T.C.
BAHÇEŞEHİR UNIVERSITY

REVIEW OF AGILE METHODOLOGIES IN BANKING SOFTWARE DEVELOPMENT SECTOR IN TURKEY

Master Thesis

ÖZNUR KILIÇ

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Member's		
Member's		

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Istanbul, 2021 Öznur Kılıç

ABSTRACT

REVIEW OF AGILE METHODOLOGIES IN SOFTWARE DEVELOPMENT SECTOR IN TURKEY

Öznur Kılıç

Business Administration Master's Program

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During the past 50 years, there have been many different software engineering methodologies, processes, and models proposed to assist software development teams to obtain predictable and cost-effective processes. But many years later, software development companies still have similar problems like customer unsatisfaction, not being able to deliver on the deadline or bugs in the software itself.

According to the 11th Annual State of Agile Survey by VersionOne, agile methodology is mostly used and originally designed for the software industry in processes. Software development with agile is a method that involves the customer in the process, and the software is developed by dividing into iterations. While the agile process enables the software to be developed rapidly with short intervals, it also allows the preparation of documentation in the process. This method decreases software delivery time while increasing productivity and software quality. Agile methodologies are increasingly being adopted by the software development companies as it assures incremental software development and better quality of products.

In this thesis project, the Scrum model, which is one of the most used methods of agile processes is examined. The historical development, content and rules of the process are presented with the literature research. The aim of this study is to provide perspective to researchers and organizations that consider transformation to agile practices about agile implementation in software development in Turkey. To achieve this objective, survey method is used based on the examinations of literature view

Keywords: Software development, Agile, Scrum.

ÖZET

TÜRKİYE'DE FİNANS SEKTÖRÜNDEKİ ÇEVİK YAZILIM GELİŞTİRME UYGULAMALARI ÜZERİNE İNCELEME

Öznur Kılıç

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Geçtiğimiz 50 yıl boyunca, yazılım geliştirme ekiplerinin öngörülebilir ve uygun maliyetli süreçler elde etmesine yardımcı olmak için birçok farklı yazılım mühendisliği metodolojisi, süreci ve modeli önerildi. Ancak yazılım geliştirme şirketleri müşteri memnuniyetsizliği, teslim tarihine yetişememe veya yazılımın kendisindeki hatalar gibi sorunları günümüzde yaşamaya devam etmektedir.

VersionOne firması tarafından yapılan 11. Yıllık Çevik Durum Anketi'ne göre, çevik metodoloji, yazılım geliştirme süreçlerine özel olarak tasarlanmıştır. Çevik metodoloji ile yazılım geliştirme, müşteriyi sürece dahil eden bir yöntemdir ve yazılım düzenli olarak tekrar eden parçalara bölünerek geliştirilir. Çevik süreç, yazılımın kısa aralıklarla hızlı bir şekilde geliştirilmesini sağlarken, süreçte dokümantasyonun hazırlanmasına da olanak tanır. Bu yöntem, üretkenliği ve yazılım kalitesini artırırken yazılım teslim süresini azaltır. Çevik metodolojiler, yazılım geliştirme şirketleri tarafından giderek artan bir şekilde benimsenmektedir, bunun nedeni bu yöntemin ortaya çıkartılan ürünlerin kalitesini artırmasıdır.

Bu tez projesinde, çevik süreçlerin en çok kullanılan yöntemlerinden biri olan Scrum modeli incelenmiştir. Scrum yönteminin tarihsel gelişimi, içeriği ve kuralları literatür araştırmasıyla sunulmuştur. Bu çalışmanın amacı, Türkiye'de yazılım geliştirmede çevik uygulama konusunda, çevik uygulamalara dönüş sürecine girmeye değerlendiren kuruluşlara ve araştırmacılara bakış açısı sağlamaktır. Bu amaca ulaşmak için literatür incelemelerine dayalı anket yöntemi kullanılmıştır.

Anahtar Kelimeler: Yazılım geliştirme, Çevik, Scrum.

İÇİNDEKİLER

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ABBREVIATIONS

SDLC	:	Software Development Lifecycle
XP	:	Extreme Programming
FDD	:	Feature-Driven Development
CPM	:	Critical Path Method
CCPM	:	Critical Chain Project Management
LPD	:	Lean Product Development

1. INTRODUCTION

Organizations need to discover the best method to be successful, to gain competitive advantage and to retain the most talented employees. They must seize new opportunities, anticipate, and adapt to change quickly to survive in the continuously changing environment. It is very important for organizations to complete software projects within the targeted scope, time, and budget. The project management method used in software development processes is critical and best practices or system development models must be implemented within the organization. Non-systematic and Non-planned approach to software development result in over costing projects, poor quality of products and unsatisfied customers.

A group of software developers pondered over the problems encountered during the project management processes. When they looked at the project development methods of some successful companies, it was found that these companies could adapt themselves to changes and customer demands very quickly. 17 professional software developers carried out a study to apply successful project development methods in the software development process. In 2001, they published the Agile Manifesto consisting of 4 main articles and 12 principles. The software development industry has shifted from traditional project management models to agile based development in response to growing software difficulties and dynamic customer demands (Fowler & Highsmith 2001). In the Agile Manifesto the word of *agile* literally means to be able to move quickly. It is claimed that agile methods increase software quality (Livermore 2007), improve communication between stakeholders (Pikkarainen et al. 2008) and coordination (Strode et al. 2012), increase productivity (Schwaber & Sutherland 2008) and they are best methods to develop, maintain and support software systems today (Suganya et al. 2010).

Agile is a project management style that focuses on producing valuable output in the shortest time possible. Agile is an approach created to increase company delivery and provide easy management. Agile approach advocates the need to respond quickly to customer needs. It is a particularly useful method for projects where uncertainty is high, and the customer needs not fully determined. The client and the project team are in contact throughout the project life.

Agile is not an SDLC (The software development lifecycle) model itself. There are software development models prepared using this approach, these are Scrum, Kanban, Lean, Extreme Programming (XP), Crystal, Test-Driven Development and Feature-Driven Development (FDD).

Scrum is one of the most popular and frequently used models in the transformed organizations according to the literature review carried out by whom (Dikert et al. 2016). According to the 8th annual report of Agile Turkey (2019)[1] the 90 percent of the software development approaches used in organization in Turkey is Scrum and secondary 46 percent of them is Kanban approach.

The purpose of this study is to determine to what extent the agile methods applied in companies operating in banking software development are compatible with the agile manifest and to determine the perception of employees against these methods in Turkey.

It is also aiming to determine the effects of using agile methods on different project types. The results of the survey can be used as a source of data for future research on similar subjects.

At the beginning of the study, similar articles are scanned, and it could not find a previous study that is related with agile application in software development companies serving in banking sector in Turkey. This study aims to fill the research gap between research publications have been carried out for this purpose in Turkey.

There are many publications that aims to determine the method of measuring agile success factors, these studies were helpful for the preparing processes for the survey questions. Studies on determining agile success factors were examined, and summary information about these articles are mentioned in the literature review section of the article.

The next parts of this research are organized as follows; a literature review related to the subject was included, agile methodologies are explained briefly, then the method of the research was presented, and the results were evaluated. Finally, the study was concluded by discussing the results of the study.

[1] Agile Turkey, 2019. Turkey agility report.

2. LITERATURE REVIEW

One of the most common problems in project management is that customers are not always able to describe exactly what they want at the beginning of the project. In addition, customers tend to change their requirements due to changing environmental conditions. For these reasons, in projects carried out with traditional methods, difficulties arise compared to agile methods in adapting to changes that may occur during the development process (Baytam et al. 2011). Baytam (2011) has developed a software system that can be used to manage the process correctly, with the idea that the selection of the process alone will not be sufficient, and that the operation and management of the process is the main factor in success. The application called ScrumMApp that is developed by Baytam (2011), has primarily selected the organizations as the target audience that have recently transforming to agile methods. In this software program, he presented a design that meets the needs of each role in the agile team. This program was developed after surveys and interviews with individuals who are experienced and new to the Scrum applications, and it has been stated that it has been successful in pilot applications. The study of Baytam (2011) gave hope that it will make positive contributions to process management in the future.

One of the most important criteria of the Scrum method is the increase in project success metrics in the software development processes. In organizations that can implement Scrum successfully, it is expected that revising the demands in a very short time will increase efficiency and customer satisfaction (Ellis 2016). Key measurement of effectiveness for five project management methods are compared in the study which are CPM, CCPM, Phase– Gate, LPD and Agile. Selected measurement criteria are good with high iteration-cost projects, good with low iteration-cost projects, process to coordinate varied disciplines, mitigates risk before large investments, provides standard work for planning, clearly defined methodology, Tools to maintain schedule, intuitive, has few adoption barriers, well-defined metrics/ visualization, plans shared resources well, availability of software tools, sustainable over time and low overhead over time. Study results shows that combination between Scrum and XP is more suitable for projects with a low cost of redoing the changes, projects where the product cannot be fully specified before starting to work and projects with higher complexity. Also, Ellis (2016) claims that Scrum and XP combination method works better in organizations that can adapt to the changes required by Agile methodology.

In 2013 a study was carried out in order to determine the success factors of agile applications and to determine the most suitable project types for agile application (Thuy and Khanh 2013). The data of the research is collected after observing the applications of Scrum in the team. After the observation interviews were made with the teams' members and the experts of project management were also participated. The empirical evidence and results were determined in detail to deliver findings in the form of generalizations for different types of applications in future. It is expected that software development efficiency and delivery time will improve in businesses where the Scrum method is successfully implemented and fully understood by all company (Thuy and Khanh 2013). With the Scrum method, depending on the principles of the agile methodology, instant changes are possible without being bound by a specific plan and contract. Thus, customer satisfaction is always brought to the fore. Based on the empirical research made by Thuy and Khanh (2013) shows that Scrum success factors are grouped by people factors, application factors, organization factors and external factors which are stakeholders and customers.

Chow and Cao (2008) gathered the success factors in projects developed by applying the Scrum method in agile methodology under five main groups: organizational structure, processes, people, technologies used and design. A survey study was made to determine success factors of agile with quantitative approach. After reliability analysis and factor analysis techniques critical success factors were obtained which are right delivering strategy, a suitable practice of engineering techniques and high talented team.

The study by Silva and Santos (2015) states that the factors affecting software development projects using the Scrum method are human, process, and technology. For human phase, the determined factors are expertise and capability, support from top management, motivation of the team, size of the team and customer's level of contribution. For process perspective; giving prioritizing most valuable product, agile practices, and enough documentation. The technology categorization is consisting of proper theoretical education, uncomplicated design, integration testing, tools support, and coding procedures. Application of these specified factors will result in project success or failure. The study had been executed for applying a systematic review using Kitchenham Procedures which includes a few specific activities. Kitchenham method group the activities into three main levels which are planning, conducting, and reporting the review (Kitchenham 2004).

Agile project management method is more successful in small projects compared to the large projects (Dybåand and Dingsøyr 2009). In addition, projects with high level of complexity and/or uncertainty can benefit better from the Scrum methodology (Thuy and Khanh 2013). As the success results of agile methods were observed over time, more organizations turned to this method but the adaption of agile to large organizations can result some challenges.

Many field researchers were investigated the consequences of agile transformations and the success factors for the transformations. According to the study of (Dikert et al. 2016), the success factors of the agile; Management support, Commitment to change, Leadership, Choosing and customizing the agile approach, Piloting, Training, and coaching, Engaging people, Communication and transparency, Mindset and Alignment, Team autonomy and Requirements management.

In this study, employees' awareness of Scrum and their approach to Scrum considered as human factor; process of the applying method, the training of the teams, their development, responsibilities and as consultancy support considered as application factors; Organizational change, spreading of change to the whole business, management support are considered as organizational factors.

Different methods have been studied to measure the success of Agile applications concretely. Although there are too many agile management methods, there are not any definite rules regarding which organization is more appropriate to apply which method. A four-dimensional method is defined to use for choosing between agile methods for the organizations. With the second dimension of this method, degree of the agility in a project can be measured at high level. The third level can be used to determine the level of compliance with the agile values of the process (Qumer et al. 2006).

Five most important assessment methods; Sidky- agile measurement index (SAMI), 4-D Framework, OOP Framework, Comparative agility and Thought works' assessment model had been evaluated according to their inadequate and useful aspects. Although a perfect method has not been found yet to measure agile competence, these methods are useful for evaluating for specific purposes (Nafchi & Zulzalil 2014).

3. AGILE METHODOLOGIES

Information technology specialists met in a conference in 2001 after they had their research about new development methodologies. The methodologies had a common rule which is instead of presenting a product or a project to the customer after preparing completely, it is the best method to work in communication with the customer during the process and to proceed by making changes according to the demands.

Four main issues are valued in the Agile Manifesto. These are individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation and Responding to change over following a plan (Fowler & Highsmith 2001). Responding to change; accepting the change needs from customers at any stage of development. Customer collaboration: the main goal is to involving customers in the process stages and allowing customers to make comment to make them satisfied. Individuals and interactions; communication between customers and development team is very important, the interaction between these individuals is what helps them to solve any problems in the process (Hneif & Hock 2009). Working software; focusing on to prepare a working software without spending too much time on documentation (Wagenaar1 et al. 2018).

In Turkey and across the globe Scrum is the most popular agile methodology and it is followed by XP and Kanban methods. Mixed methodologies which are methods that Scrum method is used with Kanban and XP and adapted according to the needs of organizations are among the main uses of agile methods. Organizations are advised to use one single methodology in the VersionOne (2017) research, while mixed methodologies are also allowed. In this project, two main agile methodologies; Scrum, Kanban and Extreme Programming are explained briefly to give general idea about implementing agile methodology according to the mostly used approaches ratios published by Turkey Agility Report (Agile Turkey 2019)[2]. There are also many software development methods are used by different organizations.

[2] Agile Turkey, 2019. Turkey agility report.

3.1 SCRUM

Scrum is an agile project management methodology based on short cycle output generation and feedback. In Scrum, projects are carried out with iterative series called sprints. Each sprint lasts 2 or 4 weeks, and Scrum teams usually consist of 2 to 9 people. Scrum includes a term called backlog which shows all pending requirements for the projects. Each requirement described with a sentence and after they are detailed by team members (Cristal et al. 2008). At each stage, a valuable piece must be done which means it is coded, tested and ready to go to production. New phase cannot be started without the current studied phase is done (Hneif & Hock 2009).

Schwaber & Sutherland (2020) defined Scrum in the first version of the Scrum Guide and they have been continuing to publish new versions of it since. Scrum guide is help organizations to understand the main idea behind the agile methodology and serves as a user guide to them and provides information about Scrum practices.

In Scrum, teams are formed by gathering people who have knowledge and skills about a specific job. The Scrum Team consists of a Product Owner, Development Team, and a Scrum Master. Scrum Teams are self-organizing and cross-functional. Cross-functional teams have all skills necessary to complete the job without being dependent on people outside of the team. Scrum Teams deliver products iteratively and incrementally, maximizing opportunities for feedback. The incremental delivery of the "Done" product ensures that a working and usable version of the product is ready in each sprint. Scrum team members can be in three different roles which are Scrum master, product owner and developers. The Development Team consists of professionals who are responsible for delivering a potentially releasable part of the product that meets the definition of "Done" at the end of each Sprint. The Product Owner is responsible for maximizing the value of the product prepared by Scrum team. The Product Owner is the only person responsible for managing the Product Backlog and may be responsible for requirements of multiple stakeholders. Decisions made by the product owner according to the product goal are added to the product backlog and should be clearly visible for everyone. Adding, changing, or removing a new requirement in the product backlog is one of the responsibilities of the product owner. (Schwaber & Sutherland 2020). The Scrum Master is responsible for implementing and promoting Scrum as described in this guide. The responsibilities of the Scrum Master in the organization are leading and coaching the organization in its adoption of Scrum, planning Scrum implementations and helping stakeholders in understanding and implementing experimental product development, initiating change that will increase the productivity of the Scrum Team and collaborating with other Scrum Masters for common purposes.

For the Scrum implementation to be successful, the process should include 3 basic features: transparency, inspection, and adaptation. The working process carried out by the team should be accessible not only within the team, but also to the customers. Inspections does not have a value without transparency, and it can cause inaccurate actions. Process should be inspected frequently whether it is progressing towards the purpose and adaptation must be provided according to the results of these inspections. Adaptation becomes more difficult when the people involved are not empowered or self-managing. Adaptation and adjustment depend on power of the team to be able to take initiative by itself. Experience and observation lead to knowledge which is the empiricism idea that Scrum is based on (Schwaber & Sutherland 2020).

With the collaboration of Harvard Business Review Turkey (2021)[3] and ACM consultancy company, an e-book has been published, which includes insights from companies that make agile transformation, change management, behavioural practices in agile transformation, activating the common mind and many more. They state that in a market such as Turkey where conventional methods are at the forefront, small changes to business models will strengthen the collective understanding in the business environment and thus prevent being thrown in this huge storm of uncertainty. According to this publication, many of the practices we do daily actually contain the effect of behavioral approaches. People's conditions and environmental influences significantly affect their behaviours and decisions. As a result of this influence, people can make irrational decisions because of their bias and systematic mistakes they tend to make. When working with people in agile transformation and applications, a better understanding of people's behavioral patterns and the reasons behind them will enable us to help them get better. In recent years, behavioral approach practices have emerged as a highly effective method in

[3] Harvard Business Review, 2021. E-kitap: Çevik ekipler inşa etmek. [internet]. https://hbrturkiye.com/storage/doc/acm/acm-sayi-2.pdf [accessed 19 May 2021].

both the economy and business world. Having these practices, a place in the agile, which is the way the new world works, will be a powerful help in making agile practitioners happier and more effective.

3.2 EXTREME PROGRAMMING-XP

One of the most popular agile processes is Extreme Programming, known as XP, created in 2000 by Beck and Andres (2004). XP has made a new wind blow in the software industry with its simple but effective methods (Beck and Andres 2004). Customers and their requirements play a central role in the agile process created with XP. During the software, it can be adapted to customer needs that are not fully defined before and change quickly. As the project progresses, the cost of the changes requested by the customer will be very high, because the existing structure (design - design) may prevent the desired changes from being made or even a new restructuring may be required. XP is built on five basic rules: planning, Managing, coding, Designing, and testing (Beck and Andres 2004).

The success of the XP programming provided with its capability to change according to the new requirements. The main goal is to supply what the customers' needs when they need it (Hneif & Hock 2009).

4. AGILE TRANSFORMATION

As the problems encountered in the project management methods used increase, organizations tend to look for new methods. Organizations are turning to agile methods, which have become an attractive alternative for various reasons such as increasing performance or competing in the market. However, as with any system, agile applications may not be suitable for all companies or business areas. In the first design of Agile, it was intended to use by teams with a small number of members and working independently. When Agile methods are used with a wider scope, it may be difficult to comply with external factors. According to the results obtained in a systematic literature study, the main factors for the success of agile transformation in organizations are sufficient training, mentality, support from agile a coach, support from senior management and choosing the most appropriate method for the needs of the teams (Dikert et al. 2016).

As the number of companies that achieve success with the agile software development method increases, it becomes quite common among companies of different sizes with similar needs. However, how agile transformation affects software companies has been a matter of debate many times. In this context, measuring the effects of agile transformation has an important role in understanding and evaluating the contributions of agile methods to software companies. In the published study by Cloke (2007), with the name Yahoo! It has been suggested that agile transformation in Music significantly increases productivity and team morale. Measuring the contributions of agile transformation to the firm objectively can be achieved by defining metrics that are suitable for information needs. After defining metrics that works best for the coorparation effects of the agile transformation can be view clearly. From study presented by Olszewska et al. (2016) conducted for the purpose of researching measurement, have provided a metric model for quantitatively measuring agile transformation in a software development organization. In a study by Heidenberg et al. (2013) a metric model developed to measure the effects of agile and lean transformation on software development organizations is presented. In their study, Olszewska et al. (2013) presented metrics to measure the effects of agile and lean transformation in terms of performance and quality. In case the study conducted by Korhonen (2010), the change in error reporting practice before and after agile transformation is presented. During the first twelve months of agile transformation, error data in a large-scale firm were analysed (Korhonen 2010).

It is difficult for organizations to abandon their existing habits and cultures and adapt to a new method. Although Scrum is a simple framework, companies can have difficulties during transformation. Corporations might have negative ideas about the process if the transformation is last longer than the expected time. Transformation can affects by the time of the process.

Although very different and competitive organizations adopt the Agile working method, a business area is outside of this cluster. While there has been an extreme change in most of the industries, the field of R&D (Research and Development) continues to work with old methods. One of the reasons for this is that R&D studies progress with linearity. In order to move on to the next step, the previous step must be completed. In the article written by Alessandro Di Fiore, founder and CEO of European Center for Strategic Innovation (ECSI) and consultants of the same center, Kendra West and Andrea Segnalini; They explain that Agile applications, which are highly embraced by competitive institutions, have not yet been adopted in science-based R&D companies, can provide new value for the teams working in Agile throughout their journey from ground breaking scientific discoveries to successful business developments (Harvard Business Review 2021).[4]

Kahneman and Tversky (1979), in their article titled "Expectation Theory" published in Econometrica in 1979, mentions that people focus on changes because they experience life through changes. People value their losses more than their earnings. This phenomenon, called loss avoidance, combined with the ownership effect, can cause people to hate loss more. The unhappiness caused by a loss is about twice the emotional weight of the happiness caused by a gain (Kahneman and Tversky 1979). This situation is also observed in the difficulties experienced in agile transformation. One of the most common situations encountered in agile transformations is the protection of resistance to change and comfort areas. People have a hard time and are reluctant to change or transfer

[4] Harvard Business Review, 2021. E-kitap: Çevik ekipler inşa etmek. [internet]. https://hbrturkiye.com/storage/doc/acm/acm-sayi-2.pdf [accessed 19 May 2021].

what they have, even if they are burdened with them. In agile transformations, the fact that change management is done in the light of this information, trying to understand what people see as their loss, listening to their expectation and gaining at least a double gain to balance the value they add to their losses can be a strong awareness in overcoming these difficulties. For similar reasons, agile team members may be more inclined not to take risks. This is a normal process, and the reason is the same: avoidance the loss. At the end of the day, keeping in mind the fact that we are "only human" and the teams consisting of them will serve as an important poke for us at this point. we humans are neither completely rational nor consistent in most matters. Our circumstances and environmental influences significantly affect our behaviours and decisions (Harvard Business Review 2021)[5].

[5] Harvard Business Review, 2021. E-kitap: Çevik ekipler inşa etmek. [internet]. https://hbrturkiye.com/storage/doc/acm/acm-sayi-2.pdf [accessed 19 May 2021].

5. RESEARCH METHODOLOGY

In this study, survey-based research methodology is used which is one of the most frequently used method in management information systems. Web-based survey is selected because they are useful, they allow collecting valuable data in a short period of time and respondents has a lot of time to think about their answers. Web based surveys can also be confidential because even the slightest changes could leave their mark on the system (Rea and Parker 2005).

The study generally consists of three parts. In the first part, survey questions are determined; in the second part, the platform where the survey will be conducted is chosen and finally answers are collected. After collecting and analysing the data, results are evaluated.

The survey is conducted with the people working in one of the biggest banking software development companies in Turkey and responses are gathered. Participants who are currently working with the agile method or who have been using this method for a short period of time was selected for the purpose of the study. Concept of the survey questions is generally related with application of agile and success factors of agile methodology and perception of the respondents about usability of agile in banking sector.

To evaluate the opinions of the participants on the Scrum success factors, 5-point Likert scale was used for some of the questions in the survey. Likert scales are commonly used to measure attitudes and ideas, considering much more nuances than a simple "yes / no" question. Likert scales, named after the American social scientist Rensis Likert, who is the creator of this scale, are highly preferred as one of the most reliable ways of measuring ideas, perceptions, and behaviours (Jamieson 2004). Likert scales are ideal for digging deep into a single specific topic and learning what people think about it. Also, different question themes are used according to the characteristics of the questions like free text format etc. Participants were asked to evaluate the written statements with a value between Strongly Agree and Strongly Disagree in terms of the use of agile approaches in the organization.

5.1 DETERMINATION OF THE SURVEY QUESTIONS

Survey Questions are selected based on the literature views from many similar studies and personal experience of agile transformation and agile maturity level applications. In the first part of the questionnaire general information about the participants was collected. In order to reach statistical results, questions such as education level, total work experience, current positions were asked to the participants firstly. In the other part of the questionnaire, questions were asked to determine the agile method experience of the participants and to investigate their thoughts on the Scrum method success factors. In line with the purpose of the study, the questionnaire of the people using the Scrum method in a banking software development company was evaluated only.

The questions that the participants answered for this study are categories as follows. The purpose of selecting these questions is explained briefly. Detailed explanations of each survey questions are given in the "Survey Results and Evaluations" section.

5.1.1 General Statistical Questions

General statistical questions are asked to obtain general information about the participants. These questions are given below.

a) "Please enter your age". The purpose of this question is to have an idea about the average age of the company. This study did not focus on the connection of the opinions of the participants about the agile with their age.
b) "How many years is your total work experience"? This question was asked related with the question of age.
c) "Which is your current position best suited to? If other, please specify. (Expert, Associate and lower levels, Manager, Senior expert, Supervisor)". This question was added to the survey questions to determine the percentage distribution of the current positions of the survey participants.
d) "…. of the work done by the agile team are legal demands". (none, less than half, half, all, more than half)". This question was asked to determine what percentage of the requests completed by the agile team are legal claims and what percentage business unit demand is. Because legal demands can differ in terms of time and predefined

details from customer demands. This situation may also have an impact on agile success.

e) "… of the work done by our agile team are small projects. Projects that last less than 3 months are considered small, projects that last more than 3 months are considered large. (none, less than half, half, all, more than half)". Project size has an effect agile success. Projects that last longer have more complexity and unknown level of requirements than the small projects. Agile software development is logically more suitable for small projects and short predetermined demands (Dybåand and Dingsøyr 2009).

f) "What is your role in the agile team? (development member, Scrum master, product owner, other)". Agile teams consist of members in different roles with different responsibilities and expertise. To determine the percentage distribution of roles in team members, the participants were asked about their current roles. Percentage of roles such as product owner or Scrum master are expected to be less than the development team member role. It is also possible to be a team member who has more than one role in agile team.

5.1.2 Questions related with Human Factor on Agile Success

a) "While applying the agile software development method, sufficient documentation is made for corporate memory. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)". It may not be possible to see the effect of agile methods on documentation immediately in companies that have recently started agile applications. Participants were asked for their opinions on whether enough sufficient documentation is being prepared by agile teams in the company.

b) "Have you taken training on agile software development method / application? (I have taken agile training, I have not taken agile training, it is planned)". It is critical to take agile training, especially in companies that have just completed the agile transformation. This question is asked related with the question of do you think you have a command of the agile software development application?

c) Do you think you have enough knowledge of the agile software development methodology that you are using now? (yes, no)". Agile success is affected by how well team members know about agile software development methodology; therefore, this question was added to the survey.

d) “Trust prevails in the agile team, and in negative situations, a solution is tried to be found by using open communication. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)”. This question is asked to determine the degree of team awareness within the agile team.

e) “In the retro meeting, all team members participate actively and contribute to the discussion of problems / positive practices. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)”. This question is asked to determine the degree of team awareness and open communication level within the agile team.

5.1.3 Questions Related with Process and Implementation Factor on Agile Success

a) “Compared to traditional project management methods, with agile methods projects require shorter time to complete and with agile method productivity is higher. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)”. The word of “agile” literally means to be able to move quickly (Fowler & Highsmith 2001). This question was asked to understand what participants thought about the positive impact of agile methods on productivity.

b) “In projects of less than 3 months or small demands, it is more appropriate to apply agile method compared to large projects.’ (Strongly disagree, Disagree, Undecided, Agree, strongly agree) “. This question was asked to the participants to understand whether they observed a relationship between project size and success in the project management processes they were a part of.

c) “With agile methods, customer needs are responded better, and customer satisfaction increases with the agile method. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)”. One of the outputs expected with agile applications is the increase in customer satisfaction. The participants were asked whether they agreed with this information or not. Because there is no exact measurement of this outcome in every business area, every type of customer or every company culture.

5.1.4 Questions Related with Organizational Factor on Agile

a) "My manager that I report supports the application of agile methods. (Strongly disagree, Disagree, Undecided, Agree, strongly agree)". Senior management support has an impact on the success in agile transformation, as in all transformations. Therefore, this question has also been asked to the participants.

b) "Do you have an agile coach in your company that you can consult about the application of agile methods? (Yes, No) ". Support from an expert during the agile transformation ensures that the transformation is painless, while at the same time allowing the opinion of an objective person to be taken from the outside. Agile coaches help teams about the application of agile rituals, and they remove the barriers to the team (Stray et al. 2020).

c) "Agile method rituals are performed regularly in our company (Sprint planning, refinement, retrospective, daily, etc. meetings). (Strongly disagree, Disagree, Undecided, Agree, strongly agree)". This question was asked to measure how much agile transformation has been adopted across the company.

d) "How long are sprint intervals? (2 weeks, 3 weeks, 1 mouth)". This question was asked to learn the agile rules determined by the team for its own work order.

e) "How many people does your Agile team have"? This question asked to have an idea about the agile team's size in the company.

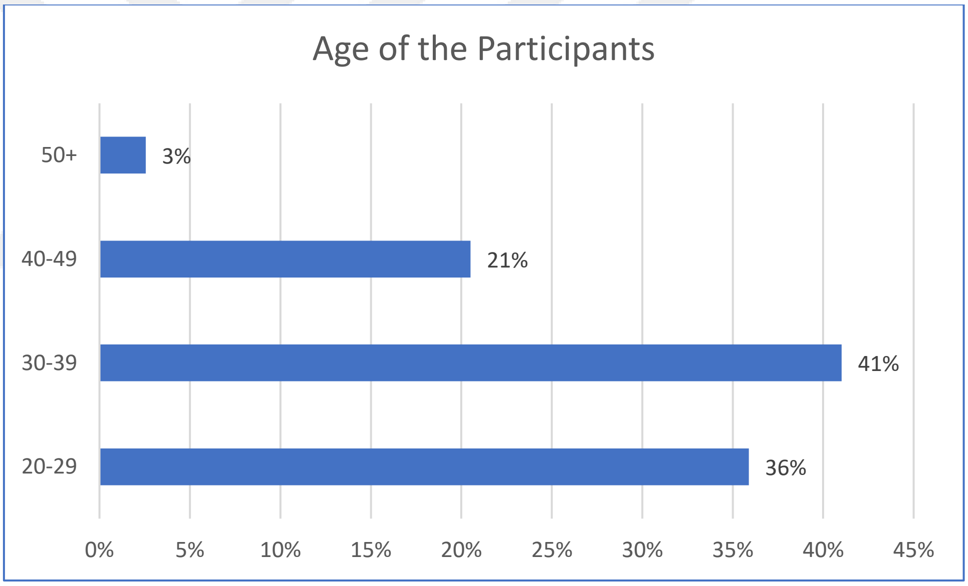
5.2 SURVEY RESULTS AND EVALUATIONS

In this part of the study, survey questions are given with their purpose and results. The reasons for choosing the questions for the questionnaire in this study were explained, and the results of the questionnaire were evaluated according to the values in similar studies conducted before. All the survey questions were answered by 39 employees of a financial software development company that operate in Turkey. The company of all participants works in is using Scrum and Kanban methodology actively. The results of the survey are reliable because the individuals participating in the questionnaire belong to a certain segment, also works in the same company and there is the possibility to communicate with each participant one-to-one during the study. Although the number of individuals participating in the survey is limited, the results of the survey do not conflict with the results of similar survey studies conducted before. For this reason, there was no elimination from the questionnaire questions and all answers were used in the study.

All the graphics prepared according to the statistical results of the survey with excel.

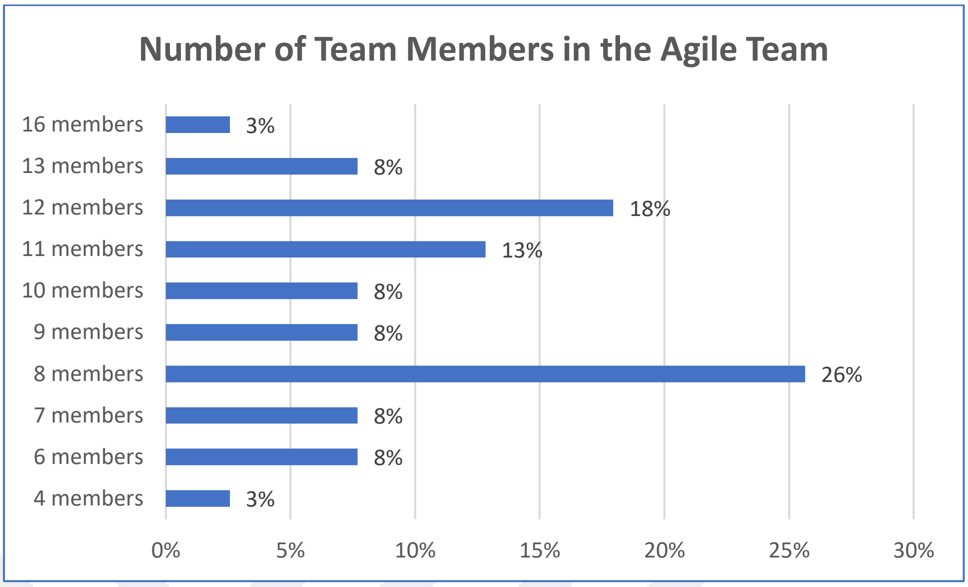
Firstly, age of the participants was asked to gain a general idea about company and to obtain statistical data for the research. 36 percent of participants between the ages of 20 and 30 years old, 41 percent of participants between the ages of 30 and 40 years old and 21 percent of participants between the ages of 40 and 50 years old. The average age of the participants is 34. According to the results of this survey question, it can be stated that the company has a relatively young age average.

Figure 5.1: Distributions of the age of the participants



When determining agile teams, the number of team members needed varies according to the work area that the team is responsible for. Since the job under the responsibility of each agile team is different in the company that the survey is conducted, the number of team members also varies. Answers between 4 people and 16 people have been given to the question of how many people does your agile team consist of. 26 percentage of the agile teams consist of 8 members following with the percentage of 18 team members.

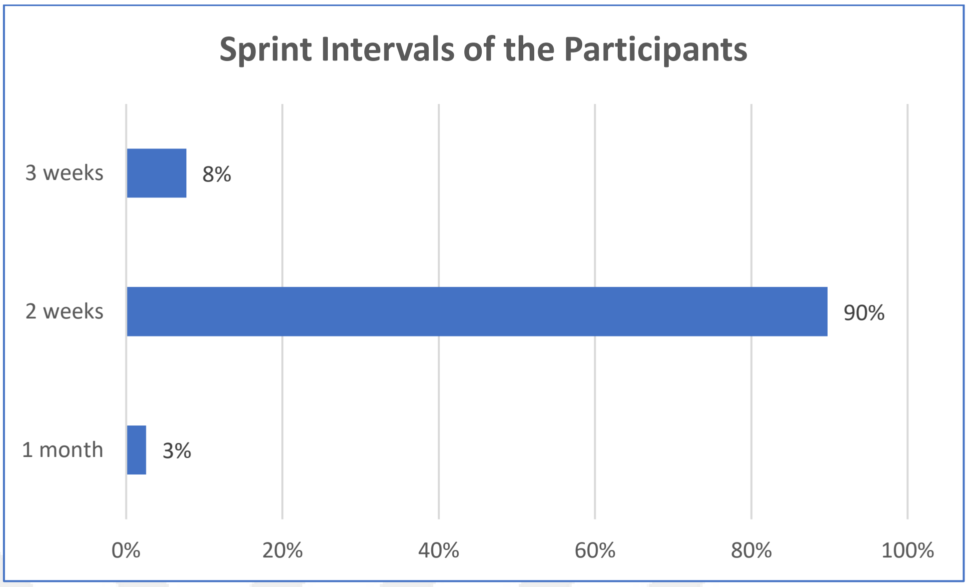
Figure 5.2: Number of team members in the agile team of the participants



According to the Turkey Agility Report (Agile Turkey 2019)[6] 69 percent of the agile teams work with sprint intervals of 2 weeks in the organizations of Turkey. 11 percent of agile teams prefer to do 3 weeks of iterations between each sprint and following with 4 weeks of iterations with the percentage of 5. In the questionnaire for this study, the question of how long the sprint intervals was asked to the participants. 90 percent of the participants stated that the sprint intervals in their team are 2 weeks, 8 percent of the participants stated that the sprint intervals in their team are 3 weeks. Only 3 percent of the participants stated that the sprint intervals in their team are 1 week. These results are also compatible with the rates of sprint intervals applied in agile teams throughout Turkey. The short sprint intervals shorten the detailing time of the work that will be done of the sprint and allows team members to focus.

[6] Agile Turkey, 2019. Turkey agility report.

Figure 5.3: Length of sprints used in agile team of the participants



According to a systematic literature review study on agile coaching and the role of the agile coach, it can be claimed that organizations need support of agile coach especially in the process of transformation to agile applications. Agile coaches guide teams about the application of agile rituals right also they focus on removing the barriers to the team (Stray et al. 2020). Agile coaches have critical roles, especially in companies that do not have much experience in agile application. One of the questions in the questionnaire was whether there was an agile coach that teams could consult about rules of agile applications. All the participants answered yes to this question. The success of agile applications is related to the presence of an expert who can be consulted during the agile application as well as the sufficient knowledge of the team members. Questions were asked in the survey to determine the level of mastery of the participants in agile methods. 90 percent of the participants answered yes to the question of whether you have received training on agile software development method / application. In the organization where the survey is carried out, all teams working in agile are given / will be given agile training with workshops from experts. Therefore, it was expected to obtain a yes answer with a high rate of agile training question.

Figure 5.4: Knowledge level of agile methodology of the participants

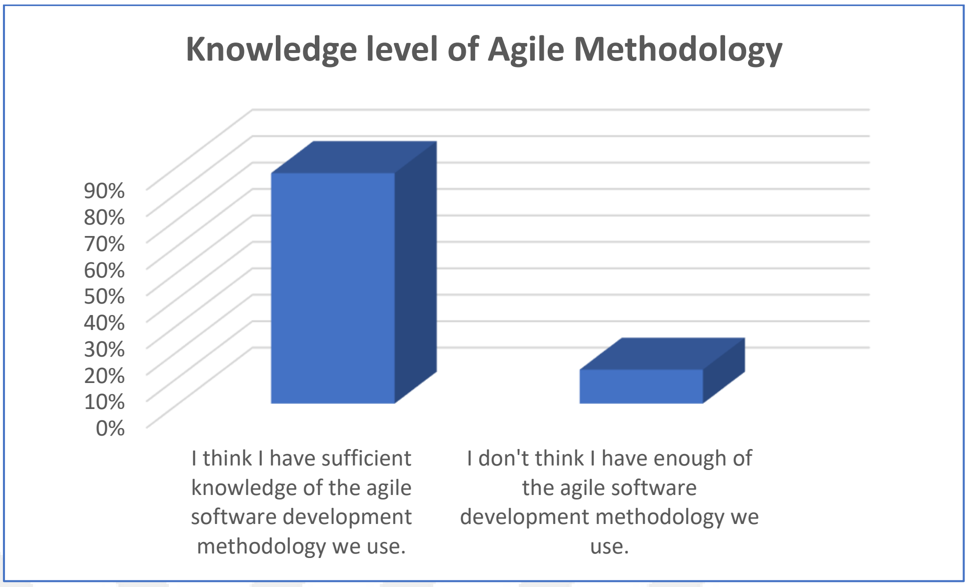
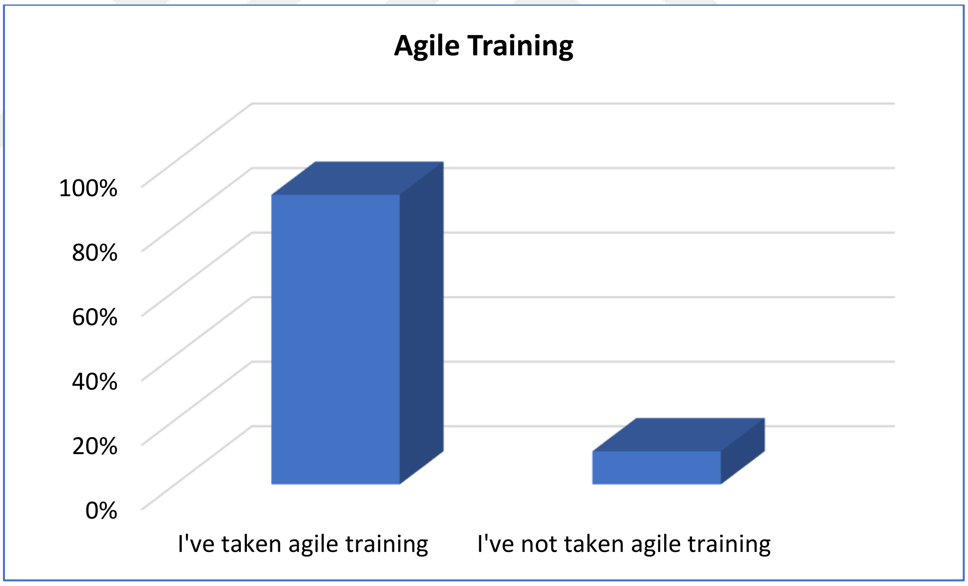


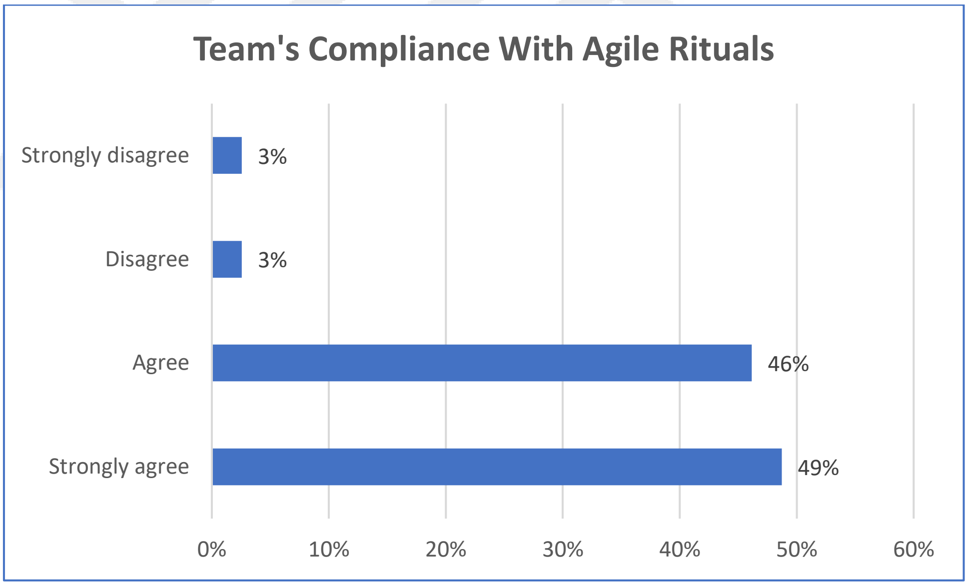
Figure 5.5: Participants' attendance in agile training



Participants were asked what their roles in the agile team. In companies, a team member can take on more than one role in accordance with the needs of the job. One of the members of the development teams is also product owner between the participants. 4 of the participants who has Scrum master role in the team are also development team member. 1 of the participants of the survey manager of the product owner. 5 of the participants has only role of product owner within the team and 3 of the participants has only role of Scrum master in the team. 74 percent of the roles between survey participants has role of development team member.

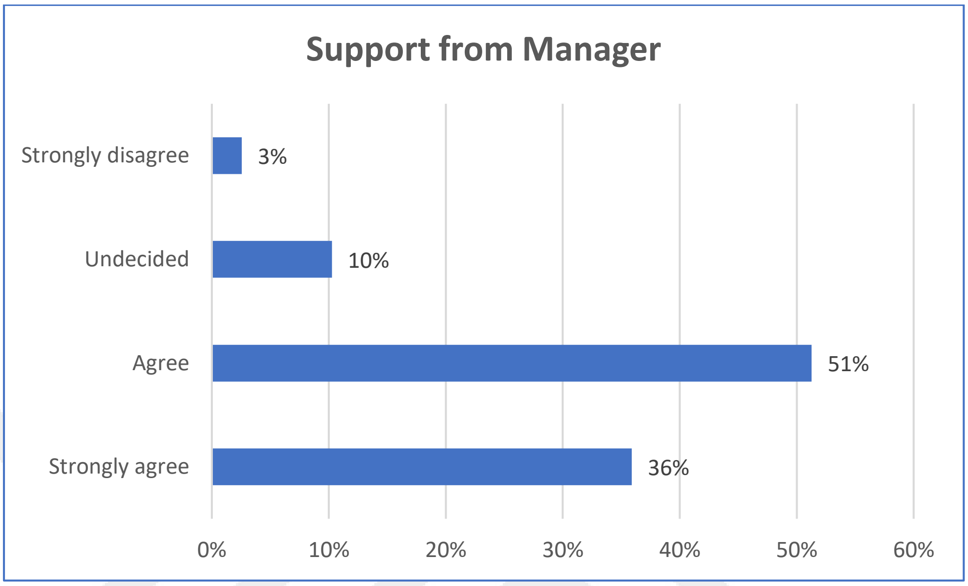
It is critical to what extent the Agile software development method is applied in accordance with the agile rules to achieve success. Agile rituals are generally sprint planning, refinement, retrospective, daily, etc. meetings. Survey participants were asked to what extent they agreed with the sentence "Agile method rituals are held regularly in our company". 49 percent of the survey participants strongly agree that company has rituals that Agile Manifesto requires. 46 percent of the agree that company has rituals that Agile Manifesto requires. Totally 95 percent of the survey participants indicates that agile rituals are easily followed. According to the result, it can be stated that the technical requirement of the agile transformation is nearly completed (Fowler & Highsmith 2001).

Figure 5.6: Agile team's compliance with agile rituals



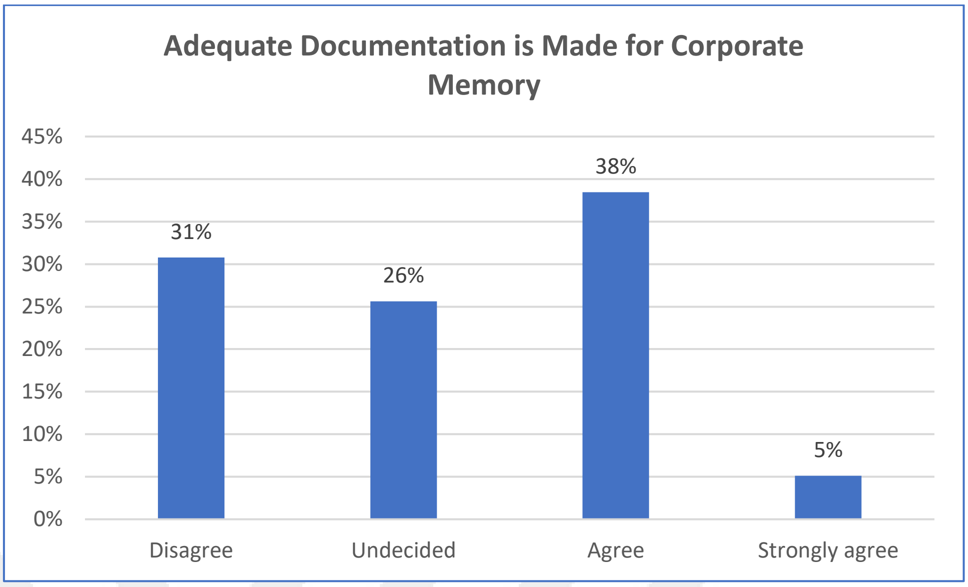
In addition to the factors that affect the success of agile, support of the top management is also very critical for people in all roles in the company. Participants were asked their opinions on the level of support of their manager who is participants directly related about the application of agile methods. 51 percent of the participants agree that their manager support application of agile methodology. 36 percent of the participants strongly agree that their manager support application of agile methodology. 10 percent of them are not sure about the support given by the manager. As a result, a high proportion of managers support agile applications and make employees feel their support.

Figure 5.7: Manager of participants' support level on agile applications



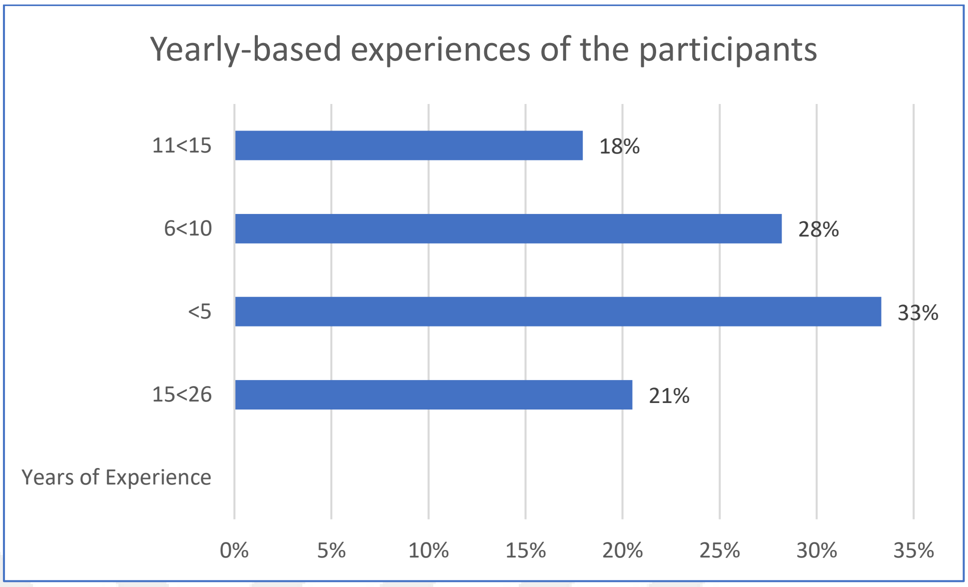
One of the principles of Fowler & Highsmith (2001) is coded software that operates correctly over detailed documentation. Instead of focusing on documenting the work that the team is doing, they should focus on producing the workpiece that is in good working condition. Also, documents are necessary to keep corporate memory in an organization. In the questionnaire, participants were asked whether there was sufficient documentation for corporate memory of the company while applying agile software development method. This questionnaire was prepared by presenting options at different levels with Likert scales instead of a yes or no question, so that a more accurate result can be learned for different ideas. According to the survey results, there is not enough consensus that the documentation made within the team is sufficient for corporate memory. The reason for the concerns about keeping sufficient documents while applying agile methods may be that the company has not experienced the agile method for a long time to see the results. There may also be concerns about whether there will be sufficient documentation if the software development products made by the team are transferred to another team.

Figure 5.8: Participants' opinion about adequate documentation



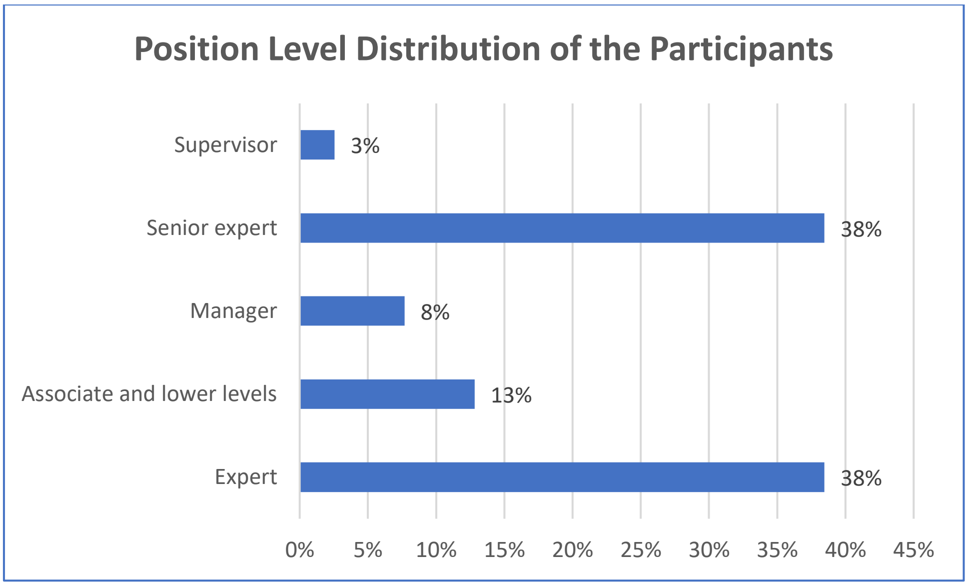
The distribution of the participants' work experience is shown in Table 7 on a yearly basis. Average experience year value is 10 years. 33 percent of the participants have a work experience of less than or equal to 5 years. 28 percent of the participants have work experience of 6 to 10 years. 21 percent of the participants have work experience of 15 to 26 years and 18 percent of the participants have work experience of 11 to 15 years. This data shows us that most of the participants are at the beginning of their professional career. At the same time, this result is consistent with the average age value of the participants.

Figure 5.9: Yearly based experiences of the participants



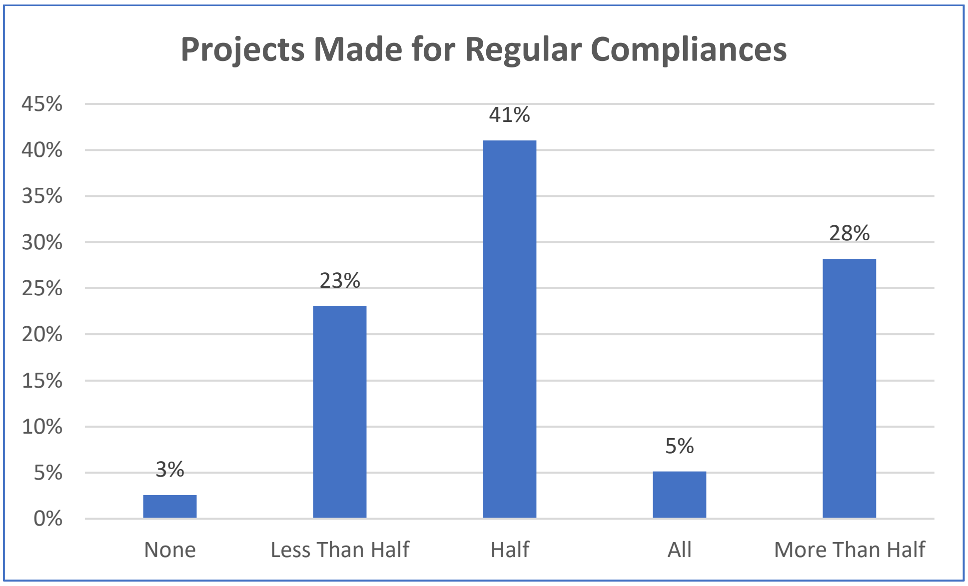
The current positions in their company of the respondents were asked. 3 percent of the survey participants' current level is supervisor, 8 percent of the survey participants' current level is manager, 13 percent of the survey participants are at the senior expert and with same 38 percent of the survey participants are at the expert level. Distribution of the positions of the survey participants given in table 8. According to the results, 76 percent of the survey participants are experts and senior experts.

Figure 5.10: Position level distribution of the participants



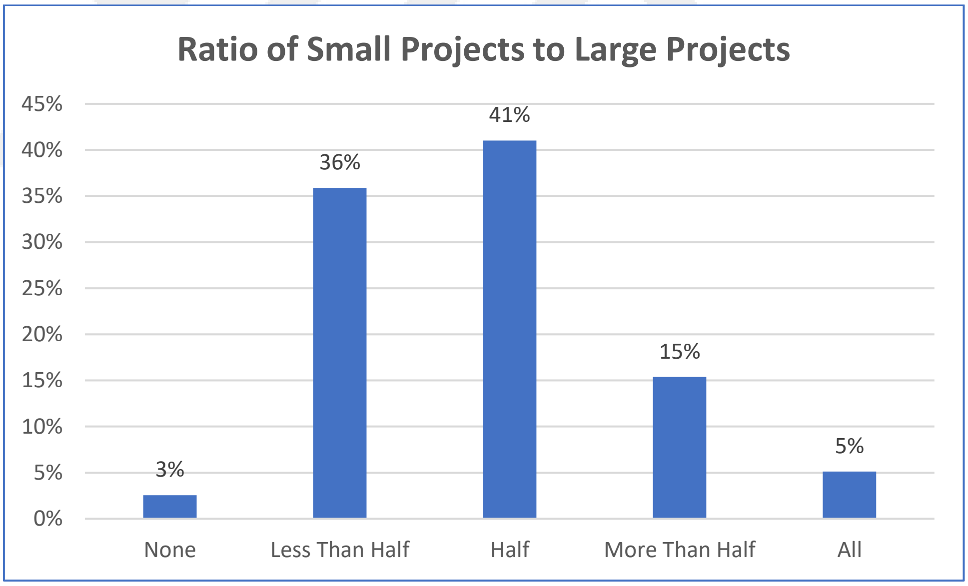
Agile success level effected by the project types and customer types like other project management practises. Since the group targeted to participate in the survey has experience in the financial software development sector, it should be taken into account that a significant part of the projects carried out by banks systems made for regulatory compliances by the institutions of government. There are difficulties in applying agile in regulatory compliance projects. An investigate about regulatory compliance projects application with agile methodology is conducted by Beerbaum (2019). Regulatory compliance projects in the software development companies serving the banking sector in Turkey has a great rate and flexibility in the legal project times are limited. Participants were asked to choose the answer they thought was the most appropriate for the "…. of the work done by the agile team are legal demands". sentence. They were asked to choose one of five options: none, less than half, half, all, and more than half. As it can be seen in table 9, only 3 percent of the participants stated that projects made by the teams are not regulatory demands. According to the survey results legal demands has a significant ratio between the projects made by the agile team. Legal projects may not be suitable for some agile practices due to their specific features such as time constraints and demand details, which may affect the agile success of the team.

Figure 5.11: Position level distribution of the participants



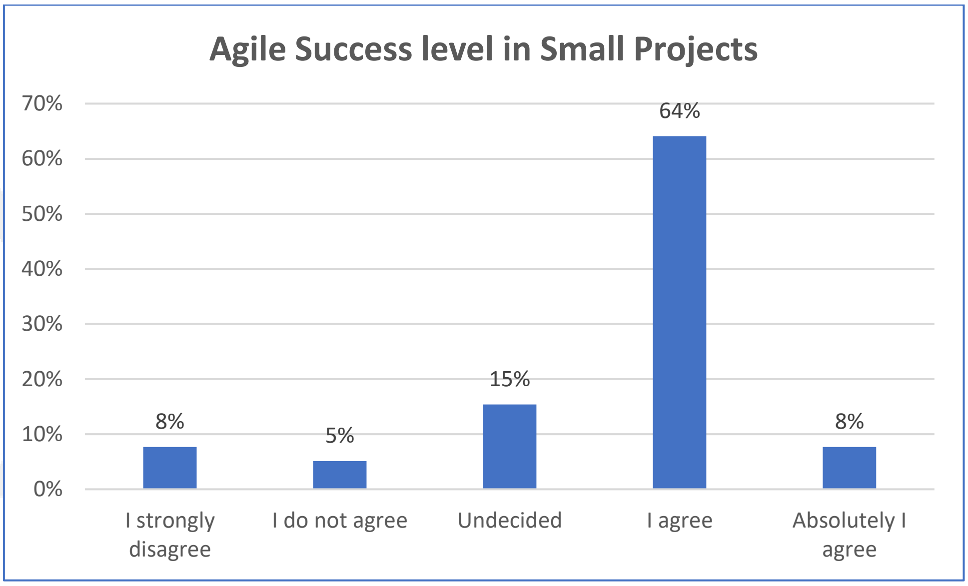
There are studies about the effects of project size on agile management success and efficiency of the method that is used. The longer the project duration, the higher the complexity and the unknown level of requirements. Agile project management method is more successful in small projects compared to the large projects (Dybåand and Dingsøyr 2009). A question was added to the questionnaire to determine the ratio of the number of small projects carried out to all project that the agile team works on. Participants were asked to choose the answer they thought was the most appropriate for the "… of the work done by our agile team are small projects. Projects that last less than 3 months are considered small, projects that last more than 3 months are considered large". sentence. They were asked to choose one of five options: none, less than half, half, all, and more than half. 3 percent of the participants. 3 percent of the participants stated that the agile team did not make small projects. 65 percent of the participants stated that projects that they have been made is half of all projects or more than half of all projects. More small projects than the big projects made by the team increase the team's agile success.

Figure 5.12: Ratio of small projects to large projects



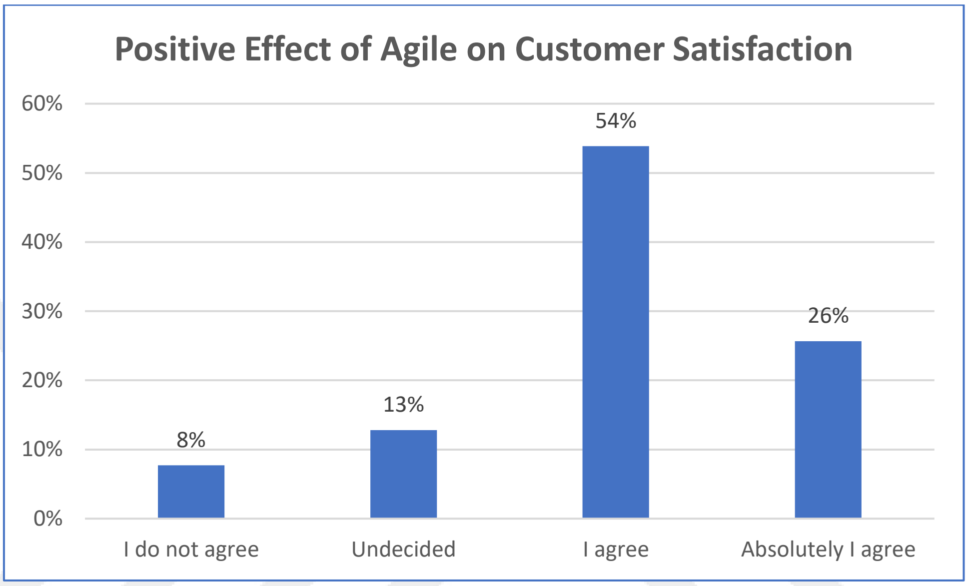
In addition to asking the participants about the proportions of the projects realized according to their size, another question related to the size of the project was asked. Participants were asked to choose the answer they thought was the most appropriate for the "In projects of less than 3 months or small demands, it is more appropriate to apply agile method compared to large projects" sentence. They were asked to choose one of five options: I strongly disagree, I do not agree, I am indecisive, I agree, and Absolutely I agree. As it can be seen in the table 11, 64 percent of the participants agreed, and 8 percent of the participants strongly agreed that it is more appropriate to apply agile method compared to large projects. 5 percent of the participants disagreed, and 8 percent of the participants strongly disagreed that it is more appropriate to apply agile method compared to large projects. With a ratio of 15 percent of the survey participants did not stated their opinion about the questions.

Figure 5.13: Participants agreement level about small project' positive effect on agile success



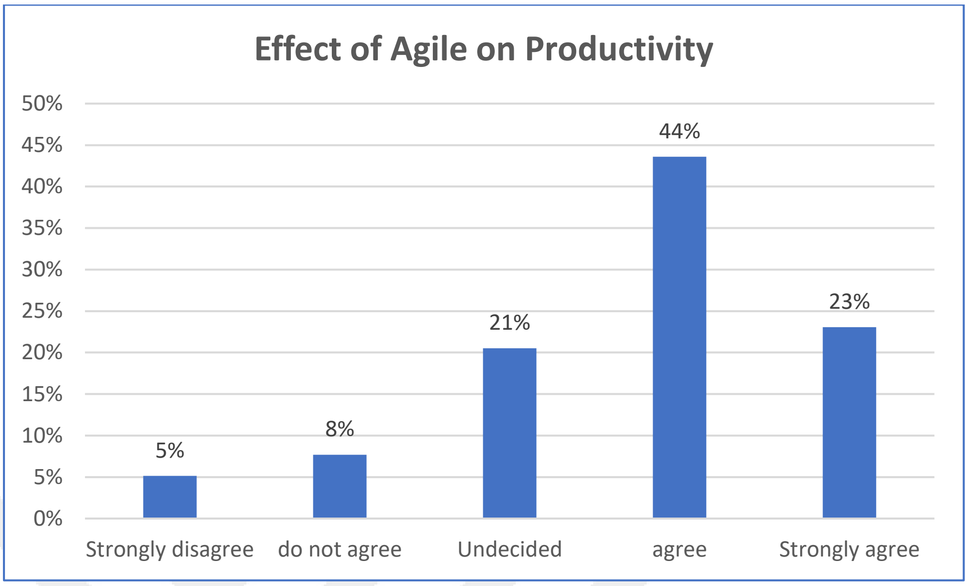
As stated in the results of the previously made studies that mentioned in the literature view, customer satisfaction is expected to increase with agile methods. Therefore, participants were asked to choose the answer they thought was the most appropriate for the "With agile methods, customer needs are responded better, and customer satisfaction increases with the agile method" sentence. They were asked to choose one of five options: I strongly disagree, I do not agree, I am indecisive, I agree, and Absolutely I agree. As it can be seen in the table 12, 54 percent of the participants agreed, and 26 percent of the participants strongly agreed that with agile methods, customer needs are responded better, and customer satisfaction increases. 8 percent of the participants disagreed that with agile methods, customer needs are responded better, and customer satisfaction increases. With a ratio of 13 percent of the survey participants did not stated their opinion about the questions. The factors affecting the response of the participants who think that customer satisfaction does not increase with agile can be various and it is also necessary to examine these factors in detail. In this study, additional questions were not posed in order not to lose the focus. Most of the participants stated that customer satisfaction has increased, and this result is consistent with the results of similar studies.

Figure 5.14: Participants agreement level about agile' positive effect on customer satisfaction



Projects that processing with agile method, productivity is expected to be increased (Sutherland et al. 2008). A question was asked to the survey participants to learn their opinions on the relationship between productivity and agile. Participants were asked to choose the answer they thought was the most appropriate for the "Compared to traditional project management methods, with agile methods projects require shorter time to complete and with agile method productivity is higher". sentence. They were asked to choose one of five options: I strongly disagree, I do not agree, I am indecisive, I agree, and Absolutely I agree. As it can be seen in the table 13, 44 percent of the participants agreed, and 23 percent of the participants strongly agreed that compared to traditional project management methods, with agile methods projects require shorter time to complete and with agile method productivity is higher. With a ratio of 21 percent of the survey participants did not stated their opinion about the questions. According to the survey results, it can be said that the agile method increases the productivity and reduces the project delivery time, in line with the results obtained in the literature research.

Figure 5.15: Participants agreement level about agile' positive effect on productivity and delivery time



Last two questions related to teamwork were asked to the participants. Agreement level of the survey participants asked of the "Confidence prevails in the agile team, and in negative situations, a solution is tried to be found by using open communication". sentence. According to the table 14, 67 percent of the participants agreed, and 15 percent of the participants strongly agreed that confidence prevails in the agile team, and in negative situations, a solution is tried to be found by using open communication. Only 3 percent of the participants does not agree with the statement. In connection with this question, another question related to team feeling was asked to learn the efficiency of retro meetings. Survey participants were asked about their agreement level of the "In the retro meeting, all team members participate actively and contribute to the discussion of problems / positive practices". Sentence. As it can be seen in table 15, 62 percent of the participants agreed, and 13 percent of the participants strongly agreed that "In the retro meeting, all team members participate actively and contribute to the discussion of problems / positive practices.". Providing feedback within the team, having a sense of trust, and establishing open communication positively affect team dynamics. It can also be stated that these results positively affect the level of agile success.

Figure 5.16: Absence of trust and open communication in the agile team

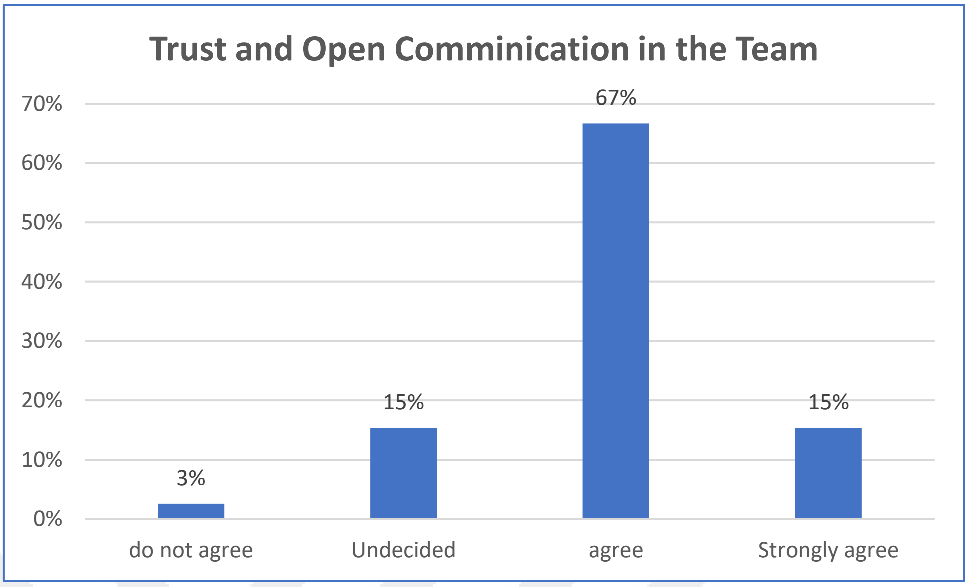
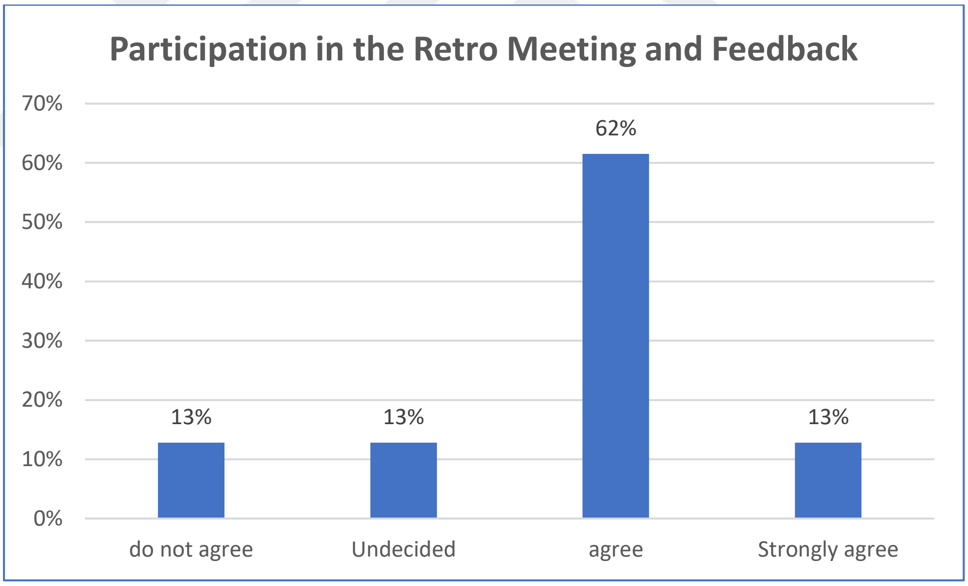


Figure 5.17: Participation in the retro meeting and feedback in the agile team



6. CONCLUSIONS AND SUMMARY

Software projects that resulted in failure led to changes in the processes and process management implemented by organizations. Agile processes have come up against organizations looking for this change with a different mindset than traditional software development methods.

In this study, the Scrum model, which is one of the most used methods of agile processes is examined. The historical development, content and rules of the processes presented with the literature research. Survey method is used based on the examinations of literature view with the purpose of to provide perspective to researchers and organizations that consider transformation to agile practices about agile implementation in software development in Turkey. After collecting the survey result from a financial software development company, each question and results are evaluated in detail. Success factors that determined in similar studies are compared with the survey results and same results are achieved.

Documentation in agile software development methodology is less prepared than traditional project management methods. In this study, the determination that agile teams using the Scrum method improve their software by keeping the documentation less shows that Scrum rules are applied. However, it is also possible that there is a risk of not doing the documentation at all, and this situation seems likely to be an obstacle to the continuity of the product. Although documentation is not a priority in agile methodology projects, it is necessary for Scrum to be successful.

Survey result evaluations were evaluated according to the statistical findings determined to maintain objectivity. As in many experimental studies, there are important limitations in this study. This study is limited in terms of theoretical and practical field of study, both due to the selected subject and the fact that the group in which the study is conducted is from a specific field. The respondents who answered the questionnaire could not be selected with a random sample across Turkey. For this reason, the results cannot be generalized to the situation in Turkey. however, it can provide a perspective for software developers and researchers on general trends in Turkey. Within the scope of future studies, it will be beneficial to expand the research in a longer time interval to cover a larger sample or to re-apply the questionnaire at periodic intervals in terms of expanding the findings. Also, in future studies, it is recommended to examine the effects of Scrum success factors on the efficiency and productivity of business processes in a multifaceted way with a large sample. In addition to the impact of agile transformation on business success, researching the effects of employees' personal and team performances on project performance will contribute to the investigation of the effects of agile work in terms of multidisciplinary studies.

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