STRESS MITIGATION IN AGILE SOFTWARE DEVELOPMENT

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Abstract

Agile, being one of the most used approaches for software development, is at the same time challenging. Stress among software developers, especially in the agile environment, is an important issue that can drastically decrease the productivity of an agile team if it is not addressed. The aim of this paper is to investigate the main sources of stress experienced by members of agile teams and propose solutions for coping with them.

1. Introduction

Agile software development has been already existing for more than twenty years (Larman & Basili, 2003). It aims to improve the development process, making it more flexible and adjustable to rapidly changing environments. Unlike the classical waterfall approach, agile does not have a detailed plan of work at the start. Instead, the entire development process is based on iterations delivering valuable software increments. Agile considers individuals as an important part of the software development lifecycle. The development team must quickly respond to the requirements changes and conflicts between the teammates may jeopardize the entire development lifecycle.

In software development, like in any other field, stress may occur. Since employees spend nearly one-third of their lives working, job stress impacts both their physical and mental health. In turn, poor health of staff directly affects the overall team productivity and performance (Crawford et al., 2014; Meier et al., 2018). Software developers appreciate the good organization of their workday and consider day good if it consists of certain expected activities (Meyer et al., 2019). Also, emotions and mood, which may be directly impacted by stress, deeply affect the performance and creativity of software developers (Graziotin et al., 2014). Stress among software developers, especially in the agile environment, is an important issue that can drastically decrease the productivity of an agile team if it is not addressed. Agile is intended to minimize the bureaucratic aspect and makes teams self-organized. Studies show that agile frameworks have more potential for stress mitigation compared to conventional project management (Pfeiffer et al., 2019). However, every agile practice that may reduce the stress level can also have downsides creating new stress sources. Delivering a valuable increments in short iterations may be challenging, but can lead to

burnout (Evenstad, 2018). While agile highlights communication between team members, if it is organized poorly, the entire team can be stressed (Sonnentag et al., 1994). Other potential reason for stress is work overload. Sometimes team commits to fulfill more than it is capable to do which could lead to stress and decrease the quality of work (Sonnentag et al., 1994). A lower focus on documentation also has both positive and negative impacts. On one hand, team members can focus more on creating a working product instead of documenting its features in detail. On the other hand, a lack of documentation may lead to mess and cause problems in the future. Agile is suitable for changing environments, however, a frequently changing environment can also cause more stress.

The aim of this paper is to investigate the main sources of stress experienced by members of agile teams and propose solutions for coping with them. This research has been made within the diploma thesis (Shcherbinin, 2022).

The rest of the paper is organized as follows. Following the Introduction, Section 2 describes the the research approach. The results of the Stress factors survey are presented in Section 3, while the Stress checklist is introduced in Section 4. Conclusion is presented in Section 5.

2. Research Method

In this section, the overview of the research approach is provided. First, review of relevant literature was conducted. To determine the main stress factors perceived by members of agile software development teams a research was conducted in a big software company with more than 1,300 people involved in development of software solutions in different areas from healthcare to finance. The company has been using agile methods for more than ten years.

Research conducted in this company had three steps. First, an open-question survey was designed that is described in Section 2.1. Then, several interviews were conducted to examine possible ways to mitigate found stress factors (see Section 2.2). Stress mitigation practices were presented in the form of a checklist that was then tested in several agile software development teams (see Section 2.3).

2.1. Stress Factors Survey

An open-question qualitative survey was carried out to reveal the reasons that made members of agile teams feel stressed. For the survey, only software developers were selected. As all software development teams in the company have adopted Scrum, everyone who participated in the survey had at least one year experience with Scrum. Developers were asked to answer following question:

As a software developer working in an agile environment, what, in your opinion, are sources of stress you encounter at work?

The respondents had a set of free-text fields where they could put their responses and thus they had a chance to list an unlimited number of stress sources they had experienced. The option (None) could have been chosen by respondents who felt a lack of stress at work.

2.2. Stress Mitigation Interviews

As a follow-up to the survey, qualitative interviews were conducted. Participants were selected based on requirements: (1) having more than five years experience in agile software development, (2) being different from respondents of the Stress Factors survey, (3) performing various roles. Overall, five agile professionals who volunteered to contribute to research were interviewed: two Scrum masters, an Agile coach, a Product owner, and a Developer. The interviews were carried out

in a face-to-face format and people were asked if they had an experience how to mitigate stress factors that had been identified in the survey. These answers were analyzed and a Stress checklist that is presented in Section 4 has been developed.

2.3. Stress Checklist Evaluation

The Stress checklist was evaluated in three Scrum software development teams in the same company. Each team consisted of ten members: one Scrum master, one Product owner, and eight developers. First, teams were asked to make self assessment and answer Yes or No for each of the 22 checklist items. No team was able to score Yes for more than 12 checklist items out of 22. Then, the teams were asked to work during the following five iterations on the checklist items where the answers were "NO" and to follow action items that were provided (action items are not listed in the paper due to page limit). As the iteration length was two weeks, teams were adopting the practices throughout ten weeks. At the end of the evaluation period, teams were asked to fill out the checklist again. The results after the application of the Stress Checklist showed that all the teams managed to adopt most of the practices and demonstrated results close to 100%.

3. Stress Factors Survey Results

Stress factors survey, described in Section 2.1, was conducted at the beginning of 2022 year. Responses from 257 agile professionals were received. Each respondent mentioned at least one source of stress he has encountered, some respondents mentioned two or more stress sources. In the end, 449 sources of stress were recorded. After removing duplicates, 23 unique sources of stress were listed. Stress sources mentioned in less than 2% cases were combined into the Other group, and so twelve stress sources, that are depicted in Figure 1 and described in the next paragraph, were identified.

According to the survey the following stress sources in agile software development teams were mentioned:

SS1. **Inadequate planning (estimation)**. Individuals feel stressed because in some cases the tasks are not estimated accurately. The real scope of these tasks is broader than it was originally assumed, and the developers feel pressured being unable to accomplish them on time.

SS2. **Short sprints**. Some developers feel frustrated having only two-week Sprints. They feel they are forcesd to deliver too small features that do not bring significant value.

SS3. **Work-life imbalance**. Several surveyed developers feel too involved in work, even though Scrum promotes different practices for work-life balancing.

SS4. **Frequent changes**. Some respondents find themselves lost in a frequently changing environment and cannot adapt to changes so quickly.

SS5. **Meetings overload**. Several individuals mentioned that they attend meetings almost half of all their work time although they do not actively participate in some of them.

SS6. **Lack of control**. Some developers reported their opinion is not heard. They do not have a feeling that they make decisions and have to obey the opinion of the majority even though they do not agree with it.

SS7. **Too big tasks**. Several respondents pointed out that the scope of tasks they work on is too broad. They feel frustrated not knowing what to start with and struggle to connect different parts of the tasks.

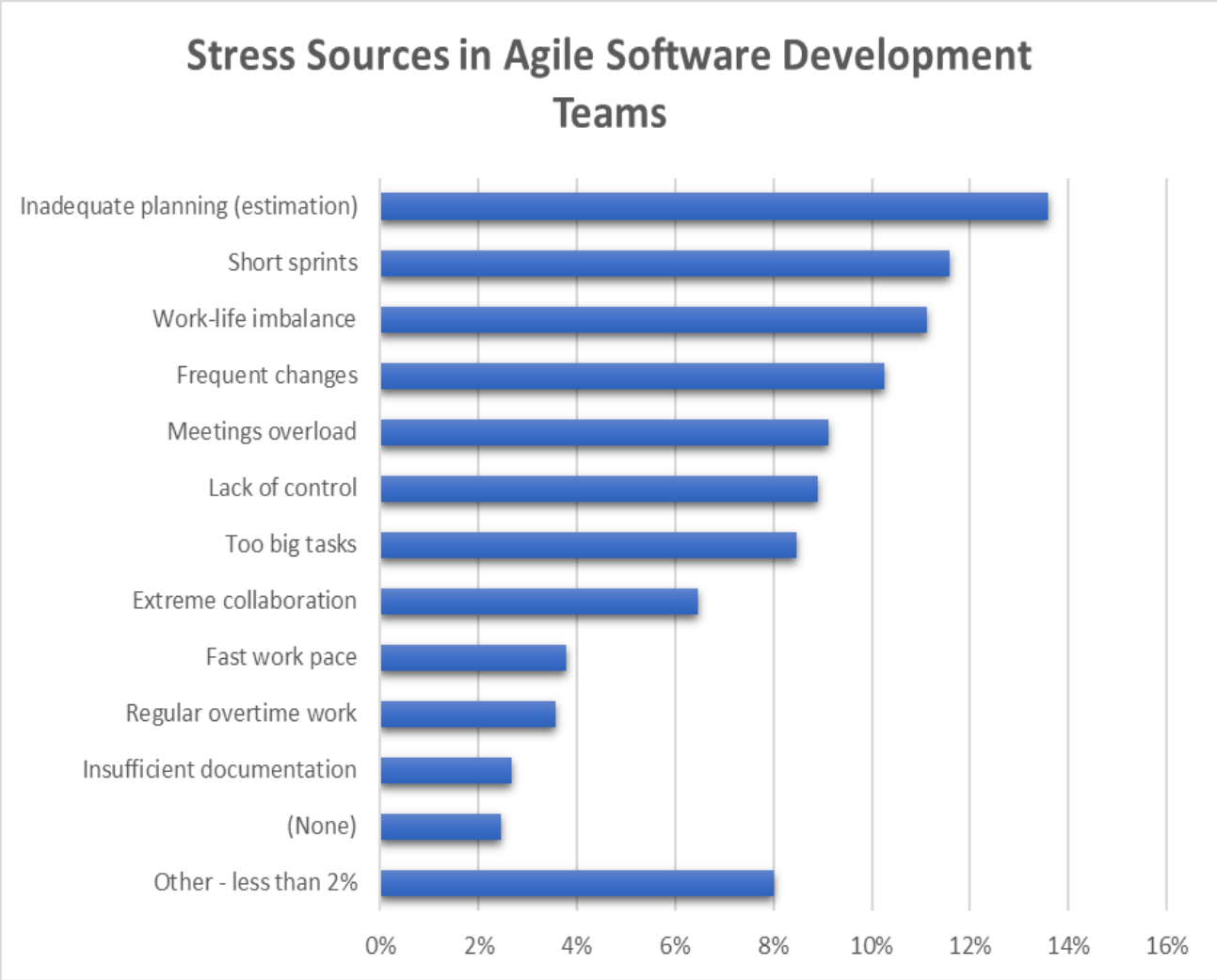

Figure 1 - Stress Sources in Agile Software Development Teams

SS8. **Extreme collaboration**. Some people mentioned that except for meetings they have too many interactions with other team members.

SS9. **Fast work pace**. A few software developers feel stressed because they have less time to deliver their work and it directly affects its quality.

SS10. **Regular overtime work**. Some individuals feel stressed because they have to work extra hours to accomplish their work. They mentioned that they voluntarily stay in the office outside of normal working hours to keep work on track.

SS11. **Insufficient documentation**. A few people stress out because they cannot find information on the source code they deal with due to poor documentation. Some of them also feel bad about having not enough time to create comprehensive documentation.

SS12. (None). 11 out of 257 (4.28%) respondents said that they feel absolutely no stress at work.

4. Stress Checklist Items

As a result of qualitative interviews described in Section 2.2 the Stress checklist has been proposed consisting of 22 items each representing a good practice for stress level reduction. For each checklist item, there were also one or two action items defined. By performing these action items the respective practice is achieved. However, due to the page limit proposed action items are not presented in the paper. The checklist items and their mapping to identified stress sources are listed in Table 1.

Table 1: Checklist Items Mapped to Stress Sources

Checklist Item ID	**Checklist Item Description**	**Mapping to Identified Stress Sources**
SC1	All the tasks my teams work on are defined as user stories with descriptions in the following format: "As a <user type> I want <goal> so that <reason>".	SS1
SC2	The team knows its velocity and regularly estimates the workload for every user story based on the team's experience. The actual workload of user stories is verified upon completion.	SS1
SC3	Every user story has dependencies listed before the work on the user story is started.	SS1
SC4	Every user story is the smallest piece of work possible. It cannot be split into smaller user stories.	SS2
SC5	Iteration length always allows delivering a valuable increment of the product. It is always possible to group user stories with cumulative estimation fitting into the iteration length and have a valuable increment upon completion of all the user stories in the group.	SS2
SC6	Team capacity for every iteration considers actual working hours planned for all the team members.	SS3
SC7	None of the team members works overtime.	SS3, SS10
SC8	Every team member must have a workplace where they can fully concentrate on their work.	SS3
SC9	The team always clearly understands the problem and has enough knowledge to deliver a valuable increment of the product.	SS4
SC10	The team participates only in the meetings required by the adopted framework and other meetings where all the team members actively participate.	SS5
SC11	Meetings are planned in a way that every team member has at least three working hours a day without meetings.	SS5
SC12	All the team members agree with the collaborative decisions made by the team. If applicable, collaborative decisions are regularly reviewed.	SS6

Checklist Item ID	Checklist Item Description	Mapping to Identified Stress Sources
SC13	None of the user stories, in progress and planned, can be split into smaller user stories.	SS7
SC14	None of the user stories, in progress and planned, are estimated for more story points than the number corresponding to ten man-days.	SS7
SC15	If a story is estimated for more than five man-days, it is done either by more than one person, or some milestones must be defined.	SS7
SC16	Collaboration protocol is established. The protocol defines specific hours for the team and every team member when they can collaborate. Every team member must have at least three working hours in a row outside of collaboration hours.	SS8
SC17	Rules for collaboration priority are established. The rules explicitly define how to classify needed collaboration acts. Specific collaboration hours in the collaboration protocol include the priorities. For example, collaboration hours are from 13:00 to 16:00 but from 15:00 to 16:00 only for high-priority cases.	SS8
SC18	Overhead and extra work is always considered during the iteration planning.	SS9
SC19	All the team members have regular short breaks at least once an hour.	SS9
SC20	All the team members often change the type of activity during a workday.	SS9
SC21	Documentation is easy to create and maintain, templates, examples are provided, automated solutions for documentation creation are used.	SS11
SC22	Documentation created by team members is a subject of review, it is sufficient. Quality and volume of documentation are included in teamwise common quality standards.	SS11

5. Conclusion

Overall, most of the stress checklist items are related to work organization, planning and estimation. Looking at the most common stress sources and proposed actions for their mitigation, most of the stress is connected with inappropriate planning. Team members could be affected by incorrect task estimation, which can put additional pressure on them. Inadequate planning makes maintaining a sustainable pace impossible. Moreover, because of a lot of events during the workday developers cannot concentrate on their work which can cause inappropriate working pace.

We can conclude that the stress level is a significant factor directly affecting performance of agile software development teams. Good piece of news is that most practices mitigating stress can be easily adopted without substantial investments. Suggested practices include improved planning,

recommended estimation techniques, cooperation and collaboration practices, and work organization tips.

5.1. Limitations of the Study

The research was conducted primarily using data that are relevant for team members practising Scrum or a hybrid agile method based on Scrum, which are the mostly used agile methods (Digital.ai, 2021). However, most research outcomes could be applicable also to other agile methods.

The research was focused on the examination of the most common issues related to stress and impediments in agile software development and the investigation of the ways how to effectively address them. Professionals who worked on several agile projects and in more than one company were selected as respondents and participants. This approach made it possible to address most of the issues that could be encountered by the vast majority of teams and organizations. However, it could be considered incomplete for teams working on unique tasks where stress sources and impediments can be specific to their area.

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