*Working title*

Interpersonal and contextual factors in the development of intelligent social systems – a mixed methods approach on software development teams working in a self-organized environment using agile working methods

Laura Sophie Aichroth
University of Applied Sciences (FOM)
Universidad Católica San Antonio de Murcia (UCAM)


Supervisors
Prof. Dr. Laura Campoy Gómez (UCAM)
Prof. Dr. Mandy Nuszbaum (FOM)

Correspondence
Laura Sophie Aichroth
E-mail: forschung@teamagile.org

**Abstract**

This report of the research results gives insights into the progress, status and plans of the dissertation project started in October 2019. It consists of two major parts: firstly, the current state of the dissertation project in June 2020 will be given. Furthermore, an overview of the first of three planned studies will be given. The two main constructs of the first study, the team climate for innovations and the flow experience, will be introduced and the research design will be briefly described. In addition, the current state of the study will be presented including the current number of participants in end-June 2020 (n = 323). Finally, a first status of the currently known possible implications will be given and the underlying ethical principles will be described to give an insight into the scientific-ethical understanding of the researcher.

**Keywords:** Work and organizational psychology, organizational development, resilient organizations, software product development

# 1   Introduction

Initiated by new markets, short innovation cycles, globalization, almost unrestricted access to knowledge and low base rates to comparatively high risk driven investors, alternative methods for the development and production of economic goods were needed. Shorter product life cycles mean faster development of new consumer goods, functions and business models. In such fastmoving times, rapid market displacement and increasing competitive pressure, hardly any company can afford to bet too long on the proverbially wrong product. The aim of companies is to be able to adapt to the rapidly changing markets (Schaper, 2014). With increasing changes in modern organizations and their environments, continuous learning and innovations are becoming more and more important to stay competitive. Organizations are dependent on multidisciplinary teams, since team work promotes individual participation, the willingness to make an effort, learning motivation, loyalty and creativity. Those effects are not only relevant for high performance, change and innovation, but also essential for the success of a team and the whole organization (Brodbeck, Anderson & West, 2000b). In order to remain competitive and survivable, organizations need to develop collaboration systems, which ensure resilient habits and enhance the full human potential (Laloux, 2015; Wohland, 2012). Therefore, the aim of the dissertation project is to examine, which variables are to be supported in order to strengthen the organization's value with regards to being sustainable.

This status report of the research results and progress contains the current state in 2020, including an overview of the status of the activities, which were started or finished in the first year of the dissertation project. Furthermore, insights will be given into the first of three studies, which are conducted for the dissertation project. Afterwards, an outlook will be given on the planned activities for the second year and the upcoming two further studies. Finally, a status of possible implications will be given and the underlying ethical principles will be described to give an insight into the scientific-ethical understanding of the researcher.

# 2   Project status 2020

The following chapter will give an overview of the development in 2019 and 2020. Furthermore, an insight will be given into the current status of the first study of the Ph.D. project, being conducted in May and June 2020.

## 2.1  Development in 2019 and 2020

Besides all action needed to fulfil the started or completed activities, the main effort went into redefining the dissertation project with the supervising professors. The research set up will consist of three sequential studies (n approx. 300 for each study) in the area of organizational development and organizational psychology, focussing on software development companies and teams. The current status of the target area is to research for moderators or mediators, which still needs to be defined, to resilient IT-organizations (Baron & Kenney, 1986). It still

needs to be decided which scale will be used to operationalize resilient organizations.

## 2.2 Study 1 - Team climate for innovations and flow experience of software development teams in Germany

The aim of study 1 was to examine, whether there is a connection between the team climate for innovations and the flow experience for software development teams in Germany.

In order to make use of team work that contributes to an organizational success, individuals need to be able to collaborate constructively and productively. As a prerequisite, a special atmosphere for innovation and team effectivity is needed (Brodbeck, Anderson & West, 2000b). Not all work settings allow to realize the full human potential.

Flow is defined as a state of mind that happens when someone feels optimally challenged and fully absorbed in the current activity. This state is perceived as engrossing and enjoyable (e.g. Csikszentmihalyi, 1999). A positive relation between work-related flow and organizationally relevant outcomes has been shown (e. g. Salanova, Bakker, & Llorens, 2006; Demerouti, 2006; Eisenberger, Jones, Stinglhamber, Shanock, & Randall, 2005; Kuo & Ho, 2010).

Little research has been conducted, focusing on the flow experience and the affection by work specific parameters like the team climate for innovations for software development organizations and teams in Germany (e. g. Debus, Sonnentag, Deutsch & Nussbeck, 2014).

In order to gain these insights, two existing psychometric tests are used by permission of the authors to operationalize the constructs. The Team Climate for Innovations is measured by the Team Climate Inventory (TCI) for Innovations by Anderson & West (1998) and the flow experience is evaluated by the Flow Short Scale by Rheinberg, Vollmeyer & Engeser (2019). The TCI is used in a preversion with the courtesy of the author Brodbeck (Anderson, Brodbeck & West, 2000a). The FSS is used with the courtesy of the author Rheinberg and in compliance with the Creative Commons conditions. Both scales, the TCI and the FSS are available in a German standardized questionnaire. The two constructs have been selected, since both are operationalized by highly standardized, validated scales (internal consistencies (Cronbach's alpha) of TCI dimensions average .86 (range: .84 - .89) (Anderson, Brodbeck & West, 2000b); Cronbach's alpha for FSS .90 (Rheinberg, Vollmeyer & Engeser, 2002).

The determined target population are adults working in software development teams in Germany. At the current state, the number of participants is n = 426 of which n = 323 are closed, completed and clean data sets.

## 3 Outlook for 2020 until 2021

The following chapter will give an outlook to the planned activities and the development from 2020 until 2021. Furthermore, an insight will be given into the planned second and third study of the Ph. D. project, planned to be conducted in August and September, respectively November and December 2020.

## 3.1 Upcoming research

Since the research design consists of three consecutive studies, two further studies will be conducted. The precise research design will be adjusted based on the results of study 1. Currently, the upcoming two studies include the following research designs.

## 3.2. Study 2 – Psychological safety and leadership

In order to follow up on the subscale of participative safety of the TCI by Brodbeck, Anderson & West (2000a) in study 1, it is planned to continue getting deeper insights into the effect of psychological safety. Investigating the findings of Edmondson (1999) for the target group of software development teams and organizations in Germany, it needs to be validated, whether the learning behavior moderates between team psychological safety and team performance as well. For other target groups, like manufacturing companies, Edmondson's results support an integrative perspective in which both team structures, like context support and team leader coaching, and shared beliefs design team outcomes. In addition, it will be specified, what influence exists regarding positive leadership (Cameron, 2012; Kelloway et al., 2013; Seligman & Csikszentmihalyi, 2000). The reason for choosing positive leadership instead of transformational leadership is that a field study by Avey et. Al (2008) showed that the predictability of employee empowerment was higher for positive leadership than for transformational leadership.

## 3.3 Study 3 – Moderating variables for organizational resiliency

Study 3 aims to specify the gain of insights into mediating or moderating variables on organizational resiliency for software development companies. It remains to be decided which scale will be used to operationalize resilient organizations. Depending on the results of study 1 and study 2 and the strength of correlations, it will be decided, which scales will be used to deepen the state of knowledge regarding those variables and to derive recommendations for action.

## 4 Status of possible implications and underlying ethical principles

In the simplest case, it will be verified that software development organizations know how to benefit from mediated or moderated work-related variables like the team climate for innovations and flow experience as a value for the organization. Furthermore, it could be verified that especially psychological safety and transformational leadership play an important role in gaining organizational resiliency. In this case, companies could adjust work environments, foster innovation friendly collaboration and take actions to improve the flow experience and enable leaders with regards to transformational leadership and tools to enhance psychological safety.

Finally, it needs to be emphasized that the ethical guideline of the American Psychological Association, which are the Ethical Principles of Psychologists and Code of Conduct, are and will be respected in all three studies. In all three

studies, the participants were and will be informed about the motivation, the aim and the procedure of each study and have the opportunity to contact the researcher for further information. At no time, the dignity and integrity of the participants will be at risk. The anonymity of the participants is always guaranteed by not collecting any personal data. Even by publishing the results, no conclusions can be drawn about the identity of the participants. The fundamental aim of this research is to determine how resilient organizations can be positively influenced with regards to collaboration conditions. The researcher is aware of the responsibility for the individuals and the results.

## 5    References

Avey, J. B., Wernsing, T. S., & Luthans, F. (2008). Can Positive Employees Help Positive Organizational Change? Impact of Psychological Capital and Emotions on Relevant Attitudes and Behaviors. *The Journal of Applied Behavioral Science*, 44(1), 48–70. https://doi.org/10.1177/0021886307311470

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: development and validation of the team climate inventory. *Journal of Organizational Behavior*, 19(3), 235258.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. https://doi.org/10.1037//0022-3514.51.6.1173

Brodbeck, F. C., Anderson, N., & West, M. A. (2000a). Das Teamklima-Inventar: Handanweisung. *[The Team Climate Inventory: Manual]*. WOP Working Paper No. 2000 / 2. Retrieved from http://www.psy.lmu.de/wirtschaftspsychologie_en/forschung/working_paper/wop_working_paper_2000_2.pdf.

Brodbeck, F. C., Anderson, N., & West, M. A. (2000b). Das Teamklima-Inventar: Handanweisung und Validierung der deutschsprachigen Version [*The Team Climate Inventory: Manual and validation of the German version*]. Heidelberg: Hogrefe.

Cameron, K. (2012). *Positive Leadership: Strategies for Extraordinary Performance.* Vol. 2nd ed. BerrettKoehler Publishers.

Csikszentmihalyi, M. (1999). If we are so rich, why aren't we happy? *American Psychologist*, 54, 821–827. doi:10.1037/0003066X.54.10 .821

Debus, M. E., Sonnentag, S., Deutsch, W., & Nussbeck, F. W. (2014). Making flow happen: The effects of being recovered on workrelated flow between and within days. *Journal of Applied Psychology, 99*(4), 713 −722. https://doi.org/10.1037/a0035881

Demerouti, E. (2006). Job characteristics, flow, and performance: The moderating role of conscientiousness. *Journal of Occupational Health Psychology*, 11(3), 266–280. https://doi.org/10.1037/10768998.11.3.266

Edmondson, A. (1999). Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly, 44*(2), 350383. doi:10.2307/2666999

Eisenberger, R., Jones, J. R., Stinglhamber, F., Shanock, L., & Randall, A. T. (2005). Flow experiences at work: for high need achievers alone? *Journal of Organizational Behavior*, 26(7), 755775. https://doi.org/10.1002/job.337

Kelloway, E. K., Weigand, H., McKee, M. C., & Das, H. (2013). Positive Leadership and Employee WellBeing. *Journal of Leadership & Organizational Studies, 20(1)*, 107–117. https://doi.org/10.1177/1548051812465892

Kuo, T.H., & Ho, L.A. (2010). Individual difference and job performance: the relationships among personal factors, job characteristics, flow experience, and service quality. *Social Behavior and Personality*: An International Journal, 38(4), 531552. https://doi.org/10.2224/sbp.2010.38.4.531

Laloux, F. (2015). *Reinventing Organizations*. Franz Vahlen.

Jacqueline Mayfield, Milton Mayfield, & and Jerry Kopf. Motivating Language: Exploring Theory with Scale Development. *The Journal of Business Communication* (1973) 1995.32:329-344.

Rheinberg, F., Vollmeyer, R. & Engeser, S. (2002). Die Erfassung des FlowErlebens. In J. StiensmeierPelster & F. Rheinberg (Hrsg.), *Diagnostik von Motivation und Selbstkonzept* (S. 261279). Göttingen: Hogrefe.

Rheinberg, F., Vollmeyer, R., & Engeser, S. (2019). *FKS FlowKurzskala*. https://doi.org/10.23668/PSYCHARCHIVES.2667

Salanova, M., Bakker, A., & Llorens, S. (2006). Flow at work: Evidence for an upward spiral of personal and organizational resources. *Journal of Happiness Studies*, 7, 1–22. doi:10.1007/s1090200588548

Schaper, Niclas (2014): *Neue Formen der Arbeit: Das Beispiel Telekooperation.* In: Friedemann W. Nerdinger, Gerhard Blickle und Niclas Schaper (Hrsg.): Arbeits und Organisationspsychologie (3. Aufl. 2014). Berlin: Springer, S. 497–514.

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5–14. https://doi.org/10.1037/0003066X.55

Wohland, G. (2012). *Denkwerkzeuge der Höchstleister: Warum dynamikrobuste Unternehmen Marktdruck erzeugen* (3. Auflage). UNIBUCH.