INVESTIGATING THE INTERDEPENDENCIES OF FACTORS AFFECTING VIRTUAL PROJECT ENVIRONMENTS

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INVESTIGATING THE INTERDEPENDENCIES OF FACTORS AFFECTING VIRTUAL PROJECT ENVIRONMENTS

Abstract

This paper investigates 1) the factors that affect virtual project environments and 2) determines the interrelationship between them i.e., how one factor leads to another or both the factors can lead to the development other factors. Data collection using qualitative methods has been undertaken focusing on a range of virtual projects i.e. distributed and offshore projects, software and web development, and new product development projects. Thematic analysis has been undertaken to identify emerging themes affecting virtual project environments. The paper identifies that geographical differences lead to new complications, disturbs collaboration and create difficulties to monitor and control virtual teams. Similarly, behavioural issues affect relationship building which comprises of number of factors. The paper proposes a conceptual model which shows the interdependencies of themes; extracted during data analysis. Finally, the conclusion has been provided, which also gives suggestions for future research.

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Track: Management or Project Management

BACKGROUND

Due to globalisation, organisations have adopted virtual style of working to meet business dynamics and demands of clients (Krumm et al., 2005). Due to rapid growth in information and communication technologies (ICT), organisations undergoing new product development or software development projects desire to use virtual form of working for innovation and amplification of projects. Thus, the organisations have found virtual working more responsive to variations and alterations (Cramton and Webber, 2005).

Virtual teams rely on effective means of communication mainly based on ICT (Chhay and Kleiner, 2013). Over the last decade, organisations have enormously shifted to virtual format as a source of interrelating and networking with geographically or physically distributed team members. Thus, virtual teams have reduced the work costs linked to international association, and enhanced flexibility and swiftness in projects (Berry, 2011).
Virtual project environments where offering a few advantages faces challenges as well (Verburg et al., 2013). These challenges or issues usually rises due to difference in location, working practises and personal conflicts (Berry, 2011). Thus, team members being a part of virtual project environments face difficulties in adapting and adjusting their selves in such circumstances.

Although there had been a number of studies highlighting challenges and issues previously (Ale Ebrahim et al., 2009; Kurruppuarachchi, 2009; Calloway and Awadzi, 2008; Lee-Kelley and Sankey, 2008; Lepsinger, 2012; Lilian, 2014), the focus of this paper is to look at the relationships of the factors or challenges which leads to new challenges or problems. The use of empirical evidence has ultimately supported to identify those factors which has been less focused in the literature. Hence, the basic research question identified is

'What are the interdependencies of factors affecting virtual project environments?'

RESEARCH PROBLEM

As previously mentioned, globalisation has provided new ways to organisations to fulfil its business dynamics. Virtual project environments have provided a number of benefits and distinct ways of working from remote or distributed locations but on the other side, organisations are facing difficulties during transition and implementation phases. The transition phase is the initial phase when organisations decided to move to virtual format of working and the implementation phase is the one where challenges or issues occurs during the projects. Due to the complex nature of projects, IT organisations are facing several difficulties to manage such project environments which comprises of diverse individuals. Similarly, investigating the root causes of those challenges or issues becomes difficult during projects for the management as the project is running under several constrains. Over the last decade, where there has been a lot of innovation in software and web development, new product development and information security projects, the organisations are fronting complications to meet their business objectives as they are not able to manage the virtual projects successfully. That is the reason that organisations have not been able to completely follow virtual format. Similarly, innovation and development have enforced to review the challenges and issues from time to time and look them from a unique viewpoint. To

investigate such challenges and difficulties, this research has been undertaken where the author attempt to investigate the factors (challenges) first and then explore the interrelationship between them. The interrelation shows that how different factor(s) affects the project environment and ultimately give rise to another factor. Previously, there has been a few studies available which focused mainly on exploring challenges and issues, and managing strategies, but the uniqueness of this research is to look explore the root causes and determine the interrelation between them.

LITERATURE

By reviewing the literature, it seemed that previously published data was focused on recognizing challenges and then using leadership or managerial approaches to manage them. The literature review section of this paper focuses on overall complications which affects environment's harmony and synchronisation. The literature review section has been drafted by looking at the basic concepts so that it gives a good an overview to readers what has been previously explored or available in literature.

Virtual Project Environments

According to Piccoli et al. (2004), virtual teams are distributed or dispersed teams brought together by latest information and communication technologies (ICT) to achieve collective goals or objectives. In another definition, Malhotra et al. (2007) determines that virtual teams are those which are geographically distributed and connected over by modern communication technologies to fulfil specific organisational goals.

Kurruppuarachchi (2009) in an investigation determines the appropriateness of virtual teams in projects and states that virtual project consists of virtual teams who are functioning from more than one physical location, have multiple backgrounds, work for a common purpose and use effective communication strategies to collaborate and communication. Lee-Kelley and Sankey (2008) further defined virtual teams as group of individuals from multiple backgrounds, departments or organisations connected by communication technologies; who jointly work together for a purpose to develop a product or service or achieve end result.

According to PMI (2004), projects are undertaken to complete particular tasks, develop unique products or services. A project consists of unique aim or objectives, a plan and strategies to execute the plan. Apart, a project consists of several stakeholders who have multiple interests and expectations focusing on the outcome (Suttrfield et al., 2006). Berggren et al. (2001) defines project environment a setting which comprises of activities undertaken by project stakeholders for fulfilling goals and objectives. Every project environment has its own challenges and constraints depending upon its scope; requirements and effective design.

In another perspective, Sense (2007) considers project environment a temporary system which is developed for attaining unique goals and then dissolved as the end product or service is achieved. Project environment works almost in the same manner as organisational environment but has limited scope; where several entities work together to meet the demands of customer and comprises of unexpected events that may influence project progress.

In regard of concepts, the authors of this paper have developed their own definition in terms of virtual project environment i.e.,

'Virtual project environment is a setting in which a system is developed explicitly to undertake virtual projects; thus, having its own constraints and limitations in contrast to

project scope, team members from different backgrounds and geographical locations jointly work together for the development of a unique product, services or result'

Advantages and Disadvantages of Virtual Project Environments

The following table shows some advantages and disadvantages of virtual project environments. The table also illustrates major benefits and challenges extracted from literature.

Table 1: Advantages and Disadvantages of Virtual Project Environments

Advantages	Disadvantages
Re-location and travel costs are decreased which has ultimately a positive effect in terms of time management (Piccoli et al., 2004)	Lack of interaction: Face-to-face interaction is found better for undergoing complex projects (Cascio, 2000)
Utilize latest information and communication technologies for communication and gain unique understanding (Malhotra et al., 2007)	Technological applications or communication means may cause interruptions and disrupt project progress (Badrinarayanan and Arnett, 2008)
Such type of project environments can allow team members to work independently which can be beneficial for their development (Ojasalo, 2008)	Team members have zero level of monitoring from managerial perspective in such project environment (Pawar and Sharifi, 2000)
Produce improved client satisfaction providing flexibility and swiftness (Berry, 2011)	Planning and prioritizing your activities to meet deadlines is at stake (Piccoli et al., 2004)
Has the tendency to adapt dynamic business and rapid e-market changes (Lilian, 2014)	Most of the activities or decisions are anticipated rather than comprehending their existence (Beranek et al., 2005)
Comprises of individuals having multiple skills and approach to solution (Piccoli et al., 2004)	Managing multi-variant teams is complex and more challenging in such project environments (Badrinarayanan and Arnett, 2008)
Focused on specific tasks and objectives which help to achieve overall scope by collective feedback and discussion (Berry, 2011)	Certain conflicts may rise due to trust, lack of social relationship, culture and language issues (Lilian, 2014; Malhotra et al., 2007)

Challenges and Issues

In contrast to the traditional project environment, virtual project environment face new challenges due its multiplicity, dynamics of working and swiftness (Jarvenpaa and Tanriverdi, 2003). As relying primarily on information and communication media, virtual project environments are found beneficial on one side but can lead to unexpected circumstances where there is a disruption in technology.

These sorts of issues are primarily focused in virtual projects as they directly impact on the outcome of the project (Malhotra et al., 2007) Along technological issues, virtual project environments comprise of factors which are linked to team development and management (Berry, 2011). However, several authors have acknowledged that these challenges or issues can be turned into opportunities if focused on root cause and effective management. In context, the major challenges or issues that have been extensively highlighted in literature are

- *Development of Trust*
- *Lack of Communication*
- *Difference in Location*
- *Leadership issues*
- *Cultural differences*
- *Technological issues*

Development of Trust

Trust has been identified by several authors as a key factor in virtual project environment. In context of teamwork, trust is significant as it affects the overall performance of team members (Lee-Kelley and Sankey. 2008). Building of trust usually initiates when team members interact and fulfil their commitments (Calloway and Awadzi, 2008). Development of trust is difficult when you are working with new team members from multiple background. Trust is thus developed and matured as the team members deliver their work on time, interact or participate in meetings timely and give feedback to each other on particular tasks (Purvanova, 2013).

As the trust starts developing, team member collaborate more often, share their opinions and which leads to development of social relationship (Pinjani and Palvia, 2013). Authors have recognised that team members with high level of trust are more productive, confident and constructive on ideas (Ale Ebrahim et al., 2009; Pullan, 2016). Team members are an important factor of maintaining harmony in project environments. Thus, keeping focus on fulfilling their responsibilities trust is build which creates a sense of responsibility, accountability and competition between individuals. At the same time, team members with lack of trust face uncertainties and not being able to settle in the virtual project environment (Cascio, 2000).

Trust may also be linked to the overall confidentiality of the project processes and documents (Pripuzic et al., 2006). Due to the diverse nature of virtual projects, development of trust becomes complex as people from different background are networked together (Kurruppuarachchi, 2009). Another important factor is the sharing or knowledge or documentation which can be affected by the lack of trust (Lilian, 2014). Malhorta et al. (2007) believes that once the trust the established, it is vital for all the project stakeholders including leadership, team members and customers to preserve it in order to get benefited from project outcomes.

Communication

Another factor which has been discussed in literature is communication. According to Berry (2011), communication in virtual project environments is the process of exchanging information and create understanding between different stakeholders. Communication is vital for attaining goals or objectives as it provides opportunity for the team members to collaborate, team up, discuss and share information, take decisions and reduce confusions over tasks (Chhay and Kleiner, 2013). Strong communication is considered as the mainstay of the virtual projects which offers several benefits and if not managed properly can lead to other issues (Zaccaro and Bader, 2003).

Communication can also play an important role in team development and formation (Bardhan et al., 2013). Project Manager and teams interact using advance information and communication technologies where ethics of communication are provided to team members like replying to emails on time, attending meetings, informing prior to absence and designing basic and secondary communication strategies (Ebrahim et al., 2009).

It is obligatory for the team members to communicate and discuss their issues with the project leader or manager (Beranek et al., 2005). More communication helps team members to digest more ideas, and then they can apply them using their skills. Meeting deadlines, understanding the scope of project, understanding roles and responsibilities are related to effective communication (Calloway and Awadzi, 2008). Effective use of communication also helps project manager to track their team members, assess the performance and give feedback (Beranek et al., 2005)

Location

Another important factor which affects virtual project environments is the related to difference in geographical or physical location. As team members are operating from different time zones, it becomes problematic to manage team members as there is difference of working hours (Lilian, 2014). Difference in time and location thus creates a lot of difficulties for team members and project manager, as they need a special corresponding plan for their activities to undergo. Due to this factor, team members cannot interact physically and socially (Berry, 2011). Additionally, without planning and drafting strategies, project environment can be badly affected and lead to poor results (Kirkman et al., 2002).

As the project stakeholders are far in distance and located in different geographical zones, it is difficult for them to share their knowledge or discuss their opinion effectively (Pitsis et al., 2004). Difference in geographical location create problems to correspond timely and arrange meetings. Project manager usually faces a lot challenges to assess the performance of each team member. Difference in location usually represents the working behaviour or practises of individuals (Ebrahim et al., 2009).

Distance can reduce ambiguities, confusions and promote more interaction based on prestige, ethics and traditional values. More face-to-face interaction helps team members to know each other in detail and respond more positively to the issues and challenges (Cascio, 2000).

Time shift and location difference give rise to many disputes in terms of meeting project deadlines and timelines usually when team members are not able to correspond timely (Saafein and Shaykhian, 2014). As the virtual projects are for a specific time and duration, it is the overall responsibility of each project stakeholder to design and plan his activities accordingly (Lilian, 2014). Provision of facilities, working space or latest technology can also be linked to the capacity of physical location. It has been observed over times that few regions do not have high band-width internet or have power issues which directly has an impact on team members' working and overall collaboration in project environments (Algesheimer et al., 2011).

Leadership

Leadership is one of the widely-acknowledged issues that has been highlighted in literature previously. Leading virtual project environments can be difficult as it involves

diversity, difference in time zone, location and working practises (Beranek et al., 2005). As the project manager is accountable on behalf of his team to higher management or project board, it is solely up to virtual project manager how he manages his team and cope up with challenges (Malhotra et al., 2007)

Leadership and managing virtual projects are two different perspective but can be elaborated in the way that managing virtual project successfully needs leadership skills or approach (Denhere et al., 2015; Malhotra et al., 2007). A project manager should be wise or experienced enough to manage routine affairs (Malhotra et al., 2007). Leaders can set examples for other team members by showing their aptitude and skills. If a project manager face to manage the project environment effectively, he may face serious concerns throughout the project journey. According to (Hunsaker and Hunsaker, 2008), there are two main functions of leaders in virtual project environment

1) Team Development
2) Performance Management

In virtual project environments, it is very complex for the team leaders to monitor, collaborate, providing training and assess the team members' performance who are located at different locations without physical interaction. Leaders' role is not only limited to manage or ensure projects completion; they are also responsible to develop the team in terms of enhancing their skills, motivating them towards work, providing information and knowledge, and help them to develop working ethics (Jarvenpaa and Tanriverdi, 2003).

Inefficient leadership can affect virtual project environments to great extent; conflicts, late feedback or not attending meetings are few of the issues (Ayoko et al., 2012). Although project manager's job is complex and over-burdened, managing team members in a planned and optimistic way help reducing confusions and produce fruitful results (Ásólfsdóttir, 2012).

Culture

Diversity in culture is another factor that affects the virtual project environments. As the team members are from multiple backgrounds, organisations, culture and have different working practises, it becomes very challenging to cope up with all the issues at the same time (Lepsinger, 2012). Culture can affect the working environment as team members from diverse culture interact and communicate which ultimately gives rise to conflicts (Verner et al., 2014)

Culture represents several themes when undergoing a virtual project. Culture can be difference in languages, moral values or individual's behaviour or functioning practises. Culture can also be differences in communication practises, beliefs or aptitudes (Oertig and Buergi, 2006). Culture can affect project process and execution of work; give rise to misunderstanding about roles or responsibilities, tasks to be performed and overall organisation structure (Nunamaker et al., 2009).

One more aspect of the culture is related to social status. People from different regions do not prefer to interact or involve extensively in project environments due to their level or standings in any organisation or background where they are from. They do not prefer to collaborate with others apart from their work. They believe that they have the higher status

and want everyone to accept this. This give rise to ambiguities and ultimately disturbs the synchronisation of virtual project environment (Vinaja, 2003; Berry, 2011).

Role of Technology

As virtual project environments mainly need effective technology, technology can be linked to development of several new complications which may occur during a project journey. Rapid innovations in information and communication technology (ICT) have provided opportunities to organisations to establish virtual networks for the team members operating from different geographical locations.

Mainly, organisations setup their own secure infrastructure for virtual project environment using Intranet, Extranet or Voice of Internet Protocol (VoIP). Intranet enhance internal communication which helps to improve end-product or services. In contrast, Extranet allows clients, customers or partners to get access to virtual project teams, group or organisation separately or jointly. Voice over Internet Protocol (VoIP) is a cheaper technology and help virtual teams to interact rather using traditional landlines. It works over certain network Identity or IP (internet protocol) address which allow team members to schedule meetings, hold conference calls or chats. Nowadays, virtual project environments require high band-width connectivity to allow users or team members to share documents and run or test their end product successfully. With the help of these technologies, virtual teams can function effectively. Using technology, team members interact via video or conference calls, and online chat messengers designed to run specifically on these technologies.

RESEARCH METHODOLOGY

The first step for conducting this study was to choose appropriate research methods and analysis tool. According to Creswell (2007; 2009), choosing proper research methods help to get close to the research aim and objectives. Consequently, as the research was exploratory type, qualitative methods were preferred to explore the latest challenges and issues which occur in virtual project environment. Qualitative methods give an opportunity to the researchers to get close to the reality and find rich information. The next step was to choose the sampling methods which directed the author to find accurate information related to research question. Theoretical sampling which is also known as purposeful sampling was preferred for this study explained as follows.

Theoretical (Or Purposeful) Sampling

Theoretical Sampling is being widely used in qualitative research since its discovery by Glaser and Strauss in 1967; comprises of rich data collection procedures. According to Morse (1991), theoretical sampling and purposeful sampling have similar properties where the researcher selects his or her participants according to the requirements of the research study or purpose. The researcher begins with collecting data from participants who have a broader knowledge around the study area or those who have typically experienced those settings.

As the study evolves over time, the researcher decides to choose his next participants based on previously data collected. Typically, in grounded theory study, where the researcher collect and analyse data concurrently (Glaser and Strauss, 1967; Strauss and Corbin, 1990), theoretical (or purposeful) sampling in other qualitative research allows the researcher to

collect the data first and then analyse it later; or data collection and analysis process can occur simultaneously (Coyne, 1997; Creswell 2009; Lincoln and Guba, 1985).

The data was collected by focusing latest challenges and issues that are most likely to occur in virtual project environments. The data has been collected from skilled project managers and professionals who have a wide-ranging experience of working in virtual project settings. The participants were theoretically chosen and the evidence is based on 18 interviews that were conducted in United Kingdom, Canada, Germany, Kuwait, Pakistan and UAE to get a broader vision and experience of different participants.

According to Cavana et al. (2001), using interviews in research for collecting give a distinct opportunity to expose rigorous and composite info from an individual. The most acknowledgeable fact about this research is that the author has conducted 18 different interviews in 6 different countries to get multiple opinions and know about diverse challenges and issues, and working practises. All the participants selected were from different organisations working in different roles. The list of participants has been drafted as follows with most recent roles/organisations

Table 2: List of Participants and Origins

S/NO	NAME	ROLE	EXPERIENCE	COUNTRY
1	Participant 1	Technical Support Manager	IT Support Services	United Kingdom
2	Participant 2	Risk Compliance Lead	Information Security Projects	United Kingdom
3	Participant 3	Business Analyst	Public Projects	United Kingdom
4	Participant 4	Project Manager	Software Development	Germany
5	Participant 5	IT Project Management Consultant	Web/Software Development; Consultant	United Kingdom
6	Participant 6	Team Lead	Software Development	Germany
7	Participant 7	Senior Project Manager	IT Projects	United Kingdom
8	Participant 8	QA Lead	Software/Web Development	Pakistan
9	Participant 9	Managing Director	Software/Web Development	Pakistan
10	Participant 10	Program Manager	Software/Web Development	Pakistan
11	Participant 11	Senior Project Manager	Software/Web Development	Pakistan
12	Participant 12	Project Manager	Automobile Industry/ Consultancy	Canada
13	Participant 13	Senior Manager	Software/Web Development	Pakistan

14	Participant 14	Senior Project Manager	Software/Web Developments	UAE
15	Participant 15	Principal Product Manager	Financial Solutions	Kuwait
16	Participant 16	Team Lead	Software/Web Development	Pakistan
17	Participant 17	Senior Principal Manager	Mobile Development Solutions	United Kingdom
18	Participant 18	Team Lead	Software/Web Development	UAE

All the interviews were based on semi-structure style which included open ended questions and provided an opportunity to each of the participant to contribute as much as out of their knowledge and experience. The data collection was based on the exploring the challenges and issues, their affects in project environment and to know about effective solutions to counter them. The questions which were part of the interviews were like:

- *What are the problems that arises when shifting from traditional to virtual form of working?*
- *What are the major challenges or issues faced during virtual projects?*
- *How are those challenges or issues managed?*
- *How the identified challenges or issues affect the proficiency of individuals?*

All the interviews were conducted from the individuals who were a part of IT projects working for new product development, software or web development and information security projects. Thus, the data collection process has been made rich and rigorous applying theoretical (or purposeful) sampling.

Unit of Analysis

The entire study of research is based upon choosing the right unit of analysis. Neuman (2011) considers unit of analysis as the fundamentals, events, actions or communal life that are under consideration. They are the focal points to generating perceptions; experimentally determining or witnessing the observing concepts during data analyses. Humans or group of humans, organisations, events or actions could be the basis of the Unit of Analysis. Cavana et al. (2011) suggests that during the early stages of research study, determining the exact Unit of Analysis is critical as the development of conceptual framework, deciding on right data collection practises and estimating the number of sample are jointly reliant on the Unit of Analysis.

Creswell (2007) has specified that in qualitative studies, the *unit of analysis* is the study of 'what' or 'who' being studied. The *unit of analysis* for this study is the investigation of unique factors affecting virtual project environments. While considering the *unit of analysis*, the researcher also considered individuals, groups or organisations that are following of virtual format of working.

DATA ANALYSIS: THEMATIC NETWORK ANALYSIS

After deciding upon the research methods and sampling strategies, the final step was to choose an analysis tool which could fit with the research and data collection methods. As the researcher was working under interpretivist paradigm, the most appropriate analysis tool found was thematic analysis which was consistent with the qualitative research methods and interviews (Lincoln and Denzin, 2005; Creswell, 2009). As the researcher was interpreting the response of the participants and focusing on multiple realities, thematic analysis gave an opportunity to researcher to review the data at different levels. According to Braun and Clarke (2006), thematic analysis helps to identify, analyse and report outlines within the data. Thematic Analysis helped to extract themes or patterns that were prominent in the data at different stages and thematic networks thus facilitated to assemble and illustrate the identified themes. Using the Braun and Clarke (2006) guidelines, data analysis process was carried out following six phases.

Getting familiar to data is application to all types of qualitative research (Denzin and Lincoln, 2005). The author transcribed the audio recording as per Intelligent verbatim specification. Intelligent verbatim allows the researcher to eliminate the uninterpretable responses or mumbled voices. The author got himself familiarise with data by reading and re-reading. In few cases, audio recording was also listened a couple of times to observe the analytical responses of participants (Braun and Clarke, 2006; Davidson, 2009).

Coding was the next stage where the author coded or labelled for significant concepts in the data relevant to research question. The author used their analytical thinking to interpret the data that represented an overall concept or information against each code. The next stage was to recognise the themes behind all the codes generated. A theme is a comprehensive and meaningful outline representing data relevant to the defined research question. The themes are not actually hidden in the data; they are overall an interpretation of the data or the characteristic waiting to be discovered out of data. The themes were again reviewed and compared with data having a broader perspective in relation to the research question. Few of themes were eliminated and some new were added to ensure effective data interpretation (Braun and Clarke, 2006). Following table shows the codes, identified issues and themes from the data.

Table 3: Codes and Themes

CODES (factors)	ISSUES	THEMES IDENTIFIED
Effective means of communication	Only virtual means for communication can be used	Collaboration
Interaction	Lack of face-to-face interaction	
Knowledge Sharing	One of the biggest problems	
Regular Meetings	There are a lot of ways where you can arrange day-to-day meeting	
Punctuality	arranging team members at one time is a big difficulty	
Feedback	Suggestions for improvement	
Progress reporting	Getting and providing updates	

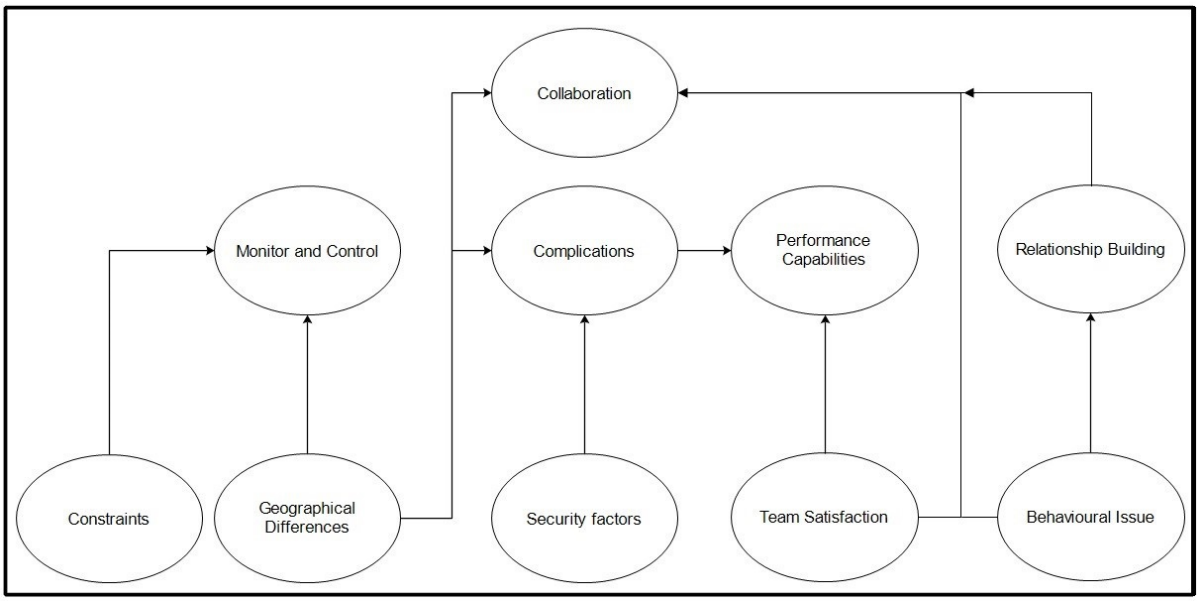
Softs Skills	What lags is the soft element which helps to integrate	Relationship Building
Trust	Effects collaboration and building relationship	
Background Checks	difficult to check the background of team members	Security Factors
Confidentiality	Government not sure to outsource projects	
Policy development	Project privacy terms and conditions may be specified	
Feeling of Isolation	Being left alone at several stages of project	Geographical Differences
Physical Interaction	Lack of face-to-face interaction	
Time Shift	Change in time effects performance	
Team Size	Limited allocated team for both massive and smaller projects	Constraints
Achieving specifications	satisfaction of stakeholder on specifications	
Project Duration	You have critical touch points to meet	
Budget	how do you organise your spend over	
Cultural Factors	More intercultural breaks in VPs	Behavioural Issues
Difference in Status	Not able to communicate due to higher status	
Working Practises	Some people are lazy, fair and some are ruthlessly efficient	
Renewal of contracts	Team member interest is effective by delaying contracts	Team Satisfaction
Team motivation	You have to keep the team ramp up	
Estimating Needs	More generalise in virtual projects to know the needs of people	
Agreeability	People from different locations needs to agree to project and methodology	
Adaptability	takes time to settle in project environment	
Smooth Transition	people have to compare and do a transition in in their brains	
Complex nature	Virtual projects are like having crack on the paper	Complications
Diversity	various people in one project	
Disruptions	technology issues	
Risk	Anything can happen anytime	
Team management	Difficult to manage together	Monitor and Control
Training	Need to assure are the team members right trained	
Tracking	Not easy to track team members in virtual projects	

Planning	Planning is a key factor of success	
Infrastructure	Provided with necessary facilities	
Project Literacy	Understanding the project scope & requirements	Performance Capabilities
Creating Balance	organise themselves between work and life	
Sorting Tasks	Understand the work to be done which is most urgent	
Workload	Team members working on other projects	

FINDINGS AND DISCUSSION

These themes identified above have been plotted by classifying the relationships between them. These relationships have been established by analysing the data and validating them with the help of literature; thus, helping to identify the interdependencies between several themes. The following illustration shows how several themes (including factors) interrelate to each other and affects virtual project environments.

Figure 1: Conceptual Framework of Interdependencies of Factors



Interdependency of effective collaboration and geographical difference, team satisfaction, behavioural issues and relationship building

The figure above illustrates that how factors of *geographical differences, team satisfaction, behavioural issues and relationship building* affect *collaboration.* In virtual project environment, differences in geographical location creates many difficulties for team members and project manager in terms of maintaining collaboration. During data analysis, one of the participants mentioned that

'Virtual projects are controlled by sustaining an effective interaction level. Due to lack of physical interaction, differences in working practises and culture, team members and project

manager could maintain good communication as they are not able to interact at a certain level as traditional teams do'

Further classifying the interrelation, Kirkman et al. (2002) suggested that virtual team collaboration is dependent on effective means of integration between the teams. Interaction can be in terms of building a strong relationship and sharing ideas. In regard, Berry (2011) propose that communication in virtual projects is the process of exchanging information and creating understanding between different stakeholders. Therefore, selecting effective means of communication can help to collaborate more distinctively; where team members and project manager share knowledge and exchange opinions that would help them in difficult times during certain stages of project.

Another participant highlighting the interrelation of collaboration and other factors mentioned that

'One of the biggest drop backs in virtual projects is the difference of location which directly impact the knowledge exchange and social interaction process'

Similarly, Beranek et al. (2005) mentioned that due to change in location team members feel isolated at different stages of the project as they lack physical interaction and effective communication. He further elaborates that because of geographical differences, team members do not prefer to team up and develop mutual understanding. Transfer of knowledge and feedback are those factors which can be particularly related to both the team members and project leaders (Malhotra et al., 2007). Feedback helps to gain understanding of the work been done and enhance individuals' skills (Ayoko et al., 2012).

Similarly, team satisfaction is another significant variable which affects collaboration. If the team members are satisfied, they may contribute and interact more than their capacity. The author has identified that nowadays team performance and better collaboration is dependent upon the timely renewal of contracts, confirming team members' agreeability towards a job, estimating the basic requirements of team members and ensuring a smooth transition if they are from a collocated organisational structure. Lee-Kelley and Sankey (2008) have identified that unclear roles and responsibilities lead to delays, because project team members are not able to recognise or understand their job assignments. Correspondingly, it is quite important for project leaders or managers to motivate their team members to complete a specific job as this helps them to gain confidence and they are more likely to finish their task on time (Purvanova, 2013).

Collaboration is also affected by behavioural issues. People from multiple backgrounds have their own way of working, are from diverse culture backgrounds and have different working practises. A participant from interview#13 mentioned that

'I have observed that some cultures are lazy and they do not bother to promote communication or interaction between other team members. Similarly, some cultures are efficient but they try to rule or impose decisions onto other; thus a lot of differences in behaviour and practises have been observed between individuals'

According to Chudoba et al. (2005), team members from different regions have particular mindsets and behaviours; it is quite difficult for them to come up as a squad and develop

team formation. Difference in language is another factor which affects their collaboration. Pitsis et al. (2004) explored that language issue can lead to conflicts between team members from different origins, because they use their national or common languages as a basis to collaborate.

One of the factors which has been identified by the author is the difference in status which affects the overall collaboration. Team members from different organisations work together for achieving collective goals or objectives. Team members who might be employed at different positions in organisations, they are not comfortable to discuss their point of view with other team members openly. The researchers observed that this may be due to differences in the hierarchy level which is stopping them to interact more positively.

Interdependency of Monitor and Control, and Geographic differences and project constraints

Monitoring and controlling is identified as a separate theme as it is purely linked to the efficient management and administration of organisation and project leadership. Geographical differences create difficulties for project managers to monitor and control the overall project environment. Virtual project environments require swiftness and rapidness; leaders who are managing or leading such projects need to be skilful so that they can manage affairs more positively. Leaders need to be aware of activities going on in the project environment; in case of inefficient leadership the project can lead to failure and disaster (Hunsaker and Hunsaker, 2008). A participant from interview#14 mentioned that

'Leaders or managers job is very difficult where they have to assume most of the project affairs rather practically observing them'

It is the concern of the organisation or leadership to ensure that the project environment has been facilitated with latest technology. Regions or countries where virtual teams are based do not have the facilities of high band-width connectivity or technology. In these circumstances, organisations should select those members who are from a location where basic technological facilities are obtainable (Algesheimer et al, 2011).

Similarly, tracking of the team has been identified by authors as being difficult to monitor due to difference in location or time zones. Project managers face difficulties in controlling the overall pace of the project (Lilian, 2014). In this regard, the authors recognise that project managers need to share their plan at initial stages of the project; to ensure that team members are informed of certain routines and timelines. Management or administration needs to make sure that team members are trained in using specific technologies, tasks and working ethics (Weimann et al., 2013).

It has been identified that project constraints make it difficult to monitor and control the project environment. Team size is limited and project managers have to manage and split tasks accordingly (Saafein and Shaykhian, 2014). In this regard, a participant mentioned that

'Virtual project environments are limited in the sense they have limited resources by using which they achieve objectives. How does the team members adhere to project standards and specifications is a common question raised by stakeholders after completion of certain stages'?

Similarly, achieving quality and satisfying stakeholders becomes difficult with a limited team size operating from different regions (Sarigiannidis and Chatzoglou, 2014). Participants have experienced that it is quite difficult for project managers to ensure that the project has been completed according to its specifications as it is being performed by several individuals. The project has to be complete within a certain time duration; thus, monitoring the overall project becomes difficult when team members are located at multiple regions.

Interdependency of complications, and geographical differences and security factors

Difference in location gives rise to many challenges like uncertainties or risks, unusual disruptions, understanding the complex nature of projects and managing diversity in terms of people. Risks or uncertainties can happen at any time of the project; project managers can play an important role in developing a moderation strategy to control risks (Vijayaraghavan et al., 2014). A participant mentioned that

'Risks can be controlled but cannot be avoided in virtual projects due to the dynamic characteristics and diversity of the project environment. Similarly, disruptions are also most likely to occur throughout during the project journey. This may include technological factors, hiring/firing individuals and following timelines'.

According to Calloway and Awadzi (2008), understanding the scope of a project is an important factor which helps to perform work efficiently. Similarly, for understanding the project dimensions and parameters, a leader plays a significant role using his skills, planning experienced and dedication (Denhere et al., 2015).

Similarly, the authors have identified that complications may rise due to security factors in virtual project environments. Nowadays, public organisations do not necessarily prefer to outsource their products or projects due to confidentiality and security factors. Based on the interviews, the authors have recognised that organisations are more concerned in the hiring of individuals from different organisations and backgrounds. They realise this as a security threat and are working on policy development prior to involving these individuals in projects.

Interdependency of performance capabilities, and team satisfaction and complications

The authors have identified that performance capabilities of team members are affected by the level of team satisfaction and project constraints. In the context of team satisfaction, it is significant that the team members would perform better when they are satisfied with the overall environment (Piccoli et al., 2004). Participants have identified that when the team is satisfied, they take more interest towards work and their performance is enhanced. When organisations do not particularly focus to fulfil the needs of individuals, this affects the performance capabilities and confidence level of team members. They do not seem to be motivated towards their tasks and have difficulties to create a balance between their work and social life.

The authors observed that project literacy is an important factor which helps team members to perform the tasks with consideration and thoughtfulness. It is obligatory for the

organisation to select those participants who have a previous experience or are related to the field of a particular project (Vinaja, 2003).

Apart from team satisfaction, complications developed during a project have a negative effect on team performance as team members are not able to fully understand the project scope or nature of the project. Similarly, the occurrence of risks which mainly include technological disruption affects their performance. *The participants acknowledged that risks can also be in the form of natural disasters in a particular region where team members are operating from and where they are not being able to get online or perform their task due to disruption in technology.* Few of the participants also highlighted that the risk of data loss is obvious in software development or new process development projects. Novice developers do not feel the need to back up their data which could result in total loss or failure.

Similarly, performance capabilities of team members are also affected by diversity. It is a unique relationship which has been identified by participants. People in virtual project environments have different mindsets and working practises; therefore, for following a common direction, team members do not prefer to change their approach and indulge in team activities.

Interdependency of relationship-building and behavioural issues

Relationship-building is quite important in virtual project environments. As the team members are from multiple backgrounds, it is difficult for them to know each other and their culture (Cramton and Webber, 2005). They often do not trust each other and there are misunderstandings due to status differences. As individuals are from different organisations and multiple backgrounds, they do not prefer to interact socially due to having a different mentality and differences in hierarchy levels.

For example, one of the participants mentioned that *'A senior project manager was working in a team where he was assigned different tasks by a person who was actually his sub-ordinate in a particular organisation, and that senior project manager was having difficulties maintaining good coordination level with him*'.

He added that virtual teams may include any member form any region or level. It does not matter who he is or what status or position that person has. Correspondingly, the participant stated that this sort of factor tends towards personal interest where team members do not desire to develop a social relationship with others.

Similarly, the research identified that soft skills are necessary in virtual project environment for building a relationship (Ásólfsdóttir, 2012). It seems that few cultures encourage developing a relationship whereas few culture do not prefer to indulge with others due to limitations of their beliefs, working practises or traditions. The authors identified during their analysis that relationship-building is fully dependent on behavioural issues. Similarly, it may be an effect of the moral beliefs or custom that allows of an individual to interact with another (Pitsis et al., 2004). Certainly, the development of relationship helps to understand each other's behaviour as people from new origins interact and work together for achieving a joint goal.

Conclusion

This paper has tried to interrelate factors and explain their interdependency (root causes) - the most significant characteristic of this study. The author applied qualitative methods and

thematic analysis to explore the key factors which affect project environments. A conceptual model illustrated thematic networks where interdependencies were shown based on the analysis and interpretation of participants' views. Additionally, the author identified several individual factors which need a more detailed examination in future studies.

As virtual project environments are very dynamic in nature, therefore all these factors need to be investigated in order to understand the dynamics and their interdependencies. Further, recommendation for testing this conceptual model is will produce more benefits for virtual project environments. This provides project leaders and team members with a toolkit enabling them to manage such dynamic projects more successfully, ensuring more positive project outcomes.

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