

Measuring Software Engineer Motivation in Globally Distributed Projects

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1. Introduction and related work

Software development today has become truly global as many individuals and teams from several geographically distant places collaborate to create software. Many organizations employ such model of work organization striving for the most effective software development in terms of speed, price and quality [1]. Global software development (GSD) approach claims to enable benefits of access to larger skilled resource pools, reduced development costs, proximity to markets and other ones [1]. However, we still hear frequent complaints about poor efficiency [2], which most often is explained by different communication, coordination and control problems caused by distance, temporal separation and socio-cultural problems inherent in GSD [3]. While it is very important to solve these problems, we argue that possibly even more attention should be paid to software engineer work motivation as it is reported to be the key determinant for retention and have large impact on productivity and software quality [4].

Motivation is commonly referred to as soft factor, which is difficult to address and even more difficult to measure [4]. Nonetheless, the importance of this factor is crucial. If motivation has the large impact on productivity and about 70% of all costs in software development are related to human resources [5], then the impact of even minimal improvements is evident. Empirical evidence suggests that improved project success directly relates to good project management, which is underpinned by human factors [6], including work motivation. The nature of offshore development and GSD projects puts new demands on managers, as such projects are significantly more complicated than even the most complex project managed entirely in-house [7]. Besides, work motivation might have cultural flavours, and it might be negatively affected by geographic and temporal distance. Contemporary managers working in globally distributed projects shall be equipped with sufficient knowledge about motivation in different GSD settings. To the best of our knowledge no empirical research focusing on addressing motivation in global software development projects exists.

In order to be able to perform an extensive empirical study on motivation of software engineers working in globally distributed projects, first, we developed a survey on software engineer motivation, which was based on previously widely used and well-tested surveys.

2. Research objective

The aim of this study is to develop a survey instrument to explore motivational needs and assessment of present work motivation of software engineers working in globally distributed projects. We expect that the survey results will provide us with better understanding of software engineer motivational needs and thus enable us to suggest ways to enhance motivation in order to achieve higher productivity and success ratio of distributed software projects. Our work is driven by the following research questions:

RQ1: How to measure software engineer motivation?

RQ2: Which aspects of project distribution are important in order to measure motivation of software engineers?

3. Research method

In order to get a deeper understanding of the concept of work motivation we performed a literature analysis focusing on what has been explored regarding motivation in general and specifically in the context of software engineering, and distributed development. Particular attention has been devoted to the tools used for measuring motivation. As software engineer motivation is not widely studied and empirical research is scarce, the research literature for analysis was gathered according to snowball-sampling method [8], using Beecham's et al. systematic literature review on software engineer motivation [4] as the starting source of references. The analyzed literature belonged to different research fields, like software engineering, organizational psychology and management. The analysis helped us to obtain the knowledge about previously widely tested tools for diagnosis of motivation. However, access to the tools themselves was limited as in the most of articles only research results were reported without providing direct access to the tools used. An exception was the work conducted by Hackman & Oldham and Morgeson & Humphrey [9, 10], which we would like to highlight as a comprehensive work design measure. Based on the gained knowledge we developed a survey for software engineers working in GSD projects comprising two types of questionnaires.

3.1. Questionnaire about project distribution

The aim of the questionnaire about project and its distribution aspects was to explore the project settings and

to find out the managers' subjective assessment of several external signs of software engineer motivation, like productivity, absenteeism, retention etc. The questions were developed according guidelines on empirical research in GSD [11] to be answered by project managers. The questionnaire contained mainly closed type questions about project size, type (e.g. maintenance or new development), involved companies, countries, sites, number of employees per site, time zones, etc.

3.2. Questionnaire about work motivation

The concept of work motivation most often has been studied in context of job satisfaction and work design. Thus motivation most often is measured indirectly by assessment of satisfaction with different motivational factors.

The structure of the questionnaire about software engineer work motivation to a great extent corresponds to Job Diagnostic Survey [9], which is based on Herzberg's motivation-hygiene theory. However, many questions were either reworded according to the Work Design Questionnaire [10] or shortened in order to improve readability. Several questions have been doubled or reformulated and some new items have been added in order to address project distribution impact on different motivational factors, e.g., relationships with local colleagues and with remote colleagues etc.

The items of the questionnaire were assessed on a 7-point Likert type scale, where higher values indicate more agreement with a given item. In one section respondents had to choose 5 out of 12 items. In total, the questionnaire consisted of 6 sections containing questions about demographics, satisfaction with different aspects of job, desired job characteristics, which are most likely to encourage producing at the highest potential, and methods and practices used in the current job. The results were processed according to the Job Diagnostic Survey guidelines [9] thus ensuring that the results can be compared with results of the former research results.

4. Research progress

So far the survey has been pilot tested on 30 respondents, from which 23 answered the questions about work motivation, but 7 answered questions about project settings. In total, respondents represented 10 GSD projects and 4 countries. The results of the survey analysis showed interesting trends and enabled us to give recommendations to project managers. We have identified several ways how to improve the survey in order to make it more efficient.

5. Expected results

At the end of the study we expect to have a large high quality data set, which would enable us to do a rigorous

analysis and identify trends regarding motivational needs of software engineers working in globally distributed projects in order to provide managers with essential knowledge.

6. Conclusions

According to the work advertisements motivation is one of the most desired assets by software houses and it is believed to have a large impact on productivity and quality. As the nature of software engineering work is changing over time the existing motivational studies are outdated. We often hear managers complaining about their employees lacking work motivation. However, as it is difficult to address and measure motivation, it is usually left out of stage. As the first step to an extensive motivational study of software engineers working in globally distributed projects we have developed a survey to investigate software engineer motivational needs and actual work motivation.

7. References

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