Follow-the-Sun Strategy: A Process for Global Software Development

PhD Research Proposal

PhD Student: Josiane Kroll

Computer Science School
Pontifical Catholic University of Rio Grande do Sul
(PUCRS)
Porto Alegre, Brazil
josiane.kroll@acad.pucrs.br

Advisor: Jorge Luis Nicolas Audy

Computer Science School
Pontifical Catholic University of Rio Grande do Sul
(PUCRS)
Porto Alegre, Brazil
audy@pucrs.br

Research Area — **Global Software Development (GSD), Follow-the-Sun (FTS).**

Abstract — **Follow-the-Sun (FTS) is a strategy in Global Software Development (GSD) focusing on software development twenty-four hours, seven days per week with physically distributed teams. Many companies have tried to implement FTS strategy, but have abandoned it after some point because of the difficulty to put it into practice. Thus, this article aims to presents a research plan for developing a software process inspired in the practices from agile methodologies, to support the adoption of the FTS strategy in GSD environments.**

Keywords - Global Software Development; Follow-the-Sun; Software Process; Software Practices.

I. INTRODUCTION

In the literature, few studies have explored FTS implementation and given evidences of success factors for the area [1]. Software processes configuration in FTS is not attended completely by existing practices in GSD. In addition, software processes are complex, and like all intellectual processes, depend on human judgment [2]. Therefore, FTS implementation can be difficult to achieve. It requires great effort from development teams involved. It is also important to notice that when not applied properly, FTS can result in failures and increase the project cost [3].

Many companies have tried to implement FTS strategy, but have abandoned it after some point because of the difficulty of putting it into practice [1]. The lack of successful cases in software industry has led companies to look for new strategies for software development. Consequently, FTS have stopped to evolve in the software industry. In order to motivate companies to adopt FTS, it is necessary first to define how FTS must be practiced. In this context, our research question posed in this study is defined as follow: *"How to develop software using the FTS strategy in GSD environments?"*

Agile methodologies has been discussed as a promising way to develop software applying FTS strategy [1] [4]. Agile methodologies are based on robust engineering for teams and process, which are adaptable to changes [5]. Hence, inspired in practices from agile methodologies, our research aims to develop a software process to support FTS strategy adoption in GSD environments. The term process is used here to designate a set of tools, methods, and practices used to produce a software product. A process guides actions, allowing to examine, to understand, to control, and to enhance the activities that it comprises [6].

II. RESEARCH OBJECTIVE

The main goal of this research is to propose a software process for adoption of the FTS strategy, incorporating agile methodologies for GSD environments. Utilization of agile methodologies appears to be promising for the FTS implementation [1] [4]. Furthermore, the use of agile methodologies in the GSD context is motivated by many benefits such as, increased productivity, innovation, and customer satisfaction [7]. To achieve the research goal, we derived the following objectives:

- To further theoretical knowledge about FTS, around-the-clock, and agile methodologies;
- To analyze agile methodologies for software development in the GSD and FTS context;
- To conduct in-depth case studies of development software projects in GSD environments;
- To identify best practices of FTS and around-the-clock development;
- To define a reference model for software development using FTS strategy;
- To propose a software process to implement FTS strategy in GSD environments.

III. RELATED WORK

The lack of studies about FTS to define practices and process is a factor that gives us motivation to perform this research. We found mainly studies performed by [8] and [4] about this.

[8] explored the utilization of the agile practices for 24-Hour Knowledge Factory (24HrKF) environments. They aim to search for solutions that enable handoffs to be practiced effectively. This study was motivated by the interest in new distributed and agile process, in especially for 24HrKF

environments. [8] claim similar methods for 24HrKF such as FTS, and having the same problem as described in the study. According to [8], many companies have not implemented FTS, because coordination, communication, and cultural difficulties were found while conducting it.

[4] described agile methodologies for FTS first. [8], was inspired in [4] to performed his study. Also, [1] and [9], claim the use of agile methodologies for FTS as promising practices.

In [4] an experience using distributed XP (eXtreme Programming) for FTS is reported. This study describes challenges, lessons learned, and solutions, emphasizing mainly using of agile methodologies for FTS implementation.

IV.   RESEARCH METHOD

This research is exploratory. Exploratory research enables the researcher to choose a collection of data collection techniques to develop the study [10]. In this research, we chose to use as main methods: case studies, literature review, systematic literature review (SLR), and controlled experiment. Next, we present how each method will be used in the context of the research design.

A.   Research Design

The research design is organized in three phases: (1) Exploratory, (2) Development, and (3) Validation. Figure 1 summarizes the selected methods selected and the timeline of the proposed execution. Each phase is described in details below.
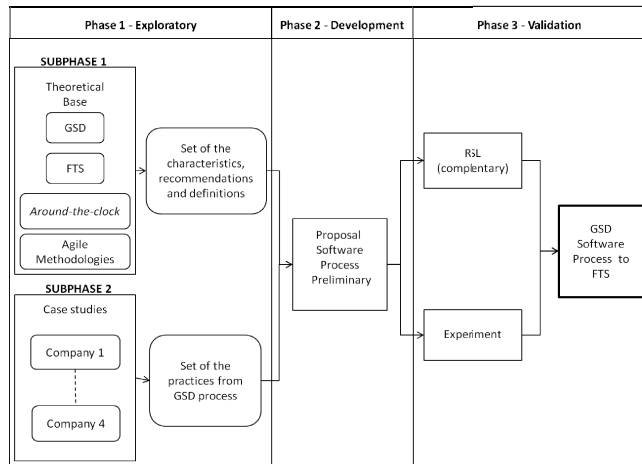

Figure 1.   Research Design

Phase 1- Exploratory: This research phase is divided into two sub phases:

Sub phase 1: In this first sub phase a review of the theoretical basis will be conducted, which involves the review of the literature and Systematic Review of Literature (SLR), about the concepts GSD, FTS, around-the-clock, and agile methodologies. The purpose of this sub-phase is to build a set of characteristics, recommendations, and definitions for the preparation of the software process preliminary. The proposed software process will be inspired in practices from the agile methodologies, which are cited by [1] and [4] as the most promising for the FTS strategy implementation.

Sub phase 2: During the second sub phase an in-depth case study to explore a database of approximately six thousand GSD projects will be developed. This study will be conducted in Dell, Inc. company, which has several centers of distributed software development in countries in Europe, Middle East, Asia, and in the Americas. Dell adopts the offshore sourcing model, with many units of development that support operations of the company's database. Developing this case study, we will be able to obtain a set of practices and processes and identify the adoption of process and practices GSD for FTS strategy. Data collection from database projects were approved by Dell and has already obtained data. This Dell's database has data from planning and execution projects.

These data will be passing by a rigorous statistical analysis process using Excel and SPSS (Statistical Package for the Social Sciences) tools. The obtained result with this process will be a set of statistical data and information that characterize practices adopted in GSD environments. From this result, three exploratory case studies will be conducted to obtain an understanding of the findings and to determine whether other process practices, not identified in the analysis from database, are also adopted. We will conduct a case study at Infosys Technologies in Bangalore, India. This case study has been already approved by Infosys.

Companies selected to apply exploratory case studies, should attend requirements, such as, developing GSD projects, working in the technology segment and use of offshore sourcing model. Attendance of those requirements for the selection of companies is important to ensure compatibility of data and information in the analysis process. To develop the research method we will be rigorously following the recommendations given by [10] to design and conduct case studies.

Phase 2 - Development: In this phase we will develop a software process preliminary to implementation FTS strategy in GSD environments. Studies conducted in Phase 1 will provide us an understanding of how software processes are built for GSD. Furthermore, results obtained in sub phases 1 and 2, will provide benefits in terms of software practices for software process construction.

Phase 3 - Validation: in the validation phase, two research methods for validating the proposed software process will be executed. There will be a systematic literature review (SLR) to complement SLRs developed in Phase 1 and an experiment. Conducting a new SLR aims to eliminate remaining issues of SLRs developed in Phase 1 and will bring new knowledge to contribute to improve and validate the proposed process, as recommended by [11] and [12].

The experiment will be developed to verify the proposed process. Experimenting performance in software engineering is used to demonstrate or refute theories, exploring new areas [13]. For preparation of the experiment plan we will follow the guide by [14] and recommendations by [13] and [15]. With the development of this experiment, it will be possible to reject null hypotheses and prove alternative hypotheses formulated for the proposed process.

Results of this experiment also aim to contribute for the improvement of the proposed process. Results may show a need for adjustments to the process, which will be held for final delivery of the proposal. Thus, it is expected to perform the experiment and SLR, obtaining a result consistent with objectives defined in this survey.

V. RESULTS AND EXPECTED RESULTS

In the Phase 1- Exploratory, we collected some results from research visits made by two renowned researchers from the study area, Professor Erran Carmel (American University) and Professor Amar Gupta (University of Arizona). With Professor Carmel, it was possible to obtain a deeper theoretical basis about FTS, interact with the research group and participate in the projects. Moreover, with him it was possible to verify which directions from a management perspective the research in FTS is taking and discuss the results found in the studies and possible solutions for the area. With Professor Amar Gupta, we studied mainly the around-the-clock concept. Professor Gupta develops research about 24 hour Knowledge Factory concept in around-the-clock environments. With Professor Gupta it was possible to archive a deeper understanding of the theoretical basis about around-the-clock and 24 hour Knowledge Factory, checking with researches being conducted in the area and which results has been already obtained.

We also have results from two SLRs. Results from the first SLR was published in the International Conference on Enterprise Information Systems (ICEIS) [16] and the International Conference on Global Software Engineering (IGGSE) [17] in 2010. This SLR aimed to identify software engineering (SE) areas that have studies in GSD, the most discussed topics in each area and studies in FTS. Consequently, it allows the analysis of the evolution of the GSD research field, SE areas that have been investigated, and the topics that have to be dealt with. A second SLR is on the review stage and will be submitted to the Journal of Systems and Software (JSS). The goal of this research was to identify what we already know about FTS in software engineering, what we call FTS software development, and how the studies in the area have evolved in recent years.

VI. EXPECTED RESULTS

In the next phases of this research, we expect to obtain results that contribute by characterizing FTS strategy and defining processes and practices for its implementation. We intend to offer the following contributions to software industry and academia:

- Development of a software process for FTS strategy implementation;

- Adoption of the agile methodologies for FTS implementation;

- Practice definition to software process to adequacy FTS strategy;

- Setting up new concepts and theories that tend to contribute to the software engineering area; and improvement of the GSD software process.

Not limited to these contributions, this research will search effectively for GSD solutions that can help to reduce culture, coordination, communications challenges.

VII. EVALUATION

An evaluation method was included in Section IV. Findings have been (and will be) published at main conferences and journals from the research area. We expect feedback to be provided by companies and the academic community to validate our findings.

REFERENCES

[1] E. Carmel, A. Espinosa, and Y. Dubinsky, "Follow the Sun Workflow in Global Software Development". Journal of Management Information Systems Vol. 27, No. 1, 17 – 38, 2010.

[2] I. Sommerville, Software Engineering . Addison Wesley, 2003, 6ed.

[3] E. O. Conchúir, H. Holmström, P. J. Ågerfalk, and B. Fitzgerald, "Global Software Development: Never Mind the Problems – Are There Really Any Benefits?" Proc. 29th Information Systems Research Seminar in Scandinavia, 2006.

[4] M. Yap, "Follow the sun: distributed extreme programming development". Agile Conference Proceedings , 2005, 218- 224.

[5] J. Sutherland, A. Viktorov, J. Blount,and N. Puntikov, "Distributed Scrum: Agile Project Management with Outsourced Development Teams". System Sciences, HICSS 2007. 40th Annual Hawaii International Conference on, p.274, 2007.

[6] S. L. Pfleeger, Software Engineering: Theory and Practice – 2. Ed. – Prentice Hall, 2004.

[7] D.Šmite, N. B. Moe, and P.J. Ågerfalk, Implementing Agile Methods in Global Software Projects. 1st Edition., 2010, XXXVI, 341 p. 37 illus.

[8] N. Denny, I. Crk, R. Seshu, A. Gupta, "Agile Software Processes for the 24-Hour Knowledge Factory Environment". Journal of Information Technology Research, Vol. 1, Issue 1, 57-71, 2008

[9] E. Carmel, A. Espinosa, and Y. Dubinsky, "Follow-The-Sun Software Development: New Perspectives, Conceptual Foundation, and Exploratory Field Study." Proceedings of the 42nd Hawaii International Conference on System Sciences, 2009.

[10] R. Yin, Case Study Research, Design and Methods, 3rd ed., California: Sage Publications, 2001.

[11] B. Kitchenham, O. P. Brereton, D. Budgen, M. Turner, J. Bailey, and S. Linkman, "Systematic literature reviews in software engineering - A systematic literature review", *Inf. Softw. Technol.* 51, 1 (January 2009), 7-15.

[12] S. Muhammad, E. Mendes, "An extended systematic review of software process improvement in small and medium Web companies," *Evaluation & Assessment in Software Engineering (EASE 2011), 15th Annual Conference on* , pp.134-143, 2011.

[13] A. Endres, D. A. Rombach, Handbook of Software and Systems Engineering: Empirical Observations, Law and Theories. Addison Wesley, 2003.

[14] G. H. Travassos, D. Gurov and, G. Amaral, "Introdução a Engenharia de Software Experimental". Relatório Técnico, PESC 590/02, COPE/UFRJ, 2002, 66 p.

[15] C. Wohlin, P. Runeson, M. Höst, M. Ohlsson, B. Regnell,and A.Wesslén, Experimentation in software engineering: an introduction. Boston: Kluwer Academic Publishers, 2002, 204p.

[16] J. Kroll, J. L. N. Audy, and R. Prikladnicki, "Mapping the Evolution of Research on Global Software Engineering: A Systematic Literature Review," In: 13th International Conference on Enterprise Information Systems (ICEIS), 2011, Beijing, Chine.

[17] J. Kroll, E. Hess, J. L. N. Audy, and R. Prikladnicki, "Researching into Follow-the-Sun Software Development: Challenges and Opportunities," In: 6th International conference on Global Software Engineering (ICGSE), 2011, Helsinki, Finland.