

## Exploring ScrumBut—An empirical study of Scrum anti-patterns



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### ABSTRACT

The wide-spread adoption of the agile movement has rapidly changed the landscape of software industry. In particular, Scrum is an agile process framework that has become extremely popular in industry. However, the practical implementation of Scrum in companies rarely follows the text book ideals, as companies often deviate from the proposed Scrum practices for various reasons. While some deviations may be well motivated and reasonable, companies can also be tempted to adjust Scrum for the company without clearly understanding the consequences of the deviations. In this paper our aim is to identify ways of potentially harmful mishandling of Scrum in industry based on empirical data collected in semi-structured interviews involving 18 teams in 11 companies. The (mal)practices that were identified at least in three different teams are presented in a semi-formal manner as anti-patterns. The study resulted in 14 anti-patterns that express the context of the deviation, the deviation itself, the broken core principles of Scrum, and the possible consequences of the deviation. In addition, where available, we have included company recommendations regarding the deviations. Furthermore, we identify potential risk areas in Scrum based on an analysis of the relationships between anti-patterns and Scrum concepts.

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### 1. Introduction

The wide-spread adoption of the agile movement—culminating in many ways in the Agile Manifesto published in 2001 [1] at the level of ideals—has taken off in the software industry in a rapid pace. However, when inspected more closely and in more detail, by phrase “we are agile in software development”, companies often mean simply, “we are using some practices or ideas of Scrum”. This is commonly referred as ScrumBut [14,18].

Scrum is a simple, iterative framework for project management [12,13,15]. At present, the adoption of Scrum has progressed in several organizations so far that it is possible to start collecting empirical data on the use of Scrum. To consolidate accurate, practical knowledge that is relevant to companies developing software, it is important to gather data on the Scrum practices in action for determining which parts of the methodology pose problems in industry. In particular, it is useful to understand how and why companies actually deviate from recommended Scrum way of working.

In this paper, our goal is to get empirical data on ScrumBut, that is, on the deviations of the recommended Scrum practices in companies that rely on Scrum in their software development, and present

those deviations systematically as anti-patterns [2]. In general, anti-patterns are common practices that are seen initially convenient and appropriate, but that are typically harmful in the long run and should therefore be avoided. An anti-pattern is often associated also with an alternative, recommended practice, which is more appropriate in most of the cases. Anti-patterns are presented using a well-defined format, identifying different aspects of the potentially harmful practices and making them easier to recognize, understand, and avoid.

The anti-pattern concept fits nicely our aim to describe in a semi-formal manner the constituents of ScrumBut. Since Scrum is a comprehensive framework rather than just a collection of practices, deviations from Scrum recommendations are, in general, regarded potentially harmful. Such a deviation may endanger the realization of the goals of Scrum as a whole. However, it should be emphasized that we do not present conclusions about the harmfulness of the found deviations based on empirical data. Indeed, sometimes a company has resorted to a deviation for good reasons, and this deviation is well justified. We have taken this into account by considering also these cases in each anti-pattern. In general, in this context the alternative “good” practice which is a part of an anti-pattern is the recommended text book Scrum practice.

The focus of this work is in the identification and presentation of the Scrum deviations based on empirical data. Essentially, our aim is to shed light on the relatively fuzzy concept of ScrumBut by identifying and exploring actual Scrum deviations in their context. We see the usefulness of this work mainly in two directions. First, a

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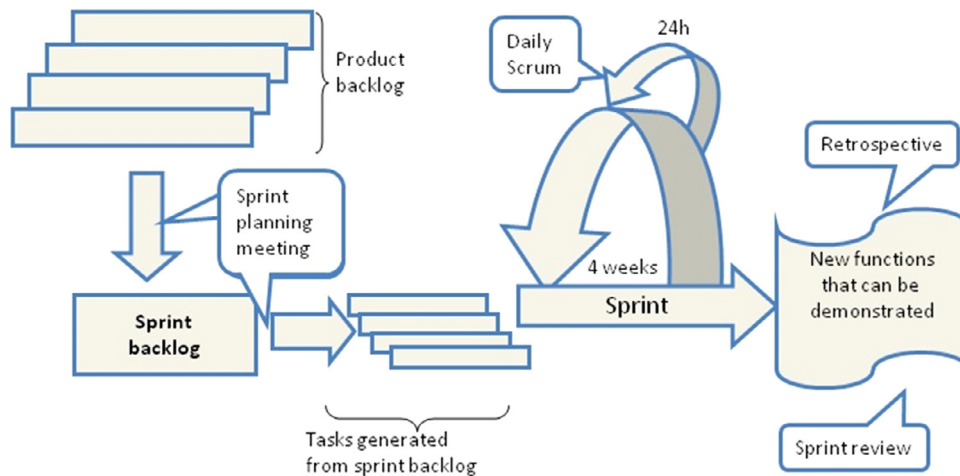


Fig. 1. Scrum in a nutshell.

company starting to use Scrum should be aware of common deviations that may look reasonable but that can be actually harmful. At least, the company should understand the context and the issues involved typically in such deviations. Second, understanding well-motivated deviations from the standard, text-book Scrum provides information for refining the methodology to fit the purposes of companies developing software.

To mine typical Scrum deviations in industry, we have conducted a survey of Scrum related practices in IT companies that use Scrum. The results of the survey are presented in this paper in terms of basic Scrum practices. For each basic practice, we summarize the contents of the interviews, especially concentrating on the ways the practices have been realized in the companies and possible deviations from Scrum recommendations. Then, we formulate the identified deviations from Scrum as anti-patterns using a format specifically designed for this purpose. These anti-patterns, together with the empirical data supporting them, are the main contribution of this paper.

The rest of this paper is structured as follows. Section 2 introduces Scrum, which forms the background of this paper. Section 3 provides the basic information concerning the survey method. In Section 4 we summarize the results of the survey structured according to the main Scrum concepts, discussing the extent to which companies follow the related Scrum practice and the possible deviations. Section 5 condenses the contribution of this paper by formulating the identified deviations as anti-patterns. Section 6 discusses the limitations of this study, and Section 7 summarizes previous work on the usage of Scrum in industry, with comparisons to our work. Towards the end of the paper, Section 8 introduces some directions for future work, and Section 9 draws final conclusions.

The paper is based on an earlier conference paper [17]. The extensions included in this paper include a brief introduction to Scrum to make the paper understandable for a wider audience, four new anti-patterns not published in the original paper, identified after further analysis of the same data, and an improved anti-pattern format with a company recommendation field to record possible solutions to problems as identified by the companies. In addition, the relationships between anti-patterns and Scrum concepts have been analyzed and visualized with a graph. Finally, the text has in general been revised to make it better suited for journal readers.

## 2. Background

Within a relatively short amount of time, an increasing number of organizations have adopted an agile way of working. When considering actions taking place inside individual companies and development teams, agile development usually means that they are using at

least some of the practices included in Scrum [15], a commonly used agile development framework (Fig. 1).

When using Scrum, incoming requirements are first stored in the Product Backlog in the form of so-called Product Backlog Items. These items are to be implemented in terms of Sprints, or iterations whose usual length is few weeks. For each Sprint, a collection of Product Backlog Items are selected for that particular Sprint and refined into a task list called the Sprint Backlog, consisting of Sprint Backlog Items. Collectively, these tasks form an implementation plan for the selected Product Backlog Items, provided in sufficiently concrete terms that it is possible to produce accurate work estimates for all of them.

After the refinement process, Sprint Backlog Items are implemented by executing the Sprint. The development team that executes the Sprint can select the best possible tools for the job, and consequently several techniques are commonly applied. Tools that are usually needed include, for example, support for version control, managing Backlog Items, testing facilities, and bug tracking systems. The details of the tool set fall beyond the scope of this paper.

Upon the completion of each Sprint, a complete system that can in principle be delivered to clients is available. In order to learn from each Sprint, a Retrospective is carried out to consider how the ways of working could be improved.

Only three roles are defined in Scrum: the Product Owner is responsible for managing the Product Backlog, the Team consists of developers responsible for executing the Sprint, and the duty of the Scrum Master is to eliminate any emerging impediment and enforce the Scrum process.

Although the above ideals form a coherent framework for executing development tasks, it is common that organizations follow them only partially or in a fashion where some of the practices are totally omitted. Omitting some Scrum practices or changing them in a way that is not aligned with the Scrum guidelines is commonly referred to as ScrumBut [18]. Such misalignment has been blamed to be a source of missing many of the benefits of Scrum [19], although little scientific evidence regarding this has been presented.

## 3. Survey method

Survey Research [6], commonly used to assess opinions and feelings, was selected as a research method for this study. The method gives an opportunity to identify characteristics of a group of individuals, and based on the results, one can compare the views of different populations.

The interview covered 11 IT companies in Tampere region, which is one of the centers of IT industry in Finland. The representatives of selected companies had participated in a certified Scrum master

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