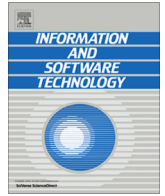




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The impact of global dispersion on coordination, team performance and software quality – A systematic literature review

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ABSTRACT

Context: Global software development (GSD) contains different context setting dimensions, which are essential for effective teamwork and success of projects. Although considerable research effort has been made in this area, as yet, no agreement has been reached about the impact of these dispersion dimensions on team coordination and project outcomes.

Objective: This paper summarizes empirical evidence on the impact of global dispersion dimensions on coordination, team performance and project outcomes.

Method: We performed a systematic literature review of 46 publications from 25 journals and 19 conference and workshop proceedings, which were published between 2001 and 2013. Thematic analysis was used to identify global dimensions and their measures. Vote counting was used to decide on the impact trends of dispersion dimensions on team performance and software quality.

Results: Global dispersion dimensions are consistently conceptualized, but quantified in many different ways. Different dispersion dimensions are associated with a distinct set of coordination challenges. Overall, geographical dispersion tends to have a negative impact on team performance and software quality. Temporal dispersion tends to have a negative impact on software quality, but its impact on team performance is inconsistent and can be explained by type of performance.

Conclusion: For researchers, we reveal several opportunities for future research, such as coordination challenges in inter-organizational software projects, impact of processes and practices mismatches on project outcomes, evolution of coordination needs and mechanism over time and impact of dispersion dimensions on open source project outcomes. For practitioners, they should consider the tradeoff between cost and benefits while dispersing tasks, alignment impact of dispersion dimensions with individual and organizational objectives, coordination mechanisms as situational approaches and collocation of development activities of high quality demand components in GSD projects.

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1. Introduction

GSD is a modern paradigm for developing software intensive systems [13,31]. Software development and maintenance tasks are continually dispersing globally for cost saving, time-to-market shortening, technology innovation and operational efficiency [60]. A large amount of empirical research has been devoted to understand general challenges [9,32,51], managing collaboration [18,35], getting requirements [14,15,77], establishing trust [7], communication and coordination [34,44] and engineering process [6,25,56] in GSD. How to effectively coordinate software teams across global boundaries is an important topic in the area [18,20,26,35,51,63,64,71].

What can be learned about coordination from GSD literature is not always straightforward. It is commonly known that coordination mechanism is a situational approach [18,35]. Projects with different team distribution over global boundaries might need different coordination mechanisms. However, studies on team coordination often lack of context description and a connection between different dimensions of global context settings and team coordination [18]. Global boundary is often referred to a context that teams members from different geographical locations. However, other dimensions of global dispersion, such as temporal dispersion, cultural dispersion and organizational dispersion, are also visible in this context [21,33,62].

Moreover, empirical studies show contradict results on how global boundaries impact coordination and project outcomes [8,12,23,30]. For example, Herbsleb et al. (2003) investigated task resolution time in global software projects and found that geographical dispersion led to lower team performance [30]. However, a recent study by Kocaguneli et al. (2013) suggested that geographical dispersion had no impact on team performance [23]. While many context factors may explain the reason for the difference between these studies, the way the dispersion dimensions is

defined and measured, might also play a role. A synthesis of these studies could provide a systematic view of commonalities and variations among them, as well as new interpretive explanations that go beyond the scope of any single study [12].

This study presents a systematic literature review (SLR) to understand different dimensions of GSD context and how they impact team coordination and project outcomes. We adopted an input-process-outcome model to organize research questions and to provide the basics for integrating literatures [28]. As shown in Fig. 1, the input element represents starting conditions for team-work, such as dispersion context of the projects. Although there is a large amount of GSD empirical studies, it is not clear what and how dispersion dimensions are empirically investigated and measured (RQ1). With respect to process element, our study focuses on team coordination as we are interested in understanding how dispersion dimensions create coordination challenges (RQ2). Via the team process factors, dispersion dimensions would have an impact on project outcomes. We would like to investigate how consistent are these relationships among primary studies in GSD (RQ3 and RQ4). Consequently, the research questions investigated in this systematic review are:

- RQ1: How are dispersion dimensions defined and measured in GSD studies?
- RQ2: What are different coordination challenges that dispersion dimensions present to GSD project outcomes?
- RQ3: How does dispersion dimensions affect team performance in GSD project?
- RQ4: How does software quality affect software quality in GSD project?

In order to decide if the systematic review shall be executed or not, a preliminary search on the topic was made. We searched Scopus and Google Scholar digital libraries, using the search string:

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