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## Factors Affecting the Success of Agile Software Teams

**Ayat Ragab Moustafa**

Ph.D. of Information Systems, Assiut University, Egypt  
ayatmostafi@yahoo.com

**Mohie Ghalab Abdulrasoul**

M.Sc. of Information Systems, Tripoli University, Libya  
mohie.mohieG@gmail.com

### Abstract

Thousands of teams are using agile software development methods, especially Scrum. Few of them are really “living” Scrum and therefore successful. This paper discusses the factors that led the Scrum team to the successful. A survey about the success factors in agile projects especially that related to the Scrum teams is presented. We proposed a new framework for the success factors of the Scrum team. According to a questionnaire is distributed to evaluate the Scrum team performance, we concluded that some of the success factors are strongly or moderated applied, but others are applied with a low degree. We calculated the Adherence degree for each success factor according to our evaluation to know its importance in the success of the software project.

**Keywords:** Agile Software Projects, Scrum Team, Development Team, Success Factors.

### Introduction

Agile software development methods have been developed since the early 1990s [1]. Scrum is the most popular of the agile software development methods which follows an iterative and incremental framework for projects and product or application development to manage, control, and enhance the existing complex software or

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product development [2]. Other popular agile methods include Extreme Programming (XP), Crystal Methods, Feature Driven Development (FDD), and Dynamic System Development Methods (DSDM) [3].

Scrum was developed by Ken Schwaber and Jeff Sutherland where the first Scrum team was created at Easel Corporation in 1993 by Jeff Sutherland [1]. The Scrum was designed to add energy, focus, clarity and transparency to project teams. It allows project teams and customers to operate as a unit to achieve common goals. The model has been successful over the years for both co-located as well as globally spread teams. Today, scrum is used by companies large and small, including Yahoo, Microsoft, Google and others [4].

Scrum teams are essential assets of a Scrum organization. The organization that uses Scrum consists of one or more Scrum teams, each team comprises of three roles: product owner, Scrum Master, and the development team [5]. The product owner is responsible for what will be developed and in what order. The Scrum Master is responsible for guiding the team in creating and following its own process based on the broader Scrum framework. The development team is responsible for determining how to deliver what the product owner has asked for. There can be other roles when using Scrum, but these three roles are the main roles in the Scrum framework.

The success of the Scrum team can affect the project's success. In this paper, we discuss the key responsibilities and success factors for each member in the Scrum team.

The rest of the paper is organized as follows: section 2 presents background about the Scrum teams, section 3 presents the related work, and a proposed framework for the Scrum team success factors is presented in section 4. Evaluation of the Scrum team's performance is presented in section 5, and finally, the conclusion and future work are presented.

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## Background

Scrum is a simple set of practices and rules that focuses on project management practices [5]. In this section, we will present the Scrum framework and the success factors that lead the Scrum projects to be successful.

### - Scrum Framework:

Scrum is a framework for organizing and managing work. The Scrum framework was formalized in 1995 by Ken Schwaber [1]. It is shown through the Scrum factors and principles, Scrum process that shows how the Scrum works?, and Scrum Roles where there are three roles for the Scrum: Product Owner, Scrum Master and Development Team.

### - Scrum Factors and Principles:

Scrum is one of the agile methods so the agile factors and principles are considered as Scrum factors and Principles. The Manifesto for Agile Software Development is a formal proclamation of four factors and 12 principles to reach better ways of developing software [6]. According to agile Manifesto, the major factors of agile factors include the following four: (1) Early customer involvement, (2) Iterative development, (3) Self-organizing teams, and (4) Adaptation to change. There are also 12 main principles as defined by the Agile Manifesto [1]; we can split these principles and factors into two parts: some of them are related to teams, while the others related to the work.

### - Scrum Process:

The Scrum process is based on iterative cycles called Sprints which typically last 2-4 weeks where the maximum duration of a sprint is 30 days, during which the product is designed, coded and tested [7]. Scrum starts with collecting user requirements from the user. During the development, the user can change anything in the requirement

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at any time; they can add new features, remove or update any existing features. The next phase is to prioritize the requirements and the list is known as product backlog where the business sets the priorities, and the team organizes themselves to determine the best way to deliver the highest priority features [8]. The Product Owner represents the Business side and is responsible for maintaining the list of product features and sets priorities for development [4]. Anyone in the team can add items in the product backlog but the Product Owner has the authority to choose the features and set the priorities. Every 2-4 weeks customers can see the real working software and decide to release it as-is or continue to enhance it for another sprint [4].

#### **- Scrum Team:**

The Scrum team consists of three main Scrum roles: product owner, Scrum Master, and the development team. All management responsibilities in a Scrum project are divided between these three roles [9].

#### **(1) Product Owner:**

The Product Owner is responsible for representing the interests of everyone in the project team and its resulting product. The Product Owner creates the project's initial requirements and participates in the planning. The Product Owner uses the Product Backlog to produce and build the most valuable functionality; that is through prioritizing the product backlog to queue up the most valuable requirements for the next iteration. The Product Owner is responsible for the product's success [5].

#### **(2) Scrum Master:**

The Scrum Master is responsible for the Scrum process, for helping everyone involved in the project to understand the Scrum to be able to implement it in the organization; and ensuring that everyone follows the Scrum values, principles, and practices [5]. The Scrum Master acts as a coach to both the development team and the product owner. A Scrum Master also provides process leadership, helping the

Scrum team and the rest of the organization develop their high-performance, organization-specific Scrum approach [9].

### **(3) Development Team:**

The development team is responsible for developing functionality. The team is typically comprised of 8-10 members. They are a mix of software engineers, architects, programmers, analysts, QA experts, testers, UI designers etc. They are self-managing and self-organized to meet the sprint goals [4]. The team members are responsible for each iteration's success in the project [5].

### **Success Factors**

The success factor is an approach for identifying and measuring the organization's performance. Several factors contribute to a project's success. From a project management perspective, "a successful project should meet the original targeted cost, schedule, quality, and functionality by the efficient use of resources" [10]. A successful project can be defined using four factors [11]:

- 1) Meeting the requirements
- 2) Delivering according to schedule.
- 3) Delivering according to the detected budget.
- 4) Achieving the expected business value and return on investment.

Agile software development methods provide great flexibility to adapt to changing requirements and rapidly market products [4]. The agile success factors can be defined from five different perspectives for five dimensions: Organizational, People, Process, Technical, and Project. These factors are summarized in Table 1.

**Table.1** Success factors of agile projects

Dimension	Success Factors
Organizational	<ul style="list-style-type: none"><li>• Support from Top Management</li><li>• User Involvement</li><li>• Team Environment</li></ul>
People	<ul style="list-style-type: none"><li>• Team Capability</li><li>• Customer Involvement</li></ul>
Prsocess	<ul style="list-style-type: none"><li>• Project Management Process</li><li>• Project Definition Process</li></ul>
Technical	<ul style="list-style-type: none"><li>• Selecting Proper Agile Method</li><li>• Using Advanced Technology</li><li>• Delivery Strategy</li></ul>
Project	<ul style="list-style-type: none"><li>• Project Nature</li><li>• Project Type</li><li>• Project Schedule</li></ul>

The success factors for an organization perspective are defining the organization culture before beginning the project, involving the user in the project development, and providing a suitable environment for the team.

The success factors from a people's perspective are the human resources factor e.g. the team's capability to manage the time, to be able to handle the project's complexity, and to have effective communication and feedback [14].

The success factors for process perspective are the process factors that related to the tasks process or functions of the project itself e.g. testing and reviewing the code of the software, reporting the project status, and risk management [12].

The success factors from a technical perspective are factors that have an impact on how a project operates and are related to the software, technology or hardware used within the project development process e.g. selecting proper agile method or using advanced technology [13].

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But the success factors for the project perspective are those concerned with the project of agile software development from setting clear objectives and goals, determining project type and nature, setting the project schedule, estimating realistic budget, and specifying clear requirements and specifications [12].

Scrum is an agile framework for completing complex projects. The success of Scrum projects requires technical and communication capabilities. The success factors of running Scrum are identified as follows: 1) explicit the process of project management and a self-managing group with Scrum; 2) professional agile development and release capability; 3) building learning organization [15].

Project teams play important roles in achieving the organization and the project objectives, such as increasing market share, launching a next generation product, improving quality, enhancing customer relationships and for other purposes.

### **Related Work**

There is a lot of research that discusses the factors that lead to success of the agile projects. In this section, we surveyed some of them.

Loeffler (2015) shows five success factors of the scrum team that lead to the project success. Such as: (1) Continuous Learning where increasing quality of the team's results depends on the continuous improvement process, (2) Another sign of successful Scrum teams is, that they support each other (Supportive Environment); In highly successful teams there are nearly always two people together in front of one computer – pair programming, (3) communication skills culture, (4) the energy level rising should be found when the team discusses the goals for the day and people are asking for or offering help; and this energy arises, when a team steers in the direction of a clear, attractive and common goal. (Energy), and (5) Successful the Scrum teams have a strong focus on their customers. They want to know exactly

what the customer needs and check on a regular basis if their hypothesis is still true (Focus on the customer).

Chow & Cao (2008) presents a research study to use a survey data to explore the critical success factors of Agile software development projects. They collected the data from 109 different Agile projects. After analyzing the data and according to some of the research hypotheses. Only six factors could be called critical success factors with some of the attributes with each. The existence of agile-friendly project team environment and having a team of high caliber are critical success factors that contribute to successful agile software development projects.

Darwish & Rizk (2015) reviewed the critical success factors for the success of agile software development projects. From all factors, there are some factors that related to the project team such as: effective communication and feedback, team size, team environment, team capability, team distribution, and others. In their paper, and according to a proposed framework, the success factors are divided into 5 dimensions (Organizational, People, Process, Project and Technical), and under each dimension, the main success factors and the sub-factors are defined.

Moe et al. (2010) provide a better understanding of the nature of self-managing agile teams, and the teamwork challenges that arise when introducing such teams. They concluded that transitioning from individual work to self-managing teams requires a reorientation not only by developers but also by management. This transition takes time and resources, but should not be neglected [19].

Berczuk (2007) discusses the team distribution and analyze the challenges of it. They put some recommendations after each challenge when using the distributed teams. They concluded that the main reason that makes the distributed teams difficult in agile projects is that the distribution can reduce communication bandwidth. Similarly, if the team was in the same location (co-located), but the communication

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between them wasn't well that can lead to failing some the agile methods. They said that "If the team feels like it owns the process and the tools it is more likely to be able to overcome obstacles and be successful" [16].

Sutherland et al. (2007) analyze and recommend the best practices for globally distributed agile teams through a case study. This case study proved that the distributed teams can be as productive as a small collocated team, but that requires excellent implementation of Scrum along with good engineering practices. To achieve the success of the distributed teams, the entire set of teams must function as a single team with one global build repository, one tracking and reporting tool, and daily meetings across geographies [17].

Sutherland et al. (2009) show that Co-located teams are more productive than distributed teams. They discussed the hyper-productivity in distributed teams and their paper was the first documented case dealing with maximum time difference where they used two companies one in San Francisco and the other in India with 12.5 hours' time difference between them. It proved the success of the distributed Scrum with the same velocity and quality as a co-located team without overlapping time zones. They said that: "Fully Distributed Scrum is the recommended strategy to unlock the full potential of Indian offshoring for the US market for teams capable of fully implementing the practices of Scrum and XP" [18].

Anan tharangachar (2007) presented a success story of his company. He showed the most three factors that helped them in making Scrum implementation successful: customer ownership, management commitment, and the cooperation of the development team. Their team was large (several hundred members); this required a high level of coordination and cooperation among team members. He showed that the reasons of success the team were that the large team had to work together as a single team, where previously they had independent design, development, test, and

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quality teams; and that the team members were involved in more meetings and discussions, which required them to collaborate much more.

## The Proposed Success Factors of the Scrum Team

We studied the success factors of the Scrum team by surveying the previous research on the success factors of the Scrum projects in general and specifically those related to the Scrum team. We collected all Scrum team success factors from the literature research. We found twenty-three success factors are related to the Scrum team. They are summarized in Table 2.

Table 2 Success Factors for Scrum Team

#	Success Factor
1	Self-organizing & Self-managing
2	Cross functionality
3	Changeable size
4	(team size) Projects with a small team
5	(team distribution) Projects with no multiple independent teams
6	Collocation of the whole team with good communication
7	Team members with high competence and expertise
8	Team members with great motivation
9	Continuous learning and Continuous improvement
10	Supportive environment (pair programming)
11	Managers knowledgeable in agile
12	Strong Management commitment
13	Communication skills culture
14	Rising of the energy level
15	Focus on the customer
16	Customer ownership
17	Appropriate technical training to the team
18	Cooperation of the team
19	Transparent communication
20	Effective communication and feedback
21	Ability to handle with complex projects
22	Hyper productivity
23	Decision time

### **(1) Team Environment:**

The environment has a great effect on the success of the team and then the success of the project. The teams are self-managing, self-organizing and cross-functionality. A team is responsible for figuring out how to turn the product Backlog into an increment of functionality within the iteration. The following factors are related to the “Team Environment” dimension:

- Self-organizing and Self-managing.
- Cross functionality.
- Continuous learning and Continuous improvement.
- Supportive environment (pair programming).
- Strong Management commitment.
- Rising of the energy level.
- Focus on the customer.
- Appropriate technical training to the team.

### **(2) Team Communication:**

Effective communication between the team members themselves or between the team members and the customer is expected during the project. The following factors are related to the “Team Communication” dimension:

- Collocation of the whole team with good communication.
- Communication skills culture.
- Cooperation of the team.
- Effective communication and feedback.

### **(3) Team Members:**

The small team is one of the success factors where each team has no more than 6 members. There may be multiple teams within a project. Small and collaborative teams of developers are able to share knowledge about development processes. Successful teams can handle complex projects. The following factors are related to the “Team Members” dimension:

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- Team size.
  - Team members with high competence and expertise.
  - Team members with great motivation.
  - Managers are knowledgeable in agile.
  - Customer ownership.
  - Ability to handle complex projects.
  - Decision time.

#### (4) Project Characteristics:

The project dimension plays an important role in the success of the project. The following factors are related to this dimension:

- Projects with a small team.
- Projects with no multiple independent teams.
- Hyper productivity.

#### Conclusion

This paper provides a review of the important factors for the success of the Scrum team. We have presented a proposed framework illustrating four dimensions of success factors of the Scrum team: team environment, team communication, team members and project characteristics. To evaluate the scrum team performance and to evaluate the proposed framework, we surveyed the previous work for evaluating and measuring the team performance.

In the future, we aim to extend the study to cover more case studies for different fields. Also, we need to use different evaluating methods for evaluating the Scrum team performance.

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