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Challenges When Using Scrum in Globally Distributed Teams

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Challenges When Using Scrum in Globally Distributed Teams

Sweta Shah

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Harrisburg University of Science & Technology

1. Abstract

The interest of companies towards using agile approaches in GSD projects is growing at a rapid pace. On that note, it is extremely vital to consider the challenging factors involved in agile practices such as scrum in GSD projects. However, the remarkable and effective attempts towards precisely identify, synthesize and report the literature on agile practices for GSD projects have always been inadequate (Hossain, AliBabar & Young Paik, 2009).

With the purpose of encouraging research committee to explore and analyze the projects that implements scrum process in globally distributed environment, the thesis paper places great emphasis on challenges involved with the implementation of agile methodologies with scrum framework in Global Software Development. In order to thoroughly understand these challenges, the thesis paper also addresses the core characteristics of a scrum team, benefits of scrum framework and the nature of Global Software Development projects.

Moreover, through the qualitative data collection approach the mythology section of this thesis will in designing the further sections of this thesis. In accordance with the selected data collection approach, the result section focuses on the communication challenges as well as gathers the bunch of information through the interviews of two professionals working in the scrum projects with GSD settings. Going forward, the discussion section talks about the lessons learned and solutions to alleviate the challenges associated with distributed scrum projects.

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2. Introduction

The interest of organizations towards implementing agile practices is growing rapidly these days. In such an environment of the great amount of research on technology and project management, it becomes very crucial for the organization to select appropriate methodology and approach for their projects in order to increase productivity and achieve their goals in a timely manner. With the correct implementation of agile methodology, an organization can attain success towards managing their project with the prime consideration of time, budget, and scope.

The thesis paper focuses on the challenges involved when the implementation of scrum approach in Global Software Development projects. The research paper will portray the core characteristics of global software development projects and the nature of scrum team and approach based on agile manifestos. The paper has placed great emphasis on available researches conducted on agile methodology and its approach such as scrum. This will help to thoroughly understand the risk factors associated with the use of scrum approach for globally distributed teams. Furthermore, the paper states that implementation of scrum approach can be feasible for the projects with small and internally co-located teams but for the projects with large scale and globally distributed teams. Currently, for the organizations that support and embrace the concept of global software development projects, overcome the challenges involved with scrum implementation is the prime point of concern. This paper will foster agile practitioners and professionals working for GSD projects to research more effectively in the area of challenges and their solutions to make scrum be addressed as a viable approach for global software development projects.

3. Statement of Problem

The prime objective of this thesis is to investigate the challenges involved when using scrum framework in globally distributed teams.

Below are the questions that are raised to analyze the scrum implementation in globally distributed teams.

- a) What type of challenges are involved when using scrum in distributed teams?
- b) What are the effective solutions to overcome the challenges when using scrum in globally distributed teams?
- c) Can scrum be an apt framework to implement for globally distributed environment.

4. Definition of Technical Terms

4.1 Scrum: Scrum is an iterative and incremental agile software development framework for managing products.

4.2 Distributed Teams: it is defined as team members working on a same project from the different physical locations.

4.3 Agile Software Development: It refers to a group of software development methodologies based on iterative development, in which requirements and solutions evolve through the teams with the characteristics of collaboration, self-organization and cross-functional.

5. Justification

During past few years, the software developmental methodologies have been thriving with a rapid pace in order to manage the fast development process and constant increase of end user demands (Abrahamsson, 2008) and (Salo O. , 2008). On that note, the pattern of early and frequent release makes scrum a suitable approach for implementing in the software development process. The significant number of industries recommend the adoption of agile methodology with scrum framework due to the high success rate in projects. However, the challenges involved in the adoption of scrum framework are being less considered. Although, increasing the popularity of scrum framework, less than 5% studies provide scientific valid evidence that address the scrum framework T .Dyba and T .Dinsoyr (2008). Since globally distributed teams work from the different geographic locations, the disparities like language, time-zone, culture and social behavior give rise to the big challenge of collaboration which eventually produces technical challenges in scrum implementation. Below are the objectives that create the requirement for the thorough exploration of the topic like scrum process in globally distributed teams.

- a. To encourage scrum practitioners for emphasizing on scrum implementation in distributed teams.
- b. To help the research community in the process to analyze challenges in scrum adoption with globally distributed teams.
- c. To come up with the effective solutions to alleviate general and technical challenges involved in the combination of the scrum process with globally distributed teams.

The objectives mentioned above justify the analysis done in this thesis paper. The paper focuses on general and technical challenges involved in scrum implementation when the software development teams work on the same project yet from the different nations and geographic locations.

6. Literature Review

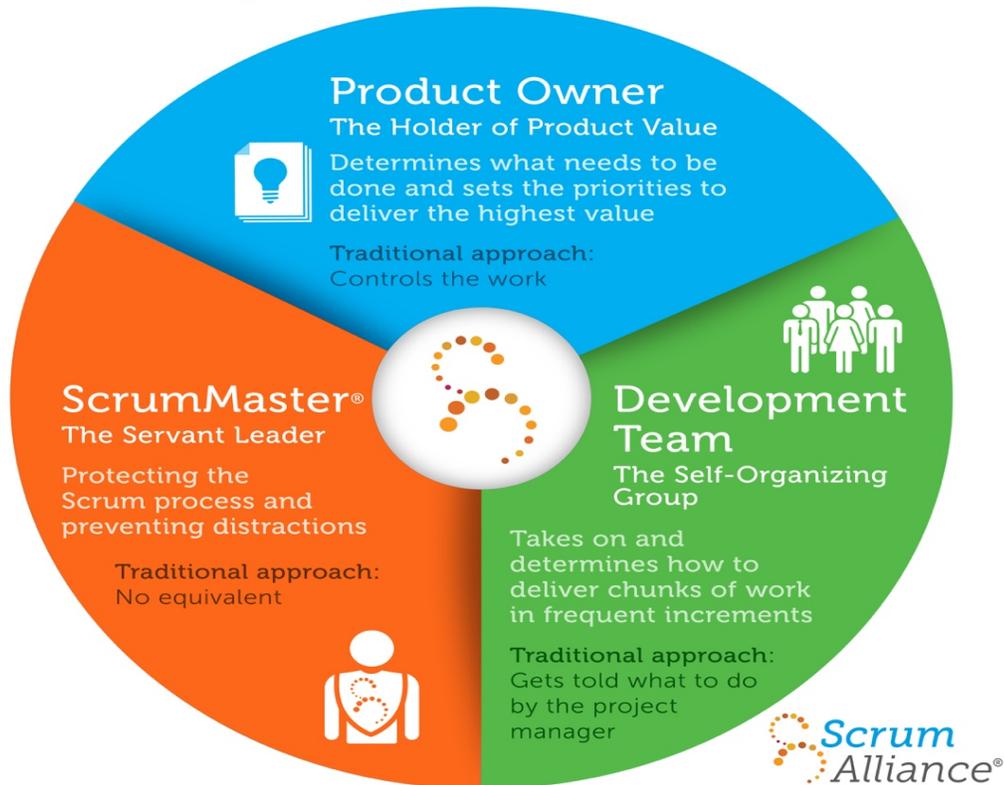
In the current era of rapidly emerging software development methodologies, there are several research articles available in the industry that address the implementation of agile software development methodology with scrum framework when teams are small and co-located. Also there has been a number of research articles that exhibit the advantages of using scrum approach in the small and co-located teams. On that note, the demand of agile methods such as scrum is apparently growing with a persistent pace. However, there are very few studies and research articles that focus on the implementation of scrum framework in globally distributed environment and also the research articles that place great emphasis on challenges faced during the use of scrum framework in the teams located at different geographic locations. This thesis paper addresses some socio-cultural, geographical location and time zone related challenges as well as scrum process related challenges. In order to thoroughly explain this challenges, it is very important to understand the nature of globally distributed teams and scrum framework including scrum roles and scrum artifacts.

6.1 Scrum Framework: It is defined as an iterative and incremental agile software development framework for managing product development. The scrum framework follows regular and repeatable cycle recognized as sprint or iteration. The product in scrum gets divided into small chunks and then released at frequent intervals. The scrum team involves the Scrum Master, Product Owner, and Development Team including Scrum Developers, DBA, BA, and Test Engineers to facilitate this process and produce the results. The Scrum Team holds certain characteristics which are vital in delivering the desired project results. The characteristics of

being Self-organized, Cross-functional, Empowered, Focused, Collaborated, Honest, Quality-driven help Scrum team to manage the scrum process with fewer hurdles. Since Scrum is an Agile framework, and hence, is consistent with agile manifestos such as a) Individuals and interaction over process and tools, b) Customer collaboration over contract negotiation, c) Working software over the comprehensive document, and d) Responding to change over following the plan. These manifestos support organizations to accomplish their projects with high feasibility as well as within timely manner (Schwaber, 2007).

The below image describes the duties and importance of the scrum roles.

Scrum Roles: A different way of thinking, a better way to drive success
 Scrum roles differ from traditional project roles.
 By collaborating, a Scrum team delivers more business value, faster.



[Figure-1 Scrum Roles and Responsibilities]

Source: <https://www.scrumalliance.org/agile-resources/scrum-roles-demystified> (Scrum Roles Demystified)

6.2 Global Software Development/Distributed Teams: The Global Software Development process comprises several teams or groups in which skilled employees are located in distinct areas of the globe. The term Global Software Development also defined as expanding a project from certain work setting or office to distributed teams or locations. Obtaining the common understanding of the project is one of the essential requirements of GSD or environment with distributed teams (Gabriela Aranda, Aurora Vizceino, & Mario Piattini, 2010).



[Figure-2 Distributed Teams]

Source: <http://www.optimusinfo.com/blog/> (Key aspects of Software Development Outsourcing life cycle)

6.3 Scrum Implementation within GSD/Distributed Team Environment: By implementing agile/scrum practices for global software development projects organizations can leverage the combined benefit of both Scrum approach and GSD environment. However, project stakeholder distribution in GSD may emanate some challenges which include communication barriers, lack of collaboration, temporal, geographical and socio-cultural differences and process related issues (Hossain, 2009).

The primary objective of agile software development processes was to develop the internet-based services and to deploy those services in a timely manner. An agile framework such as scrum, utilize technical and managerial processes to adapt and calibrate a) changes derived from experiences gained during development, b) changes in software development and c) changes in the development environment with a constant pace (Dan Turk, p. 2014).

The Scrum practice is considered to be successful for co-located projects with small sized teams. On other hand GSD projects usually, consist of large teams with stakeholders located in different parts of the globe. Projects with distributed settings often face the challenges such as lack of trust, collaboration, communication and self-organization due to geographical, temporal and socio-cultural differences. In such cases of contrast combination, projects often fail to achieve the desired results and reach the ultimate goal (Baber, 2009).

Below are the challenges faced during the implementation of scrum process in distributed teams.

6.4 Challenge Faced During Scrum Meeting: In this meeting, the scrum master discusses the updates and future goals with the teams. In Scrum projects with distributed teams, face to face communication becomes rare during the daily scrum meetings. This type of scenario may give rise to communication gap which leads to failure in sharing common knowledge. These challenges promote Scrum master to take the stand of the entire meeting rather conducting it in a collaborative way which does not fulfill the fundamental purpose the Scrum meeting (Marchenko, 2007).

6.5 Challenge Faced During Product Backlog: The product backlog is a sequential list of all the things that might be need in the product. It is a source of requirements for any changes to be applied on the product. It is product owner's responsibility to select the content of the product backlog and to prioritize the backlog. In distributed environment, teams often take more time to understand the change request due to lack of direct involvement with the end user/client. Also, for product owner it becomes difficult to prioritize the backlog items on which all teams get agree (Bass, p. 2013).

6.6 High Demand for Maintenance: Lack of mutual understanding among multiple teams generates the risk of low-quality product which induces constant demand for change and maintenance. The constant maintenance process impacts on productivity and team morale along with creating employee fatigue (Abrahamsson, 2008).

6.7 Over specialism: In scrum-based projects with distributed team settings, the vulnerability of over-specialism might arise. According to (Marchenko, p. 2007) few teams might consist of

over-specialized and experienced members who may create the challenge for other teams to have common reference points during the estimation and planning sessions. In such cases, team members with less experience become weak and slow to put their effort and convey their perspective during meetings due to team fear and technical inadequacies.

6.8 Over individualism: Sometimes scrum teams working on a same location ignores to follow frequent interaction and collaboration with the teams located at different location. The lack of effort to use high-tech conference tools and communication modes affects on the sprints which may cause delay or failure in the final outcome (Spector, P. E., 2012).

6.9 High Commitments: Since GSD comprises multiple teams for a single project, it may look easy and fast process due to large number of team members. However, due to time-zone disparities, differences in socio-cultural environment and behavior are the remarkable risk factors when using scrum in globally distributed teams (Glass, R. 2014).

6.10 Difficulty in Tracking Progress: Usually burnt-down charts help to track the coordinated efforts done by different teams. However, lack of interest and time zone differences in globally distributed teams restrict the need for tracking the progress with play cards (Gotel, O., & Kulkarni, V. 2010).

6.11 Management Interference: Sometimes with the mentality to track the up to date progress, management interferes too much with the team rather than allowing them to work with self-

organization and cross-functionality. This may arise the challenge of less productivity (Guzmán, J. G., Ramos, J. S.2010).

Several research articles have provided some effective solutions to alleviate the challenges observed and faced when using agile software development method such as scrum in globally distributed teams which will be explored in the discussion section of this paper.



7. Methodology

The qualitative data collection approach will be followed in order to accomplish this thesis paper. Since there has been an involvement of various types of challenges observed during the scrum implementation in distributed teams and therefore, the qualitative approach is an apt way to gather information for conducting the further thesis followed by results, discussion and conclusion section.

7.1 Qualitative Data Collection Approach

The qualitative data collection method includes document review, personal observation and profound interviews. These sources can be helpful in order to select the data that support the thesis content including literature review, problem statement, findings, results and conclusion. In some cases, the researcher collects the data from all the three sources in order to evaluate the findings and check the authenticity of the results achieved from the data.

Document review involves in-depth study of the literature papers, articles, and journals that help the researcher to conduct the study with more authenticity and to come up with adequate and functional solution. Since this type of data collection method provides evidence stated from the highly experienced community, it is recognized to be an extremely authentic approach of data collection.

Personal observation requires the researcher to spend most of the time in conducting field research which enables researcher to gather the knowledge and data for the related work and domain.

7.2 Method-1: For this particular section, the approach includes the review and comprehensive study of total five literature papers/scholarly articles that accurately focus on the communication challenges faced by the organizations during the scrum implementation with globally distributed team settings. The reviewed papers will help to provide the insight of the communication-based challenges and their solutions when using scrum in the distributed environment. Through the findings and study of the literature reviews by various authors, the useful data would be accurately recorded in the form of notes to analyze and evaluate them for the result section of the thesis.

7.3 Why Qualitative Data Collection Approach

Qualitative data collection approach helps in providing data that is easily understandable. Moreover, compare to quantitative data collection, qualitative data collection is very flexible because of its light requirement of following no specific structure or standard. This allows an individual to study and conduct the research more accurately and thoroughly regardless of the types of the data. Also, the gathered data from the qualitative approach helps to generate the questions of the related work which eventually encourages an individual to create high-end focus towards finding the key solution to the problems or challenges.

7.4 Method-2: Since this paper focuses on all types of challenges when using scrum in distributed teams, there has been a requirement of not only the papers and journals that convey information about communication challenges but the also need for interviews of the professionals who can share their experience and perspective on process-based and other

technical challenges faced during their day-to-day practice of scrum with globally distributed teams.

Interviews enable the researcher to gather the knowledge and data of the related field from the individual who has personally experienced and analyzed the issue/challenge of the research topic. This type of data collection can help in providing a number of solutions to alleviate or overcome the challenges of the related topic.

In order to accomplish further literature review including results and conclusion, questionnaire for the related work/topic has been prepared. As a part of qualitative data collection approach, the result section has been presented here based on the response received through the telephonic interview of 2 different professionals whose organizations follow agile as a software development life cycle with scrum framework for globally distributed projects.

7.5 Set of Questions

Interview Questions	
a.	How do you facilitate the scrum process when you have globally distributed teams?
b.	What kind of challenges do you experience when using scrum in globally distributed projects?

c.	Based on your work experience, which element of the scrum process you believe more challenging than any other elements?
d.	What actions do you take to overcome communication issues when you have distributed teams?
e.	How do you decide the length of iteration when teams are globally distributed?
f.	Do you experience any issue while delivering the product when your teams are located at different geographical location and with different time zones as well?
g.	Scrum teams have usual characteristics like honesty and quality driven. Have you ever experienced or observed the scenario where these key characteristics of scrum teams get compromised due to globally distributed teams?
h.	Out of scrum teams, product owner and scrum master, who do you think plays a key role in overcoming the issues and challenges faced during scrum implementation with globally distributed teams?
i.	Can proper training help to manage issues and improve scrum process while having distributed teams?

j.	What other solutions do you have or you think that can help to alleviate challenges associated with scrum implementation especially with globally distributed teams?
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8. Results

The result section of this thesis is divided into two different sections. As mentioned in the methodology section of this paper, the qualitative data collection approach includes review of papers, journals, articles, personal observation and in-depth interviews. To thoroughly follow the selected data collection approach, the result section will explore/discuss **Section-A)** Review and profound study of the literature papers and journal that particularly focus on the communication challenges associated with the Scrum implementation in the global software development projects, and **Section-B)** will portray the real life experience of two different professionals working in scrum project with globally distributed team environment.

8.1 Section-A

The Section-A of results places great emphasis on qualitative data collection method which covers review and profound study of papers and journals in this section. Several literature papers and journals have been reviewed and studied thoroughly in order to focus the issues and challenges involved in scrum practice with globally distributed teams.

A number of literature papers focus on the challenges and issues in global software development and scrum projects. Most studies state that the challenges get produced because of the language, geographical, temporal, and socio-cultural diversities and distance. These factors eventually impact on communication, team coordination, and the control process of software projects (Fitzgarld, 2006).

Lack of Face-to-Face Communication: Projects with distributed team settings face the challenge of communication because of the prime reason of lack of face-to-face meetings. Without having an opportunity to meet the distant team members in person, it becomes difficult to create collaborative environment as well as to establish the bonding of trust and respects between team members. Moreover, differences in language becomes remarkable barrier in communication (Modi, S., Abbott, P., & Counsell, S., 2012).

Lack of Opportunity to Synchronous Communication: In global software development the projects have their teams located at the distant geographical area of the globe. In this case, teams often come across the significant difference in time zone which impairs the synchronization of their regular meetings and conferences. The situation like this may impact the schedule of the delivery cycle and entire project as well (Modi, S., Abbott, P., & Counsell, S., 2012).

Cultural Misunderstanding: Since the teams are distributed in the distinct area of the globe, cultural, social and professional differences can cause great effect on the communication and behavior with leaving the major risk of inadequate and less quality product. It affects the smooth flow of knowledge spread and information which give rise to the issues and inadequacies in common understanding and knowledge of the project and its related tasks (Modi, S., Abbott, P., & Counsell, S., 2012).

Lack of Effective Communication Tools: In many projects, the communication gets affected by the lack of effective communication tools. This situation involves a number of factors that may impact the communication such as, proper use of communication tools, fluctuation in

network and weak band-width, and availability of different modes of effective communication in case of disconnection of a particular tool (Marchenko, 2007).

8.2 Section-B

The Section-B of the thesis results includes interviews of two professionals working in scrum environment with globally distributed teams. Based on the interview questions and response from the scrum professional the thesis will able to convey few important aspects such as scrum process in the real world, challenges involved with scrum implementation, scrum practice with globally distributed teams, importance of scrum roles and solution to alleviate cardinal challenges with the successful facilitation of the scrum process.

The interviews and their responses given in this section portrays telephonic conversation. Out of two different interviews, one includes the responses from the professional working as a Scrum master in global software development project. The second interview described in this section talks about the Scrum Business Analyst's experience with the global software development projects.

Both the interviews and their responses will help Scrum and GSD professionals to compare and evaluate their experiences as well as it will provide the set of real world experience, challenges and their solutions in order to overcome the issues associated with the combination of scrum and global software development.

8.3 Interviews

How do you facilitate the scrum process when you have globally distributed teams?	
Scrum Master	Business Analyst
<p>It requires robust planning in order to implement scrum when you have teams that are located in different geographical locations. In such an environment, it is quite important to thoroughly understand the client’s requirement as well as the process requirement for the high-quality product or end result. We have two different teams working on the same project from the sites located at New Jersey, USA, and Bangalore, India. In order to facilitate entire scrum process, we had set up first two iterations of the project to finalize the critical requirements which helped us to form the architecture of the projects. Once the framework was set up, it became quite straightforward for everyone to work in a determined flow.</p>	<p>Facilitation of scrum process is not really easy task when the project has globally distributed teams. We have one of our teams working from Harrisburg, USA and other team working from Mumbai, India. We follow regular scrum meeting through which we discuss our work updates and further tasks. In order to collaborate with Mumbai team, we use communication platforms such as skype and IM. In order to manage iterations, we make sure the length of the iteration first to synchronize in an appropriate manner with another team so that tasks get accomplished within a determined time.</p>

<p>What kind of challenges do you experience when using scrum in globally distributed projects?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>The challenges always depend upon the teams you work with as well as the type of project and requirements you have for the client. However, lack of communication and collaboration are the critical challenges being faced during the implementation of the scrum framework in a globally distributed environment. Lack of communication and collaboration often give rise to other challenges in all the crucial aspects of project management including planning, execution, control and monitoring and closing with lessons learned. Particularly in a scrum framework communication and collaboration</p>	<p>In order to facilitate scrum process with global distributed team environment, effective communication plays a key role. However, sometimes lack of high communication bandwidth and weak or unreliable network support directly impact on development life cycle. Moreover, deficiency in sharing common knowledge arises many challenges while work prioritization as well as at the further level of work execution.</p>

<p>challenges directly impact on the process of successful iteration, duration and prime goal of the project.</p>	
<p>Based on your work experience, which element of the scrum process you believe more challenging than any other elements?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>In order to implement successful scrum process, it is quite important to have a thorough knowledge of agile characteristics, manifestos, and scrum roles. When each team member shares equal awareness of the process, it becomes easy to execute the work and accomplish it with determined goals. On that note, as a scrum master, I believe that sprint planning is the most challenging element of the scrum process when you have globally distributed teams.</p>	<p>The key success factor in scrum implementation is to have a team that commit to work and deliver the product within a determined time box. Due to lack of collaboration in distributed environment, managing backlog is always a difficult task or element that a team faces during the scrum implementation. lack of clarity in defining tasks and duration can affect the successful backlog management process. So I believe that, projects with distributed teams should always consider the backlog management process with individual supervision.</p>

<p>What actions do you take to overcome communication issues when you have distributed teams?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>Since effective communication is the cardinal requirement of the project while having globally distributed teams, it is very important to properly deal with communication related issues. In order to overcome the communication challenges, we have set shifts style work hours for our team in India so that it becomes easy to match time zone related issues first. This patten eventually helps to cut off communication gap between two teams. Secondly, we have set up multiple platforms in order to support instant communication. We use IM, Skype, Adobe connect and google hangout to connect with our teams instantly. Moreover, for short messages and</p>	<p>Communication issues are always there especially when the project has globally distributed teams. We too come across this communication issues and challenges, however, we ensure trust and mutual respect with our team members as well as with other team members. Regular tele conferences and video conferences help us to build trust and overcome the communication gaps between teams. Since we have large time zone differences due to teams located in two different countries, we always pay thorough attention to each team member’s view point and request during audio and video conferences. This way we not only respect team members but their quality time as</p>

<p>plan related team communication, we use WhatsApp group talk. This is how we manage the communication challenge.</p>	<p>well. This is how we manage communication issues with globally distributed team while scrum implementation.</p>
<p>How do you decide the length of iteration when teams are globally distributed?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>In order to plan and decide the length, collaboration is the crucial characteristic which should be followed by each team member with enough time and explicitly. As I said that we use different modes of communication through which we collaborate with the other team to discuss the work, to divide the work into small chunks and distribute them according to team's skill set and to prioritize the work. Collaboration through daily scrum meeting helps us to get aware of each team member's capability and availability to accomplish the determined task. Then ultimately, based on each team</p>	<p>When teams are globally distributed, the biggest challenge that project face is deciding the length of iteration. Iteration length always depends upon the project type as well as on the end product. We prioritize the the backlogs and distribute the work according to skill set of our teams. Each team member come up with their view points and based on those perspective we manage to set iteration length which match with the workability and availability of each team member.</p>

<p>member’s workability and availability for particular task we diced the length of iteration. Moreover, place great emphasis on priority of the particular element of the work. For that, we always use to keep buffer time in our iteration which helps us to provide the product which matches client’s time, budget and quality as well.</p>	
<p>Have you ever experienced any issue while delivering the product when your teams are located at the different geographical location and with different time zones as well?</p>	
<p>Scrum master</p>	<p>Business Analyst</p>
<p>We usually keep the buffer time in each iteration so that we can get enough time to overcome challenges if we have any. However, sometimes things may not fall in an appropriate manner, and we have to face</p>	<p>Product delivery again correlates to team collaboration. Having decent team collaboration support teams to maintain the continuity of work. In many cases, our team fails to collaborate and communicate properly which</p>

<p>some difficulties too. Once we had to face a major issue because there was a communication gap between two teams and the length of the iteration was misunderstood by one of our teams. This scenario created many problems in the process to accomplish our delivery cycle within the determined time. Eventually, the skills of our teams like cross functionality and self-organization helped us to overcome this issue.</p>	<p>may arise the risk of synchronization in product delivery process. Moreover, due to time zone differences, it becomes difficult to get each and every member of the team available to the date of product delivery. We try our best to prevent and overcome such issues by considering effective communication as the prime requirement of our job.</p>
<p>Scrum teams hold the usual characteristics of being honest and quality driven. Have you ever experienced or observed the scenario where these essential components of Scrum teams get compromised due to globally distributed teams?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>Yes, although being honest and quality driven are the essential characteristics of the scrum team, many times team member fails to follow these aspects in an appropriate manner.</p>	<p>Scrum team holds the characteristic of being honest and quality driven. However, these qualities often get compromised particularly when the project has globally distributed teams.</p>

<p>We have teams working in two different countries and because of which we often face cultural and behavioral issues. Many times the environmental, professional and cultural differences give rise to team problems and constraints which prompt employees to make excuses that are not quite reasonable.</p>	<p>Although having strong teams that are well aware of scrum technicalities, some factors like global differences, sociocultural differences, time zone disparities and work environment differences may impact on the software development life cycle. These differences also give rise to team conflicts, productivity, and dishonesty.</p>
<p>Based on your experience who do you think plays a key role in overcoming the issues and challenges faced during scrum implementation with globally distributed teams?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>The Scrum framework is designed in such a way that each team member has his/her particular duty to perform. Every single member of the team has to provide his/her remarkable contribution. It is product owner's responsibility to convey the high-end vision to the team so that scrum team can prioritize the tasks to achieve the project goal. Scrum</p>	<p>Scrum is a framework where all team members provide an equal contribution. However, I believe that scrum master works as a key person who thoroughly helps the Scrum team to overcome the issues and challenges mainly encountered in global software development projects. Scrum Master is a role that handles entire scrum team with a quite effective</p>

<p>master facilitates the entire scrum process whereas Scrum team rigorously works on determined tasks so they can provide the quality outcome/product within fixed timeline and budget. So the whole process gets accomplished by a team work rather than a single effort.</p>	<p>facilitation of the scrum process. Moreover, he/she is the key person who coordinates with both Scrum team and the product owner to meet all the requirements from the client's end.</p>
<p>Can proper training help the process of managing issues and sometimes improving scrum practice when the project has globally distributed teams?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>Team training is one of the key success factors to facilitate the Scrum process. A Certain level of scrum seminars, certified courses, and learning sessions help organizations to manage the scrum artifacts with more efficient and quick manner. Moreover, with the aid of some mandatory training programs, it becomes easier to share same knowledge among both offshore and</p>	<p>Yes, definitely. Working as a Scrum business analyst for past three years I too believe that Scrum training provides the useful knowledge that one can not attain through having work experience only.</p>

<p>onshore teams.</p>	
<p>What other solutions do you have or you think that can help to alleviate challenges associated with Scrum implementation especially with globally distributed teams?</p>	
<p>Scrum Master</p>	<p>Business Analyst</p>
<p>Sharing same knowledge and information among other team members, time management, explicitly, understanding the importance of employee fatigue and leisure time, proper prioritization and buffer time can help to alleviate challenges associated with Scrum implementation especially with globally distribute team environment.</p>	<p>Proper training Shift work practice Seminars Effective communication Team Respect.</p>

9. Discussion

This thesis presents challenges associated with Scrum implementation in global software development projects. Along with focusing on challenges and limitations, the paper also considers the essential characteristics of the Scrum team and nature of global software development projects which establish the remarkable set of lessons learned. The lessons learned discussed in this section will provide aid to IT professional and organizations to efficiently embark on Scrum implementation with GSD projects or distributed teams.

The discussion section of this paper also talks about some solutions to effectively overcome the challenges observed while selecting the combination of Scrum and GSD/distributed teams. The solutions discussed in this section will contribute the necessary guideline on how to smoothly navigate the projects with distributed scrum by preventing challenges or getting minimal exposure to those problems so that it becomes easy to overcome them without letting them impacted on the product development and end product itself.

Lessons learned can be derived from the in-depth analysis of the project, and events and challenges face during the project. The exact set of lessons learned can help similar types of projects to overcome the issues at particular stages of software development life cycle. Moreover, the consideration of experience gained in the early stage of project development can prevent the challenges which help management to drive development process within time and budget. They also assist organizations and higher management in designing the robust structure of the set of solutions to alleviate the challenges (Youker, R. 1999).

From the thorough analysis of issues and challenges considered in the literature papers and journals, the discussion section will explore the set of lessons learned to support future projects with distributed Scrum.

9.1 Lessons Learned

The Improper and inadequate transition from traditional/waterfall to agile/scrum methodology may produce high risk in the project. Organization's prime objective for opting agile methodologies such as Scrum is to increase the transparency of both development process and the product which is vital while having distributed teams (Scarff, C., Gotel, O., & Kulkarni, V., 2010).

It is imperative for organizations to realize and determine exactly at which level the adoption process of agile methodology should be taken place. Some organizations embark on their agile adoption at team level first and then makes entire R&D system to respond in agreement with immediate customer requirement and iterative development process. Also, when projects have globally distributed teams and the adoption of the agile methodology are limited to individual teams only, it becomes difficult to coordinate with other teams due to differences in the process.

Moreover, the transition process from traditional/waterfall to agile/scrum methodology requires a profound introduction of agile practices into the organizations along with placing great emphasis on features rather than components. There has been a requirement of a product management unit that works with team collaboration, deep involvement and with the proactive manner to manage customers and their constant change requests. Ignorance and inadequacies in the proper

transition process towards agile/scrum can directly impact on the end product by leaving its adverse events project scope, goal, time and budget (Olsson, H. H., Alahyari, H., & Bosch, J. 2012).

Lack of coordination between central and distant teams directly impacts on product delivery cycles eventually affecting the relationship of organizations with the end clients. Many studies suggest the need for organizations to focus on activities that support team collaboration. Coordination between both central and distant teams is one of the essential requirements of distributed scrum framework and its facilitation. The bonding between teams and sense of trust enhance the scrum team characteristics such as being cross-functional, self-organized and empowered. Lack of coordination restricts team communication, the chain of shared knowledge and scrum ceremonies like scrum meeting, retrospection, and product backlog meeting. In such cases initialization of all teams to coordinate and communicate with knowledge sharing and process, facilitation becomes essential for the projects and organizations (Gotel, O., Kulkarni, V., Scharff, C., & Neak, L. 2008).

Over commitment with the client results in the low quality product, work overload and employee fatigue. In scrum projects with globally distributed team settings, the number of employees is always higher as compare to projects with co-located team environment. The upper management often considers the number of teams and staff only rather than focusing on the priority and importance of the work or changes requested by the client. The management sometimes over commits with client and teams have to manage with the product backlogs prioritized by the product owner. The over commitment induces employees to follow over time which eventually impacts on the quality of the end product. Also, overtime give rise to employee

fatigue which is considered as high risk to the project. In order to accomplish the determined tasks, it is crucial for organizations to avoid over commitments so that scrum traits like transparency in work and honesty with the client never get affected along with project delivery cycles and relationship with the customer (Dybå, T., Maiden, N., & Glass, R. 2014).

Some employee's style of working individually for the same projects may create the negative effects on the team members as well as on the team activities. Agile methodology and its framework such as Scrum promotes team collaboration and effective communication between among team members. All the ceremonies of Scrum framework are designed in such a way that encourages teams to work with reciprocity and trustworthy environment. In such a case, employee's individual approach towards work accomplishment affects the pace of work. Moreover, individualism disrupts the clear flow of knowledge share by leaving negative effects on other team members. As an important lessons learned, over individualism should be strictly avoided within the team to encourage team work (Yang, L. Q., 2012).

9.2 Solutions

Along with placing great emphasis on lessons learned, the discussion section will also provide the set of basic solutions to overcome or prevent the challenges associated with scrum implementation in global software development projects or distributed team settings. The key solutions explored in this section will foster agile/scrums practitioners and GSD professional to work with ease in distributed scrum settings. Moreover, they will encourage organizations to adopt agile methodologies like scrum approach as a viable option especially in the projects with globally distributed teams.

Agile Coaching

In virtual or distributed teams, interdependence and high level of collaboration play major role in making projects successful. On the other hand, through encouraging collaboration and trustworthy environment among team members, the software development life cycle like agile/scrum framework can support projects to achieve the prime goal along with determined time, scope, and budget. However, for organizations it becomes essential to introduce their employees to the agile/scrum team characteristics, framework, artifacts and ceremonies as well as to the nature of global software development projects. Hiring an agile coach is the wise and apt option because of his/her help to the organizations in the transitioning process towards agile/scrum from the waterfall/traditional ones (Moe, N. B., Cruzes, D. S., Dybå, T., & Engebretsen, E. 2015).

Delivery Synchronization

Some projects face problems with the delivery cycles with different lengths due to distributed team settings. This give rise to the use of long iteration and eventually the delay.

Solution: In any GSD project that implements iterative and incremental development, the length of iteration or cycle should be same for all the teams. To make this happen team-to-team synchronization is very important (Senapathi, M., & Srinivasan, A. 2013).

Communication Problems



Some of the projects observe difficulties in communicating with their teams from the different sites. Lack of interaction between teams and other stakeholders causes productivity issues in their projects.

Solution: Agile practices such as scrum encourages highly collaborative work culture. While it comes to implement effective communication in global software development and between globally distributed teams, organizations should utilize the efficient communication tools. Moreover, team members should conduct meetings and interaction on determined schedules. If needed, the teams should work in a proactive manner to spread the information in a correct and instant way with the right use of technology (Aranda, G. N., 2010).

Featured-Based Development

Some projects follow builds on weekly timeframe. However, customers demand for functionality testing on regular basis. In this case, codes affecting functionality are hard to get ready at the same time.

Solution: Such problems require cross functionality in the teams. The manager from the subcontractor team should take care that plan should be made on weekly basis to match with the customer's requirement. Also, the delivery of code on development phase should be regular and punctual (Guzmán, J. G., Ramos, J. S. 2010).

Behavioral Patterns

Sometimes projects observe that the implementing iterative and incremental development is not efficient and key solution to achieve the project goal with success.

Solution: For the successful outcome in global software development with a scrum implementation, characteristics of scrum framework as well as characteristics and nature of global software development projects should be synchronized in such a way that help to bring quality outcome (Neak, L. 2008).

Planning: Focusing on challenges described in this paper, for any GSD projects with the scrum practice, the critical success factor is Planning. Proper planning of project schedules, sprint length and work break down structure can help to prevent the consequences and reduce the chance of project failure (Rigby, D. K., Sutherland, J., & Takeuchi, H 2016).

Training: Since it is ongoing trend and demand of global software development in many industries, employees are well aware of the nature of GSD projects. However, working with new project management life cycle is altogether a different thing. In order to work in a new environment and life cycle, organizations should conduct the effective training sessions to make the process easy and understandable. Training in areas such as leadership, soft skill

improvement, agile life cycle methodologies, communication, behavior, project management can help employees to give their best possible outcome for the project.

Some general solutions include, standardization of work environment and pattern for GSD projects, effective requirement engineering with the use of technology and robust communication, frequent feedback, collaboration, brainstorming sessions and fun activities to reduce the work fatigue level, establishment of trust and honesty between team, client, customers and other stakeholders of the projects (Rigby, D. K., Sutherland, J., & Takeuchi, H 2016).

10. Conclusion

The thesis talks about a number of papers and literature reviews published on challenges when using scrum in projects with globally distributed teams. Including communication, challenges like team synchronization, maintenance of product backlog, over specialism, over individualism, management interference, high commitments, high demand of maintenance and much more have been thoroughly described in this thesis paper. Moreover, the thesis exhibits the interviews of real-life experienced professionals who work in Scrum project with globally distributed teams.

Through the literature papers, articles, and journals, the thesis states that the projects that implement agile software development life cycle and its framework such as Scrum along with having globally distributed teams may face countless amount of issues and challenges that directly impact on the project's determined goal. Eventually these challenges create their adverse effects on the project's scope, duration, budget, and product as well. However, the thesis brings the discussion to a conclusion that effective and proper transitioning process towards agile/scrum, robust teams selection, profound knowledge of scrum framework, awareness of global software development, effective communication, trustworthy environment, honest and explicit attitude towards the client, high-standard communication tools, transparency, respectful attitude towards other teams and their culture and environment can easily help scrum based projects to achieve their determined goals even when they have teams working from the different geographical locations.

The challenges discussed in this paper arises the research questions like, ‘Can scrum be an apt framework to implement with the globally distributed teams in the project?’

From the information gained through the review of multiple papers, journals and articles and to the best of my knowledge, I conclude that implementation of Agile framework such as Scrum can be apt and successful in the global software development projects or distributed team environment. However, accurate instrumentation of certain industrial and personal approaches is required to enhance the success factor involved in the combination of scrum and global software development.

The organizations that desire to obtain the combined benefit of scrum and GSD should be well aware of challenges associated with this combination. Moreover, the issues and challenges should be acknowledged carefully by the projects and higher management so that process for overcoming challenges becomes easy.

Moreover, building collaborative environment among team members, encouragement for spreading knowledge, through cultivating team’s interest towards gaining knowledge in the form of training, seminar and educational sessions, through evolving process-based and behavioral skill in employees to get adjust with the multi-cultural environments.

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