# **Factors in Agile Methods Adoption**

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Abstract-There are many factors that can affect the process of adopting Agile methods during software developing. This paper illustrates the critical factors in Agile methods adoption in software organizations. To present the success and failure factors, an exploratory study is carried out among the critical factors of success and failure from existing studies. Dimensions and Factors are introduced utilizing success and failure dimensions. The mind map was used to clarify these factors.

*Keywords* – Agile Methodlogies, Success , Failure, Adoption.Factors.

#### 1. Introduction

Recently, agile methodologies have turned out to be more prevalent in developing software industry, and these techniques are applied, which led to significant debate [1]. Adopting agile methods has managed a few issues that can be confronted amid the process of developing software since the agile methodologies permit to deliver the software faster and to ensure that the item meets customers' unstable requirements [2]. While Agile software development tends to concentrate ahead of schedule and quick generation of working code, frequent, little, incremental changes, pair programming, short iterations, fast and incessant user feedback and

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**Corresponding author:** Samia Abdalhamid, Department of Modeling & Design of Engineering Systems, Atilim University, Ankara, Turkey **Email:** <u>samiaabdalhmeed@gmail.com</u> interaction [3,4]. The traditional development has a tendency to underline broad analysis before coding, creation, and conservation of models, moderately long time traverses amongst deliverables and achievement, and usually small amount of client communication. In addition, methods of Agile software development (ASD) [4] have been winning approval among prevailing programming developers since the late 1990s, when they were initially proposed in the types of Scrum [5], Crystal, Extreme Programming, and different strategies. Today they are built up to different degrees in the scholastic, instructional and professional programming development communities [6].

As a resolution for the shortcomings of the traditional methods, Agile methods have been shaped and created by experts, they are designated to adopt, rather than reject, high rates of adjustment. These methodologies focus essentially on the iterative and incremental change, customer participation, and frequent delivery through a light and fast development cycle [7]. The fact that numerous investigators have notified that Agile methodologies can possibly give a more great amount of consumer satisfaction, bring down bug rates, a shorter advancement cycle, and a speedier adjustment to quickly changing business requirements. For this reason, many organizations are looking to adopt agile methodologies to get the different benefits that they offer to enterprises. These advantages include fast return on investment, better programming quality, and better customer satisfaction [8]. However, to switch from non-Agile to Agile in an enterprise is considered a tricky and hard process. According to Sahota, the process of adoption of Agile methods and the effort of transformation in the organization are encountering high failure rates by 84% of respondents in the Agile Development Survey announced that they had encountered a failed Agile venture. While just 16% of respondents had experienced success [9].

Moreover, Agile methodologies adoption by software development enterprises can be a simple procedure or troublesome relying upon some variables, for example, human factor is one of the most fundamental factors in Agile techniques (Cockburn

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and Highsmith, 2001, Lee, 2008)[10][11], and the organizational factor (Strode et al., 2008b). Both of these are viewed as essential components that ought to be dealt with before the adoption of Agile methods in software development can begin (Iivari and Huisman, 2007) [12][13].

So to ensure the success of Agile methods adoption, there are some success factors that can help the organization to adopt Agile without dread of disappointment, however, in the meantime, they have to know the failure factors that can make the Agile adoption to become a catastrophe. Knowing these factors can help any organization that thinks of adopting Agile to follow specific steps to avoid any failure. For this reason, this article will present both success and failure factors in agile methods adoption to provide a guideline to any organization that attempts to move in this direction.

## 2. Literature Review

There are many studies that covered success and failure factors in agile methods adoption. In this section, the success factors studies will be presented first, then the previous studies of failure factors will be introduced.

The search started in 1996 when Walid and Oya recommended new frame to decide critical success and failure elements. They recommended new outline for basic factors and the effect of these factors on the execution of the venture were described. They utilized an Empirical study to test the practicality of utilizing the recommended design and divided the factors into 4 groups, and they are Project, Managers and team member, organization, and environment .In addition, the results of the survey showed that venture directors, administrative skills, colleagues, obligation and their technical background, ventures attributes and environment factors are as practical and can be as a vital as an organization factor and the criticality of these elements differ between industries[14]. There were many researches done and examined from 1996 till 2006. A survey paper was made by Mahanti, and the objective of this paper was to study real difficulties in Agile practices adoption by companies. Effective adoption of Agile approach involves gain administration buy-in, education, and support, related to outside procedures, beginning pilot activities, report and adjust, and maintain agility. In other words, the success of adopting Agile methods is specifically identified with how the new procedure is presented in the organization [15].

Moreover, there was a survey done by Tsun chow, Dac-Buu Cao in 2008 to study the success factors in Agile software ventures by utilizing quantitative approach. A review drove Agile specialists, a collected study of 109 Agile ventures from 25 nations everywhere throughout the world. They used multiple regression methods. The overview results got that only 10 out of 48 theories were bolstered, and recognized critical success factors for Agile programming ventures, which are: "Delivery Strategy, agile software engineering techniques and team capability"[16]. They find that they ought to attempt to characterize diverse success elements or attempt to show the success of Agile ventures with various techniques [16]. At that point, Dragan et al. proceeded with the review (Chow and Cao, 2008). In attempting to check the rating of crucial success factors which were described previously in the review done by Chow and Cao (2008). They used a regression analysis for the gathered information which presented three more factors that could conceivably be considered as basic success factors [17].

In addition, there was another study done by Subhas et al., they developed a guessed theoretical components frame to address success the examination questions. They utilized the information analysis methods to confirm the hypotheses. The review was made using a broad scale study based technique, including respondents who rehearse Agile software development and who had previous involvement in practicing arrangement driven programming development. The results of the study presented that, there were 9 out of 14 hypothesized factors which have critical association with success and the essential success factors that were defined are: client cooperation, client satisfaction, client obligation, decision time, companies' culture, the characteristics of people, societal culture, and preparing and learning [18]. Moreover, another study conducted by Zulkefi, Saadiah and Noor in 2010, they carried out a literature review to collect information from the former study, and they discovered that each of Client participation, communication, least change requirement, companies culture, active testing, clarity, allocation of time client cooperation and code check define the success in Agile programming development methods [19].

Jianping and Routing have outlined Ρ organization success variables model such as "leading (acknowledgment of top heads, involvement of top leaders), organization (making clear vision, constructing the Agile hierarchical culture, changing the method for administration), devices and technology (configuring the essential tools and foundation, utilizing configuration designs and other developed design techniques, utilizing programming reuse technology), suitable import (selecting relevant import venture, brilliance execution staff, choosing appropriate Agile strategy practice), preparing and education (correct comprehension and ability of Agile strategies, improving the professional capacities of the member of staff), measuring success (flexible and innovative advancement strategy, quick reaction to the request, effectively constructing learning organization ) which they checked them by a questionnaire in P Company" [20]. They found that education and preparing play a positive part in Agile development. So Agile methodology must be set up in the culture of Agile with due interest to the designing and application of technology.

There were two case studies made by Claudia et al. in the industry in 2011 where they analyzed the collected data from two ventures. In addition, they recognized three literature reviews and showed the basic factors on most related factors, and these factors involve: "product software (reuse. characteristics), project (resource constraint, schedule, composition, communication), team personnel (team experience and motivation) and process (customer participation, daily builds, documentation, early prototyping, incremental and development, modern programming iterative programming abstraction, practice, language software methods, tool usage)"[21]. They reason that there are a few factors affecting the efficiency of Agile methods. These elements are group break down and distribution, outer dependencies, and staff turnover. A review began by Ani Liza et al.,that includes 13 members including CEOs, venture managers, originators, and engineers. Their review showed that social and human viewpoints are critical when they begin utilizing the Agile strategies. Amid the review, they utilized qualitative semi-structure meet and presumed that the issues and difficulties that face during the process of adoption were attitudes, information, venture, people, learning exchange, communication, administration participation, technical angles, and organizational structure [22].

There was one of the studies conducted by Kumar and Goel in 2012, and the results of this survey were conducted to present and clarify the factors considered by programming professionals while adopting Agile strategies, and the impacts of adopting Agile techniques on clients and business while practicing agile. Their study showed six hypotheses which are: effect of group size, the effect of requirement collecting for Agile methods, efficient requirement capturing process, time needed to solve a problem and effect of small response time with the client in software development [23]. The outcome of this research showed that Agile adoption can increase the output of an organization and also raise the customer satisfaction [23].

In terms of failure issues, failure research in software development is commonly depended on lessons learned from specific sorts of ventures, however, they are generally similar enough to be generalized [24].For example, in 1999, Reel concentrates more on general software development ventures and collects 10 indications of programming development ventures failure, no less than seven of which are located even before an outline is produced or a line of code is written [25]. In addition, the issues in transitioning organizations to Agile methods were studied by Cohn and Ford in 2003 [28], whereas in 2004 Larman debates in detail errors and confusion that happened during developing Agile projects [26]. There was a research by Boehm and Turner in 2005, which confirms administration challenges during the implementation of Agile projects [27]. While another study was conducted by Nerur et al. in 2005 that includes issues in administration angle as well as in people, processes, and technology aspects of the transition to Agile ventures [29]. So, in light of the previously mentioned literature, failure can be classified into four classifications which are: organizational, people, process, and technical.

Moreover, in 2008 Vijayasarathy and Turk observed that a portion of the factors that cause failure of Agile project involve the absence of preparing and associate support, the inexperience of Agile methodologies, the absence of offices for pair programming, people's resistance, and depending just on financial assessment criteria [31]. Another worry raised is administrative disregard and organizational impedance to change. Thus to success elements, Chow and Cao (2008) talk about failure factors and classify the failure into four group which are: organizational, people, process, and technical [16].

## **3.** Success Factors that affect the process of adopting agile methodology:

This section will display the critical success dimensions that were gathered from past quantitative and subjective reviews:

Dimension	Success Factor
Organization	Companies' Culture.
•	Collocation of Whole group.
	Maintain Agility.
	Organizational Environment
	(Political efficient, innovative
	condition).
People	Education and support.
	Client Centric problems.
	Administration Style.
	Skills of Communication.
	Obligation.
	Report and Adapt.
	Venture Champion.
Technical	High knowledge of group and
	organizational aspect.
	Practices.
	Troubleshooting for group.
	The use of tools.
Project	Type of project.
	Agenda.
	Size of the team.
	Pilot Project.
	Least changes of Requirements.
Process	Regular Delivery of software.
	Efficient requirement collecting
	technique.
	Clarity.
	The merge in external
	procedures.
	Choose suitable methodology.

Table 1. Success Factors. Adopted from [30]

A. Organization: Adoption of Agile methods by an organization requires a change in the culture and attitude of the organization. The idea of Agile based on the way of working to deliver along new practices for members of team and managers, and normally Agile affects the culture of organization. [30]



Figure 1. Organization Mind Map

*B. People:* people dimension presents an essential part in any product development venture, this fact achieved by most of the researches. There are eight factors in people dimension, and these factors are shown in table 1., people factors may involve education where group ought to learn Agile strategies and how to apply and adopted them in non-agile organizations, achieved by figuring out how to support groups, as the venture manager ought to be able to trade off, have the capacity to arrange and take an interest in all aspects. Likewise, the colleague and the supervisor must be entrusted with their tasks and venture [30].



Figure2. People Mind Map

*C. Technical :* There are some Technical Practices that make possible for the organization to deliver work as the client requires in an efficient way, and these practices are continuous integration, test-driven development, pair programming, refactoring, and collective ownership. As a result, the team will be more productive when to adopt some of the practices that mentioned previously [24].



Figure 3. Technical Mind Map

*D. Project:* It is known that Agile methods are most appropriate to projects where requirements are not well characterized and fluid because they look for containing change without difficulty. Ventures that are uncommon inside an organization or utilize cutting-edge technology are cases of ventures where change is probably going to significantly affect the venture [32].



Figure 4. Project Mind Map

*E. Process:* There are many agile methodologies such as: SCRUM, Crystal, Extreme Programming (XP),

and more. It is important to choose the proper method for each project and ability to integrate to external processes.



Figure 5. Process Mind Map

## 4. Failure Factors that affect the process of adopting Agile methodology:

This section will display the critical failure dimensions that were gathered from past quantitative and subjective reviews:

Table 2: Failure Factors Adopted from [16]

D' '	
Dimension	Failure Factor
Organizational	Absence of official
	sponsorship.
	Lack of administration
	responsibility.
	Organizational culture being
	excessively traditional.
	Organizational culture being
	excessively political.
	Organization is too large.
	Absence of Agile logistical
<b>D</b> 1	plans.
People	Lack of the necessary skill
	set.
	Lack of project management
	competence.
	Lack of team work.
	Resistance from groups or
	individuals
	Bad relationship with
-	customer.
Process	Poorly defined venture scope
	and venture requirements.
	Ill-characterized venture
	planning.
	III-characterized client part.
	Lack of tracking mechanisms
	for Agile progress.
T. 1 . 1	Lack of client attendance.
Technical	Tools and technology are
	Inappropriate
	lack of the right Agile
	practices

Α. Organizational: there are some factors in organizational dimension that can be the reason of failure such as the culture of an organization being too traditional or political, so it cannot accept any changes that may be necessary.





B. People: People factors play essential role in the process of developing software, for example keeping good relationship with customer during the developing process is required, and if there is any problem in this relationship, it may cause misunderstanding which leads to failure.



Figure 7. People Mind Map

C. Process: one of the factors that can cause failure in process dimension is not having tracking mechanisms for Agile progress.



Figure 8. Process Mind Map

A. D. Technical: Absence of the right Agile practices is considered one of the most important factors that can lead to failure.



Figure 9. Technical Mind Map

#### 5. **Conclusion and Future Work**

This paper presents factors that affect the process of agile methods adoption in software development organizations. There are many organizations which consider transition to Agile but they hesitate, because of fear of failures. So, introducing success factors can be beneficial to these organizations, especially some of the factors related to organization culture that needs to be able to change in order to adopt Agile. People Dimension present critical factors such as customer participation, which is important during

software development when using the Agile methods. Knowing failure factors is essential because it helps organizations to learn from these factors and avoid failure such as bad relationship with the customer which can cause problems during developing software by using Agile since customer should be included during the process of developing. In addition, more work can be done in terms of presenting Factors based on their priority. In other words, the display of factors in adoption of Agile methods can be arranged to show from the most significant factors to the less significant one. This can also provide a guideline to organizations that are planning of adopting Agile methods as which set of factors should the focus be more on.

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