

KEY PRACTICES FOR AN EFFICIENT DEPLOYMENT OF GLOBALLY DISTRIBUTED SOFTWARE REQUIREMENTS DEVELOPMENT WORK (WIP)

Sameer Wadhwa

Infosys Technologies Limited
sameer_wadhwa01@infosys.com

Gaurav Pande

Infosys Technologies Limited
gaurav_pande02@infosys.com

ABSTRACT

Requirements phase is an integral part of software development lifecycle which involves understanding needs of the proposed software's end users. Like other phases of software development, the requirements phase is also witnessing an increasing trend of global distribution. However, requirements phase by itself is fraught with ambiguity and this issue gets further compounded due to the global distribution of this phase. Objective of this work is to identify key practices which can help a globally distributed requirements process to run efficiently. This Work-in-Progress paper studies difference between outputs of requirements phase of two projects to identify a consideration set of key practices which can impact the efficiency of a globally distributed requirements process. This work can form a basis for further detailed investigations by incorporating more projects from varying contexts and different control variables to arrive at a comprehensive set of key practices which can contribute to an efficient deployment of a globally distributed requirements development work.

Key Words :

Requirements development, Software development, Global Development Model, Globally Distributed Requirements, Requirements development tool

1. INTRODUCTION

Literature (Hersleb et al 2001) indicates that there is an irreversible trend of globalization being embraced by the software industry and new forms of collaboration and competition are coming forth to support this change. Factors such as access to global talent, reduction in elapsed time and overall cost have been the key drivers of this transition and the outcome of increasing globalization is manifested in several multi-site and globally distributed projects which are taking place in the software industry. (Carmel 1999; Iyengar 2004)

Requirements is an integral phase of software development which involves understanding needs of end users of the proposed software and communicating it to developers so that software can be developed according to the user needs. Requirements phase is a critical and a difficult phase of a software project and this complexity gets further exacerbated in a distributed software development environment. (Brooks 1987)

Previous work undertaken identifies the key factors which result in increase of difficulty in capturing requirements in a Globally Distributed Requirements (GDR) scenario. (Damian et al 2003; Hersleb et al 2001) However, there is a need to gather more evidence on key practices that make a GDR process to run efficiently in order to reap the benefits associated with the globally distributed work such as access to global talent pool, lower cost, lower elapsed time etc..

In this Work in Progress paper, we report comparative findings of two projects undertaken in a client - vendor environment. These findings highlight an initial set of key practices which can impact efficiency of a GDR process.

This paper begins by a description of the research methodology in Section 2. This is followed by a brief background of the two projects in Section 3. In Section 4, we highlight the differences in output of the two projects, there by identifying an efficiently run GDR process. Section 5 identifies a set of key practices which have resulted in the comparatively efficient GDR process based on the data collated from the two projects. Section 6 and 7 cover conclusions, limitations of existing work and suggested directions for further research for gathering more comprehensive information around the key practices.

In Project 2, another Line of Business with in the client organization was about to launch a new financial services product and it needed a new Commercial off the Shelf product (COTS2) to support operations of the new product. The project involved capturing detailed requirements for configuring and integrating the COTS2 product with the legacy environment of the client.

In both the projects, GDR process was adopted for capturing and defining the requirements. In this process, an initial elicitation and a high level definition of requirements was done by the onsite team of the vendor while the offshore team participated in detailing and documenting the requirements, as is shown in Figure 1. In both the cases, the client did not have a direct contact with the offshore team; and vendor's onsite team coordinated with the offshore team.⁴³

Project 1 had a peak team size of 9 resources during the requirements phase. In total, around 3800 person hours of effort was spent on detailed requirements. There were 5 resources in onsite and 4 resources in offshore and all of them were involved in detailing the requirements associated with Project 1.

Project 2 had a peak team size of 15 resources during the requirements phase and had spent 3480 person hours of effort in the requirements phase. Out of these, 5 persons were onsite and the rest were in offshore. For a detailed description of onsite and offshore resources and their skill sets, please refer to Table 1.

Above information indicates that the operating variables in the two projects were largely similar to each other. Though the peak team size for the requirements phase of P1 was relatively smaller than that of P2, overall effort for the requirements phase of the two projects was similar. The onsite – offshore distribution ratio of the two teams was also different. However, as is indicated in the section 5.2, this difference in the offshore – onsite ratio of the two projects was an outcome of the efficiency of the GDR process adopted by the two projects.

4. DIFFERENCE IN OUTPUTS OF THE TWO PROJECTS

The previous section indicated that the two projects had largely similar operating environments. In this section we evaluate the outputs of the requirements phases of the two projects.

Previous studies (Chatzoglou et al 1999) indicate that output of a requirements process should be measured in terms of elapsed time and quality of requirements. Reduction in elapsed time can offer significant competitive benefits such as reduced time to market for a strategic initiative, faster realization of software lead BPR benefits etc. Quality of requirements is measured in terms of rework required in the requirements can potentially impact the satisfaction level of the key stakeholders and elapsed time for the project.

Based on the above, we measured the difference in output of the requirements phase of the two projects as a combination of the following two factors

- Factor 1: Proportion of billable efforts (in %) undertaken by the offshore team out of the total effort undertaken in the requirements phase. Billable Efforts indicated time spent in producing deliverable for which client could be billed and were measured in terms of Full Time Equivalent (FTEs). The billable effort did not include the “non-productive” efforts – such as ramp up time, training etc. which did not contribute to creation of tangible deliverable for the client. A higher proportion of the billable effort undertaken in offshore helped to “stretch the day” thereby leading to reduced elapsed time for the project.
- Factor 2: Quality of requirements: Quality of requirements artifacts was measured in terms of “amount of rework required by the onsite team on the artifacts produced by the offshore team”. It was captured as High/Medium/Low based on feedback from the relevant stakeholders.

Both the factors were measured on the basis of inputs received from the key project stakeholders⁴⁴. An overview of evaluation of both the factors by the stakeholders is given below.

⁴³ Client's direct interaction with the offshore team can be a variable that can potentially impact efficiency of a GDR process. However, it will be difficult to study a scenario in which the client interacts directly with the vendor offshore team in the outsourced – off-shoring model because in this model, the onsite team front ends with the client team and interfaces with the offshore team.

⁴⁴ For the purpose of this case study, “key stakeholders” include 10 roles consisting of requirement consultants, project manager and domain expert of the respective project teams at both onsite and offshore. Refer to Table 1 for details.

difference in culture within each client or vendor organization can potentially impact efficiency of the GDR process due to reasons such as client's maturity related with Global Development Model, client team member readiness to interact with out sourced off-shored vendors etc. As is already mentioned in section 3, the impact of difference in cultural factors on the GDR is ruled out since both the projects were from the same client / vendor environment.

Perception of hierarchy within the teams was identified as an important factor which could potentially impact the interactions between the globally distributed teams (Damian et al 2003). In some cases, there was a "distributed ownership" of the project and both onsite and offshore teams considered each other at the same level of hierarchy. Such arrangements resulted in frequent back-and-forth between the two teams and resulted in longer duration in reaching the decisions.

In other cases, either the onsite team or the offshore team could play a dominant role in decision making leading to a "single point ownership" situation. The "single point ownership" could result in a faster decision making for the team but may result in alienation of the onsite/offshore teams.

Based on the above inputs, following key people related practices were identified for evaluation of the GDR process

- Distribution of skill sets between the onsite and offshore teams⁴⁶: It involved an evaluation of type of skill sets (such as domain expert, requirements consultant, project manager etc.) available in the two project teams.
- Concept of hierarchy between the onsite and offshore teams of the two projects: It implied checking whether the teams had a
 - o Distributed Ownership– where in both the teams had an equal say in the project decisions or
 - o Single Point Ownership – where in one of the project managers had the final say in the project related decisions
- Familiarity with client's organizational culture: This practice was ranked as "high" if the offshore team had members who had worked onsite in the client environment and was ranked as "low" if there were no members in the offshore team who have had hands-on onsite experience in the client environment.

Above practices were evaluated on the basis of inputs received from the project stakeholders. The results of the evaluations are summarized in Table 1 below and highlight key differences in the people related practices of the two projects.

The table highlights the fact that the Project 1 did not have any requirements consultants in the offshore team and the concept of hierarchy between the two teams were different.

The offshore teams of both the teams had a similar level of exposure to the client environment – hence there were no issues associated with the familiarity with client's organizational culture. Further discussions with the stakeholders revealed that other issues which usually impact the efficiency of a globally distributed work – such as time zone differences, lack of informal contact points amongst the team members (Damian et al 2003; Zowghi et al 2003) - did not play a significant role in the outsourcing off-shoring vendor scenario because the GDR process was handled by teams which were well familiar with the Global Development Model.

5.2 Process related practices

Previous work (Lopes et al 2004) has suggested that the onsite team should be responsible for elicitation, analysis and validation of software requirements whereas the offshore or development team should be responsible for a detailed adaptation of the software requirements.

Based on the above, the type of the requirement artifacts to be created by the onsite/ offshore team was identified as one of the practices to be evaluated for the process context.

⁴⁶ This evaluation assumed that both the teams were of similar capability levels. This assumption can be considered because both the teams were large teams from the same client/vendor context and any variation in capabilities of the individual team members would get averaged out because of the large team size.

Above practices were evaluated on the basis of inputs received from the stakeholders. Results are summarized in Table 2 below.

Key differences observed in the Process related practices was presence of a structured communication process followed in Project 2 as compared to Project 1. A key reason why Project 2 was able to follow a structured communication process was because they had a dedicated team of requirements consultants in onsite and offshore both to help facilitate the structured communication.

5.3 Technology related practices

The tools to be used in a Global Distributed Application Development should support generic practices of formalization of user requirements, overall traceability, coherent change, automation and seamless SDLC coverage. (Fieman 2005)

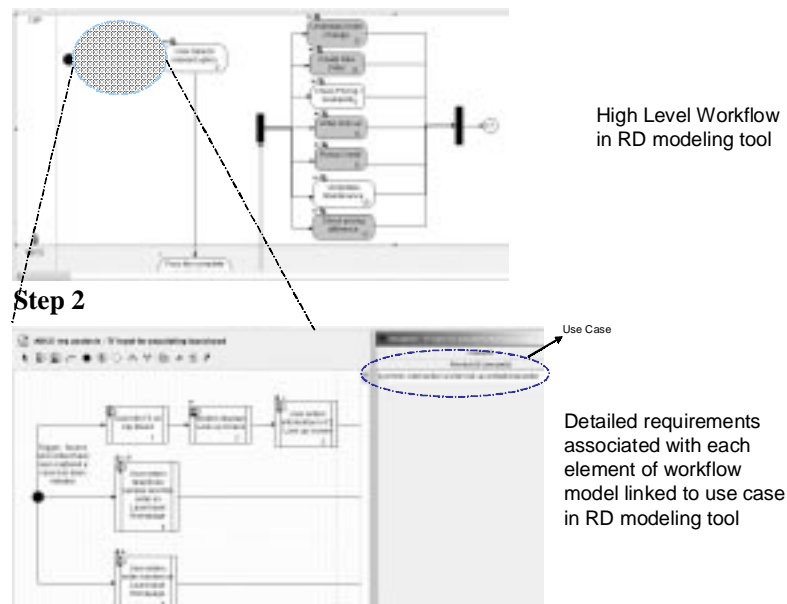
Out of the above, the practices related to formalization of requirements and overall traceability during requirements development phase were found to be relevant for the context of our paper.⁴⁷

Based on the above, key technology practices identified for evaluation of the two projects were:

- The technology used to assist in formalization of requirements during requirements development phase: This practice was evaluated as “High” or “Low” depending on availability of a structured tool or templates to aid the formalization of requirements.
- The technology used to assist in traceability of requirements during the requirements development phase: This practice was evaluated as “Automated” or “Manual” based on the ability of the technology used to provide an environment to house all the requirements artifacts and to enable a structured breakdown of the high level requirements into a set of detailed formal requirements models. It should be noted that in the context of requirements development, traceability ensures that the requirements artifacts are developed in a linked, drill down manner.

Table 3 captures the evaluation results for the key technology practices followed in the two projects.

Fig 2. Requirements development tool used in Project 2



⁴⁷ Since the focus of this WIP paper was on Requirements Development alone, the practices related to requirement management such as overall traceability across the design/build/test phases and change management practices were not considered in scope.

Table 4. Ranking of practices

	Key differences in practices	Impact on efficiency of GDR	Detailed observations
1	Absence of a requirements consultant role in Offshore in Project 1 as compared to Project 2	HIGH	<p>Role of a requirements consultant was identified as critical in the initial stages to establish a structured requirements process between the onsite and offshore teams as indicated by feedback given below.</p> <ul style="list-style-type: none"> - In Project 1, a substantial amount of time was spent in explaining usage of various requirements templates to the offshore team which delayed the start of generation of quality requirements artifacts by the offshore team. The project time line pressures forced the onsite team to take up the majority of requirements development work which resulted in an overall higher requirements effort in onsite for Project 1 as compared to Project 2. - In Project 2, presence of a requirements consultant in offshore and his ability to create the first few artifacts in an onsite-offshore model helped to kick start the project in an efficient manner.
2.	Absence of a full time domain expert role in Offshore in Project 1 as compared to Project 2	HIGH	<p>Role of a full time domain expert was critical in a GDR process to aid the creation of detailed requirements artifacts by the offshore team as indicated below</p> <ul style="list-style-type: none"> - In Project 1, the domain expert was available only partially to the offshore team. It resulted in an increased need for the offshore team to get in touch with the onsite team for various clarifications while creating the detailed requirements; there by reducing the efficiency of the offshore team. - In Project 2, presence of a domain expert in both onsite and offshore teams resulted in a faster creation of the quality requirements artifacts since all the queries of the Business Analysts were getting answered promptly.
3	Concept of distributed hierarchy in Project 1 as compared to a single point ownership in Project 2	LOW	Stakeholders from both the projects felt that the impact of difference in perception of hierarchy was not so strong because the team members were well familiar with each other and hence could have informal interactions with each other over phone/emails. Various issues/interest areas could be easily brought to the fore and discussed.
4.	Lack of a structured communication protocol in Project 1	HIGH	The structured communication protocol followed by the Project 2 team was identified as one of the key factors that ensured development of quality requirements artifacts by the offshore team of Project 2.
5	Usage of a requirements development tool in Project 2	MEDIUM	Presence of a requirements development tool in Project 2 helped in an efficient and scalable implementation of the requirements process and ensured a faster turnaround of quality requirements artifacts.

5.5: Key practices for an efficient deployment of the GDR process

Based on study of data of the two projects included in this paper, following Key Practices were found relevant for an efficient deployment of a GDR process:

- a. Placing a Requirements Consultant role in onsite and offshore teams: Role of requirements consultant was found important to kick start the GDR model.
- b. Placing a domain expert in both onsite and offshore teams: The role of a domain expert was important to provide content for the detailed requirements artifacts in offshore which reduced the elapsed time needed to create the artifacts.
- c. Establish structured communication protocol between the teams: A clear communication process with structured inputs/outputs was important to control the exchanges between the onsite – offshore teams. The requirements consultant role played an important role in setting up and implementing the communication protocol.
- d. Requirements Development tool: Usage of a structured tool which offered guidance for formalization of requirements and provided a platform for creating linked, formal requirements artifacts ensured scalability and efficiency in production of quality requirements artifacts.

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