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Implementation of Scrum in the Construction Industry

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Abstract

The way in which construction projects are managed has not changed significantly in the last decades; however, stakeholders, materials, competition, and user requirements are continuously changing. This creates a gap between the current managerial view on how construction projects are conducted and how they could be managed to increase efficiency.
The construction industry could use new frameworks for action in the project and product management, and learn from the experiences of other industries. With this background in mind, some construction companies are enhancing the performance of their project teams to improve their competitiveness and increase the added value to their clients and themselves.
This paper investigates the implementation of a framework from the IT sector into the construction industry: Scrum. Conducting a case study, the implementation and application of Scrum was analysed through the evaluation of its different artifacts. This research covers the following questions: Can Scrum be implemented in the design phase of the construction industry? What adaptations are needed to use Scrum to improve the design phase of construction projects? How and where could Scrum, or parts of it, be used by the design and planning departments of construction companies?
The results from this study show that Scrum has great potential in the design and planning departments of construction firms. From the analysis of the applications of Scrum in the case study, tangible benefits and weaknesses of the implementation, and its different artifacts, were identified. Finally, this paper gives recommendations about the use of Scrum in the design phase and proposes an outlook to implement Scrum in other phases of construction projects.

Keywords: Agile; Design Phase; Process Model; Project Management; Scrum

1. Introduction

In the construction industry, one of the biggest challenges when creating a building is to account for the unforeseeable [1]. In order to reduce the amount of unforeseeable events, project managers typically use templates, checklists and often models with phases, sub-phases and sub-sub-phases, as indicated for example in [2]. This so-called sequential project management approach aims to plan the project in detail and tries to carry it out without any deviation [3]. The creation of this plan often takes up significant resources before the actual construction has even started. In many cases, these processes are so long that by the time the execution phase has started, the plan needs to be revised because of modified project requirements [4]. Constant modifications of the project requirements coupled with occurring problems in defining the original product requirement causes cost overruns and schedule delay and lowers the product quality. As a countermeasure, agile project management was created [1], whereas agility is defined

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as *"…the ability to both create and respond to change in order to profit in a turbulent business environment"* [5]. Instead of trying to predict unforeseeable risks, one should approach them as opportunities to profit. Therefore, the agile approach is advantageous to the traditional one, as resource consuming detailed planning from the start of the project is avoided. At the same time, decisions are delayed as long as possible [3, 5].

Scrum is one of many agile project management methods. It was created by Sutherland and Schwaber between 1993 and 1995 [6] and their work strongly influenced the Agile Manifesto [7], which sets twelve principles and four key values for all agile project management methods. Similarly, the work by Sutherland and Schwaber was heavily influenced by Nonaka and Takeuschi [8]. In fact, [8] was one of the main foundations for the lean concept. Therefore, it is important to make the differentiation between lean and agile [9]: "*Lean manufacturing* [was developed as] *a response to competitive pressures with limited resources. Agile manufacturing, on the other hand, is a response to complexity brought about by constant change. Lean is a collection of operational techniques focused on productive use of resources. Agility is an overall strategy focused on thriving in an unpredictable environment.* […] *Flexible manufacturing system* [offers] *reactive adaption, while* [agile system offers] *proactive adaption.*"

In this paper, section 2 explains the basics of Scrum before the case study is then presented in Section 3 and the implementation in Section 4. The results are presented in Section 5, and Section 6 concludes this paper and gives an outlook for the implementation of Scrum in the construction industry.

2. Scrum – An agile project management method

Scrum is a framework for product development where different processes and techniques can be applied to complex projects. A typical Scrum framework is shown in Figure 1. The Scrum framework consists of the Scrum Roles, the Scrum Artifacts and the Scrum Events [10], which are all explained in the following sections. The expression Scrum is a move from Rugby, where a detailed position, with a clear purpose is needed to achieve a common goal [6].

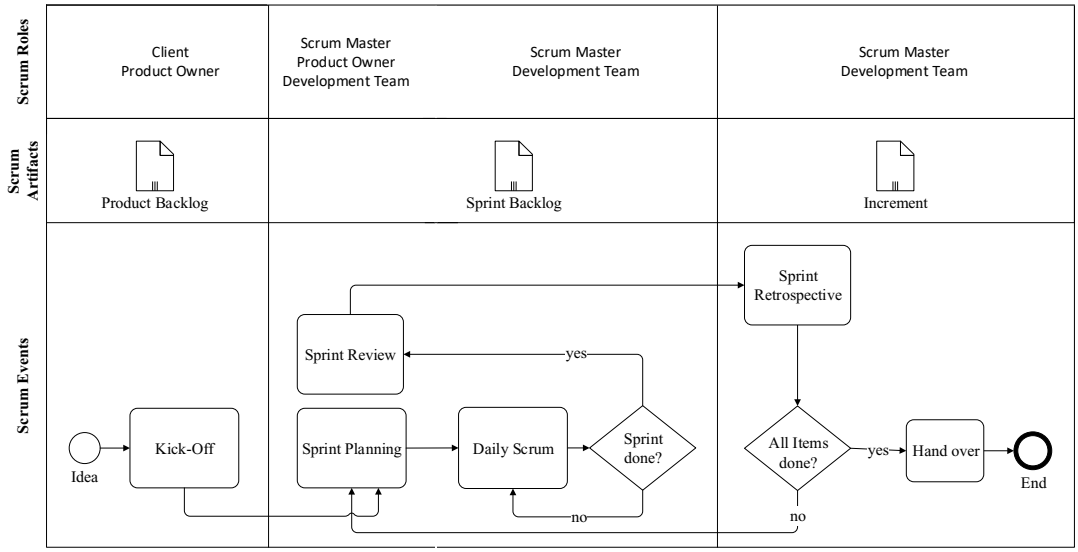

Figure 1: Typical Scrum Framework

2.1. Scrum Roles

The *Scrum Team* consists of the Product Owner, the Development Team and the Scrum Master. The team is self-organised and cross-functional. All decisions of the project are taken within this entity and they have all the competencies needed for the project – there are no advisors to the Scrum Team. The management's sole purpose is to assist and support the Scrum Team to the best of their abilities so that the Scrum Team achieves their goal [10]. The size of the team varies depending on the area of operations, but a size of seven (± two) members has proven to be successful [6].

The *Product Owner* is responsible for maximizing the value of the project and is the sole representation of the client. He is in charge of creating, updating, and prioritizing the Product Backlog Items (PBIs; Section 2.2). In addition, other responsibilities include optimizing the work performance of the Development Team, to ensure that the PBIs are clear,