Studying Gamification as a Collaboration Motivator for Virtual Software Teams: Social Issues, Cultural Issues, and Research Methods

Sabrina Marczak

Pontifícia Universidade Católica do Rio Grande do Sul - Faculdade de Informática, Porto Alegre, RS, Brazil 90619-900
sabrina.marczak@pucrs.br

Fernando Figueira Filho

Departamento de Informática e Matemática Aplicada
U. Federal do Rio Grande do Norte
Natal, RN, Brazil 59072-970
fernando@dimap.ufrn.br

Leif Singer

University of Victoria
ECS Building, Room 504
3800 Finnerty Road
Victoria BC V8W 2Y2 Canada
lsinger@uvic.ca

Christoph Treude

Departamento de Informática e Matemática Aplicada
U. Federal do Rio Grande do Norte
Natal, RN, Brazil 59072-970
ctreude@dimap.ufrn.br

Flávio Steffens

Pontifícia Universidade Católica do Rio Grande do Sul - Faculdade de Informática, Porto Alegre, RS, Brazil 90619-900
flavio.steffens@acad.pucrs.br

David Redmiles
Ban Al-Ani

Department of Informatics,
University of California, Irvine
Irvine, CA 92697-3425, USA
{redmiles,balani}@ics.uci.edu

Abstract

Gamification is the application of game elements and game design techniques in non-game contexts to engage and motivate people to achieve their goals. Motivation is an essential requirement for effective and efficient collaboration, which is particularly challenging when people work distributedly. In this paper, we discuss the topics of collaboration, motivation, and gamification in the context of software engineering. We then introduce our long-term research goal—building a theoretical framework that defines how gamification can be used as a collaboration motivator for virtual software teams. We also highlight the roles that social and cultural issues might play in understanding the phenomenon. Finally, we give an overview of our proposed research method to foster discussion during the workshop on how to best investigate the topic.

Author Keywords

Gamification; virtual team collaboration; motivation; social and cultural issues; empirical work.

ACM Classification Keywords

H5.3 Group and Organization Interface: Computer-supported cooperative work; K.4.3 Computers and Society: Organizational Impacts: Computer-supported collaborative work.

Introduction

Virtual teams–those in which team members are in different locations or time zones [1]–have become common due to several factors: the need to reduce travel costs, a globalized and competitive market, the distribution of qualified human resources across different locations, and the availability of software applications and infrastructure for collaborative activities. While there is a reasonable body of knowledge on how to support collaboration among members of virtual teams, how to motivate such collaboration remains an open question.

Virtual teams need to overcome the challenges of collaborating across different boundaries that emerge as a result of time zones and physical, cultural, functional, and organizational distribution. Motivation–the force that triggers an organism to take action towards a goal–becomes essential to promote collaboration in such dispersed environments [2]. We seek to explore whether *gamification* can motivate virtual team members to collaborate.

Gamification is the use of game elements in non-game contexts [3]. More specifically, it is the application of game elements (e.g., points, badges, or leaderboards) and game design techniques to engage and motivate people to achieve their goals [4]. A popular example of gamification is Stack Overflow[1], a Q&A site in which users earn points for providing programming-related questions and answers that are voted on by their peers, and these points are aggregated to create the users' reputation on the site.

The gamification of activities has recently received attention because of its broader adoption in several work-related situations (e.g., [5]). *How exactly gamification can motivate collaboration in virtual software teams*, however, is still an open question. In this paper, we present our proposed research method for investigating this topic and for uncovering the roles that social and cultural issues might play in understanding this phenomenon. Our aim is to foster discussion on how to best investigate the topic from diverse local perspectives.

Collaboration, Motivation, and Gamification in Software Engineering

Essential collaboration activities include having members share information with each other, coordinating dependent activities, communicating in a timely fashion, participating in active knowledge sharing, and building trust. Previous work investigating collaboration in virtual teams has focused on the role of communication [6], distance [7], and performance [8].

The collaboration that is necessary to complete a task can be fostered through individual or group motivation. Beecham and colleagues (2008) [9] conducted a literature review on motivation in software engineering and found that motivation has a large impact on developer productivity and quality. While there are

---

1 http://stackoverflow.com/

several studies discussing the topic, most of them focus on identifying the motivators and de-motivators for developers (e.g., [10]). To the best of our knowledge, none have directly investigated how to motivate collaboration in virtual software teams.

Gamification has recently been reported as a means for motivating people to achieve their goals [4]. In software engineering, the gamification of collaborative work has become a topic of interest. For instance, researchers have reported the interplay of human aspects, social media, and gamification in open-source software [11], on monetarily rewarding open-source developers [12], on motivating developers to adopt new practices, tools [13], and methods [14], as well as on motivating developers to perform certain software development activities, such as version controlling [15]. However, there are no studies yet on how to foster collaboration in virtual software teams using gamification as a motivational strategy.

Proposed Research Method
Our goal is to develop an understanding of how exactly gamification can motivate collaboration in virtual software teams. We understand that motivation and collaboration are affected, to a certain extent, by social and cultural aspects. For instance, in a collectivist culture (e.g., Latin America), an individual is typically committed to the well-being of the community or the collective, whereas in an individualistic culture (e.g., the US), the individual is more concerned about personal gains and achievements [16]. Game mechanisms can also be perceived differently by developers from different cultures.

Therefore, to answer our research question and to account for the social and cultural issues mentioned above, we need to better comprehend how developers get motivated to collaborate (objective 1), which collaboration mechanisms they use and which collaboration issues they face when working in a distributed setting (objective 2), which software development activities are suitable to be gamified (objective 3), and how these activities can be gamified in a virtual setting (objective 4). Our contribution will be represented in a framework format, indicating which game elements and mechanisms promote aspects of collaboration in virtual software teams.

We propose a qualitative study organized in four major phases: (1) Literature review, (2) Exploratory field study, (3) Framework development, and (4) Framework evaluation. In *Phase 1 - Literature review*, we will systematically review literature in software engineering on the following topics: motivation, collaboration, and gamification (objectives 1-3). In parallel to Phase 1, in *Phase 2 – Exploratory field study*, given the anticipated limited material available, we will conduct a field study based on semi-structured interviews with experts on global software development aiming to collect their perceptions on these topics (objectives 1-3). We will select practitioners with different roles and seniority levels located in several countries aiming to account for social and cultural issues. Next, in *Phase 3 – Framework development*, we will propose how to gamify such activities (objectives 3-4). The framework proposal will include social and cultural aspects as well as individual, inter-personal and work context factors that shape collaboration processes in virtual teams. Singer [17] has previously identified persuasive mechanisms in a pattern catalog aimed at increasing

the adoption of best practices among software developers—this and similar work will provide a foundation for the framework to be developed. In *Phase 4 – Framework evaluation*, we aim to evaluate the framework through experiments that will measure how much it attends its purpose (objectives 3-4).

Final Considerations

A framework on gamification of software development activities to motivate virtual team collaboration can enable us to provide guidance and recommendations to practitioners for approaching collaboration issues in virtual teams. Researchers will benefit from having a theoretical perspective over existing methods and techniques for investigating the topic. Our main goal for this workshop is to foster discussion on how to improve the investigation of the topic and how to best account for social and cultural issues.

References

[1] Hinds, P.J. and Bailey, D.E. Out of sight, out of sync: Understanding conflict in distributed teams. *Organization Science* 14, 6 (2003), 615-632.

[2] Geister, S., Konradt, U., and Hertel, G. Effects of process feedback on motivation, satisfaction, and performance in virtual teams. *Small Group Research 37,* 5 (2006), 459-489.

[3] Deterding, S., Dixon, D., Khaled, R., and Nacke, L. From game design elements to gamefulness: Defining "gamification". In *Proc. Int'l Academic MindTrek Conference:* ACM, Tampere, Finland, 2011, 9-15.

[4] Deterding, S. Gamification: Designing for motivation. *Interactions* 19, 4 (2012), 14-17.

[5] Kumar, J. Gamification at work: Designing engaging business software. In: Design, User Experience, and Usability. Marcus, A. (Ed.), Springer (2013), 528-537.

[6] Jarvenpaa, S.L. and Leidner, D.E. Communication and trust in global virtual teams. *Organization Science* 10, 6 (1999), 791-815.

[7] Hertel, G., Konradt, U., and Orlikowski, B. Managing distance by interdependence: Goal setting, task interdependence, and team-based rewards in virtual teams. *European Journal of Work and Organizational Psychology* 13, 1 (2004), 1-28.

[8] Maznevski, M.L. and Chudoba, K.M. Bridging space over time: Global virtual team dynamics and effectiveness. *Org. Science* 11, 5 (2000), 473-492.

[9] Beecham, S., Baddoo, N., Hall, T., Hobinson, H., and Sharp, H. Motivation in Software Engineering: A SLR. *IST* 50 (2008), 860-878.

[10] Rehman, M., Mahmood, A., Salleh, R., and Amin, A. Understanding motivators and de-motivators for software engineers: A case of Malaysian software engineering industry. *ICSECS,* pp. 205–214, 2011.

[11] Vasilescu, B. Human aspects, gamification, and social media in collaborative software engineering. In: *Companion Proc. ICSE*, Hyderabad (2014), 646-649.

[12] Krishnamurthya, A., Oub, S. and Tripathi, A.K. Acceptance of monetary rewards in open source sw. development. *Research Policy* 43 (2014), 632-644.

[13] Snipes, W., Nair, A.R., and Murphy-Hill, E. Experiences gamifying developer adoption of practices and tools. In: *ICSE*, ACM, Hyderabad (2014), 105-114.

[14] Singer, L. and Schneider, K. Influencing the adoption of software engineering methods using social sw. In *ICSE*, Zurich, Switzerland (2012), 1325-1328.

[15] Singer, L. and Schneider, K. It was a bit of a race: Gamification of version control. In *Companion Proc. ICSE*, IEEE, Zurich, Switzerland (2012), 5-8.

[16] Hofstede, G. *Cultures and organizations:* Software of the mind. McGraw-Hill: New York, 1997.

[17] Singer, L. Improving the adoption of software engineering practices through persuasive interventions. PhD thesis, University of Hannover, 2013.