Research Challenges and Opportunities in Conducting Quantitative Studies on Large-Scale Agile Methodology

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ABSTRACT

This research note suggests five research challenges when conducting quantitative studies on large-scale agile methodology (LSAM). First, the LSAM empirical literature, which is mainly characterized by qualitative studies primarily focusing on coordination issues, provides limited background. Second, the notion of “large” in LSAM needs to be clarified because the existing research seems to have focused on “very large” or outlier projects. Third, the popular LSAM methods suggest broad and general maxims that may result in difficulty in operationalizing dependent variables, especially in innovation adoption studies. Fourth, the researcher may get overwhelmed when selecting independent variables from the plethora of suggested constructs. Finally, some of the problems associated with large-scale agile are mostly challenges of using conventional agile during a time-period when LSAM had not formally emerged. Researchers should take a balanced approach considering both benefits and challenges of using LSAM and focusing on project-level dependent measures such as success and acceptance.

KEYWORDS
Continuous Improvement, Coordination, Customer Collaboration, Incremental Development, Large-Scale Agile, Lean Development, Quantitative Method, Systems Approach

INTRODUCTION

The announcement of the Agile Manifesto (Fowler & Highsmith, 2001) signaled a paradigm shift (Kuhn, 2012) in software development. The resulting community response to agile software development was quite favorable, and while researchers and practitioners raised or discussed issues on quality (Ambler, 2005), balance between agility and discipline (Boehm & Turner, 2004; Henderson-Sellers & Serour, 2005), project management (Turk, France, & Rumpe, 2005), novelty (Merisalo-Rantanen, Tuunanen, & Rossi, 2005), and adaptability (Aydin, Harmsen, Van Slooten, & Stagwee, 2005), others asked for theory-based, rigorous research to evaluate the practices (Batra, VanderMeer, & Dutta, 2011; Erickson, Lyytinen, & Siau, 2005). Based on a review of empirical studies, Dyba and Dingsoyr (2008) reported that agile development was being used only for small projects. Jeffingwell (2007) provided a basic framework for scaling agile for larger projects. Although it took some time before practitioners addressed the scaling issue, in recent years, large-scale agile methodology...
(LSAM) has become commonplace in part because of the increasing popularity of methods such as Scaled Agile Framework or SAFe (Knaster & Leffingwell, 2017) and Large-scale Scrum or LeSS (Larman & Vodde, 2016). The rising demand of LSAM (VersionOne, 2018) provides preliminary evidence that we may have found an acceptable balance between agility and discipline as commended by (Boehm & Turner, 2004).

This research commentary suggests five research challenges when conducting quantitative studies on LSAM. First, the LSAM empirical literature needs to be expanded, given that it mainly characterized by qualitative studies that primarily focus on coordination or related issues. Future research should evaluate and validate research models proposed in the qualitative studies by using quantitative techniques. Second, the notion of “large” in LSAM needs to be clarified. Third, the popular methods list too many maxims, which may result in difficulty in operationalizing the LSAM dependent variable, particularly for acceptance studies. Fourth, the researcher may encounter difficulty in choosing independent variables from a lengthy list of LSAM constructs, especially for project success studies. Finally, given the recent criticisms of LSAM practices, researchers should take a cost-benefit approach when evaluating LSAM because large projects invariably have inherent problems that can be mitigated but not eliminated by software development methods. Researchers may mistakenly focus on shortcomings that may not result solely from the use of LSAM; in fact, practitioners may rate a project as a success despite noting some deficiencies. For a more accurate assessment, researchers should compare the performance of LSAM with that of a conventional methodology.

PAUCITY: LIMITED RESEARCH METHODS AND THE LACK OF THEORY

Challenge

The case, grounded theory, and other qualitative approaches have been methods of choice for studying the effectiveness of LSAM and the essential antecedents (Conboy & Carroll, 2019; Dikert, Paasivaara, & Lassenius, 2016). Studies such as (Bick, Spohrer, Hoda, Scheerer, & Heinzl, 2018; Dingsøyr, Moe, Fægri, & Seim, 2018; Dingsøyr, Moe, & Seim, 2018; Paasivaara, Lassenius, & Heikkilä, 2012) mainly focus on coordination challenges. Other studies address topics such as governance (Bass, 2016; Bass & Haxby, 2019), customer involvement, software architecture, and coordination (Dingsøyr, Moe, Fægri, et al., 2018; Hannay & Benestad, 2010), project roles, implementation strategies, and coordination (Hobbs & Petit, 2017), company culture, prior experience, management support, and integration (Kalenda, Hyna, & Rossi, 2018), maturity (Laanti, 2017), management challenges, organizational dependencies, and communicating goals (Moe, Dahl, Stray, Karlsen, & Schjødt-Osmo, 2019), complex knowledge across boundaries (Rolland, Fitzgerald, Dingsøyr, & Stol, 2016), and knowledge sharing, alignment, and collective decisions (Smite, Moe, Levinta, & Floryan, 2019).

The case method dominates the empirical studies, which have addressed a variety of topics but focused more on coordination or related issues such as organizational dependencies, integration, and knowledge across boundaries. The literature has proposed many frameworks, but quantitative studies based on the complex interaction of many constructs, say by employing structural equation modeling (SEM) models, are missing. Qualitative studies are useful in recommending research models but not evaluating them. The purpose of an experience report is to provide a broad context of issues on a topic whereas a case or an action research study extends the experiences by formally examining the problems in detail (Sein, Henfridsson, Purao, Rossi, & Lindgren, 2011; Yin, 2017). Grounded theory approaches purport to propose preliminary research models (Corbin & Strauss, 2014).

Solutions and Opportunities

Future research should build upon and test the proposed theories and propositions on LSAM attained from the qualitative studies and popular practices by using quantitative techniques such as SEM (Hair, Hult, Ringle, & Sarstedt, 2016). Research on systems analysis and design needs to keep up
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