



Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

A framework to study requirements-driven collaboration among agile teams: Findings from two case studies

Irum Inayat*, Siti Salwah Salim

Department of Software Engineering, Faculty of Computer Science and Information Technology, University of Malaya (UM), 50603, Kuala Lumpur, Malaysia

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Agile methods
Collaboration
Distributed agile teams
Requirements-driven collaboration
Communication and awareness

ABSTRACT

Stakeholders' collaboration is required to develop requirements in agile software development. Requirements engineering and agile methods share common grounds as they both focus on stakeholder collaboration. The key issue is finding a way to study collaboration driven by requirements in geographically distributed agile teams. In this paper, we aim to propose a framework to study collaboration driven by requirements among agile teams and determine the impact of their collaboration patterns on the iteration performance. We define collaboration in terms of communication as *information exchange among members*, and awareness *knowledge of others*. Two case studies were conducted to examine communication and awareness network patterns among distributed agile teams. Data were collected through questionnaires, semi-structured interviews and onsite observation. The findings revealed that the framework aids in determining the core members, collaboration trends, clustering tendency, communication and awareness reciprocity of the teams, small worldliness and centralisation behaviour of the networks and iteration performance of the agile teams. The framework has implications for the industrial practitioners, i.e. managers to learn about their team's collaboration in order to take measures for performance improvement. At the same time, the researchers can use this framework to study other social aspects in variable settings to produce more empirical results.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Requirements engineering (RE) is part of a human-centric social process, called software engineering. The requirements are treated as a unit of work for which the stakeholders collaborate, i.e. communicate with each other, share knowledge and exchange information. The collaboration driven by the requirements during their development and management to the downstream artefacts, i.e. code, design, etc., is defined as requirements-driven collaboration (RDC) (Damian, Kwan, & Marczak, 2010).

Agile methods, being collaborative in nature, entail an organic management of requirements, unlike traditional software development methods (Cao & Ramesh, 2008); they also serve as an alternative approach as they address the challenges posed by traditional software development (i.e. communication gaps, over-scoping (Bjarnason, Wnuk, & Regnell, 2010, 2011)). Agile methods emphasise extensive collaboration between customers and developers, and encourage small, self-organised and collocated teams (Sharp, Robinson, & Hall, 2003). In such a dynamic software

development process, requirements are highly volatile and constant collaboration is essential to cope with the ever-changing requirements for risk mitigation due to dependencies (Martakis & Daneva, 2013). Developer collaboration is dependent on the communication of changes and of new tasks, as well as on the awareness of what others are doing, whether they are available to help, or what they know that can help one's work (Damian, Izquierdo, & Singer, 2007). Agile methods stress stakeholders' collaboration throughout the development process. Unlike traditional software development teams, agile teams are cross-functional, closely knit and highly interactive. The information is believed to be highly dispersed in the agile teams due to members working closely and changing roles constantly. Therefore, this difference in team structures raises interesting aspects to be explored.

In the literature, there are just a handful of empirical research studies that focused on the social aspects of agile requirements engineering, especially communication (e.g. Cataldo & Ehrlich, 2011; Iivari & Iivari, 2011; Mishra & Mishra, 2009; Pikkarainen, Haikara, Salo, Abrahamsson, & Still, 2008)). It is mentioned in a study carried out by Komi-Sirviö and Tihinen (2005) that 74% of the problems encountered by distributed development teams are related to communication due to cultural differences (Summers, 2008), language barriers (Kajko-Mattsson, Azizyan, & Magarian,

* Corresponding author.

E-mail addresses: irum@siswa.um.edu.my (I. Inayat), salwa@um.edu.my (S.S. Salim).

2010), etc. Therefore, communication among agile has been studied more widely as compared with the other socio-technical aspects in agile teams, e.g. trust, knowledge sharing (Licorish & MacDonell, 2014). Moreover, based on our previous research, agile practitioners also declared communication and awareness as the most relevant socio-technical aspects of collaboration driven by requirements (Inayat, Salim, Marczak, & Kasirun, 2014). Therefore, the proposed framework is an initiative to provide a formalised set of steps to study the socio-technical aspects (i.e. communication and awareness) among agile teams empirically supported by two real-world case studies.

The framework intends to close the research gap by studying the characteristics of the collaboration patterns of agile teams. Moreover, the available literature remained silent on several issues such as team performance in variable development atmospheres involving agile methods with a high rate of change acceptability. Hence, this justifies the need for proposing a framework for agile teams with high collaboration, requirements volatility and small teams. A formal set of steps was introduced to study the collaboration among agile teams in terms of their communication and knowledge of each other. The purpose of this framework is to investigate the relevant aspects of RDC for agile teams, to further the knowledge on the topic and to find the impact of RDC on iteration performance.

2. Related work and motivation

Agile methods focus on team collaboration through frequent face-to-face communication (Beck, 2000). However, only a handful of empirical researches explored social aspects of collaboration among agile teams, including communication (Cataldo & Ehrlich, 2011; Pikkarainen et al., 2008), trust (McHugh, Conboy, & Lang, 2012; Tjørnehøj, 2012), organisational culture (Robinson & Sharp, 2005; Susan, 2011) among others. Some of the studies that focused on communication are discussed in this paper.

Abdullah, Honiden, Sharp, Nuseibeh, and Notkin (2011) studied communication patterns of agile teams while carrying out requirements engineering activities (i.e. elicitation, analysis, modelling, etc.). The results revealed that the concept of shared conceptualisation among agile teams supports the requirements engineering activities by introducing common goals.

Cataldo and Ehrlich (2011) studied communication patterns of distributed agile teams to find out the impact of hierarchal and small world network structures on iteration performance and outcome quality. The results revealed that hierarchal network structures have a strong positive effect on performance and negative effect on outcome quality. However, small world structures showed strong positive effect on quality and negative effect on performance.

Pikkarainen et al. (2008) investigated the effects of variable agile methods, i.e. XP and Scrum on agile teams' communication. The authors proposed a theoretical framework to study the impacts of agile methods on communication among the team members. The results revealed that agile methods improve formal and informal communication among team members. Informal communication is defined as the communication that happens outside the official reporting hierarchy of the team (Herbsleb & Grinter, 1999). However, the involvement of a large number of stakeholders and use of different communication mediums can cause problems.

The above discussion shows that the collaboration patterns of agile teams for requirements engineering activities yet need to be explored thoroughly. Although there are a few literature studies available on social factors involved in agile software development methods, agile way of dealing with requirements still warrants further research. In addition, there is a need of a systematic approach to guide the investigation of social factors in agile teams. In terms

of research on collaboration driven by requirements engineering activities in traditional software development teams, a set of steps based on social network analysis (SNA) was proposed by Damian et al. (2010). However, Damian et al. (2010) remained silent on the issues like studying the effects of collaboration on team performance. Therefore, the proposed framework is an initiative to close this research gap and provide a formalised set of steps to study socio-technical aspects (i.e. communication and awareness) among agile teams.

3. Data sources for the formulation of framework

The two data sources, which are systematic literature reviews (SLR1 and SLR2) and survey are used as a basis for the framework formulation, which are described in this section and depicted in Fig. 1.

3.1. Online survey

The survey study was conducted to identify the most relevant socio-technical aspects from the perception of industry practitioners using agile methods (Inayat, Salim, Marczak, & Kasirun, 2014). The main aims were to: (i) find out the perception of agile practitioners about collaboration; and (ii) identify the socio-technical aspects which agile teams find relevant while collaborating with each other for certain interdependent requirements (user stories). We used an online questionnaire for gathering responses from industry practitioners. A total of 103 responses were collected from all over the world. About three-quarters of the responses were gathered through the professional virtual community (PVC), i.e. [linkedin.com](http://www.linkedin.com) while about one-quarter was collected through e-mail (50 email invites were sent and 30 people replied, considered 26). The survey results showed that practitioners perceived collaboration mainly as communication among peers, knowledge of other team members (awareness) and trust in each other. Moreover, the practitioners selected communication, awareness and knowledge sharing as the most relevant aspects of collaboration among teams. Therefore, communication and awareness were chosen to be studied in detail for agile teams.

3.2. Systematic literature review

Two systematic literature reviews (SLRs) were conducted:

- SLR1 (Inayat, Salim, Marczak, Daneva, Shamshirban, 2014) is conducted to further the understanding of the underlying concepts of agile RE, i.e. agile teams, user stories, agile RE practices and challenges.
- SLR2 is conducted to review communication and awareness in the literature in order to further the understanding of both aspects in RE activities.

These reviews were conducted according to the available guidelines for conducting systematic literature reviews (Kitchenham & Charters, 2007) to develop further understanding of the topic. Of the 543 initial papers located in well-known electronic research databases, 21 relevant papers were extracted for SLR1. Likewise, 16 studies were selected out of 340 studies for SLR2.

The findings of SLR1 (Inayat, Salim, Marczak, Daneva, Shamshirban, 2014) revealed the agile RE practices, agile RE challenges and implications. The findings suggest that agile requirements engineering in a research context needs additional attention and more empirical results are required to better understand the impact of agile requirements engineering on team performance and outcome quality. The implications stated that the

Download English Version:

<https://daneshyari.com/en/article/10312684>

Download Persian Version:

<https://daneshyari.com/article/10312684>

[Daneshyari.com](https://daneshyari.com)