

# Culture in Global Software development - a Weakness or Strength?

**Sadhana Deshpande**

Lero-The Irish Software Engineering Research Centre  
University of Limerick, Ireland  
[sadhana.deshpande@ul.ie](mailto:sadhana.deshpande@ul.ie)

**Ita Richardson**

Lero-The Irish Software Engineering Research Centre  
University of Limerick, Ireland  
[ita.richardson@ul.ie](mailto:ita.richardson@ul.ie)

**Valentine Casey**

Dundalk Institute of Technology - Member of Lero  
Dundalk, Co. Louth, Ireland  
[val.casey@dkit.ie](mailto:val.casey@dkit.ie)

**Sarah Beecham**

Lero-The Irish Software Engineering Research Centre  
University of Limerick, Ireland  
[sarah.beecham@ul.ie](mailto:sarah.beecham@ul.ie)

**Abstract:** Cultural diversity is assumed to be a fundamental issue in global software development. Research carried out to date has raised concerns over how to manage cultural differences in global software development. Our empirical research in India, a major outsourcing destination, has helped us investigate this complex issue of global software development. A triangulated study based on a questionnaire, telephonic interviews and structured face-to-face interviews with 15 Project Managers and Senior Executives has revealed how they cope with the demands of cultural differences imposed by a geographically distributed environment. This research study brings forward various techniques initiated by these project managers to deal with cultural differences that exist within geographically distributed software development teams. We also discuss different strategies and make a case to explain how to build on and take advantage of cultural differences that exist in global software development.

## I. INTRODUCTION

Outsourcing software development projects to low cost economies has become the norm for many organisations today and the popularity of this strategy continues to increase. Companies are endeavoring to gain and maintain economic advantage through numerous technical and commercial factors [1][2]. The revolution in availability of various communication tools and their accessibility with an option to utilize remotely located competent workforce has helped globalisation of software development [3]. The highly skilled workforce which is available within low cost countries are capable and willing to undertake outsourced and offshored software development [4] thus allowing outsourcing companies to substantially reduce the cost incurred in software development projects [5]. The prospect of continuous software development by leveraging temporal differences has provided the opportunity to implement *follow the sun* strategies [4] [5]. These strategies have ensured the

provision of 24/7 support between various development locations throughout the year [6] [7]. However, outsourcing software development to organisations at various outsourcing destinations is not an easy and straightforward task [8][9][10][11]. The impact of global distance comprising geographic, cultural and temporal distance introduces numerous difficulties between teams and team members. These 'distance' factors can and do impede global software development projects [12][13]. Thus, the management of globally outsourced software development has been accepted as a difficult and complex task [14].

With emergence of technologies in a world which has become increasingly globalised, the relationship between culture and management of remote work has become an unavoidable issue which needs to be addressed [15]. Globalization of software projects has increased demographic and cultural diversity obstructing smooth team functioning [16] as geographic and temporal distance limits opportunities for direct contact and cooperation [8] [17]. Culture is termed as the centrifugal issue in global software development [8] and cultural diversity is often stated as a barrier within distributed teams [18] [19]. This diversity appears in different forms such as language and ethnic differences, national and political differences, individual perceptions and motivation, and work ethics [20][21]. Cultural distance is assumed to increase with the degree of cultural differences between geographically distributed teams [22] and consequently negatively impact on the level of understanding and appreciation of the activities and efforts of remote colleagues and teams [23]. Linguistic distance limits the ability for coherent communication to take place [24] and can impact on the development of trust amongst teams [25]. Thus, managing virtual teams whose members are geographically and linguistically dispersed is seen as a daunting task [26] due to the numerous constraints involved [27].

In contrast some studies have attempted to emphasize the positive aspects of cultural differences by stating that diversity of spoken languages or cultural backgrounds does not affect team performance [28]. Gaining knowledge of the national culture and religious values facilitates in interpreting and understanding the behavior of culturally diverse groups [29][30] where members of the group are from various cultural and religious background. Heterogeneous groups with enhanced standards of collaboration and conflict management systems achieve higher levels of consensus [31]. Escalating technical versus social diversity within various teams helps reduce project risk [32]. Cultural diversity has the benefit of increasing a team's creativity, innovation and problem solving potential [33]. When team members are exposed to new customs, ideas and different work cultures it helps them get better to creatively sort out issues of collocated development [34]. While the validity of these findings have been contested [60], developing working relationships with other team members facilitates communication between key contacts around the globe who are subject-matter experts in their field [34]. Indeed, it is argued whether the observed cultural differences truly result from culture difference or are merely measurement artifacts [35], and it has been suggested that multicultural models consisting of multiple cultures, subcultures, and countercultures better represent contemporary organizations [36].

In this paper we present the results of primary and secondary research that we conducted to understand cultural diversity. The results in this paper discuss various issues that arise within culturally diverse teams. However, we then make a case to explain how to build-on different strategies to take advantage of cultural differences that exist in global software development projects. We believe that addressing and leveraging cultural diversity in global software development is more important than merely considering it as a problem of global software development. Project managers must assess and understand existing cultural diversity to develop and establish strategies to help overcome and leverage the cultural differences.

We take a focused look at the cultural differences that exist in global software development. We demonstrate that by harnessing and managing these cultural differences, project managers can turn weaknesses into strengths. We propose several strategies which have evolved from an in-depth empirical study where we have conducted interviews with 15 Project Managers, Team Leads and Senior Executives from six different software companies in India.

The paper is organized as follows: Section 2 will provide the background and motivation for this work. Section 3 will define culture and various cultural theories. Section 4 will describe the research approach undertaken and the data sampling and data analysis techniques employed. Section 5 will illustrate our research findings. Section 6 contains a discussion on the various strategies that can be followed. In conclusion, Section 7 discusses the importance of managing cultural diversity and the contribution this paper makes to GSD research.

## II. BACKGROUND: INDIA AS AN OUTSOURCING DESTINATION

The economic imperatives driving the globalisation of software development and *Offshore Location Attractiveness Index* [44] have identified many countries as outsourcing destinations for software development. Countries from Eastern Europe, Latin America and the Far East have emerged as popular locations for offshoring and outsourcing software development [45]. Since the 1990's significant GSD has taken place within Ireland, India and Israel [3]. Today Israel and Ireland have seen their popularity as locations for low cost offshoring and outsourcing software development decrease [46]. From these initial three I's, India continues to be the popular location for outsourcing and offshoring software development. [45] [46] [47]. It is also predicted that India will maintain this position in the short to medium term [47]. With India's recognized position as the primary location for undertaking offshored and outsourced software development, our research has centred on the perspective of the Indian Project Manager. The issues they consider and the problems which they and their teams experience while coping with the international and national cultural diversity was of particular relevance.

From the Western perspective, India is perceived as a uniform or homogeneous society which is frequently portrayed by the media in a stereotypical fashion. The reality is quite different! India is a large and diverse nation which is often referred to as the '*Subcontinent*' because of its size. It is made up of 28 States with 22 recognised languages and many religious and culturally diverse groups. The major religions include the Hindu, Muslim, Christian and Sikh faiths. Several other diversities, such as caste, sub-caste and sect within various religions that exist are successfully accommodated within the nation. India is also the largest democracy in the world based on population [48]. It is noteworthy that India's linguistic, cultural, and genetic diversity is only exceeded by that of the continent of Africa [49]. Given this background, we decided to focus on the cultural diversity which exists within the country.

Our study provides an account of our investigations from the Indian software industry perspective, envisaging how the nation's cultural, religious and linguistic diversity reflects on the establishment and operation of Indian based global software development teams.

From the global software development literature we have observed that most published research papers report cultural diversity mainly as an issue from the customer perspective rather than from the vendor or supplier perspective. In contrast with this, the study presented in this paper focuses on cultural diversity from those software companies to whom development projects are outsourced. In addition, one of the authors has experience of working in the Indian software industry and has closely observed the management of cultural diversity within the Indian software industry. Hence it was considered of value to describe how cultural diversity is managed within this large and culturally diverse nation. Based on the lessons learnt from this in-depth study, we

suggest strategies that can be helpful for managing cultural diversity that exists within the global software development environment.

### III. CULTURE AND CULTURAL THEORIES

Culture is defined as the integrated pattern of human knowledge, belief, and behavior that depends upon the capacity for learning and transmitting knowledge to succeeding generations [37]. Culture is the learned values and behaviors shared by a group of people and play a vital role in how a person performs his or her work based on individual patterns of thinking, feeling, and acting [38]. Culture has visible and invisible attributes [39]. For example, visible attributes include dining, clothing, religious rituals, architectures, or sports while invisible attributes comprise of orientations to environment, time, communication, space, power, individualism, competitiveness, structure, and thinking [39]. Several theories have been proposed to categorize cultural differences.

The significance of culture in an organisational setting is clearly demonstrated in the work of several social scientists over the years. In this section we list some of the theories that demonstrate that there are many ways in which to view culture.

#### A. Hofstede's Cultural Dimensions [40]

Hofstede conducted a study for IBM employees in 40 countries to find the impact of culture in workplaces. He defines culture as "the collective programming of the human mind" that distinguishes the members of one human group from another. He identified 5 cultural dimensions; they are Power Distance (PDI), Individualism/Collectivism (IDV), Uncertainty Avoidance (UAI), Masculinity/Femininity (MAS), Short-term or Long-term Orientation (LTO). These dimensions give insight to different national cultures for effective interaction with people from different countries. If these dimensions are understood and applied appropriately it should reduce the level of frustration, anxiety, and concern among team members and help in effective communication.

#### B. E. T. Hall's Cultural Factors [41] [42]

Based on anthropological analyses Hall identified key cultural factors. These are classified into High Context and Low Context based on time and space. He states that in High Context cultures more importance is placed on context rather than on content while in Low Context cultures information is transmitted through clear and explicit messages. In Low Context cultures more explanation is needed and there is less chance of misunderstanding. With respect to time, he says that cultures that follow Monochronic time prefer doing one thing at a time while in Polychronic time human interaction is valued over time and material things.

#### C. Alfons Trompenaars & Charles Hampden-Turner [43]

They state that the purpose of national culture is to provide answers and solutions to challenges faced by individuals. They have identified seven distinctive dimensions of culture; Universalism/Particularism, Individualism/Collectivism, Neutral/Affective relationships, Specific/Diffuse relationships, Achievement/Ascription, Sequential/Synchronic cultures and Internal/External control. They have tried to explain to international managers how to build the skills, sensitivity, and cultural awareness needed to establish and sustain management effectiveness across cultural borders.

#### D. Culture to Management

These theories help international managers to gain insight into culture in various ways. Hofstede's cultural dimensions assist managers to identify individual and group behaviors in different countries. E.T. Hall's [41] concept of culture is similar to that of Hofstede's except they are based in context of time and space. Trompenaars and Hampden-Turner [43] have a contradicting approach towards Hofstede's cultural dimensions where they view culture as process and propose that 'culture is the way in which a group of people solve problems and reconcile dilemmas'. Hofstede analyses the variables of national cultures, whereas Trompenaars and Hampden-Turner are involved in the processes of cultural creation. They have tried to show international managers how to build the skills, sensitivity, and cultural awareness needed to establish and sustain management effectiveness across cultural borders.

Many other researchers such as Philippe d'Iribarne [59] have the same approach as Hall but with an ethnographic method for sense-making. Vaara [58] has broadened these cultural studies with an epistemological approach where they state that culture and cultural differences exist only when people become aware of it in their social interactions.

## IV. RESEARCH APPROACH

A qualitative inductive approach was selected to undertake this study. As it was important that interviewees were given a chance to clearly articulate their experiences and views on cultural diversity that exists within India, we used Strauss and Corbin's grounded theory approach [50]. Our research question was: "*How is cultural diversity managed within Indian Software Companies?*" and various issues that arise within culture were considered as the sub-questions. A key reason for the selection of an inductive grounded theory approach was that it was very important that our findings should emerge directly from the data and it is proved very successful in previous studies [61] [62] [63]. We employed the following data gathering and analysis techniques.

Name	Total Employees	Description	Persons Interviewed	Total Interviews
<b>SysInfo Technologies Ltd.</b>	100,000	Technology consulting, application services, systems integration, product engineering, custom software development, maintenance, re-engineering and business process outsourcing.	2 Senior & 1 Junior Software Engineer	3
<b>Dream Moon Software</b>	110,000	Investment Banking, Retail Banking, Credit Cards, Corporate Banking and Life Insurance	Vice President, Assistant Vice President, 2 Senior. PM, 1 Junior Software Engineer. (1 PM & Software Engineer was females.)	5
<b>Mega Technology Software</b>	70,000	IT strategy, consulting, system integration, design, application development, implementation, maintenance and product engineering.	Chief Consultant, Senior & Junior Software Engineer	3
<b>Cyber Epoch India Ltd.</b>	12,000	Software development, maintenance, & re-engineering, quality assurance and testing, technical writing, customer support, etc.	Software Engineer (Female)	1
<b>FJ Software</b>	160,000	Customer-focused information technology and communications solutions for the global marketplace.	1 Senior and 1 Junior Software Engineer	2
<b>Vision India Software</b>	25-50	Handle small projects in various sectors.	Project Manager (Female)	1
<b>Table 1: Summary of Organisations Researched</b>				

### A. Interviewees

Our starting point for interviewing through personal contacts was to approach multinational and national companies based in India. As three of the interviewees were previously known to one of the authors this is an opportunistic sample. We conducted the study within one national and five multinational software companies listed in Table 1. Our population of interest was those people involved in management and decision-making for the teams – mainly Project Managers and senior staff.

We interviewed 15 Project Managers and Senior Executives in different roles ranging from Junior Project Manager to Vice President (Software Projects) within these companies. For reasons of confidentiality, we use pseudonyms for the participating companies.

### B. Data Collection

A three phase research protocol was developed to guide our grounded theory approach. The interview process was deliberately kept reflexive to allow refocusing on responses

to certain questions. This stimulated new awareness and interest in particular issues which then required additional probing.

At the first phase of the research protocol, a questionnaire was developed to gather initial information such as demographic details, formal and informal languages used for communication. The questionnaire was distributed amongst 3 Senior Executives, 3 Senior Project Managers, 5 Senior Engineers (Team Lead), 4 Junior Engineers.

These questionnaires were completed by all our respondents hence our response rate is 100%. The telephone and face-to-face interviews were conducted later with these respondents.

Following receipt of responses, we carried out the second phase of the research protocol, which was to conduct telephone interviews from Ireland. Each of the telephone interviews lasted more than 90 minutes and was recorded with the interviewee's permission. We probed deeper into the responses from the questionnaires asking questions such as: *"Is cultural or religious background taken into*

*consideration while selecting team members?”* As the analysis of the data from the initial data collection phase provided relevant and interesting results, the decision was made that one of the authors would conduct on-site interviews. Thus in the third phase of the research protocol we probed further into the details of cultural diversity. During the visits to the companies this author was given an opportunity to spend more than 5-6 hours in each organisation. This allowed her to conduct in-depth questioning of those people who had answered the questionnaire and had been interviewed by telephone. The participants freely expressed and shared their experiences while also presenting ideas and suggestions.

### C. Data Analysis

All interviews were transcribed and summarised. The data was analysed using factual coding, open coding, axial coding, and selective coding [50]. This facilitated the identification of various issues, techniques and strategies followed within the companies with whom research had taken place.

Initial results from data analysis were presented in [7]. The current paper builds on this research by focusing on cultural diversity in global software development.

## V. RESEARCH FINDINGS

In much of the published research, cultural diversity is assumed to be at the international level and is referred when outsourcing takes place between client and vendor companies which are based in various countries. Contrary to this, as an outsourcing destination and focus of our study, the results show that the project managers in Indian software companies have to manage both National and International or Western culture.

### A. National culture

India is a country with a population of over a billion people and within the country there is a diverse cultural background. People speak different languages and follow various religions such as Hinduism, Islamic, Sikhism, Buddhism, Christianity, Jainism and Zoroastrianism. Within these, there is a complex caste and sub-caste system. Moreover, each individual also holds his or her own beliefs and misbeliefs. The total number of languages and dialects spoken in India vary by source and counting method. The Indian census lists 114 languages that are further categorized into 216 dialects or “mother tongues”. An estimated 850 languages are in daily use, and the Indian Government notes there are more than 1,600 dialects [49]. This all leads to cultural, religious and linguistic diversity at national level in the country and, in turn, within Indian software industry. While we often speak of ‘software centres’ such as Electronic City in Bangalore-India, there are many such software development centres and major companies located at various geographical locations across India and software professionals move to these different places within the country to pursue their career. Thus, software developers

working on global teams within India come from different cultural and religious backgrounds and speak a variety of languages in different accents and dialects. Consequently, Indian Project Managers have to establish, manage and coordinate a culturally and linguistically diverse collocated group into an operational team [13] to successfully carry out global software development. With this identified diversity within the country, we could identify how such differences are addressed by the project managers.

One of our interests was to determine if team members within Indian software companies are selected based on their possible contribution to project and global team. In our previous paper [7] we reported initial results. Participants were asked to rate on a *Likert scale* of 1 to 8 their answers to *Is the cultural background taken into consideration while selecting the team members?* Options offered were: Professional Skills, Technical Ability, Domain Knowledge, Cultural Background, Gender, Marital Status, English Language Proficiency and Other Language Skills. Results showed that *Professional Skills* and *Technical Ability* were rated as the most important factors. *Cultural Background was not taken into consideration while selecting team members.* Unlike the difficulties which emerge with cultural diversity in the international environment, our data shows that instead of considering it as a negative issue the software companies in India have taken advantage of the existing cultural diversity within teams. However, our recent in-depth analysis has highlighted the important role Project Manager and Senior Executives perform while managing cultural diversity. These can be categorised into languages, religions and festivals and gender difference.

*i) Language* As the team members are generally from diverse cultural backgrounds and may well be speaking different languages or different dialects, we were interested in establishing what languages are used for communication by each team members. In the questionnaire we asked, ‘Which are the formal and informal languages for communication amongst teams and team members.’ We were told that that English is always the formal language for communication in the project whereas team members are flexible enough to follow several languages for informal communication. Language has never been a barrier for communication within the teams. In a situation when the proficiency of English language differs and the project demands a more comprehensive knowledge of English the team members are provided with training to enhance their skills.

*ii) Religions and Festival* Apart from the national festivals and holidays, every state in India has its own religious and festive calendar. Project managers revealed how they leverage the individual and regional cultural diversity by setting up Backup Teams where cultural differences are transformed into strengths. Such Backup Teams are formed both at national and international level to ensure that 24/7 support is provided all 365 days a year. For example, to form the Backup Teams, the Chief Consultant from Mega Technology Software emphasized that at least 10 percent members of each team should every time be part of the Backup Teams to ensure that 24/7 support is provided in

all circumstances. Explaining how backup support works during religious festivals in India, he stated that for his large project, the development teams and team members are based within various states in India and also at various client sites in different countries. If the “development teams based in Mumbai or Pune are enjoying regional festive holidays then teams based in different states and cities such as Delhi or Bangalore take the responsibility of providing 24/7 support” for the project. This, in turn, is then reciprocated by the development teams during other festival times. When “team members celebrate their own religious festivals, other team members in the local team take responsibility” and provide the necessary support. The clients or outsourcing companies may not necessarily be aware of this festive calendar. However, as per the project plan the teams in India manage to provide 24/7 support and carry out work 365 days a year. During national holidays in India such as Republic Day and Independence Day or nationwide festivals like Diwali and Holi, the project teams located in different part of the world or at the client site, for example, in Japan, Malaysia, South Korea, United Kingdom, Mexico or United States of America often take the responsibility to complete the task. In addition, Backup Teams provide support under various circumstances and help in overcoming any superfluous situations and assist to accomplish software development projects as per the required project plan.

**iii) Gender** In previous research, Casey [51] studied the Ireland-Malaysian relationship and noted that gender differences can cause difficulty within international projects. Therefore, we were interested in studying this concept at greater depth within the study presented here. India is generally perceived as a traditional, orthodox and conservative country. In the questionnaire, project managers were asked if gender was considered while selecting the team members and the answer was no. However, when we probed further during the second and third phases of our research we observed a preference for married female team members. The main reason given was that married female members are considered to be stable with fewer chances of relocating. A senior project manager from SysInfo Technology stated that having a female team member is considered an advantage as “they are trustworthy and good to complete deliverables”. It was acknowledged by all other Project Managers and Senior Executives by stating that “female team members finish the allocated work within a stipulated time frame” and they are judged to be “good at time management and multitasking”. On the negative side, Managers also stated that “female team members are not flexible in working hours and are unwilling to work longer hours”. The NASSCOM 2007 [52] survey states that the female workforce in Indian software industry has risen from 25% to 30% in 2008 and is expected to rise up to 45% by 2010.

## **B. International Culture**

Our study has revealed that team members based in India are normally educated in the cultural knowledge and religious values of customers and geographically located team members. This helps them to interpret the behaviour of

both geographically located team members and clients, consequently creating a required level of understanding. Hofstede’s [38] [40] cultural dimensions help to gain insight of various national cultures for effective interaction with people from different countries. If applied appropriately, these dimensions should help reduce the level of frustration, anxiety, and concern among team members for effective communication. To overcome the international cultural issues various steps are taken by Indian companies including onsite coordinators, onsite visits and training.

**i) Onsite Coordinator** Project managers often place an experienced Indian analyst or senior team member at the client site for an extended period [12]. The role of the onsite coordinator is to plan, coordinate and manage the work between different geographically located teams and team members. They are expected to perform as a *bridge* [33] across communication channels. They also act as a *Cultural Liaison* to create mutual understanding between people at distributed sites by supporting the reconciliation of their cultural difference.

**ii) Onsite Visits** Regular onsite visits are planned for team members to meet their counterparts with whom they interact regularly. This helps them to improve mutual understanding, resolve various issues and become familiar with their work practices, priorities and environment.

**iii) Training** Major initiatives are often taken in Indian software companies to ensure that team members understand international culture and related issues. A *Corporate University* has been established in Dream Moon Software for training employees in cultural understanding and appropriate conduct. The Vice-President of this company mentioned that this also helps provide employees with the techniques to avoid the consequences related to cultural differences and other matters. This university also helps employees to enhance their technical and professional skill along with the English language use, accent and communication style. The Senior Project Manager of SysInfo Technologies Ltd. stated that “experts from national and international levels are hired to train their employees in various areas”. Such training helps software professionals in India to overcome international cultural issues for successful operation of the teams at various locations.

These research findings point out several challenges faced by Indian project managers while managing national and international culture within India. They have resolved these challenges by implementing various constructive strategies. Cultural diversity has, in reality, helped Indian project managers in establishing Backup Teams to deal with the diverse religious and festive calendars that exist in India and provide 24/7 support to carry out work 365 days a year. This study has also facilitated to identify the role of female team members in global software development. Onsite visits and onsite coordinators have helped to bridge the international cultural diversity. Training has assisted project managers to educate team members in different cultures and religious values and to interpret the behaviour of both geographically located team members and clients, consequently creating a required level of understanding.

## VI. DISCUSSION

This research study has allowed us to systematically analyse the cultural aspect of global software development from an entirely different perspective. It has placed emphasis on the role Project Managers and Senior Executives play while addressing the cultural differences. Our objective here is to make a case so as to build-on the various strategies followed by Indian project managers. In this section we make an attempt to justify how these strategies can be implemented to manage the apparent cultural issues that exist in global software development projects. It is necessary that the project managers should have comprehensive knowledge of the prevailing cultural diversity to take advantage and effectively accomplish global software development project.

*i) Backup Teams* Establishing Backup teams at various geographical locations in global software development can help project managers at an international level to deal with unforeseen or surplus events that arise due to cultural differences. Project managers in coordination with different distributed teams can establish Backup Teams by evaluating the potential cultural differences that exist within various geographically located teams. Linguistic, ethnic and religious background of the team members can be taken into account while establishing such Backup Teams. The project managers and senior executives should also keep themselves well informed with the different cultural and festive events that happen throughout the year within various countries where teams are operating. Annual calendars mentioning festivals and holidays from various nations can be taken into account. Proper scheduling and huge efforts are needed while establishing Backup Teams. Effective communication tools and coordination techniques are required to support Backup Teams. The project manager's role is to efficiently manage all activities related to cultural diversity. If possible, a senior team member should be allocated to this task so that the project managers can manage the other important components of the project.

Establishing the Backup Teams has recompensed Indian software industry for providing 24/7 support all round the year. Indian project managers have established Backup Teams by taking support of team members based either offshore or at client site.

*ii) Cultural Training* Gaining knowledge of different national culture and the religious values of clients and geographically located team members who interact daily is vital for successful global software development projects because it helps them to interpret and understand each other's behaviours and develop respect for one another. Providing such training can help to transform cultural diversity from being a problem into a strength. Orientation courses also help to create a level of understanding and reduce frustration, anxiety and concern which are part of team or group behaviour particularly when operating in a GSD environment. Team members can also be trained in appropriate dialect of English, regional communication styles, conduct and techniques to avoid the consequences related to cultural differences. Such cultural training can be

facilitated with the help of experts from national and international level. In addition, University courses in outsourcing destination such as Ireland, USA, Canada and Germany should seriously consider the addition of relevant modules to their University degree programs. This should comprise global software development training which specifically includes cultural diversity. In this way university graduates would be better able to cope with belonging to global teams when they join the workforce.

*iii) Gender* Every culture has different outlooks towards gender. It is very important to identify the role of female team members as part of teams while managing cultural diversity. Female team members may be perceived differently in different cultures. Our findings have revealed that female team members in the Indian software industry play an equal and important role with their male counterparts. This may not be necessarily same in different cultures; hence the project managers must acquire appropriate details of managing female team members in geographically distributed teams.

*iv) Onsite Visits* When teams and team members are geographically distributed over long distances they are either recognised by their role in the team or by their job profile. The distinct working environment that exists between globally distributed teams provides very little opportunity for face to face communication. In such cases *Onsite visits* can help resolve various issues. Team members should be encouraged to visit the sites of other teams with whom they daily coordinate. Scheduling such visits to the location of the other teams serves to improve understanding between teams and team members [34]. It also makes them aware of their work practices, priorities and environment in which they are carrying out their development work [34]. These visits also allow team members resolve cultural issues and misunderstandings [34] that might have happened prior to meeting each other. This helps to establish relationships amongst members of teams from different geographic locations [53]. Having frequent contact and the development of good professional working relationships amongst teams has a positive impact on team performance as compared to disconnected teams [54]. These visits also let team members resolve issues and misunderstandings [34] that have happened prior to meeting each other and thus establish relationships amongst members of teams from different geographic locations [53]. Having high connections amongst the teams has a positive impact on team performance as compared to disconnected teams [54]. This consequently helps in effective coordination of distributed software development teams. These onsite visits help to 'put faces to roles' [34] instead of knowing team members by their role or job profiles. An overall advantage of an 'Onsite visit' strategy in distributed development is that, it facilitates visiting team members to develop professional relationships with the team members they are visiting. On their return these relationship can be leveraged to resolve problem and improve the operations of the teams as whole for the duration of the project as happens in a collocated development environment [34]. An important point is that social interaction helps in building ties between team members

which continue even after they return home [55][56]. In addition, during their stay visiting members absorb a significant amount of tacit knowledge as they work closely with each other which is later disseminated to the team members on return back home [55].

v) **Onsite Coordinators** Having onsite coordinators [12] can help manage cultural diversity in global software development. A senior team member can usually be positioned at the client or team site to act as a liaison across teams. These liaisons are the *panel points* who can help bring various teams and members together so as to ease coordination and to be the main communication conduit to the non-collocated teams [34]. Their main role includes arbitrating team conflicts and resolving miscommunications that happens between team members. Their role is to be a cultural liaison to bridge the cultural and linguistic differences between teams and facilitate organizational flow of communication [22]. They are usually individuals with sufficient global knowledge and willingness to travel between locations. A native of a particular country who emigrated might serve as the cultural liaison with an offshore site [22].

vi) **Bridges** Bridging the teams can be a further technique to overcome cultural diversity in global software development. Bridging helps in the successful management of geographically distributed teams where team members can act as bridges by becoming boundary spanners to fill the structural holes [57]. One bridging tactic is to build shorter paths between non-collocated workgroups in countries where teams are compatible with the cultures with which they are collaborating [33]. Careful attention is needed in the management of bridges in global software development as it has to be tied to the organizational and national culture of team members which can be achieved by choosing appropriate bridge countries [33]. Bridging can be accomplished by strategically embedding liaisons across the teams.

### **Summary**

In this research study we demonstrate that cultural differences that exist in global software development can be addressed by taking innovative steps. Indian project managers never consider cultural diversity within the teams as a weakness or key issue of global software development. They judge other issues such as documenting software architecture or changes in requirements specifications which they have to deal with most to provide 24/7 support as more complex aspects of global software development. Cultural diversity in India is mainly considered as an administrative and managing problem and project managers believe that it can be easily avoided by taking appropriate steps. Establishing Backup teams, training, onsite visits, onsite coordinators and several other strategies have helped Indian project manager to turn this weakness into strength. Most of these strategies are already followed by various companies and the related studies have demonstrated that these strategies have been effective in various ways. Thus having a proper understanding of the available cultural diversity will help project managers to implement these strategies and

overcome this overstated issue of culture within global software development.

## **VII. CONCLUSION**

The premise of this paper is culture in global software development. Though much of the literature in global software development states culture as a difficult and complex issue for global software development, we discuss how existing cultural diversity can be built-on. Cultural diversity is an inevitable aspect of global software development. The magnitude and pace of global software development emphasises the need to acknowledge cultural issues to ensure project success. If we understand personal, national and organizational culture, we can seek to align with them to gain the potential benefits offered by global software development. Our analysis suggests that Project Managers and Senior Executives should examine the existing cultural differences to embark on the strategies to manage cultural diversity. Cultural proximity needs to be estimated to develop concrete strategies to recognise potential impact of culture on distributed development.

Most of the strategies suggested in the discussion section are not speculative but rather are more definite as they are already implemented by various globally distributed software development teams and companies. We have tried to bring together these strategies based on our research carried out within Indian software companies.

Through our direct access to Indian companies we have been able to study culture in the context of global software development from the Indian Project Managers' perspective. Though cultural diversity is stated as a centrifugal force [8] of global software development we have attempted to show how it can be transformed to become a centripetal force [8]. We have presented a comprehensive set of strategies which have emerged from our research which can be considered when managing cultural diversity at various geographic locations in global software development projects. Given this perspective we believe, this research is of value to both the academic and industrial communities and the discussion should help manage global software development teams more efficiently.

### **FUTURE WORK**

As part of our ongoing study and further research, we intend to replicate similar studies at the international level in order to compare with current study by comprehending the cultural diversity within various outsourcing destination countries especially within Scandinavian and eastern European countries. We also aim to bring up and verify the various overheads invested in managing cultural diversity within global software development environment.

### **ACCESS TO RESEARCH RECORDS**

Due to the limitations of maximum page length, the research process and its details cannot be provided within



this paper. However, the underlying research records such as questionnaire, data analysis and coding analysis etc. can be obtained from the first author of this paper (wherein certain terms and conditions apply).

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