependence power towards virtual team success.

The variables are categorized into ranks. Variables have different ranks in dependence power and in driving power; Variables are grouped into four clusters. First cluster includes variables with weak driver and weak dependence power. Second cluster consists of variables that include variables with weak driving power but strong dependence power. Third cluster includes variables with strong driving and dependence power. Fourth cluster includes independent variables with weak dependence power and strong driving power. There is no linkage variable having strong

**Table 3.** Initial reachability matrix

Elements	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	1	0	1	1	0	0	0	0	0	1	1	1
2	0	1	1	0	1	1	0	0	1	0	1	1	1
3	1	1	1	1	1	1	0	0	0	1	1	1	1
4	1	1	1	1	0	0	0	1	1	1	1	1	1
5	0	0	0	0	1	0	0	0	0	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	0	1	1	1	1	1	1
9	1	0	1	0	1	1	0	0	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1
11	0	0	0	0	1	1	0	0	0	0	1	1	1
12	0	0	1	0	1	1	0	0	0	0	1	1	1
13	0	0	0	0	0	1	0	0	0	0	1	1	1

(Based on the VAXO entries are drawn in the initial reachability matrix)

V: i will be 1, and j will be 0

A: I will be 0 and j will be 1

X: both I and j are 1

O: both I and j are 0

**Table 4.** Final reachability matrix

Elements	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	0	0	1	1	0	0	0	0	0	1	1	1
2	0	1	1	0	1	1	0	0	1	0	1	1	1
3	1	1	1	1	1	1	0	0	0	1	1	1	1
4	1	1	1	1	1*	0	0	1	1	1	1	1	1
5	0	0	0	0	1	0	0	0	0	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	0	1	1	1	1	1	1
9	1	0	1	0	1	1	0	0	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1
11	0	0	0	0	1	1	0	0	0	0	1	1	1
12	0	0	1	0	1	1	0	0	0	0	1	1	1
13	0	0	0	0	0	1	0	0	0	0	1	1	1

1\* includes those entries where transitivity is applied to fill the gap in any opinion collected during the preparation of SSIM.

**Table 5.** Iterations

Elements (Pi)	Reachability Set R (Pi)	Antecedent A (Pi)	Intersection R (Pi)∩A(Pi)	Level
1	1,2, 4,5,11,12,13	1,3,4,6,7,8,9,10	1,4	V
2	2,3,5,6,9,11,12,13	2,3,4,6,7,8,10	2,3,6	IV
3	1,2,3,4,5,6,10,11,12,13	2,3,4,6,7,8,9,10,12	2,3,4,6,10,12	VI
4	1,2,3,4,5,8,9,10,11,12,13	1,3,4,6,7,8,10	1,3,4,8,10	V
5	5,10,11,12,13	1-12	5,10,11,12	II
6	1-13	2,3,6-13	2,3,6-13	VI
7	1-13	6,7,10	6,7,10	VIII
8	1-6,8-13	4,6-8,10	4,6,8,10	VII
9	1,3,5,6,9-13	2,4,6,7,8,9,10	6,9,10	III
10	1-13	3-10	3-10	II
11	5,6,11,12,13	1-13	5,6,11,12	I
12	3,5,6,11,12,13	1-13	3,5,6,12	I
13	6,11,12,13	1-13	6,13	I

Iterations are drawn based on the intersection between reachability and antecedent sets. 8 iterations were derived till all the elements found intersections.

driving and dependence power. MICMAC Analysis clearly demonstrates the entire process.

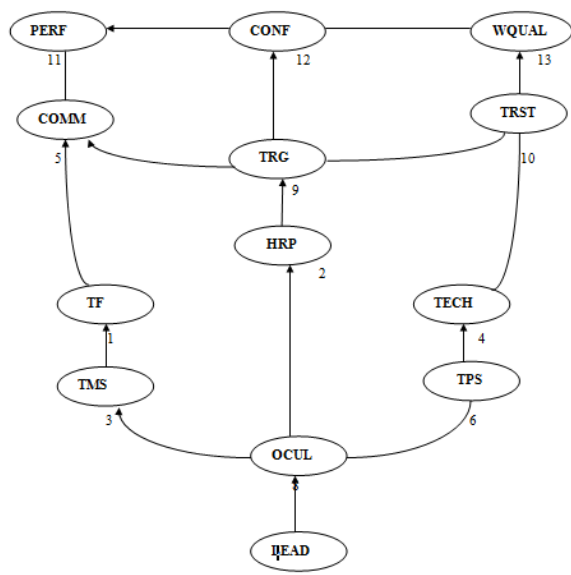
The study indicates virtual team success depends on the variables like performance of the team, less conflict, quality of work. All of this can be achieved by strong leadership, organizational Culture, top management support and effective HR policies. It was concluded that the

effective use of information and communication technologies plays an important enabling role in providing the flexibility<sup>32</sup>. Moreover, ICT-mediated VT perform well and reduces time-to market, which is one of the significant successful keys in some organisations<sup>33</sup>. Virtual teams have produced high quality outcomes because Virtual teams permit the highest qualified members for

**Table 6.** Driving and dependence power in reachability matrix

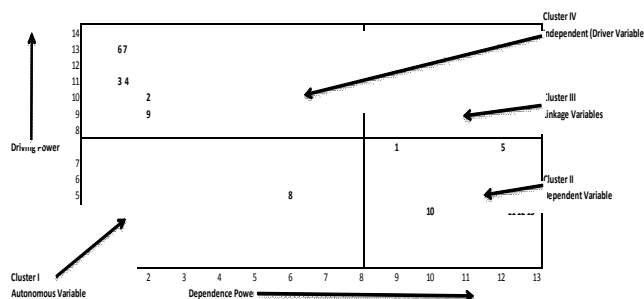
Elements	11	12	13	5	10	9	2	1	4	3	6	8	7	Driving Power	Ranks
11	1	1	1	1	0	0	0	0	0	0	1	0	0	5	IX
12	1	1	1	1	0	0	0	0	0	1	1	0	0	6	VII
13	1	1	1	0	0	0	0	0	0	0	1	0	0	4	X
5	1	1	1	1	1	0	0	0	0	0	0	0	0	5	IX
10	1	1	1	1	1	1	1	1	1	1	1	1	1	13	I
9	1	1	1	1	1	1	0	1	0	1	1	0	0	9	V
2	1	1	1	1	1	1	1	0	0	1	1	1	0	10	IV
1	1	1	1	1	0	0	1	1	1	0	0	0	0	7	VI
4	1	1	1	1	1	1	1	1	1	1	0	1	0	11	III
3	1	1	1	1	1	0	1	1	1	1	1	0	0	10	IV
6	1	1	1	1	1	1	1	1	1	1	1	1	1	13	I
8	1	1	1	1	1	1	1	1	1	1	1	1	0	12	II
7	1	1	1	1	1	1	1	1	1	1	1	1	1	13	I
<b>Dependence</b>	13	13	13	12	9	7	8	8	7	9	9	6	3		
<b>Ranks</b>	I	I	I	II	III	V	IV	IV	V	III	III	VI	VII		

(Dependence and driving power is identified based on the iterations)



**Figure 2.** ISM based model of the variables for making virtual teams successful after removing indirect link.

a particular job to join Virtual teams regardless of their location. In contrast, it was found that cultural diversity within teams leads to differences in the members thinking process, which will affect their performance negatively<sup>34</sup>. Similarly, implementing VT could impact on trust negatively because of the geographical distance, difference



(Derived from dependence and driving power)

**Figure 3.** Cluster of variables for improving virtual team success.

in time zone, and other characteristics<sup>35,36</sup>. Hence, all the variables like trust development, communication, team formation has to be diligently planned. These are bottom level variables but are very strong with driving power as it can drive the success of the virtual teams.

Variables in the second cluster as per the MIC MAC analysis found to have a strong dependence power. Variables in Cluster II like Team formation, communication, trust, team performance, reduced conflict, quality of work have a high dependence power as these variables can be successfully achieved only with the help of Cluster IV variables which have a strong driving power. Cluster

IV variables are effective HR policies, top management support, availability of technology, clarity of objective, leadership and training help in driving Cluster II.

## 4. Conclusion

To determine the success of virtual teams a strategy should be formulated as explained in the ISM model. Variables like training on technology depend on the availability of technology and sound HR practices. First time users of virtual teams may need training as working in a face to face team is entirely different. There are certain variables which lay the foundation of the virtual team like right leadership, culture, team formation (structure, size, skills), objective with which the team is formed. Later operational variables like HR policies, technology, training, support from top management leads to better communication, technology and, trust building which is a very cumbersome task in managing virtual team's further leads to outcome variables like team performance, less conflict and improved work quality.

ISM helps in understanding the strategic operational and outcome variables and its linkages. MIC MAC analysis on the other hand explains the driving and dependency power of the virtual team variables. ISM is developed for the organizations with virtual teams to understand the variables of virtual team success.

## 5. Limitations and Further Scope

The study has following limitations

- 13 variables are taken for the study. Variables can be extended.
- More experts can be invited from diverse companies to understand the challenges faced by them.

This acts as a future scope of the study. Analysis can be further done on the same to gain more insight.

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