*I.J. Information Engineering and Electronic Business*, 2022, 2, 39-46
Published Online April 2022 in MECS (http://www.mecs-press.org/)
DOI: 10.5815/ijieeb.2022.02.03

# Hindrance to Requirements Engineering During Software Development with Globally Distributed Teams

**Waqas Mahmood**
Department of Computer Science, Institute of Business Administration, Karachi, Pakistan
E-mail : wmehmood@iba.edu.pk

**Syed Shaharyar Rizvi**
Department of Computer Science, Institute of Business Administration, Karachi, Pakistan
E-mail : s.rizvi.23243@khi.iba.edu.pk

**Siraj Munir**
Department of Computer Science, Institute of Business Administration, Karachi, Pakistan
E-mail : s.munir.23254@khi.iba.edu.pk

Received: 05 January 2022; Revised: 17 February 2022; Accepted: 12 March 2022; Published: 08 April 2022

**Abstract:** With the increase in the availability of skilled software engineers, the process of global software development is being increasingly adopted by organizations, at a relatively lesser cost. This has led to software processes being more viable in a progressive manner for several reasons that include better communication technologies and the levels of maturity seen in the software industry.

That being said, Organizations that undertake the decision of adopting Global software development should realize that this process isn't exactly a risk-free action and there have been many failures reported with regard to it. The existing bools of globally distributed projects portray a number of challenges. During the interactive phase, the need for particular consideration towards the requirements of the client and the globally dispersed distributed software provider teams has been indicated.

This paper makes use of surveys collected from IT professionals and people working in the software industry in order to present realistic insights gathered from them.

**Index Terms:** Requirement gathering, Globally Distributed Development (GSD), Virtual Teams, Offshore Outsourcing, Challenges, Major problems in RE.

## 1. Introduction

As Software Industry is booming day by day, Requirements Engineering is still one of the important prerequisite phases in the development life cycle of any software. In the past few years, researchers have identified several hindrances and impediments in the aspect of Requirements engineering and some of them are Communication issues, Time differences, Trust issues between client and team members, and cultural differences of various regions. [1]

Some issues that occur frequently while working with globally distributed teams include working in different time zones, loss of communication, lack of management support, and cultural differences. [2]

Recently after COVID-19, [3]the majority of IT companies have shifted to remote work, the focus on requirements engineering (RE) has been increased during global software development (GSD). Globalization is an essential trend in today's industry. And IT industry is also impacted by this globalization letting multicultural people and stakeholders work together on a global venue identified as a global software development environment (GSDE). [4] As compared to the traditional software development practices, the popularity of global software development has provided numerous advantages. Global software development required proper RE processes which can work for this environment as the success of the project relies on this technique as these projects consist of globally dispersed teams around the world who work concurrently on a software project. [4,5]

For any software project, Requirement engineering requires special attention as it is considered to be the most important activity and any incorrect requirements can lead to project failure as well. It is an activity comprised of

communication and setting expectations which can be easily affected in globally distributed teams. It comprises five major activities that include:

1. Requirement Inception and Elicitation
2. Requirement Analysis
3. Requirement Specification
4. Requirement Validation and Verification
5. Requirement Management. [6, 7]

Requirement management processes also include change management processes, either we need to approve/disapprove or when to implement the approved changes.

Before creating any software product, Customer requirements are the main provisions that need to be gathered and analyzed before going into the development phase. It is the very phase of SDLC that elicit, gathers, analyzes, identifies, and confirms the needs of a customer or stakeholder. It is a crucial activity, any mistakes or blunders regarding wrong requirements can lead to a higher development cost as compared to the original estimates and it can defame the organization name as well. [1, 8]

In a study, it was shown that about 80% of the software bugs/failures occur due to wrong requirements that were gathered at the time of requirement gathering. In all that, Requirement engineering is a challenging phase, and it gets more complex when we work with globally dispersed teams. Also, communication is the key in virtual teams which is done using different channels like Instant messaging, Emails, Video calls, etc. [2, 3]

Because of the diversity in the culture, background, and interest of the team members and other stakeholders, requirements engineering became a challenge while working with globally dispersed software development (GSD) teams. There is a need exists to accomplish a common agreement among the team about the project. [2]

The goal of this paper is to identify and provide the solution to the hindrances and impediments that occur during the requirement engineering phase in Globally dispersed software development teams. Also, we have surveyed various Software companies of Pakistan, and we have discussed its results in the form of facts and figures. [9, 10, 11]

## 2. Literature Review

Exactly Ten years ago from today, remote work mainly consisted of individual-level freelancing or simple managerial tasks which required little cooperation and teamwork. When the idea of a globally distributed team, global software development (GSD) arose where people started solving complex problems such as requirements management virtually. [10]

During Covid-19, it seems like having a Virtual work environment has become essential for operating your IT business these days and it became a phenomenon that needs to organize and managed effectively.

Basically, the Globally distributed teams are those whose team members are located in two to three different countries working in different time zones to achieve a common goal and challenge. [11]

Working with Global software development teams requires a lot of cooperation and collaboration of team members and it requires different communication tools, media, and software to collaborate and communicate complex problems efficiently. Due to the large shift to Global software development and teams working virtually many Software services companies are facing problems while working with such projects. The teams have stuck to old traditional ways of dealing with the Requirement gathering (RE) part, which results in project failures and financial plus reputational loss to the companies.

There is a study conducted by Yadav et al. [16] that suggests the conceptual framework for a successful Requirement engineering process in a Globally dispersed team environment. They have discussed three main factors that need to follow to achieve success in the Requirements engineering process.

Yadev et al. have suggested that there should be a proper means for close project monitoring. Also, there should be a designated point of contact on both client and service provider end who is responsible for managing all the coordination needed to streamline the Requirements Engineering process. Also, the service provider can hire a Customer Success Executive (CSE) or a Business Analyst (BA) who is responsible for tasks related to RE. [2, 13]

They also suggested having common Standard Operating Procedures will help globally distributed teams to align and work with the clients. GSDs should follow the SDLCs approach like Agile (Scrum/Kanban) to enhance flexibility in processes. [1, 14]With the help of Agile, teams will be more adaptive to change in a proper way, the working product would be visible by the end of each sprint or Iterations. [3]

Yadav et al. suggested and emphasized using the communication and collaboration tools for appropriate and effective communication. Some common tools can be JIRA, Slack, Trello, MS-Teams, etc. [12]

Richard et al. in their paper presented a graph-based method for Requirement Change management by including those factors which are required in Global software development (GSD). [12] The graph theory proposed the following solutions:

(a) By finalizing the requirements changes after getting the agreement from globally dispersed software teams on the acceptance or refusal of the possible change in requirements.
(b) By analyzing the possible change in client needs w.r.t the work in progress in the different geolocations.
(c) Estimate the change in requirements that can indirectly or directly impact the timelines of software development which is currently in progress at different geolocations.

Another study conducted by Rahman et al. highlighted other challenges faced in Globally distributed software development teams and identified some strategies which can mitigate those challenges. [2]

(a) The major challenge was the lack of trust between the team members and this can be mitigated through the Agile approach specifically Scrum where teams can jell in together in Sprint Ceremonies and other team activities like Daily Scrum, Sprint Planning, Reviews, Retros which help them to know each other and it builds trust and relationships between team members.
(b) Another major issue was Lack of Visibility which is the most significant issue in Globally dispersed teams' environments, and this can be tackled through the sprints process, having Agile management tools like JIRA where managers can track the progress of every individual during the sprint and also, they can get the velocity of teams after every sprint. Also, managers have to trust their team members to do their job done. With the use of proper tools and Agile approaches, these issues can be easily eliminated. [10]

## 3. Research Methodology

We will discuss the research techniques and methodologies that were used while conducting this research. We adopted this questionnaire from the existing research paper and we added our own research questions (RQs) according to our local industry needs. [14, 15]

We have discussed the survey questionnaire and the questions that we asked while conducting the survey. [17,20]

We conducted this survey from the IT industry professionals having practical experience of more than 3 years. We will conduct an online survey to gather responses from industry practitioners. We will also rely on our own experience in conducting online surveys through google forms. [13]

**RQ1:** Have you ever worked with a globally distributed software development team?
**RQ2:** Which development methodology is implemented in your organization?
**RQ3:** How frequently do changes in gathered requirements occur?
**RQ4:** Means of communication is preferred to communicate with remote teams? [1]
**RQ5:** Major reasons of requirement changes?
**RQ6:** Do you feel that different time zones cause hindrance in Requirement Engineering processes? [1]

## 4. Results

We have illustrated the results of the survey that we conducted from the IT industry practitioners based in the different organizations of Pakistan. There are more than 95 people who participated in this survey. Our target audience varies from Project Managers, Product Managers, Business Analysts, Tech Team Leads, Software Engineers, and Software Quality Assurance Engineers. These designation levels also differed from Associate/Junior level to Senior and Lead level. [10]

In the first portion of our survey, we asked about different demographics like what's their current job title and from which organization they belong to. This helped us in affirming the credibility of the data that we were collecting. Also, we have compiled data from some of the most reputed IT companies of Pakistan but we have concealed the names of the organizations due to privacy concerns.

**RQ. 01-** Discuss the target audience who has partaken in our survey. Most of them belong to different IT companies and work as Business Analysts/Requirement Engineers, Software QAs on different levels of their designation varying from Mid-level, Senior, Lead and that goes to Senior Delivery Managers, Project Managers, Directors, and Software Engineers as well.

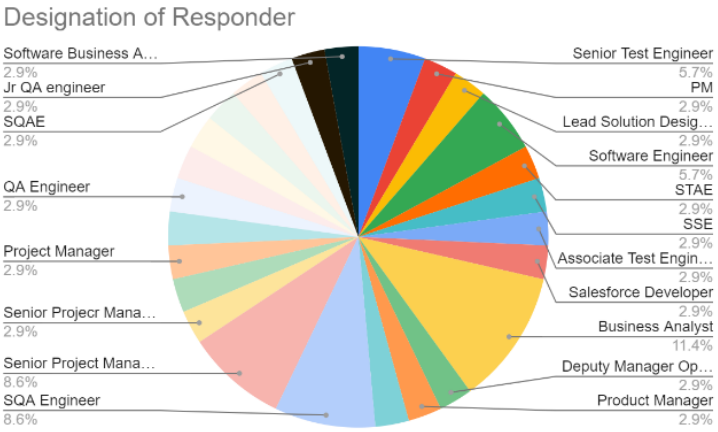



Fig. 1. shows the Job titles of participants.

**RQ. 02-** shows the level of industry experience of the participants. We gave them different slabs for their ease and to save their time. The data shows that more than 40% of people have industry experience of more than 5 years whereas the rest of the 60% participants have work experience of around 2 to 3 years.

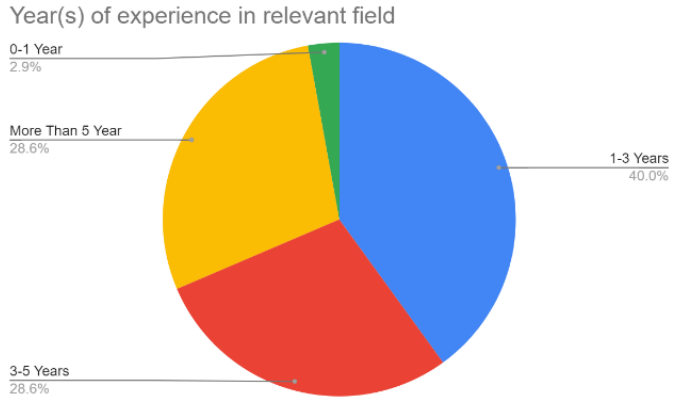



Fig.2. shows the level of industry experience of the participants.

**RQ. 03-** According to this result, most participants have worked in a globally distributed team.

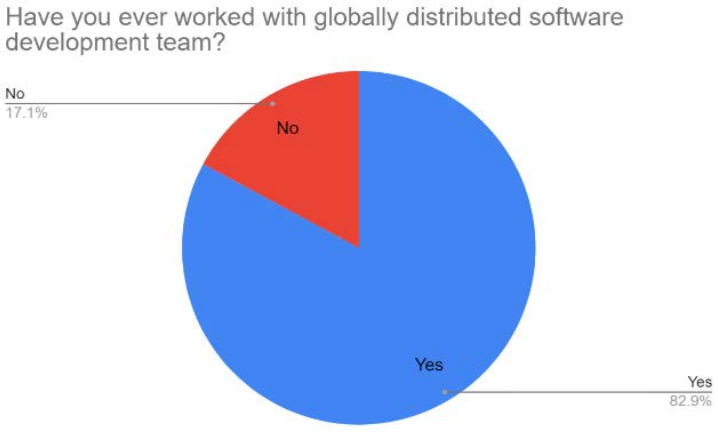



Fig. 3. Shows the results of how many people have worked in globally dispersed teams.

**RQ. 04-** According to this result, Majority of the companies are using Iterative approaches that include Agile (Scrum/Kanban).

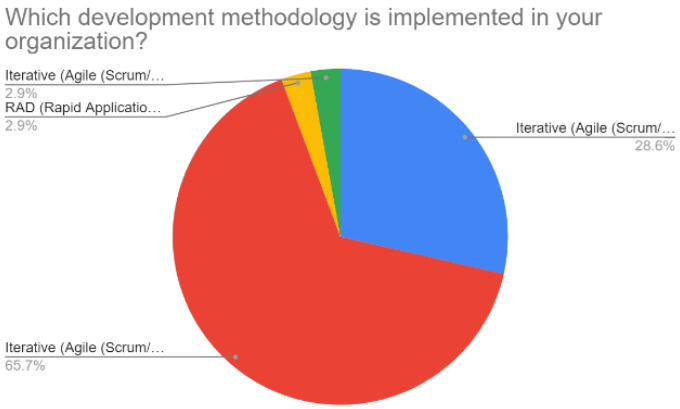



Fig. 4. Development methodology.

**RQ. 05-** More than 32% of the responders say that they always face requirement change issues.

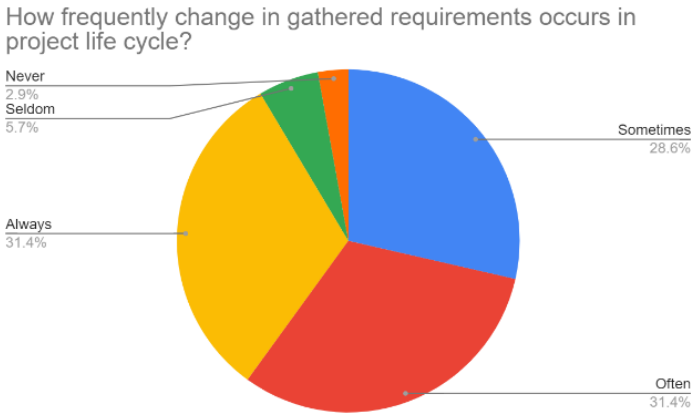
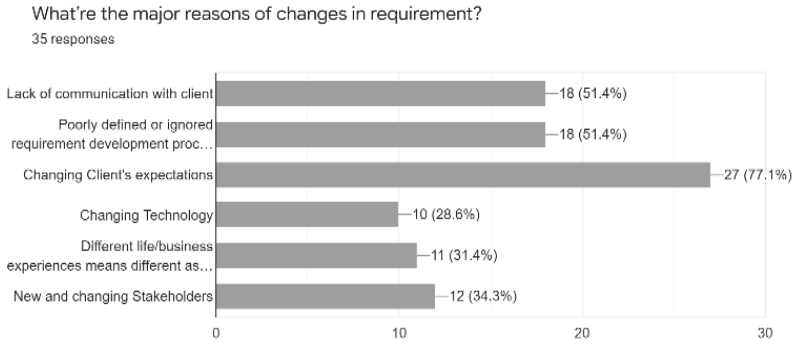



Fig. 5. Occurrences of Requirement change.

**RQ. 06-** More than 50% people thinks that change in requirements occurs due to lack of client communication. Also, more than 50% people thinks that time zone causes major hinderances in the RE processes.



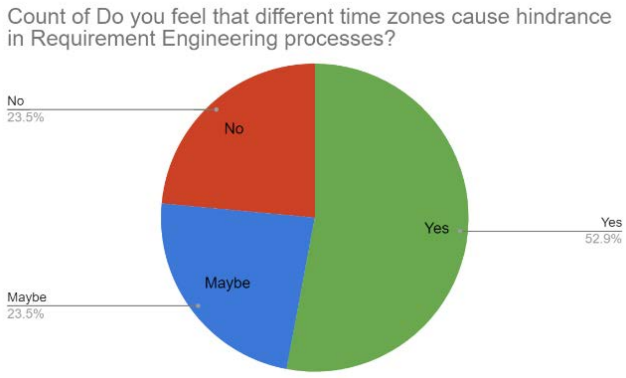



Fig. 6. Reason for Requirement change and hinderances due to RE processes

Also, we asked about the frequency of communication with remote teams. Around 50% of the people meet with their client once a week.

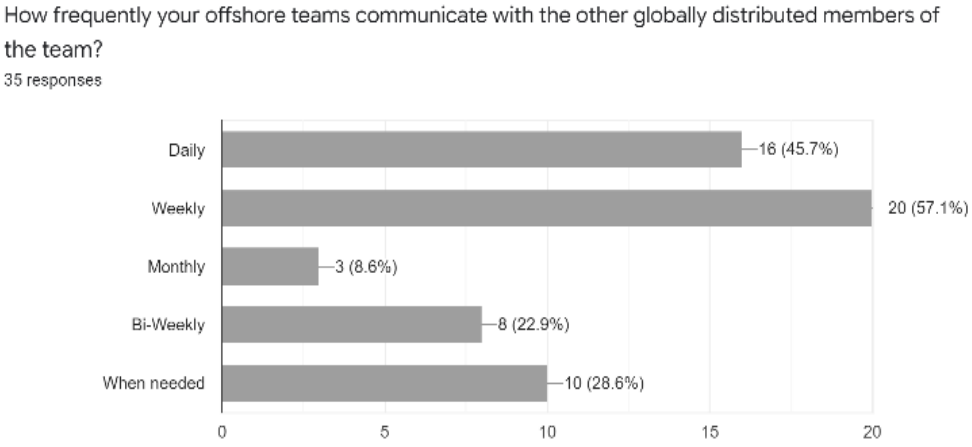



Fig. 7. Communication with Offshore team.

## 5. Conclusion & Future Work

Our research examined the Hindrances faced in Requirement engineering processes by the Global Software Development team and highlighted some of the major issues that cause the hindrances [21-27]. As we know the concept of GSD is widely used by most organizations around the world but we see organizations are reluctant in introducing proper Requirement Engineering processes. As we know that the inaccurate requirements may cause major setbacks to the project and cause monetary and reputational damage to the company as well.

Global Software teams would need some time at the early stages in choosing and opting for the right tools. Project management tools like JIRA, Asana, or Trello can be used in tracking the requirements and version controlling tools to keep track of the code and documentation. The project planning documents should be kept in a centralized place that will also ensure that the whole team is on the same page. Also, the team should have weekly sync-up calls to share any updates, work status, or discuss any issue.

We proposed some of the best practices that can be adopted by the teams accordingly to avoid the hindrances in the requirement engineering while working with globally distributed teams.

Our future work will be based on gathering the practitioner's perspectives in resolving the hinderances caused during RE processes by global teams.

## References


[1] R. H. W. M. Nabiha Usmani, "Impediments to Requirement Engineering in Distributed Team," International Journal of Information Engineering and Electronic Business, vol. 9, no. 6, pp. 10-18, 2017.

[2] N. Ali, "A Method of requirements change management for global software development.," 2015.

[3] S. Gregory, "Requirements for the New Normal: Requirements Engineering in a Pandemic," IEEE Software, vol. 38, no. 2, pp. 15-18, March-April 2021.

[4] H. H. Khan, "Risk Generating Situations of Requirement Engineering in Global Software Development," Second International Conference on Informatics Engineering & Information Science, pp. 221-233.

[5] S. N. Kumari, "A survey on global requirements elicitation issues and proposed research framework," ware Engineering and Service Science 4th IEEE International Conference, pp. 554-557.

[6] W. M. Muhammad Jawed, "Agile development of e-commerce portals," 2017.

[7] J. H. a. A. Mockus, "An Empirical Study of Speed and Communication in Globally-Distributed Software Development," IEEE, vol. 29, no. 3, 2003.

[8] N. N. a. T. Z. D. Lo, "How Practitioners Perceive the Relevance of Software Engineering Research," in Proc. 10th Joint Meeting Foundations of Software Eng. (ESEC/FSE 15), 2015.

[9] T. T. a. C. B. HANISCH J, "Exploring the cultural and social impacts on the rrquirements engineering processes highlighting some problems challenging virtual team relationships with clients," Journal of Systems and Information Technology , 2001.

[10] B. I. J. A. S. A. S. A. A. a. M. A. M. Shahzad, "Reliable Requirements Engineering Practices for COVID-19 Using Blockchain," no. 12.

[11] J. S. N. A. A. B. June M. Verner, "Guidelines for industrially-based multiple case studies in software engineering," in Research Challenges in Information Science, RCIS 2009, 2009.

[12] R. L. Naveed Ali, "Managing Requirements Change in Global Software".

[13] S. R. S. M. G. Waqas Mahmood, "The Emerging Role of Academia in SQA," International Journal of Engineering and Manufacturing, vol. 11, pp. 28-34, 2021.

[14] P. R. M. H. M. C. O. B. R. a. A. W. C. Wohlin, "Experimentation in Software Engineering," Springer, 2012.

[15] C. Wohlin, "Software Engineering Research Under the Lamppost," ICSOFT 2013, 2013.

[16] Yadav, R. and Pathak, G.S. (2016) Young Consumers' Intention towards Buying Green Products in a Developing Nation: Extending the Theory of Planned Behavior. Journal of Cleaner Production, 135, 732-739.

[17] N. J. a. D. M. O. Dieste, "Software Industry Experiments: A Systematic Literature Review," in Proceedings of the 1st International Workshop on Conducting Empirical Studies in Industry, Madrid, 2013.

[18] A. Senchenko, "The Future Is Here: Top Software Testing Trends 2020," [Online]. Available: https://www.qamadness.com/the-future-is-here-top-software-testing-trends-2020/. [Accessed 10 Jan 2021].

[19] J. H. &. B. Corbitt, "Impediments to requirements engineering during global software development," European Journal of Information Systems, pp. 793-805, 2017.

[20] A. M. Layla Hasan, "A comparison of usability evaluation methods for evaluating e-commerce websites," Behaviour & Information Technology, vol. 31, no. 7, pp. 707-737, 2011.

[21] R. F. Viktoria Stray, "A Global View on the Hard Skills and Testing Tools in Software Testing," in ACM/IEEE 14th International Conference on Global Software Engineering (ICGSE), May 2019.

[22] D. Sjoeberg, J. Hannay, O. Hansen, V. Kampenes, A. Karahasanovic, N.-K. Liborg and A. Rekdal, "A survey of controlled experiments in software engineering," 03 October 2005. [Online]. Available: https://ieeexplore.ieee.org/document/1514443. [Accessed Dec 2020].

[23] S. Thilakasiri, "Advantages and Disadvantages of Heuristics," 10 02 2014. [Online]. Available: http://blog.sameerast.com/2014/02/advantages-and- disadvantages-of-heuristics/.

[24] C. R. P. H. M. O. M. R. B. W. A. Wohlin, "Experimentation in Software Engineering," Springer, 2012.

[25]S. M. S. M. H. Johan Lin˚aker, Guidelines for Conducting Surveys in Software, Sweden: Software Engineering Research Group, June, 2015.

[26] K. P. Paloli Mohammed Shareef, "Software Quality Assurance (SQA): Current and Emerging Trends," International Journal on Intelligent Electronic Systems ISSN 0973-9238, p. 5, 2007.

[27] V. S. Raluca Florea, "The skills that employers look for in software testers," Software Quality Journal (2019) Springer Science, Business Media, LLC, August 2019.


## Authors' Profiles

**Waqas Mahmood** has done Masters in Economics and Finance from Institute of Business Management (IoBM), in 2012. He also holds a degree of Masters in Software Project Management from National University of Computer & Emerging Sciences - FAST. He has also completed M. Engg from Hamdard University and M.E from NED University, Karachi. His Bachelor's was completed in 1998 from Sir Syed University of Engineering & Technology, Karachi. He is currently working as Joint Director in State Bank of Pakistan since January 2008. In IBA, he's serving as visiting faculty for last 10 years.

**Syed Shaharyar Rizvi** is a Tech-Functional Consultant by Profession currently working at InfoTech Group. He got his BS degree in Computer Sciences from DSU, Karachi and is currently perusing MS Degree for the IBA, Karachi.

**Siraj Munir** is a Senior Test Automation Engineer by Profession currently working at 10 Pearls. He got his BS degree in Computer Sciences from DSU, Karachi and is currently perusing MS Degree for the IBA, Karachi.

**How to cite this paper:** Waqas Mahmood, Syed Shaharyar Rizvi, Siraj Munir, " Hindrance to Requirements Engineering During Software Development with Globally Distributed Teams", International Journal of Information Engineering and Electronic Business(IJIEEB), Vol.14, No.2, pp. 39-46, 2022. DOI: 10.5815/ijieeb.2022.02.03