The Relationship between the Scrum Method and Employee Satisfaction

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Abstract: - The Scrum method has an important place among agile software development methods, and its use worldwide has increased over the years. This study aims to measure the impact of the Scrum method on business processes and examine its relationship with employee satisfaction. Specifically, a common survey was applied to both the development team and stakeholders working with the Scrum method. Since separate studies are generally conducted for the development team or stakeholders, evaluating employees in both roles in a single research constitutes a distinctive element of the study. An in-depth examination of the effects of Scrum and its relationship with employee satisfaction will significantly contribute to the literature. Within the scope of the research, a survey was administered to the employees of a bank. In the survey, following the demographic questions, the participants were asked questions about Scrum method applications and their perspectives on the method, and then other questions were included to understand their satisfaction levels. 108 people participated in the survey, and the answers were analyzed using SPSS. Since the data did not show a parametric distribution due to the survey, the answers were analyzed using Spearman Correlation Analysis, Mann Whitney U, and Kruskal Wallis test. As a result, it has been seen that the factors that increase the satisfaction between IT teams and stakeholders the most are related to the alignment and team solidarity between the teams. In addition, it has been observed that regardless of the roles of the people in the team, seeing their work as meaningful has a significant positive impact on satisfaction. Finally, there was rarely a notable difference between demographic elements and stress and satisfaction variables, and a significant difference was only seen between the number of people in the team and stress.

Key-Words: - Agile, Scrum practices, Project management processes, Stress, Software development methodologies, Satisfaction, Employee satisfaction.

1 Introduction

It is thought that the history of project management dates back to the Egyptian pyramids. In this process, which has been going on since 2750 BC, traces of project management were initially found primarily on physical structures, but as time progressed, it was observed that this structure became more systematic. In this context, the Gantt chart is considered the beginning of modern project management, [1]. Today, the fundamental processes of project management, namely initiation, planning, implementation, monitoring/control, and evaluation/closing, have remained constant, but their management style has changed. Rapidly changing customer demands and the abundance of alternatives in the market have caused companies to reconsider their project management processes. In line with these needs, the Agile Manifesto was declared in 2001, and a new perspective was given to project management, [2].

Agile methods focus on customer satisfaction and aim to respond quickly to customer demands. To achieve this, unlike traditional methods, it delivers continuously in short periods of time and

enables transition between stages in the project. In this respect, it naturally keeps customer satisfaction higher than other methods. In addition, the concept of satisfaction depends on many variables, and for an institution to survive, it must consider employee satisfaction as well as customer satisfaction. Based on this perspective, the scope of the study was determined.

Considering the previous studies, it is common to see many studies investigating the concept of agile methods and satisfaction, considering the importance of the subject. However, it has been observed that the studies are mostly applied to stakeholders or the developer team. In this research, a survey was conducted on both the IT employees of a bank and the stakeholders in the team to eliminate this deficiency. The survey was conducted among individuals who have had previous experience or are currently working with the Scrum methodology. The study consists of 3 parts in total. In the first part, demographic questions were asked of the employees, and then the second part was aimed at learning the satisfaction and stress levels of the people while working with the Scrum method. In the last section, questions were asked about the practices people made while working with the Scrum method and the effects of this method. While creating the questions in the survey study, the following studies were used: "Satisfaction and Relationships in Agile Software Development", "Investigating the Role of Stakeholders in Agile Information Systems Development Projects: A Mixed Method Approach", "Success Factors of Enterprises Applying the Scrum Method in Agile Software Development Processes in Turkey" and "Job Satisfaction in Agile Development Teams: Agile Development as Job Redesign", [3], [4], [5], [6].

When the studies in the literature are examined, it is often seen that research on the Scrum method is aimed either at stakeholders or developers. Survey studies applied to both developers and stakeholders are rare. When we look at Turkey, where this study was implemented, it was seen that the agile method mainly was examined in terms of project success or customer satisfaction in a few studies. In this study, aiming to fill this gap in the literature, the same survey was applied to both IT teams and stakeholders of a bank in Turkey working with the Scrum method, and the effects of the Scrum method were examined by measuring the satisfaction levels of the participants.

2 Literature Review

When the studies in the literature are examined, it is seen that the effect of extreme programming and other agile methods on job satisfaction is investigated, [7]. While some studies examine the relationship between agile and traditional methods and job satisfaction [8], some studies examine the relationship between the number of people in the Scrum team and job satisfaction, [9]. When the results of the studies are discussed in order, it is seen that those who use extreme programming are more satisfied than those who use other agile methods. Additionally, especially teams with managerial roles or a small number of employees have a higher satisfaction rate. Studies have shown that the relationship between job satisfaction and agile methods has been examined from only a few perspectives. These studies show that the relationship between agile methods and satisfaction has been examined under certain headings. Still, they prove that the relationship between Scrum and satisfaction has yet to be examined in depth.

When looking at the studies conducted in 2020 and 2021, it was seen that the relationship between satisfaction and agile software development was examined, [3], [4]. A nationwide survey conducted in Switzerland in 2016 aimed to determine whether satisfaction was related to the development method, application usage, work, team, and software problems, [3]. As a result of the study, it was found that the satisfaction level of those using agile development was higher than those using traditional methods. Another study conducted afterward measured the satisfaction level of the stakeholders and the development team in teams implementing the agile software development method, [4]. As a result, it was seen that the communication established by the stakeholders working with the team using the agile method moderated the relationship between job satisfaction. When looking at these studies, it is seen that the relationship between satisfaction and agile software development was examined in more depth. Nevertheless, the study's target audience is limited to a particular area.

In 2016 and 2019, people's job satisfaction using the agile methodology was measured by taking the Job Characteristics Model into account [6], [10]. The 2016 study examined the relationship between the Scrum method and the Job Characteristics Model and its effect on job satisfaction, [6]. As a result, a positive relationship was determined between Scrum and this model, and the direct impact of Scrum on job satisfaction was observed. In the 2019 study, remote working and

workplace communication elements were added to the Job Characteristics Model for employees using the agile method, and the effects of these factors on job satisfaction were examined, [10]. According to the results of the research, both elements increased job satisfaction. Consequently, an evaluation based on the Job Characteristics Model was made in both studies. Accordingly, the scope of the studies is primarily based on the foundations of the model and is limited by this perspective.

Some studies were conducted in 2018 and 2023 to use the Scrum method more effectively. In a study conducted in 2018, other studies in the literature were scanned, seven different motivations were revealed to find the best version of the Scrum method for teams, and 6 general strategies were determined to apply these motivations best, [11]. The study emphasized the importance of UX as a source of motivation and a strategy to be followed, and it was concluded that combining Scrum with methods such as Lean or XP would be more beneficial. In a study conducted in 2023, the reasons why Scrum teams are effective were investigated, [12]. The research findings showed that the most substantial role in team effectiveness is maintaining strong relationships with stakeholders and responding quickly to their demands.

In this study, it is aimed to fill the gap in the literature by reviewing previous studies on the subject. In previous studies, it was possible to come across studies comparing agile methods and traditional methods. It has often been observed that the Scrum method needs to be specifically examined, but general research is conducted on agile methods. Our study conducted research on the Scrum method, which has been widely used in recent years. This research was conducted with a joint survey applied to both IT employees and stakeholders, aiming to measure the answers of both segments as clearly as possible. The way the Scrum method was implemented and its effects were measured with a comprehensive survey, the relationship between the answers and employee satisfaction and stress was examined, and the significance of satisfaction and stress levels was investigated in the light of employee demographic data.

3 Materials and Methods

3.1 Research Design and Hypotheses
In the study, the application of the Scrum method was examined, and then the relationship of these levels with business processes, satisfaction, and

stress was investigated. The model of the research is shown in Figure 1. In the study, first, the relationship between agile method practices and their effects on the left side of the model and satisfaction was examined. Then, it was observed whether there was a significant difference between the concepts of satisfaction and stress and the demographic data on the right side of the model.
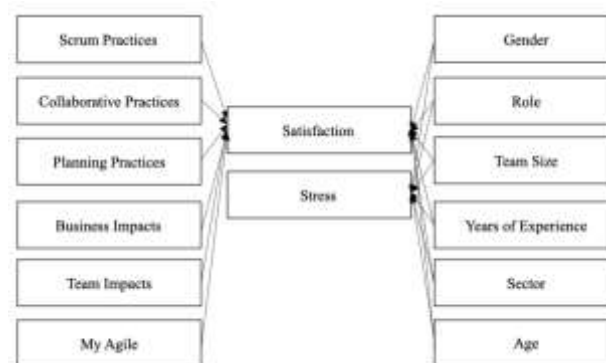

Fig. 1: Research model

Agile method practices include the practices that form the basis of the agile methodology. According to the Agile Manifesto, the agile methodology consists of 4 values and 12 principles. These 12 principles outline the building blocks of the agile methodology. The following can be given as examples of principles that include certain essential practices: a) even changing the requirements towards the end of the project is valuable, and compliance with them is seen as a competitive advantage; b) the customer and developers must be in constant communication throughout the project, c) the software must be delivered to the customer in a short time and continuously. Customer satisfaction is ensured by delivering the product as required, [13]. The primary purpose of the agile methodology is to meet customer satisfaction as quickly as possible.

Hypothesis 1: A significant relationship exists between agile method practices and satisfaction.
H1a: When a change is requested, the team adapts quickly.
H1b: Too much time is spent on documentation when a change occurs.
H1c: The project documentation is prepared in a way that the business unit and development team can understand.
H1d: When a change is required in the project, development is carried out for this need, even in the software phase.
H1e: The customer is aware of the project-related changes that occur within the team.

H1f: Working synchronously with stakeholders outside the team to complete the assigned task.

H1g: When it is necessary to hand over the work to someone outside the team, the methods/documents used within the team are sufficient.

H1h: I think user acceptance test scenarios are tested well enough.

H1ı: Using the agile method in the software development process ensures that tasks are completed in a shorter time.

Collaboration occurs when more than one person contributes to a task. This concept is essential in agile teams, especially Scrum teams. Solidarity is reinforced with daily meetings, more than one team member responsible for a common task, and an environment without hierarchy, [14]. Collaborative practices are expected to increase both the team's motivation and the employees' satisfaction level.

Hypothesis 2: There is a significant relationship between collaborative practices and satisfaction.

H2a: The entire team regularly participates in daily meetings.

H2b: The customer takes an active role in the project.

H2c: Team members share responsibility for the quality of the product and act accordingly.

H2d: I have a colleague with whom I can regularly exchange ideas regarding the task I am responsible for.

H2e: There is no hierarchy among team members within the team.

There is also the idea that Scrum does not have a specific software development method; instead, the process progresses with specific applications and tools, [15]. Indispensable parts of these practices include planning meetings, also known as scrum rituals. The process is constantly reviewed from end to end through meetings attended by the entire team, from the customer to the software developer, and interventions can be made in an agile manner in necessary areas. It is thought that regular participation of the entire team in these meetings will increase team motivation and enable them to manage their work better.

Hypothesis 3: There is a significant relationship between planning practices and satisfaction.

H3a: The team takes new tasks into the plan mid-sprint when necessary.

H3b: Project requirements are obtained from the customer as a user story.

H3c: Sprint planning meetings are held regularly.

H3d: In meetings, work is tracked via the task board.

H3e: The tasks included in the sprint plan are completed on time.

H3f: Before starting the sprint, tasks are prioritized in order of importance.

H3g: Daily meetings are completed within the planned time.

One of the most claimed advantages of Scrum is the shortening of time to market. It is seen that the delivery time of the product to the customer is shortened thanks to the constant contact of everyone who has a say in the demand, from the product owner to the software developer, and rapid response to changes. According to the senior director of the product development process of Danfoss company, with the transition to agile, the time to market in business processes has been shortened by 30%, [16]. Agile software development has many positive effects on business processes. Of course, while these features are factors that will increase customer satisfaction, it is yet to be known for sure whether the same is true for other team members.

Hypothesis 4: There is a significant relationship between business impacts and satisfaction.

H4a: The time to market for projects has decreased.

H4b: Management of changing priorities of demands has become easier.

H4c: Alignment is achieved between the customer and IT teams.

H4d: The team can clearly observe at which point it is in the project.

H4e: Progression of processes is carried out successfully with remote working.

Teamwork plays an essential role in agile software development. However, few studies have determined the effectiveness of teamwork in agile software development and modeled this, [17]. Since the Scrum team has an autonomous structure, it is important that the team maintains its own balance. The lack of this can prevent things from progressing smoothly.

Hypothesis 5: There is a significant relationship between team impacts and satisfaction.

H5a: Team members ensure that tasks are completed by supporting each other when necessary.

H5b: The technical knowledge of the team members is sufficient to complete the tasks.

H5c: The team's morale and motivation are high.

H5d: There is a need to work overtime to complete tasks.

It is possible to discuss many factors that affect and create people's satisfaction level. However, it cannot be said that these elements are related to people's satisfaction level. To find out this, it is necessary to examine people's emotional states, [3]. In this way, people's real reasons for satisfaction will be revealed, and correct interventions can be provided.

Hypothesis 6: There is a significant relationship between satisfaction with my agile.

H6a: I pay enough attention to technical excellence.

H6b: My work-life balance is good.

H6c: The deployment process is not a nightmare.

H6d: There is a culture of mutual respect within the team.

H6e: I feel committed to the team and the job.

H6f: I enjoy doing my job.

H6g: My work is valuable.

H6h: We have an honest and trustworthy team environment.

H6ı: Team members take the initiative to accomplish tasks.

H6i: The team has been empowered to decide how to do their work without outside intervention.

H6j: We have a culture of servant leadership.

H6k: We have a team environment that allows for mistakes.

H6l: The team is encouraged to be creative and try new ideas.

Satisfaction and stress levels may differ in the agile method process depending on the gender variable, one of the main sociodemographic elements. Research shows women's satisfaction level in business life is higher than men's, [18]. Digging deeper, it was seen that female employees' identification with the organization had a great impact on their work engagement, while this impact was only average on men. Since engaged employees work more effectively and efficiently, they have more job satisfaction. It has been observed that women's being more dedicated and committed to their jobs affects job satisfaction more strongly than men, [19]. Similarly, it is possible that the stress variable, like satisfaction, varies by gender.

Hypothesis 7: Satisfaction and stress levels significantly differ according to the gender variable.

There are 3 main roles in the Scrum team. These are product owners, scrum masters, and developers.

The product owner determines the business need in the project and ranks it according to the required priority. The Scrum master is responsible for the smooth running of Scrum routines. When there is a problem in the work progress, he is responsible for removing it. Developers are people who are assigned tasks and are responsible for completing them. Since the primary purpose of the Scrum method is to ensure customer satisfaction and respond to its demands as quickly as possible, this can sometimes cause stress or dissatisfaction, especially in some roles. For the life of a team to be sustainable, the morale and motivation of the people in the team are crucial.

Hypothesis 8: Satisfaction and stress levels show significant differences according to roles within the team.

The recommended number of people in Scrum teams is less than 10. More people are thought to decrease effectiveness. However, there is no information about the exact number of teams formed.

Hypothesis 9: Satisfaction and stress levels significantly differ depending on the number of people in the team.

Being experienced in business life is an action that will improve a person in many aspects. It may be thought that someone experienced will do their job faster and easier. However, as people get older, the speed at which they adapt to something new may decrease. People find it more difficult to give up what they know. However, people with little experience in business life may also be insufficient in terms of knowledge. This dilemma creates a matter of curiosity about how less experienced and more experienced people in business life will encounter the Scrum method and how they will adapt to this methodology.

Hypothesis 10: Satisfaction and stress levels significantly differ according to experience in business life.

People may have different emotions depending on the characteristics of the sector they work in. If we consider the software industry, it can be said that employees work at a more intense pace, especially due to the customer-oriented approach that has emerged in recent years. This, of course, can cause people's stress levels to increase. However, with agile approaches, satisfaction may also increase as

processes become tangible and incrementally generate value.

Hypothesis 11: Satisfaction and stress levels show a significant difference depending on the sector worked.

A study conducted between 2008 and 2009 on employees in the service sector and academia examined the effects of employee satisfaction and stress on age, [20]. According to the results of the study, it was seen that the youngest employees had the least workload, while the oldest employees were the ones who were most satisfied with their jobs. Again, when we look at employees in the service sector, it is seen that satisfaction decreases in both young and older people as workload increases, but the decrease is sharper in young people [20]. A study conducted in Hong Kong in 2001 with samples from three different management groups examined the relationship between age and job well-being, [21]. According to the results, well-being, that is, job satisfaction, increases with age. It was also concluded that older managers have fewer sources of stress and can cope better with their jobs, [21]. As seen in other studies conducted on Scrum teams, satisfaction and stress can change with age. Regardless of the sector, it can be expected that people's experiences increase as they age, and their stress will be less than that of young people.

Hypothesis 12: Satisfaction and stress levels significantly differ according to age.

3.2 Data Collection
In the research, data was collected using the survey method to measure Scrum management's effect on business processes. In this context, the survey was applied to people who have previously worked or are currently working with the Scrum method, which is among the agile methods. Data was collected between June and September 2023 by communicating with participants face-to-face or through digital channels via Google Docs. The study was applied to the employees of Kuveyt Türk Katılım Bankası, who use the Scrum method, and the employees of the Architecht company, where the IT processes of the same bank are carried out. The survey was completed by 112 people in total, and 108 of them were deemed suitable for analysis.

The Cronbach Alpha value was calculated as 0.921 to measure reliability in the survey. When this value is above 0.70, the reliability of the survey is considered high. Therefore, the study's reliability level can be said to be good.

To measure the validity of the survey, expert opinion was taken from an agile coach and an experienced person at the management level in the sector for the questions prepared before the survey was implemented in its final form, and the questions were arranged accordingly. The resulting survey was then administered to 15 people as a pilot, face to face or over the Internet, and the survey was finalized after necessary corrections were made.

Finally, Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to determine appropriate analysis methods for testing the hypotheses. Since the significance value of both tests was less than $p<0.001$ and 0.05, non-parametric tests such as Kruskal Wallis, Mann Whitney U, and Spearman's rho coefficient were used in the study.

4 Results

4.1 Satisfaction and Stress Levels
In the study, participants were first asked demographic questions. Then, satisfaction and stress levels were asked directly, and the relationship between the concept of satisfaction and Scrum was examined by including questions regarding Scrum practices. Finally, the relationship between satisfaction and stress and demographic data was analyzed.

Table 1 shows the participants' satisfaction and stress levels. While satisfaction was measured using a 4-point Likert scale, a 5-point Likert scale was used for all other questions in the survey.

Table 1. Averages of participants' satisfaction and stress levels

	Satisfaction	Stress
N	108	108
Mean	2.81	2.63
Std. Mean	0.775	0.953

When Table 1 is examined, the satisfaction level has a higher mean than the stress level, although it is measured with a 4-point Likert scale. The next part of the study examined the relationship between these satisfaction and stress levels and Scrum practices and their impacts.

4.2 Hypothesis Tests
The research has 12 hypotheses. In the first part, Spearman correlation analysis was applied to test the hypotheses, while Kruskal Wallis and Mann Whitney U tests were used for the hypotheses in the

second part. Below, the research hypotheses and the applied test results are explained in detail.

The first hypothesis measures the relationship between satisfaction and the concepts in the agile method applications section of the survey. Since this section has 9 questions, Hypothesis 1 also has 9 hypotheses. The relationship of each of these with satisfaction was measured by Spearman correlation analysis. Table 2 examines whether there is a significant relationship between agile method practices and satisfaction.

Hypothesis 1: A significant relationship exists between agile method practices and satisfaction.

Table 2. Correlations between Scrum practices questions and satisfaction

#	Scrum Practices	rho	p value
1	When a change is requested, the team adapts quickly.	0.203	0.035
2	When a change occurs, too much time is spent on documentation.	-0.134	0.168
3	The documentation of the project is prepared in a way that the business unit and development team can understand.	0.197	0.041
4	When a change is required in the project, development is carried out for this need even in the software phase.	-0.013	0.896
5	The customer is aware of the project-related changes that occur within the team.	0.275	0.004
6	Working synchronously with stakeholders outside the team to complete the assigned task.	0.208	0.031
7	When it is necessary to handover the work to someone outside the team, the methods/documents used within the team are sufficient.	0.246	0.010
8	I think user acceptance test scenarios are tested well enough.	0.090	0.354
9	Using the agile method in the software development process ensures that tasks are completed in a shorter time.	0.474	<0.001

Since the p-value in the hypotheses H1a, H1c, H1e, H1f, H1g, and H1ı was less than 0.05, it was observed that there was a significant relationship between them and satisfaction. Since the p-value is greater than 0.05 in the other hypotheses (H1b, H1d, H1h), it can be said that there is no significant relationship.

It was seen that the strongest relationship in the section belonged to the H9 hypothesis. Accordingly, there is a strong positive relationship between satisfaction and the idea that the project is completed in a shorter time than other methods, thanks to the structure of the Scrum team. A significant positive relationship between satisfaction and the items can also be mentioned, indicating that

the IT team and the requestor are aligned and that the requester takes an active role in the projects. The relationship between satisfaction and the other hypothesis in the section is not very strong.

The second hypothesis measured the relationship between satisfaction and the questions in the survey's collaborative practices section. Since there are 5 questions in this section of the survey, there are 5 hypotheses under the 2nd hypothesis. Here too, Spearman correlation analysis was applied for each hypothesis.

Table 3 includes Spearman's rho and significance values calculated from the correlation analysis applied for Hypothesis 2. Then, the results of the hypotheses H2a, H2b, H2c, H2d, and H2e based on this hypothesis are explained.

Hypothesis 2: There is a significant relationship between collaborative practices and satisfaction.

Table 3. Correlations between collaborative practices questions and satisfaction

#	Collaborative Practices	rho	p value
1	The entire team regularly participates in daily meetings.	0.256	0.007
2	The customer takes an active role in the project.	0.327	<0.001
3	Team members share responsibility for the quality of the product and act accordingly.	0.379	<0.001
4	I have a colleague with whom I can regularly exchange ideas regarding the task I am responsible for.	0.303	0.001
5	There is no hierarchy among team members within the team.	0.327	<0.001

It has been observed that there is no significant relationship between the opinion that regular participation in daily meetings (H2a) is ensured in collaborative practices and employee satisfaction. However, it was observed that there was a significant relationship between collaborative practices and satisfaction in all items other than this one. There is a moderately positive significant relationship between the hypotheses H2b, H2c, H2d, and H2e and satisfaction. It can be seen in Table 2 that the correlation coefficients are close to each other for these 4 hypotheses. In the Scrum method, it is mentioned that communication within the team must be strong. The results in this section prove that this strength has a positive and significant relationship with satisfaction.

The third hypothesis questioned the significance of the relationship between planning practices and satisfaction. Each question under this section was evaluated as a hypotheses belonging to this section, and the relationship between all of them and satisfaction was examined by Spearman correlation analysis.

After examining the relationship between collaborative practices and satisfaction, Table 4 shows Spearman's rho and significance values of Hypothesis 3 and the related hypotheses H3a, H3b, H3c, H3d, H3e, H3f, and H3g.

Hypothesis 3: There is a significant relationship between planning practices and satisfaction.

Table 4. Correlations between planning practices questions and satisfaction

#	Planning Practices	rho	p value
1	The team takes new tasks into the plan mid-sprint when necessary.	0.030	0.754
2	Project requirements are obtained from the customer as a user story.	0.215	0.026
3	Sprint planning meetings are held regularly.	0.159	0.101
4	In meetings, work is tracked via the task board.	0.212	0.028
5	The tasks included in the sprint plan are completed on time.	0.086	0.377
6	Before starting the sprint, tasks are prioritized in order of importance.	0.165	0.087
7	Daily meetings are completed within the planned time.	0.025	0.797

When the hypotheses in this part of the study were examined, it was seen that there was no significant relationship between the hypotheses H3a, H3c, H3e, H3f, and H3g and satisfaction. There is a significant relationship only for hypotheses H3b and H3d. The relationship was positive but weak for these hypotheses.

With the 4th hypothesis, the impact of the Scrum method on business processes started to be examined. There are 5 more hypotheses related to this hypothesis. Table 5 shows Spearman's rho and this section's significance values of the H4a, H4b, H4c, H4d, and H4e hypotheses.

Hypothesis 4: There is a significant relationship between business impacts and satisfaction.
H4a: The time to market for projects has decreased.

It has been observed that there is a significant relationship between satisfaction and all hypotheses in this section. Since the positive effect of the Scrum method on business processes is known, the result was not surprising. However, the result of the study

supported that information. Particularly, ensuring acceleration between the customer and IT teams, facilitating the management of demands, and shortening the time to market are the issues with the highest positive relationship, respectively.

Table 5. Correlations between business impact questions and satisfaction

#	Business Impacts	rho	p value
1	The time to market for projects has decreased.	0.425	<0.001
2	Management of changing priorities of demands has become easier.	0.430	<0.001
3	Alignment is achieved between the customer and IT teams.	0.435	<0.001
4	The team can clearly observe at which point it is in the project.	0.291	0.002
5	Progression of processes is carried out successfully with remote working.	0.216	0.025

The 5th hypothesis examined the relationship between the impact of the Scrum method on teamwork and satisfaction. This survey section has 4 questions. Table 6 lists Spearman's rho and significance values of the hypotheses, and the test results are explained below.

Hypothesis 5: There is a significant relationship between team impacts and satisfaction.

Table 6. Correlations between teams' impact questions and satisfaction

#	Team Impacts	rho	p value
1	Team members ensure that tasks are completed by supporting each other when necessary.	0.328	<0.001
2	The technical knowledge of the team members is sufficient to complete the tasks.	0.204	0.034
3	The team's morale and motivation are high.	0.327	<0.001
4	There is a need to work overtime to complete tasks.	-0.059	0.547

The first three hypotheses showed a significant relationship between the Scrum method's impact on teamwork and satisfaction. However, the last hypothesis, which mentioned the need to work overtime, did not show a significant relationship. The relationship between the other hypotheses can be said to be positive, weak, and moderate.

The 6th hypothesis examined the relationship between the questions in the My Agile section and satisfaction. The questions in this section were applied to observe employees' perspectives and

experiences on the Scrum method. There are 13 questions in total. The significance of the relationship between satisfaction and the item in each question was questioned using Spearman correlation analysis. Table 7 lists the Spearman's rho and significance values of the hypotheses, and then the test results are explained below.

Hypothesis 6: There is a significant relationship between satisfaction with my agile.

Table 7. Correlations between my agile questions and satisfaction

#	My Agile	rho	p value
1	I pay enough attention to technical excellence.	0.185	0.055
2	My work-life balance is good.	-0.014	0.883
3	The deployment process is not a nightmare.	0.174	0.072
4	There is a culture of mutual respect within the team.	0.130	0.180
5	I feel committed to the team and the job.	0.371	<0.001
6	I enjoy doing my job.	0.464	<0.001
7	My work is valuable.	0.380	<0.001
8	We have an honest and trustworthy team environment.	0.346	<0.001
9	Team members take the initiative to accomplish tasks.	0.364	<0.001
10	The team has been empowered to make decisions about how to do their work without outside intervention.	0.228	0.017
11	We have a culture of servant leadership.	0.406	<0.001
12	We have a team environment that allows for mistakes.	0.253	0.008
13	The team is encouraged to be creative and try new ideas.	0.335	<0.001

One of the notable hypotheses in this section is H6c. According to the results, there is no significant relationship between stress and satisfaction during the deployment process while working with the Scrum method. In the Scrum method, unlike the waterfall method, the deployment process takes place in parts, so the pressure on the person is expected to be less. In general, it was seen that there was a significant and positive relationship between the questions in this section and satisfaction.

In the next part of the study, the hypotheses on the right side of the research model were tested. Hypotheses and test results are listed below.

Hypothesis 7: Satisfaction and stress levels significantly differ according to the gender variable.

Table 8. Mann Whitney U test significance value by gender

	Satisfaction	Stress
Sig. (2-tailed)	0.149	0.088

Mann Whitney U test was applied to measure Hypothesis 7, and the results are shown in Table 8. When the satisfaction level was examined by gender, it was seen that both the satisfaction and stress levels of women were higher than men. However, since the p-value for satisfaction and stress concepts was greater than 0.05, it was understood that satisfaction and stress levels did not differ significantly by gender.

Hypothesis 8: Satisfaction and stress levels show significant differences according to roles within the team.

Table 9. Kruskal Wallis significance value according to roles in the team

	Satisfaction	Stress
Sig.	0.629	0.831

In the study, the roles of the development team, stakeholders, product owner, and scrum master are included under the title of roles in the team. When looking at the answers, it was seen that the group with the lowest satisfaction rate was the development team and had a noticeably lower average than the others. It has been noticed that the stress rate of the group in the same role is also low but has a similar average to other roles. Another notable point is the scrum master. It was observed that respondents' satisfaction and stress rates in this role were high. Stakeholders and product owners make up an audience with high satisfaction and low stress levels.

Looking at Table 9, the p-value of both satisfaction and stress variables is greater than 0.05. Accordingly, these variables do not show any significant difference according to the roles within the team.

Hypothesis 9: Satisfaction and stress levels significantly differ according to the number of people in the team.

Table 10. Kruskal Wallis significance value according to the number of people in the team

	Satisfaction	Stress
Sig.	0.522	0.017

The number of people in the Scrum team was examined in 3 groups. Groups were examined under

3 headings: 0-3, 4-10, and >10. While the group with the highest satisfaction rate was the group of 4-10 people, the group with the least stress was the group of >10 people. It was observed that satisfaction was lowest, and stress was highest in the group of 0-3 people. Table 10 also includes significant values. Accordingly, it was seen that satisfaction did not differ significantly according to the number of people on the team, but stress differed significantly.

Hypothesis 10: Satisfaction and stress levels significantly differ according to experience in business life.

Table 11. Kruskal Wallis significance value according to experience in business life

	Satisfaction	Stress
Sig.	0.121	0.113

Respondents were asked about their experience in business life in 6 groups of options. These are: <3 Years, 3-5 years, 6-10 years, 11-15 years, 16-20 years and >20 years. It has been observed that the group with the highest satisfaction is those who have been working for more than 20 years. The group with the least stress is the group of employees with 16-20 years of experience. When the results were examined, it was seen that satisfaction or stress did not show a linear increase or decrease according to experience in business life. When the p-value in Table 11 is examined, it is seen that the satisfaction and stress variables do not differ significantly according to experience in business life.

Hypothesis 11: Satisfaction and stress levels significantly differ depending on the sector worked.

Table 12. Kruskal Wallis significance value according to experience in business life

	Satisfaction	Stress
Sig.	0.703	0.564

The survey examined the sectors in which the respondents worked in 3 groups: banking, software development company, and other sectors. It has been observed that satisfaction and stress levels in banking and software development companies are close to each other and in better condition than in different sectors. It has been observed that employees' satisfaction and stress levels in other sectors are noticeably low. When we look at Table 12, considering the significance values, it is seen that satisfaction and stress levels do not show a

significant difference according to the sector worked.

Hypothesis 12: Satisfaction and stress levels significantly differ according to age.

Table 13. Kruskal Wallis significance value according to age

	Satisfaction	Stress
Sig.	0.638	0.790

The ages of the participants were examined in 6 groups. The groups are 25 years and under, 26-30, 31-35, 36-40, and 41 and over. When the results were examined, it was seen that the most satisfying and stressed age group was 41 years and above. It was observed that the age group with the lowest level of satisfaction was between the ages of 31-35. However, it was observed that satisfaction or stress did not change linearly with an increase or decrease in age. As seen in Table 13, the p-value is greater than 0.05 for the satisfaction and stress variables, so satisfaction and stress levels do not significantly differ according to age.

5 Discussions

In the study, the participants were asked demographic questions at the beginning. Afterward, satisfaction and stress levels were asked directly, and as predicted, the satisfaction rate was higher than the stress level. Then, to find out what the satisfaction and stress variables are related to and the level of this relationship, 12 hypotheses were established, and the results were analyzed. In the first 6 hypotheses, the applications of the Scrum method, work and team effects, and people's emotional states were examined with the concept of satisfaction. In comparison, in the other 6 hypotheses, the relationship between demographic data and satisfaction and stress variables was examined.

When the relationship between Scrum practices and satisfaction was examined, it was seen that the strongest relationship was related to the completion of tasks in a short time. Apart from this, it has been observed that the relationship between satisfaction and issues such as low documentation and easy adaptation, which are the basic principles of the Scrum method, is low. When collaborative practices were examined, it was seen that the relationship between most of the items here and satisfaction was high. Since it is known that one of the elements on which the Scrum method is based is teamwork, this

result supports this idea. Similarly, in Kropp et al.'s3 study, it was observed that the relationship between satisfaction and practices involving teamwork, such as team self-organization, was higher than the relationship between documentation or adaptation and satisfaction. However, it was a surprising result that the relationship between the questions in the practices planning section containing Scrum rituals and satisfaction was low.

When looking at the impacts of Scrum, it was seen that the highest relationship with satisfaction was in the field of business impacts. A high correlation was observed between shortened time to market and satisfaction. Another noteworthy item was the strong relationship between ensuring alignment between the customer and IT teams and satisfaction. When looking at team impacts, it was seen that the relationship between team members' good technical proficiency and satisfaction was weak. In contrast, the relationship between team members' support for each other and satisfaction was strong.

In the last part of the survey, the My Agile section, questions were asked to understand the participants' emotional states during the Scrum method. When the relationship with satisfaction was examined, it was seen that the most vital relationship was related to the person seeing their work as valuable and enjoying doing their job. In support of this result, another study on the subject showed that the satisfaction levels of the stakeholders were regulated by how the members interpreted their existence in the team, [4]. Other positive relationships were found to be related to teamwork. It was observed that the weakest relationship was associated with the autonomous decision-making of the team. Another noteworthy result is no significant relationship between the thought that the deployment is no longer stressful and satisfaction. Unlike the Waterfall method, Scrum is a method in which the risk is divided into parts, and the entire development is not completed with a single distribution process. For this reason, it is thought that with this method, the distribution process will be faced with less stress by the employees. However, with this result of the research, it has been understood that this assumption does not maintain its accuracy.

The first hypothesis in the second part of the research model is that there is a significant relationship between gender satisfaction and stress variables. According to research, women's satisfaction level in business life is higher than men's, [18]. The reason for this is that women are more committed to their jobs than men and work to

contribute to their jobs more effectively, [19]. According to the results of our study, although it was seen that both satisfaction and stress levels of women were higher than men, this difference was not statistically significant.

Another issue where satisfaction and stress variables are examined is the role of the team. When analyzed, it was concluded that satisfaction and stress variables did not show a significant difference according to the roles in the team. The roles with the highest satisfaction are also those with the highest stress. However, it is noteworthy that while employees' stress levels in the development team role are close to those of employees in other roles, their satisfaction levels are noticeably lower than others. It can be said that the roles with high satisfaction and low stress are stakeholders and product owners.

It is thought there will be no productive teamwork when the number of people in the Scrum team is more than 10. When this study was examined in terms of satisfaction and stress, it was seen that the group with the highest satisfaction was the group of 4-10 people. Still, it was concluded that there was no significant difference between satisfaction and the number of people in the team. However, it was observed that there was an important difference between stress and the number of people in the team, and it was observed that the satisfaction of teams with 0-3 people was the lowest, and the stress was the highest.

The research also examined whether satisfaction and stress levels differ significantly according to experience in business life. As a result of the study, it was concluded that satisfaction and stress levels did not vary significantly according to experience in business life. However, as a result of the examinations, it was seen that the group with more than 20 years of work experience had the highest satisfaction and stress levels. It was observed that the group with the least stress was the group with employees between 16-20 years, while no linear increase or decrease was observed in the groups with other work experience periods.

The relationship between satisfaction and stress according to the sector worked in the study was also examined. As a result of the analysis, no significant difference was found between the satisfaction and stress variables according to the sector in which they worked. It was observed that both those working in the software company and those working in the banking sector had similar satisfaction and stress levels. This means that the sector in which people work (for the banking and software development

sectors) does not affect their satisfaction and stress levels.

Finally, the study examined the changes in satisfaction and stress levels depending on age. Although when studies in the literature are examined, it has been observed that satisfaction increases and stress decreases as age increases, our study concluded that satisfaction or stress at the point of working with Scrum does not differ significantly according to age, [20], [21]. It was observed that the distribution of the participants' satisfaction and stress levels according to age was close, and there was no linear increase or decrease.

6 Conclusions

As a result, it was seen that there was a significant relationship between the applications of the Scrum method and employee satisfaction. It has been observed that the strongest relationship with satisfaction is related to teamwork, while close work between the customer and IT teams also increases satisfaction. However, it was observed that satisfaction did not differ significantly according to demographic characteristics such as gender, role in the team, team size, years of experience, sector, or age.

Since this study is conducted in the finance sector, its impact on the financial engineering field can also be discussed. Risk is high in the finance sector, and the returns to be realized in projects can cause too much cost. However, it is possible to say that most companies still apply the Waterfall method in this sector, [22]. Although it will take time to abandon this method and start using agile methods such as Scrum, this event seems inevitable when the dominance of agile methods in the market is considered. Financial engineering can be briefly evaluated as a branch that includes activities such as pricing securities, evaluating portfolio risks, or making some economic estimates, [23]. The study shows that people working with Scrum, whether they are stakeholders or employees in the IT sector, have high job satisfaction. Again, according to the study results, the time to market the product is shortened in companies working with Scrum, and everyone who is a project stakeholder contributes to the product and has a good level of knowledge about the job. When the needs of the financial engineering field are considered, it would be beneficial to use the Scrum method in this field where there is a lot of uncertainty and estimates are made with specific tools.

The study's limitations are that the number of participants in different roles of the Scrum team is

far from one another and that a normal distribution cannot be observed among the variables. As employees switched to hybrid or fully remote working models, it became difficult to reach participants, and it was only possible to reach audiences with some opinions. Notably, respondents from the development team participated in the study, most of whom were software developers. Additionally, non-parametric tests were used since normal distribution was not observed among the variables in the study. As a result of the study, comments could only be made for the study sample.

In future studies on this subject, the relationship between satisfaction and the Scrum method can be examined in detail by dividing the concept of satisfaction into dimensions, and the study can even be enriched by adding a comparison of the waterfall and Scrum methods. In addition, the issues can be examined in detail by going beyond the issue of satisfaction and investigating the dilemma of which studies should be preferred for Scrum and for which Waterfall method. In this way, users can be presented with a road map for this method, which continues to become widespread in today's world.

References:
[1] Seymour, T., & Hussein, S., The history of project management, *International Journal of Management & Information Systems (IJMIS)*, 18(4) (2014), 233-240.
[2] Abrahamsson, P., Salo, O., Ronkainen, J., & Warsta, J., Agile software development methods: Review and analysis. arXiv preprint arXiv:1709.08439, (2017), https://doi.org/10.48550/arXiv.1709.08439 .
[3] Kropp, M., Meier, A., Anslow, C., & Biddle, R., Satisfaction and its correlates in agile software development. *Journal of Systems and Software*, 164 (2020), 110544, https://doi.org/10.1016/j.jss.2020.110544.
[4] Huck-Fries, V., Nothaft, F., & Wiesche, M. (January, 2021) Investigating the Role of Stakeholders in Agile Information Systems Development Projects: A Mixed Methods Approach.*In 54th Hawaii International Conference on System Sciences, Kauai, Hawaii, USA, (pp. 6806-6815).*
[5] Aydiner, A. S., Esen, M. F., & Erhan, Ö. Z. L. Ü., Success Factors of Businesses Applying Scrum Method in Agile Software Development Processes in Turkey (Türkiye'de Çevik Yazılım Geliştirme Süreçlerinde Scrum Yönemini Uygulayan İşetmelerin Başarı Faktörleri), *Bilişim*

Teknolojileri Dergisi, 13(4) (2020), 463-477, https://doi.org/10.17671/gazibtd.598346.

[6] Tripp, J. F., Riemenschneider, C., & Thatcher, J. B., Job satisfaction in agile development teams: Agile development as work redesign, *Journal of the Association for Information Systems*, 17(4) (2016), 1, 266-307, https://doi.org/10.17705/1jais.00426 .

[7] Mannaro, K., Melis, M., & Marchesi, M. (2004, June), Empirical analysis on the satisfaction of IT employees comparing XP practices with other software development methodologies, *In International conference on extreme programming and agile processes in software engineering (pp. 166-174)*. Berlin, Heidelberg: Springer Berlin Heidelberg, https://doi.org/10.1007/978-3-540-24853-8_19.

[8] Melnik, G., & Maurer, F. (2006, June), Comparative analysis of job satisfaction in agile and non-agile software development teams, *In International conference on extreme programming and agile processes in software engineering (pp. 32-42)*. Berlin, Heidelberg: Springer Berlin Heidelberg, https://doi.org/10.1007/11774129_4.

[9] Tessem, B., & Maurer, F., Job satisfaction and motivation in a large agile team, *In Agile Processes in Software Engineering and Extreme Programming: 8th International Conference, XP 2007, Como, Italy, June 18-22, 2007*. Proceedings 8 (pp. 54-61). Springer Berlin Heidelberg, https://doi.org/10.1007/978-3-540-73101-6_8.

[10] Bhatnagar, S., & Grosse, M., Future workplace organisation: how digitisation affects employees' job satisfaction in agile workplaces, *International Journal of Product Development*, 23(4) (2019), 264-291, https://doi.org/10.1504/IJPD.2019.105492.

[11] Hron, M., & Obwegeser, N.(January, 2018). Scrum in practice: an overview of Scrum adaptations. *In 51st Hawaii International Conference on System Sciences, Hilton Waikoloa Village, Hawaii, USA (pp. 5445-5454)*

[12] Verwijs, C., & Russo, D., A theory of scrum team effectiveness, *ACM Transactions on Software Engineering and Methodology*, 32(3) (2023), 1-51, https://doi.org/10.1145/3571849.

[13] Misra, S., Kumar, V., Kumar, U., Fantazy, K., & Akhter, M., Agile software development practices: evolution, principles, and criticisms, *International Journal of Quality & Reliability Management*, 29(9) (2012), 972-980, https://doi.org/10.1108/02656711211272863.

[14] Sharp, H., & Robinson, H. (January, 2010), Three 'C's of agile practice: collaboration, co-ordination and communication. *In Agile software development: current research and future directions (pp. 61-85)*. Berlin, Heidelberg: Springer Berlin Heidelberg, https://doi.org/10.1007/978-3-642-12575-1_4.

[15] Awad, M. A., *A comparison between agile and traditional software development methodologies*. University of Western Australia, 30 (2005), 1-69.

[16] Cooper, R. G., & Sommer, A. F., Agile–Stage-Gate for Manufacturers: Changing the Way New Products Are Developed Integrating Agile project management methods into a Stage-Gate system offers both opportunities and challenges, *Research-Technology Management*, 61(2) (2018), 17-26, https://doi.org/10.1080/08956308.2018.1421380.

[17] Strode, D., Dingsøyr, T., & Lindsjorn, Y., A teamwork effectiveness model for agile software development, *Empirical Software Engineering*, 27(2) (2022), 56, https://doi.org/10.1007/s10664-021-10115-0.

[18] Perugini, C., & Vladisavljević, M., Gender inequality and the gender-job satisfaction paradox in Europe, *Labour Economics*, 60 (2019), 129-147, https://doi.org/10.1016/j.labeco.2019.06.006.

[19] Mascarenhas, C., Galvão, A. R., & Marques, C. S., How perceived organizational support, identification with organization and work engagement influence job satisfaction: a gender-based perspective, *Administrative Sciences*, 12(2) (2022), 66, https://doi.org/10.3390/admsci12020066.

[20] Mauno, S., Ruokolainen, M., & Kinnunen, U., Does aging make employees more resilient to job stress? Age as a moderator in the job stressor–well-being relationship in three Finnish occupational samples, *Aging & Mental Health*, 17(4) (2013), 411-422, https://doi.org/10.1080/13607863.2012.74707.

[21] Siu, O. L., Spector, P. E., Cooper, C. L., & Donald, I., Age differences in coping and locus of control: A study of managerial stress in Hong Kong, *Psychology and Aging*, 16(4)

(2001), 707, https://doi.org/10.1037/0882-7974.16.4.707.

[22] Munteanu, V. P., & Dragos, P. (2021). The case for agile methodologies against traditional ones in financial software projects, European *Journal of Business and Management Research*, 6(1), 134-141, https://doi.org/10.24018/ejbmr.2021.6.1.741.

[23] Chen, N., & Hong, L. J. (2007, December). Monte Carlo simulation in financial engineering. In *2007 Winter Simulation Conference, Washington D.C., USA* (pp. 919-931). IEEE, https://doi.org/10.1007/978-0-387-21617-1.

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The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

Conflict of Interest
The authors have no conflicts of interest to declare.