
Trust in Virtual Teams: Theory and Tools

Ban Al-Ani

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

David Redmiles

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

Cleudson R. B. de Souza

Federal University of Pará &
Vale Institute of Technology
Rua Augusto Corrêa, 01, Belém,
PA, Brazil - 66075-110
cleudson.desouza@acm.org

Rafael Prikladnicki

Pontifícia Universidade Católica do
Rio Grande do Sul - Faculdade de
Informática, Prédio 32 - Sala 505
Porto Alegre, RS, Brazil 90619-900
rafael.prikladnicki@puccrs.br

Sabrina Marczak

Pontifícia Universidade Católica do
Rio Grande do Sul - Faculdade de
Informática, Prédio 32 - Sala 505
Porto Alegre, RS, Brazil 90619-900
sabrina.marczak@puccrs.br

Filippo Lanubile

University of Bari,
Dipartimento di Informatica
Via Orabona 4, 70126 Bari, Italy
lanubile@di.uniba.it

Fabio Calefato

University of Bari,
Dipartimento di Informatica
Via Orabona 4, 70126 Bari, Italy
calefato@di.uniba.it

Abstract

We present a workshop in which trust in virtual teams is the central theme. Trust is essential for effective and efficient collaborations to take place and is more challenging when people are unable to meet face-to-face. The workshop aims to generate discussions which address three key issues within this general theme: 1) the factors that engender and inhibit trust, 2) the structure of a trust framework, 3) and the requirements for software tools that support the development of trust during virtual collaborations.

Author Keywords

Trust; virtual collaborations; virtual and distributed teams; software tool development.

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 have become prevalent as the result of the interplay of several factors. These factors include an increase in travel costs, a competitive market, the distribution of resources, and the availability of software platforms for collaborative activities, among

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others. While there is some progress in supporting collaborations among members of virtual teams, trust remains an aspect that bears further investigation.

A team is generally defined as being made up of two or more individuals who share a common goal or purpose to achieve a certain outcome [12]. The term “virtual team” implies that these individuals will achieve their goal(s) by utilizing one more tools to overcome the challenges of collaborating across different boundaries that emerge as a result of distribution across space, time and working units [12].

Trust is often a challenge that emerges during a team’s collaboration. It is generally considered more of a challenge when individuals are expected to collaborate “virtually” with strangers they may not meet face-to-face during the project’s lifetime. Trust is considered positive when there is a belief that the trustee (individual, team and/or organization) will meet the positive expectations of the trustor (individual, team and/or organization) [1]. Positive trust can better enable virtual teams to manage uncertainty, complexity, and the expectations of the reported environment. Consequently, positive trust, or simply trust, can reduce transaction costs and increase confidence [1]. It can also promote open, substantive, and influential information exchange [10], [11]. Trust is often found to be an antecedent to synergistic behavior and support team members’ adaptation to changing circumstances [4], [8]. On the other hand, a lack of trust can mean added cost and an increased need for structure to guard against opportunistic behavior [19], [15].

Workshop Themes

The workshop focuses on three main issues pertaining to the main workshop theme. These issues include discussing factors that engender and inhibit trust, the structure of an overarching trust framework and the requirements for software tools that can support the development of positive trust during virtual collaborations. Workshop discussion will be directed to identifying intersection points of these three dimensions.

Factors that Engender and Inhibit Trust in Virtual Teams

Trust can be fostered through interactions over a period of time and as a result of positive experiences during these interactions. For example, trust is engendered when individuals uphold commitments and act honestly and ethically [5]. Citizenship behaviors, performance, information sharing, and cooperative negotiation behaviors may also engender trust [6]. Previous work investigating trust has focused on investigating the role different communication media play in the development of trust [4], the different kinds of trust [1], and the various measures of trust [8], [4], [19]. There is also some work investigating the behaviors and processes which engender trust [3][7]. We find that the investigation of factors which engender trust within different domains of collaborative work, some of which has focused on collaborations within virtual teams, has led researchers to conclude the important role trust plays in collaborations. We expect discussions focusing on issues relating to trust in virtual teams across various areas of interest.

Developing a Trust Framework

Once we have achieved a reasonable, collective understanding of the factors that engender and inhibit trust, we anticipate that these factors are fragmented and scattered across different research domains (e.g., business, management, organizations, global software engineering, etc). We aim to identify these fragments to enable us to develop a “*trust in virtual teams*” framework, which is the second aim of the workshop.

A comprehensive framework can enable us to identify areas which require further investigations, approaches best suited to such research and how we can extend existing theories, among other issues that may be identified during the workshop.

Requirements for Software Tool Support

Researchers have found that once trust is manifested, it is typically reciprocated [6]. They also report that trust can be transmitted from one group to another via risk-taking behavior, such as delegation, and reduced monitoring and formalization. These findings imply that positive trust can be contagious and can snowball to include all team members, once trust is established. These findings also highlight the importance of supporting the development of trust. The third workshop theme focuses on the possibility of developing automated tools or extending existing tools to support the growth of positive trust among virtual team members.

Previous work illustrates that tools can play a role in starting the trust development process [2], [18]. In an experimental study researchers found that subjects were more likely to trust team members they had not met when provided with some visualizations of prior

activities [18]. In this experimental study, researchers report that their subjects indicated that the visualization and the representation of interdependencies in these visualizations played a role in their decision making process. Other work has also explored the use of a diverse suit of tool prototypes and how they can lend themselves to supporting the development of trust [2].

These reports illustrate that tools can play a role in supporting the development of positive trust and that identifying dependencies are one way to measure the extent of collaboration taking place. The prospect of building tools or extending existing tools to support trust is a central goal of our workshop. Although some attempts have been made to support positive trust in virtual software engineering teams through intervention, rewards, and training (e.g., [13]; [14], [21]), we seek to discuss automated support that can be incorporated into existing virtual team environments.

Workshop Format and Outcomes

This is a one full day workshop which is made up of three sessions. In the first session, we will focus on introducing the participants and their work on trust in virtual teams in addition to identifying commonality across areas of interests. The sessions will therefore highlight current understanding on what engenders trust in virtual teams as per workshop theme. The session time will be divided equally amongst team members. We will also allow time for discussions and identification of commonality to occur.

Individuals whose work focuses on the use of tools (e.g., [9], [20] and [16] and the influence of personal

characteristics [17], for example, can seed conversations into future directions of computer support for virtual collaborative work. The main outcome of this session is to create a map of participants' interest and an outline of the existing body of work that they are familiar with.

In the second session, discussions will involve *building* a framework from participants existing knowledge of their own work and others. We will use the understanding gained from the first session to identify trust dimensions and trace existing work into these dimensions. The main outcome from this session will be a theoretical framework that can be used as a starting point and which can be refined further in future work.

Workshop organizers will identify dimensions based on submissions, the discussions which take place in the first session and in consultation with workshop participants will help refine these dimensions further. The participants can then choose which group to join. Each group will develop a map of their knowledge within the boundaries of their group's trust dimension. Each group will present their results towards the end of this session.

In the third and final session, we will discuss how we can use existing knowledge to develop new collaborative tools or extend existing tools such they can better support positive trust. The main outcome from this session will be the initial draft of requirements which describe desired tool features. These requirements can be grouped into sets according to different types of tools.

We propose that participants assign themselves to another group dimension (different from the one they worked in during the second session). Each newly formed group will consider the theory that has been

reported by others and discuss how such understanding can be utilized to develop tool support by tracing the results to requirements which describe functional and non-functional features that can be developed to support virtual teams.

Ultimately, we aim to develop insights from all three sessions which will be reported as a technical report available online and in a submission to a research magazine, e.g. *Interactions*, at a future date. Participants are encouraged to explore potential collaborations with one another for future research.

Organizers

Dr. Ban Al-Ani is a Research Scientist at the Donald Bren School of Information and Computer Sciences at the University of California, Irvine. She received her Ph.D. in Computer Systems from the University of Technology, Sydney in 2002. Her dissertation research was in the area of analysis of early informal requirements. Her work spans three main research areas within the general domain of software engineering, namely: requirements engineering, distributed collaboration and human-computer-interaction. She was also workshop chair for the 2010 and 2012 IEEE International Conference on Global Software Engineering.

Dr. David Redmiles is a Professor in the Department of Informatics in the Donald Bren School of Information and Computer Sciences at the University of California, Irvine. He received his Ph.D. in Computer Science from the University of Colorado, Boulder, in 1992. He has a background in software engineering, human-computer interaction, and computer-supported cooperative work. For the past decade, he has been researching

collaborative software engineering, including issues of awareness, trust, and related visual software tools. He has organized a number of workshops including ones at ICSE and CHI. He was General Chair of the 2005 IEEE/ACM Conference on Automated Software Engineering and is Program Co-Chair of the 2013 International Symposium on End-User Development.

Dr. Cleidson R. B. de Souza is an Associate Professor at the Federal University of Pará in Brazil and a Researcher at the Vale Institute of Technology. He received his Ph.D. in Information and Computer Science from the University of California, Irvine in 2005. His dissertation research was at the intersection of computer-supported cooperative work and software engineering. Currently, he is interested in virtual and distributed teams as well as tools to support them. He was also one of organizers for the CHASE Workshop at ICSE since 2007 and the Collaborative Software Development Workshop at CSCW in 2006.

Dr. Rafael Prikladnicki is an Associate Professor at the Computer Science School at PUCRS University, Brazil, where he leads the Munddos research group. He received his Ph.D. in Computer Science from the PUCRS University in 2009. His areas of expertise are Distributed Software Development and Agile Methods for Software Development. He is mainly interested in how global software engineering impacts organizations, the role of Brazil in the global IT industry, how global software engineering interplays with agile methods, and the usage of agile methods to build high performance software development teams. He was General Chair of the 2012 IEEE International Conference on Global Software Engineering.

Dr. Sabrina Marczak is a Research Assistant at the Computer Science School at PUCRS University, Brazil. She received her Ph.D. in Computer Science from the University of Victoria, Canada in 2011. Her dissertation research was in the area of collaboration in software engineering. Her research interests are in the areas of global software development, collaboration in distributed teams, and requirements engineering. She was Local Chair for the 2012 IEEE International Conference on Global Software Engineering.

Dr. Filippo Lanubile is an Associate Professor at the Computer Science Department at the University of Bari, Italy, where he leads the Collaborative Development Group. His research interests lie in the areas of software engineering and computer supported cooperative work, focusing on social software engineering and distributed software development. In 2013, he will be the General Chair of the 8th IEEE Int. Conf. on Global Software Engineering and was Program Chair of the same conference in 2008.

Dr. Fabio Calefato is a Post-Doc Fellow in the Collaborative Development Group at the University of Bari, Italy. He received his Ph.D. in Computer Science from the University of Bari in 2007. His dissertation research was focused on applying computer-mediated communication theories to the analysis of distributed requirements meetings. His research interests lie in the general domain of global software engineering and include: distributed requirements engineering, collaboration in software development, and social software engineering.

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