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## Article

### **BScrum: An Agile Development Method for Blockchain Software Development**

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#### **Abstract**

Blockchain system is of the most recent invention, which brings more challenges to software developers. To overcome these emerged challenges, software engineers should invent engineering methods that covers the whole process of blockchain system development. However, currently, there is a serious lack of mature development methods. In this paper we present BScrum, an agile method to eliminate issues related to blockchain system development. From agile methods, the proposed method is based on Scrum, which in turn makes the development process is manageable and incrementally delivered. BScrum method covers the whole development process in details to fill the research gap and to advance the research body of knowledge.

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## 1. Introduction

Technologies are continuously and rapidly growing, which advance many aspects of our life. Nearly a decade ago [1], new emerging concepts called blockchain and smart contract have attracted the attention of noticeable number of researchers and industries [2]. One of the main reason behind this popularity is because of the promises that blockchain brought. Currently, it is an undeniable that blockchain is recognized as the fifth evolution of computing because it is considered as a trust layer for the internet [3]. Blockchain has changed the traditional business process since its onset, in which the business process can operate in a decentralized architecture instated of centralized in a trust way [1].

The system architecture of blockchain is peer-to-peer, which makes the system redundant and transparent [4, 5]. Therefore, it provides a trusted environment that does not need the involvement of third party [6]. This is perhaps one of the most influential factors for the popularity of blockchain adaption in different domains. This brings undeniable challenge, in which every domain has its own specific requirements to ensure the success of this adaption. Therefore, adhering to software engineering development methods is mandatory to ensure the success of the project and to deliver it within the specified time and budget.

Software engineering is an old but continuously growing and active field whose focus on system production from initial conception to maintenance [7]. It is essential for developing any kind of software ranging from embedded systems to systems of systems such as cloud computing. Therefore, adhering to software engineering principles and methods during the development process of blockchain system is not an exceptional. However, software engineering

offers a wide range of methods which introduces a difficulty for developers to choose from especially when developing new systems with new theories such as blockchain systems.

Plan-driven is one of the essential and old software engineering approaches, which has been used widely. The concept behind this approach is that, software activities are separate and each activity should be done before moving into the next activity as depicted in waterfall model. This implies that, system requirements must be understood and stable from the beginning. Despite the fact that this approach is better for addressing security issues, agile approach could deliver the required software faster than plan-driven without compromising security [4]. According to agile manifesto "We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value: Individuals and interactions over processes and tools Working software over comprehensive documentation Customer collaboration over contract negotiation Responding to change over following a plan". Therefore, by developing blockchain systems using agile methods developers could deliver systems faster than following plan-driven approach. As a natural result from the popularity of agile approach, several methods have been emerged, including Scrum, Extreme Programming (XP), Crystal, Feature Driven Development (FDD), Adaptive Software Development (ASD) etc. According to this manifesto, agile pays more attention on the code to deliver software as fast as possible and it reduces the documentation which is very important for maintenance. To overcome this issue, agile adapts refactoring principle in which developers should look back to the code that have been done and make it very clean and understandable.

According to K. Schwaber [8], “Scrum increases flexibility and produces a system that is responsive to both initial and additional requirements discovered during the ongoing development”. To the best of our knowledge, the requirements of most of the current systems are not fully understood and changeable due to some reasons such as involving new technologies and market changes. Thus, Scrum is a suitable development method for the current systems including blockchain.

The process of developing blockchain systems is not similar to the process of developing traditional systems. According to [9], there are some critical software engineering components that impact the success of blockchain systems development including requirements collection and tasks assignment among the team members. Since the market is a dynamic environment, in which new products, business strategies and policies are involving contentiously, systems’ requirements are certainly not fully understood by developers, and could be changed at any time. To tackle this serious issue, we have to utilize software engineering best practices with taking into consideration the special blockchain system development process as will.

Therefore, this paper extends Scrum method which is one of agile method that is most widely used [10]. The extend method is called BScrum to suite blockchain system development process with distributed team. The reminder of this paper is organized as follow: section 2 discusses some related work. Section 3 presents in detail the proposed method. Section 4 concludes this paper.

## 2. Related Work

New technologies and techniques are emerging continuously as a response to the business and mark needs. Blockchain is a technology that is

recently emerged which has not reached its maturity. Therefore, many researchers have paid attentions to advance this technology from different perspectives.

From software engineering perspective, precisely from development process there is undeniable effort toward aligning the blockchain development process with software engineering practices [11]. Preliminary steps towards modeling blockchain oriented software (BOS) were proposed by Henrique Rocha and S. Ducasse [12] with the aim of standardizing the designing and molding the BOS. They focus on three modeling standards including entity relation (ER) for data driven, unified modeling language (UML) for structure driven, and business process model and notation (BPMN) for process driven. However, [13] proposed blockchain lifecycle to link between business process management (BPM) and internet-of-thing (IoT).

From blockchain use case point of view, Gilbert Fridgen etl [14] proposed a method for development of blockchain use case as a systematic approach to improve the understanding of potential of blockchain and to develop sound use cases. The proposed blockchain use case development method has six stages. However, this proposed method focus only on use case development where other aspects of blockchain system development were neglected.

In contrast, Michele Marchesi etl [15] proposed a full software development process. The common activities including requirement gathering, analyze, design, develop, test and deploy blockchain applications. They claimed that, the proposed process is based on some agile practices with the use of some UML diagrams. It is worth mentioning that agile methods are usually used when the requirements are not fully understood from the beginning [7]. Therefore, it is difficult to separate the development process activities to

make the process able to cope with requirements changing.

A method based on model driven architecture was proposed in [16]. Authors claimed that the proposed method might be used for defining and specifying blockchain structure and behavior. This is to facilitate the development of a blockchain-based system. Nevertheless, this method does not provide detailed descriptions about its usage.

One of the most recent and excellent work was done by Lodovica Marchesi et al [4]. They proposed ABCDE as a method for blockchain software development. This proposed method is based on Scrum, but it differs from Scrum as it separates the development activities into two parts, one for smart contract development and the other one for the software that will interact with blockchain. However, our proposed BScrum method is oriented and focused on blockchain system development with the focus of distributed team management.

### **3. BScrum Method**

In software practices, plan-driven and agile approaches are the well-known and used development approaches and it is difficult to say that one is better than the other. This is true, because plan-driven is more suitable than agile approach for some projects, while agile approach is more suitable than the plan-driven in another some projects. Despite the advantages and disadvantages of those approaches, agile approach is used when the project requirements are not fully understood, and when the requirements are unstable, which might be changed during project development process. From agile methods, we have extended Scrum method to ensure better blockchain system development. The main reason for this, is that Scrum provides project management and shows

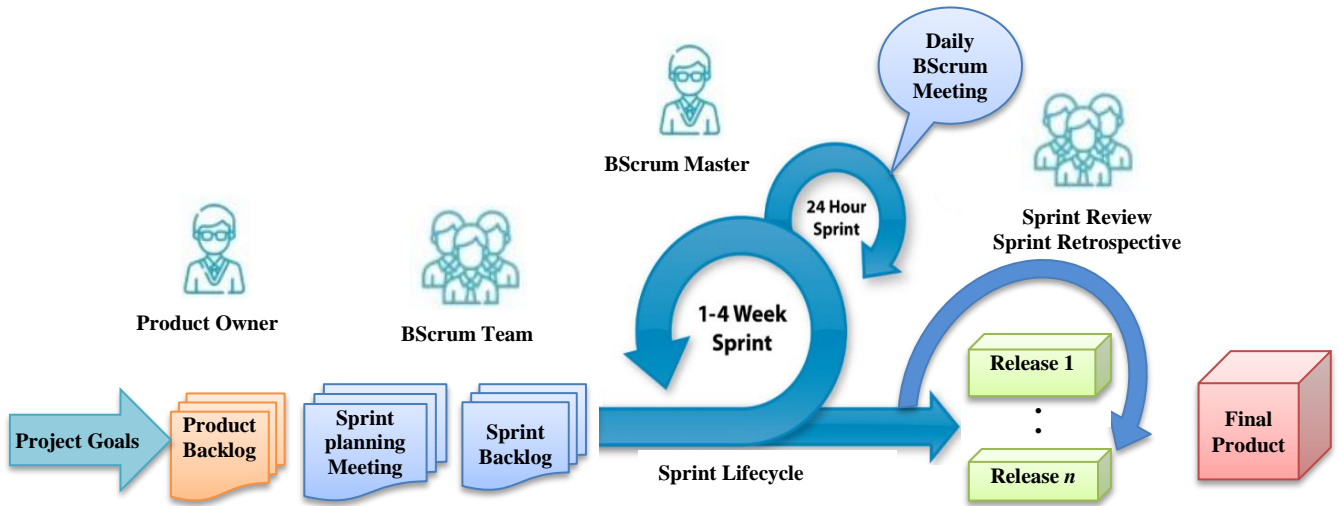
external visibility of what have been done in the project [7]. In addition, it helps managing the distributed development teams, which is the nature blockchain development process. The proposed BScrum method is illustrated in Figure 1.

#### **3.1. Project goals**

Any project should start with clear goals, which should be written very clearly and briefly with few words up to 30 words summarizing the project goals and make them visible to the whole team [4]. This is a good software practice which allows every team member who involved in the project development to know the project goals.

#### **3.2. Product backlog**

It contains the list of project requirements which is the responsibility of product owner to manage this list in a form of user stories [17]. This is due to the fact that, agile methods do not approach the requirements as a separate engineering activity, instead they handle requirements elicitation during the development activity. The idea behind that is to cope with requirements changing and understanding. One of the main tasks that assigned to product owner (or representative) is to prioritize which story should be developed and delivered first. Therefore, the first release of the product is delivered first. We highly recommend that, the first release should contain the most critical and urgent requirements for several reasons. Of these, perhaps the most important one, the first release is subject to be tested more than others, which increased the security of the system. This is very important for blockchain systems where the security is one of the main and critical concerns. It is obvious that, product backlog should be visible to all team members as the product goals.



**Figure 1:** The proposed BScrum method

### 3.3. Sprint

A sprint is a period of one week up to four weeks in which at the end of the sprint a potentially release is created. Sprints are completely separate, thus it is impossible to start a new sprint until the pervious one has been completed. BScrum recommends allocating a day for sprint planning and a few days for sprint retrospectives. The goal of every sprint is to deliver some user stories within the sprint period.

### 3.4. Sprint planning meeting

This meeting is held at the beginning of each sprint with present of BScrum master, team member and product owner [18]. This meeting should take enough time up to a day to discuss what requirements should be implemented in this sprint and what is the outcome of this sprint. Since BScrum support distributes team work, we highly recommend using videoconference to allow the participants to effectively share their opinions. It is worth mentioning that the team members could exist in different time zone. To tackle this issue, BScrum masters (the Scrum master of every team) should arrange for meeting to share and discuss the opinions of their teams.

### 3.5. Sprint backlog

After requirements prioritizations, some user stories are chosen to be developed in a sprint based on team velocity. The selected user stories are broken down into small and manageable tasks. Therefore, team members start the development process by selecting tasks from sprint backlog.

### 3.6. Daily BScrum meeting

This daily meeting called a stand up meeting which is typically takes no more than 15 minutes. The focus of this meeting is to discuss what have been done since that last meeting, what should be done today, and review the progress. They should look back to the sprint backlog to maintain project progress.

### 3.7. Release

A release is a part of the whole project which is the outcome of a sprint. It contains some user stories that have been developed within the sprint period. Every release is added to the previous release until the final product is done. Customer could get the advantage of these releases before delivering the complete system.

### 3.8. Sprint review and retrospective meeting

It is one of the core concepts of Scrum to make a review at the end of every sprint. This review is conducted by the whole team members, BScrum master and product owner. This meeting should answer three primary questions “What has been good during this sprint?”, “What has not been that good?” and “What kind of improvements could we do?” [16]. Answering those questions is one of software engineering best practices that help improving team experience and communication. Nonetheless, participants can discuss the quality issues and the problems that faced the team and how to overcome them.

### 3.9. Final Product

The final product is conceptually drowned by project goals. The result from integrating all releases is the final product, which contains all user stories that have been implemented in all sprints. It should meet the project goals and delivers all system requirements.

## 4. Conclusion

Blockchain system development is lack of mature software method to enhance the development process. Thus, this paper proposed an agile method called BScrum to improve the management of blockchain system development process with distributed team. This method is based on the well-known Scrum method, which has been proofed as one of the best software development process. In the future work, we are planning to develop some case studies to demonstrate the real applicability of the proposed method.

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