T.C. DOĞUŞ ÜNİVERSİTESİ
INSTITUTE OF SCIENCE AND TECHNOLOGY
DEPARTMENT: ENGINEERING AND TECHNOLOGY MANAGEMENT

SCRUM ADOPTION IN KUVEYT TURK IT

Master Thesis

Gülname KIR
201199018

Thesis Supervisor: Assist. Prof. Özay ÖZAYDIN

Istanbul, Aug 2014

INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT: ENGINEERING AND TECHNOLOGY MANAGEMENT

SCRUM ADOPTION IN KUVEYT TURK IT

Master Thesis

Gülname KIR
201199018

Thesis Supervisor: Assist. Prof. Özay ÖZAYDIN

Istanbul, Aug 2014

CONTENTS

ACKNOWLEDGMENT

I would like to take this opportunity to thank people who helped me during thesis preparation. First of all, I thank my family because of their patience and support. I thank my friends, Zeynep Yasemin Tekşen Altaş and İlker Kandazoğlu. I am so grateful to their contribution for my thesis. I also thank my thesis supervisor Assist. Prof. Özay Özaydın

Istanbul, May 2014 Gülname KIR

ABSTRACT

In today's world flexibility and speed are very important. Waterfall models can't satisfy this. Since that agile methodologies become popular. Scrum is one of the agile methodologies and it is adopted by many companies like Microsoft, Yahoo, Intel, BBC etc.

Scrum methodology guarantees these:

- Increasing in the quality of deliverables
- Flexible structure.
- Better planning estimations.
- Proactive approach for coming problems.
- Team motivation

Kuveyt Turk as a bank competitor wants being more effective and more flexible for product creation process. Quality is also important for a bank which aims being in 10 top banks of Turkey in the coming years. Using scrum methodology can accelerate the achievement of its goals. This paper searches "Is scrum methodology suitable for Kuveyt Turk or is not? How it will be effective?" In this context this research includes literature review, output analysis of a questionnaire, an interview, a study about burn-down charts and performance analysis made using focus factor which is accepted as a key performance index of scrum. Literature Review includes scrum terminology, case studies and information about Kuveyt Turk IT. Case studies which were examined show that scrum methodology needs behavior change in the work so that it needs also time. Adoption is a process that evolves in time.

These are the key areas for scrum adoption:

- Team adoption
- Management support
- Business support

Questionnaire and interview was made accordance with these 3 subjects. To see the team adoptions, burn-down charts of 2 teams are dealt and improvement is observed through the

5 sprints. Velocity and Focus factor was used as key performance indexes. How team's performance increases and the other results were discussed in part 5 and conclusion chapter.

ÖZET

Bugünün dünyasında esneklik ve hız çok önemlidir. “Waterfall Yazılım Modelleri” bu durumu tatmin edemezler. Çevik yöntemlerin esneklik ve hızı karşıladıkları için popülerliği zaman içerisinde artmıştır. Scrum, çevik yöntemlerden biridir ve Microsoft, Yahoo, Intel ve BBC gibi birçok şirket scrum yöntemini kullanmaya başlamışlardır.

Scrum metodolojisi aşağıdaki maddelerin garanti altına aldığını söyler:

- Çıktıların kalitesinin artırılması
- Esneklik
- Daha iyi planlama yapısı
- Sorunların erken teşhisi
- Takım motivasyonu

Bugünün yenilenen dünyasında Kuveyt Türk daha etkin ve esnek ürünler çıkarmak istiyor. Kuveyt Türk ana hedefinin en iyi ilk 10 banka arasına girmek olması doğrudan çıktıların kalitesinin artmasıyla ancak mümkündür. Kuveyt Türk’ün scrum metodolojisini kullanması, hedeflerine ulaşmasını hızlandırabilir. Bu tez "Scrum metodolojisi Kuveyt Türk için uygun mudur ve nasıl etkili bir şekilde kullanılır?" sorularına cevap arar. Bu araştırma içerisinde kaynak taraması, anket çıktı analizi, röportaj, 1 örnek çalışma ve proje plan kıyaslaması vardır. Kaynak taraması scrum terminolojisi, vaka çalışmaları ve Kuveyt Türk BT hakkında bilgi içerir. Vaka çalışmaları incelendiğinde scrum metodolojisinin benimsenmesinin zamana ve kurumsal davranış değişikliğine ihtiyacı vardır.

Kabul süreci için önemli alanlar şunlardır:

- Takım benimsenmesi
- Yönetim desteği
- İş birimi desteği

Anket ve görüşme bu 3 konu hakkındaki algıyı ölçmek için yapılmıştır. Takımların uyum sürecini gözlemlemek için “burn-down” grafikleri incelenmiş, düzelme tespit edilmiştir.

Hız ve Odak faktör temel performans endeksleri olarak kullanılmıştır. Nasıl takım performansı artırılır ve diğer sonuçlar bölüm 5 ve sonuç kısmında tartışılmıştır.

FIGURE LIST

TABLE LIST

LIST OF ABBREVIATIONS

ADK	Alternative Distributed Channel
AVG	Average
CSM	Certified Scrum Master
FF	Focus Factor
HBR	Harvard Business Review
IT	Information Technologies
Kuveyt Turk	Kuveyt Türk Participation Bank
KPI	Key Performance Indicator
MIL	United States Military Standard
PO	Product Owner
R&D	Resource and Development

1. INTRODUCTION

Scrum is a framework in which people create complex products and provide sustainability for these products (Schwaber and Sutherland, 1991-2013). In 1986 which is the first time, scrum is defined in HBR article "New Product Development Game". This article gives information about holistic or rugby approach which creates basics of scrum. The holistic approach basics are:
"Instability,
Self-organizing teams,
Overlapping phases,
"Multi-learning," subtle control,
Organizational transfer of learning" (Takeuchi and Nonaka, 1986).

In those days speed and flexibility importance to compete was realized by companies. The rugby approach gives flexibility and speed with overlapping processes (Takeuchi and Nonaka, 1986). The real scrum definition made by Jeff Sutherland, John Scumniotales, and Jeff McKenna in 1993. (URL-1)

In OOPSLA 1995 conference. Schwaber and Sutherland shared their scrum experiences. Schwaber and Beedle wrote the first Scrum book Agile Software Development with Scrum (Krishnamurthy, 2012). After all scrum community creates a platform which is Scrum Alliances and it has a Certified Scrum Master (CSM) (Krishnamurthy, 2012).

Scrum theory based on empiricism which says that knowledge comes from experience and transparency, inspection, adaptation concepts uphold empiricism. (Schwaber and Sutherland, 1991, 2013) With transparency everyone share common language and the outcomes must be visible for everyone. (Schwaber and Sutherland, 1991, 2013).Scrum users must frequently inspect Scrum artifacts (increment, sprint backlog, product backlog) and progress. There are 4 events for adaptation and audit which are:

- Sprint Planning
- Daily Scrum
- Sprint Review

- Sprint Retrospective (Schwaber and Sutherland, 1991, 2013)

In this context, "Scrum is designed to add energy, focus, clarity, and transparency to project planning and implementation. It will consistently:

- Increase speed of development
- Align individual and corporate objectives
- Create a culture driven by performance
- Support shareholder value creation
- Achieve stable and consistent communication of performance at all levels
- Enhance individual development and quality of life" (Sutherland, 2012).

On the other hand several problems may occur through scrum implementation. Because of these problems scrum may fail. Failure means time and money in addition to low motivation and pressure on the Scrum Teams (URL-2).

1.1. Aim and Significance

Today's competitive world, Kuveyt Turk wants to create more qualified products and put these products to production environment as soon as possible. Qualified people, and good communication satisfied better these needs. In banking industry, these qualities create value for Kuveyt Turk. Scrum methodology assured these qualities by "increasing speed of development, aligning individual and corporate objectives, creating a culture driven by performance, supporting shareholder value creation, achieving stable and consistent communication of performance at all levels, enhancing individual development and quality of life" (Sutherland, 2012).

In Kuveyt Turk case scrum is a new methodology for the project management. Kuveyt Turk has great and talented teams to use scrum. In some projects, uncertainty is real problem. Because of this, the team waste time to create a product. Sometimes uncertainty problem is not solved and the project does not start or is suspended. By using scrum, Kuveyt Turk may handle these problems.

On the other hand, there are not always dedicated teams for the projects and team members do not work just one project. While they create project, they solve also some production problems. These problems may take a lot of time. The teams are not always small sized groups and the team members don't have same location in many projects. Furthermore, Kuveyt Turk works with third party companies which don't use scrum. This may create problem that the product owner waits potentially releasable Increment of "Done" product at the end of each sprint (Schwaber and Sutherland, 1991, 2013).

In the light of these aspects, this study will show "Is Scrum methodology suitable for Kuveyt Turk projects and how does Kuveyt Turk use scrum more effective way?"

1.2. Materials and Methodology

Materials:

Journal papers, symposium papers, books, internet sources, reports, interviews, etc.

Equipment and Device:

Computer and software

Methodology:

1. Literature review
2. Interview
3. Questionnaire
4. Data Collection
5. Rhetorical and quantitative analysis
6. Burn-Down Chart Comparison
7. Key Performance Index Analysis
8. Final arrangements and write up

1.3. Constraints

Because of Kuveyt Turk has a pilot application, small number people can response the questionnaire. Data collection is also difficult for the teams.

2. DEFINITION OF SCRUM

According to scrum guide “Scrum is a way for teams to work together to develop a product. Product development, using Scrum, occurs in small pieces, with each piece building upon previously created pieces. Building products one small piece at a time encourages creativity and enables teams to respond to feedback and change, to build exactly and only what is needed.” It indicates that scrum is a framework and it is used for success of complex projects. On the other hand this guide says that scrum is not just a framework, it supports human being creative, effective and more interactive (Schwaber and Sutherland, 1991, 2013).

According to scrum alliances “Scrum is an agile framework for completing complex projects. Scrum originally was formalized for software development projects, but it works well for any complex, innovative scope of work. The possibilities are endless. The Scrum framework is deceptively simple.” (URL-3)

Another definition is for scrum from Wikipedia “Scrum is an iterative and incremental agile software development framework for managing software projects and product or application development. It defines "a flexible, holistic product development strategy where a development team works as a unit to reach a common goal". It challenges assumptions of the "traditional, sequential approach" to product development. Scrum enables teams to self-organize by encouraging physical co-location or close online collaboration of all team members and daily face to face communication among all team members and disciplines in the project” (URL-3).

All the definitions sure that scrum is more than a framework but it is a simple framework. Scrum is an agile methodology also and it deals with human and product together. With a holistic product strategy scrum provides flexibility and speed for product. With focusing interactions, Scrum increases human creativity and quality.

Some of the people say that scrum is a process (Krishnamurthy, 2012). But these definitions show that scrum is a framework.

2.1. History of Scrum

In Takeuchi and Nonaka (1986) article, scrum first defined as a new rapid flexible and self-organizing product development process. It draws inspiration from rugby game whose strategy is "getting an out-of play ball back into the game" (Schwaber, Schwaber and Beedle 1995, 2002).

In OOPSLA 1995 conference, Schwaber and Sutherland their scrum experiences. Schwaber Beedle wrote the first Scrum book Agile Software Development with Scrum (Krishnamurthy, 2012).

After all scrum community creates a platform which is Scrum Alliances and it has a Certified Scrum Master (CSM) (Krishnamurthy, 2012).

2.2. Scrum Subjects

2.2.1. Scrum Theory

Scrum is an empirical process which is supported by its own properties transparency, audit, and adaptation. Transparency process must be visible all the other shareholders. Process must be inspected by talented inspectors. Adaptation has 4 scrum events which are:

- Daily Scrum Meeting
- Sprint Planning Meeting
- Sprint Review Meeting
- Sprint Retrospective Meeting

2.2.2. Scrum Team

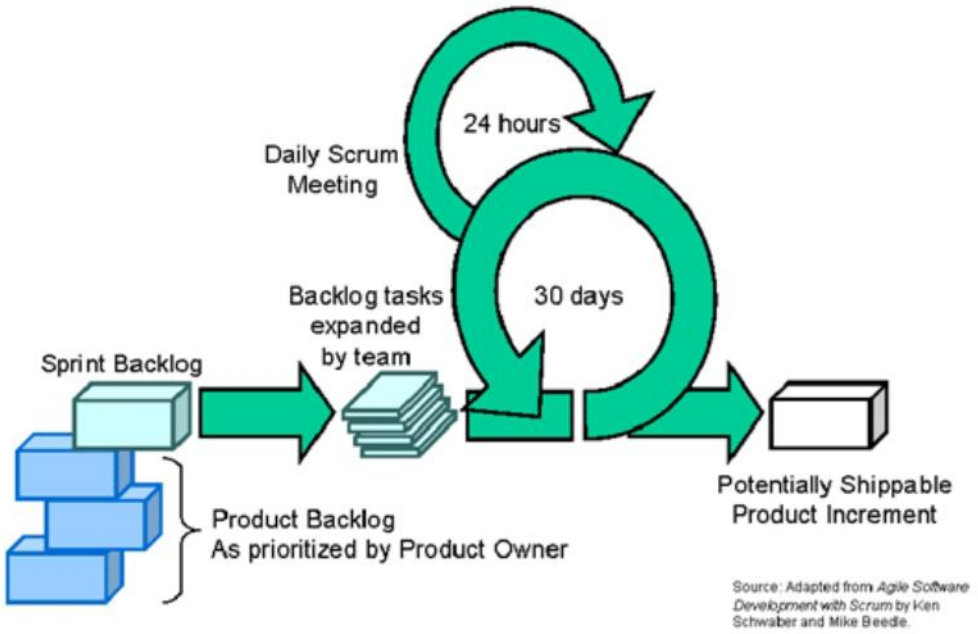


Figure 2.1 Agile development with Scrum (URL-5)

To achieve an important goal, every organization should act as a team and organization members should correct each other's mistakes. Scrum team is also such a team whose product will be the mirror of the team. Taking account this reality, team size, communication within team members, members' trusting each other are essential for scrum adaptation. The technical design of the system, domain knowledge of the team experts, adaptation of new technologies, expectations about project delivery date will affect team and also product success. (Cohn, 2009)

Scrum team should be cross functional and self- organizing this means that every team member does not depend each other's skills and they make their own decisions about the team. Products are delivered by scrum teams iteratively and incrementally to get business opportunities. "Done" product which is a potentially useful working product always produced by scrum team. "Did I complete the requirement list?" question is not enough for each member of scrum team, they also think seriously about customer satisfaction and team goals.

Scrum team consists of development team, product owner and scrum master (Schwaber and Sutherland, 1991, 2013).

2.2.3. Scrum Roles

2.2.3.1. Product Owner

Product Owners:

- Define the product;
- Order backlog items considering the market value;
- Decide on product delivery date ;
- Make some changes on the features and priority every sprint, if it is needed;
- Be responsible for outcome of the product ;
- Accept or Reject product features.

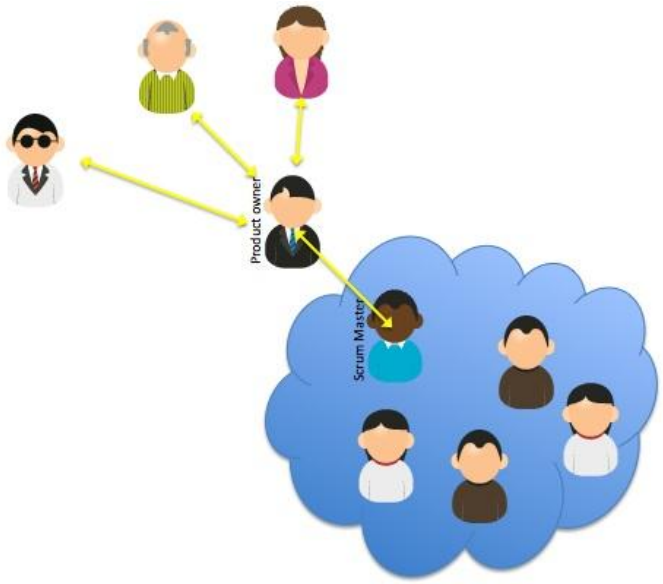


Figure 2.2 Scrum roles & Stakeholders (URL-6)

Product owner tries to maximize product's value. To do this product owner searches market trends. He/she is the only person who responsible for product backlog management.

Product backlog management includes defining items clearly, ordering the items in the product backlog, ensuring product backlog's transparency, visibility and clarity for every team member (Schwaber and Sutherland, 1991, 2013).

The product owner should know the business very well. If there is no such a person, one of the scrum members can take role of the product owner (For example scrum master can be also a product owner) but in normal situations, everyone should have only one role (Levison, 2008). Product's owner is owner of the product but Product Owner and development team can create collective ownership over all products. It provides sustainability of excellence and desire for product innovation. (Judy, 2008)

2.2.3.2.Scrum Master

Scrum master must ensure that scrum work very well. The Scrum Master is a servant-leader for the Scrum Team. He/she is not a manager but he/she has to have leader characteristics.
She/he also should know the domain very well since he/she has to overcome problems.

Scrum masters:

- Try to increase team functionality, productivity , motivation
- Organize the relations over team.
- Try to build high performance team.
- Remove problems which effect team functionality and product process.
- Protect the team from distractions
- Ensure that each member attend daily scrum, sprint planning and sprint review meetings.
- Track burn-down charts.
- Ensure that Scrum is running.

Mike Cohn**,** Mountain Goat Software expressed six attributes of a good Scrum Master. Scrum master should be

- Responsible
- Modest
- Collaborative
- Committed
- Influential
- Knowledgeable (Cohn, 2007)

2.2.3.3.Development Team

Development Teams is group of the members which come together to produce a potentially releasable product at the end of each sprint. They are chosen exactly for the project.

Development team is cross functional and self-organizing. It has balanced skills. In the development team there is no title than developer. Development team is responsible as a whole; an individual person is not responsible for failure and success. Team size should be small because of difficulty of running backlog items and team communication. (Schwaber and Sutherland, 1991, 2013)

2.2.4. Scrum Events

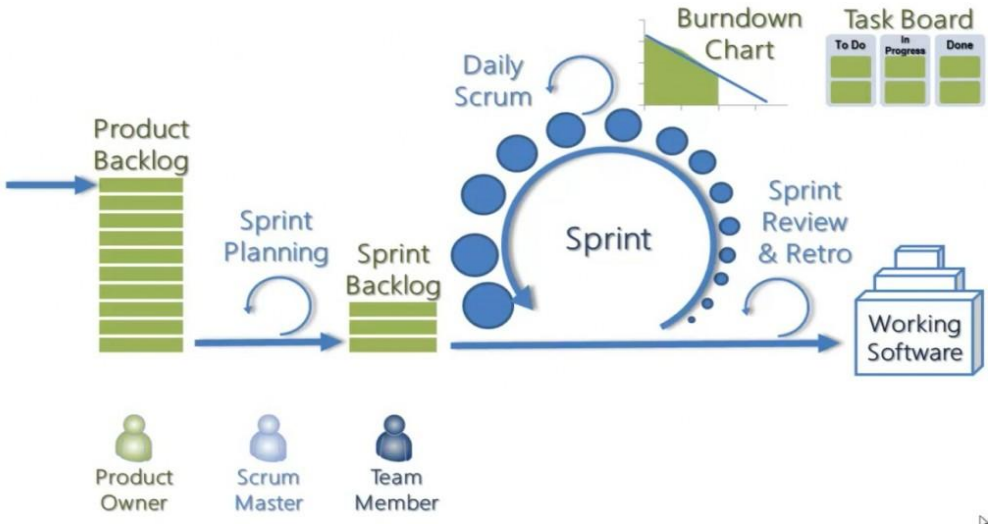


Figure 2.3 Scrum events (URL-7)

2.2.4.1. Daily Scrum

It is a daily meeting which is holding by team members. Every member should attend this meeting and answer following 3 questions:

- What did you do yesterday?
- What will you do today?
- Are there any problems for your process?

It is time-boxed; it is limited by 15 minutes. (Schwaber and Sutherland, 1991, 2013)

2.2.4.2.Sprint Planning

In this meeting, sprint backlog is prepared by choosing items from product backlog to complete in the upcoming sprint. Each team member and product owner should attend sprint planning meeting. Team may invite the other stakeholders to this meeting.

This meeting targets to create:

- Sprint Goal
- Sprint Backlog

Sprint Goal is a statement which is created by team together. It may consist of one or two sentences. It should be clear.

A sprint backlog is a created from product backlog items which the team commits to complete and the list of tasks necessary to complete those product backlog items. Each task on the sprint backlog may be estimated. This meeting is time-boxed by 2 hours.

2.2.4.3. Sprint Review Meeting

At the end of each sprint the team must create a potentially shippable product increment. The team members have to realize their definition of the done. In this meeting increment must be presented by the team members. There must be a review of previous sprint.

In this meeting the most important question is "Did the sprint goal is achieved?"
Participants of the sprint review are the Scrum Master, product owner, development team, the, Customers, Management. This meeting is time-boxed by 4 hours.

2.2.4.4. Spring Retrospective Meeting

A meeting time-boxed to 3 hours is the last meeting of the sprint. In this meeting team discusses previous Sprint and determines what could be changed that might make the next Sprint more productive. For this meeting one of the effective ways is start-stop-continue meeting approach. Using this approach each team member is asked to identify things which the team should:

- Start "What the team should start to be more productive, motivated, and functional?"
- Stop doing something that is not useful, creates extra problems.
- Continue doing something that keeps the team productive, motivated, and functional (URL-8)

2.2.5. Scrum Artifacts

Scrum uses:

- Sprint Backlog
- Increment (URL-9)
- Product Backlog

2.2.5.1. Product Backlog

The product backlog includes items which are prioritized by importance/market value. Product backlog is a single source and if the some changes are needed for the features then the change is made on it. The product backlog enhancement, prioritizing and defining its items are responsibility of the product owner. (Schwaber and Sutherland, 1991, 2013)

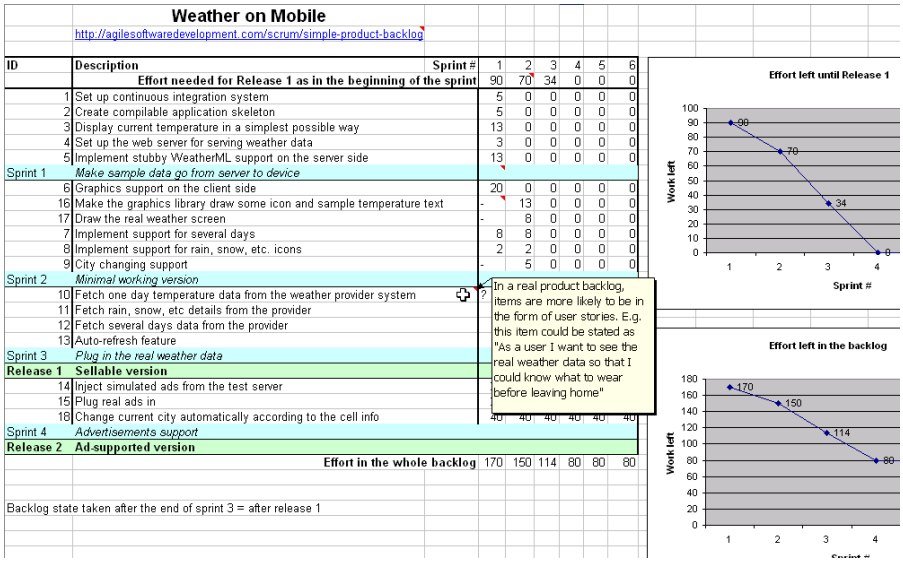


Figure 2.4 Simple product backlog (URL-10)

Product backlog items which have high priority are more detailed than other lower-priority ones. The product backlog items are estimated. The estimates are expressed in story points. The product backlog can never be completed. It evolves by time. All items are prioritized. Item which has high priority must be implemented first. (Picler, 2010)

2.2.5.2. Sprint Backlog

During the sprint planning meeting, sprint backlog is created by scrum team and product owner. It is a set of product backlog items and also it is a plan for delivering sprint increment. (Schwaber and Sutherland, 1991, 2013)

Most of the development teams use board to visualize sprint backlog.

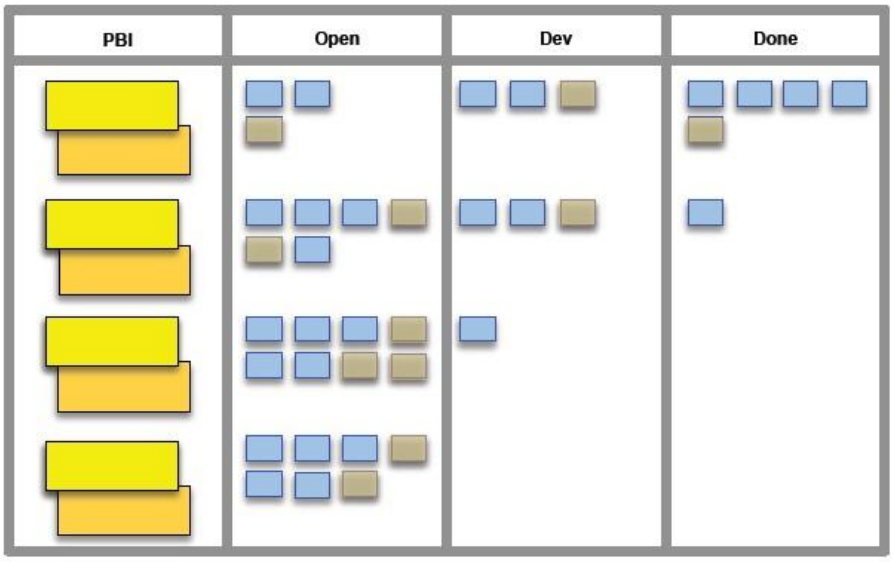


Figure 2.5 Sprint backlog (URL-11)

2.2.5.3. Increment

In the sprint planning meeting definition of done is determined. It is sprint's increment which has potentially releasable functionality. The Increment should be useable, so that a Product Owner may want to release it.

Figure 2.6 Sprint (Kath, 2010)

2.3. Scrum Performance Metrics

Measuring performance of the scrum teams is essential to improve the performance. If the team knows the exact performance then can have chance to increase it. But data collection is difficult for the agile teams. They always focus on the work which will be done at the end of the sprint. The metrics are related with productivity, quality, earned value, predictability and effectiveness of scrum. (URL-12)
Some of the metrics are defined following.

2.3.1. Capacity

It shows the story points which is accepted to do in coming sprint by the team.

2.3.2. Velocity

It is completed story points during sprint. Story point is an empirical data. It is not day nor hour, it is a unit. Sum of the completed estimation for the deliverables shows the velocity.

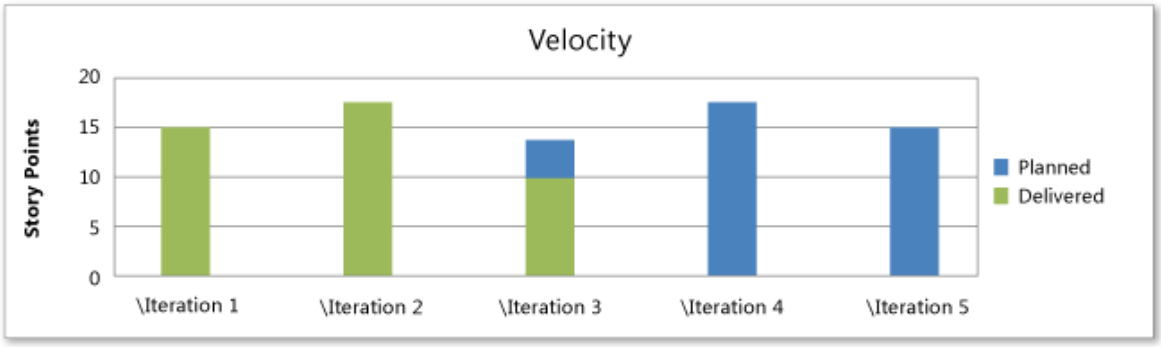


Figure 2.7 Velocity (URL- 13)

2.3.3. Focus Factor

Velocity /Work Capacity gives the focus factor. (URL -14)
Focus factor should be approximately 0.80. (URL -14)

2.3.4. Percentage of Adopted Work

∑ (Original Estimates of Adopted Work) ÷ (Original Forecast for the Sprint)

If scrum team completed all the works which is committed by team, before sprint end, then it take more items from the product backlog. This work is called “Adopted Work”. (URL -14)

2.3.5. Percentage of Found Work

Found Work is work related with a piece of Work which is expected, after the original work is completed.

Sum of the found and adopted work percentage should be under 0.20. (URL -14)

2.3.6. Targeted Value Increase

Current Sprint’s Velocity ÷ Original Velocity (URL -14)

3. CASE STUDIES OF SCRUM

3.1. Dutch Railways

The scrum story is about Dutch Railways which is a transportation company having 1.1 million passengers (annual report). The company wanted to create a new information system to give the customers better service and get rid of manual operations. This project's scope was to control information centrally and audio broadcast in all stations.

Figure 3.1 Dutch Railways station screen (Mulder and Viliet, 2008)

At first project was given a company which manages the projects by using waterfall methodology. The project failed, 100000+ line codes and 20 man years became trash according to Dutch Railways.

Then Dutch Railways found a new vendor Xebia Company which is an international Agile software development company, with offices in the Netherlands, France and India to complete the project.

Challenges of the project:

- There was no an experienced product owner.
- The project would be developed by a distributed team.
- Dutch railways wanted documentation using MIL standards.

- The work was not actually suitable for scrum.

To overcome absence of product owner problem, Xebia Company allocates 2 analysts for this role. These analysts had knowledge about the business but they had no idea about user stories, prioritization of product backlog items. By scrum master's help this problem was disappeared.

Xebia Company had developers who located India. At onwards of first sprint they came to Dutch, after forming the heart of the system returned India. In Scrum meetings, the team used Skype to communicate. ScrumWorks was used as a tool rather than whiteboard to keep track of who was working on what. These steps were taken for tackle of distributed team problem.

Figure 3.2 (Mulder and Vliet, 2008)

Documentation problem was solved by allocating a new person to write documents in MIL standards. To fit the work scrum, the company arranged a separate team for other facilities.

This project was completed on time and on budget. Scrum team satisfied customer expectations and Dutch Railways asked an external audit company to audit the software.

The result:

- Ease of maintenance
- Source Code quality. (Mulder and Vliet, 2008)

3.2. Odyssey at Intel

After using a strong waterfall model for many years, Intel Company wanted to change their working model with scrum methodology. It took 2 years and for one product 3 empirical steps (Preparing-Surviving-Manufacturing Silicon).

The company started scrum methodology with low motivation. There were thrash requirements, wasted man weeks. In waterfall model some teams had high turnover at the end of the project.

The Intel Company took training for scrum execution. The staff learned scrum terminology and the teams are determined. After first three months, some changes was made to fit scrum methodology. All of the role definition was made. These roles were defined:

- Business Owners are senior managers who set milestones.
- Product Owners are Functional Group Managers.
- Technical Owners has knowledge on technical and architectural domain.
- Scrum Master does not have a specific role in the project team like “she or he scrum mastering”.
- Transients are group members who have special skills needed by multiple teams for only a sprint or two at a time.
- Conduit is more than one person including contractor supervisors or local members of a remote team. Conduits can commit for more story points than a normal team member.
- Story Owner is a technical expert with particular knowledge of how to complete a work item.

After 2 years, Scrum is adopted by Intel Company. The results are:

- Scrum improved communication and job satisfaction

- The team which has lowest motivation before scrum showed highest performance.
- Increased transparency.
- On early times, huge product backlogs were created but the management was very difficult then improvement was made for product backlog creation.
- Thanks to restorative meetings, improved engineering and tools. (Elwer, 2008)

3.3. Adobe Premiere Pro Scrum Adoption

Market competition was the one of the key cause of Adobe Premiere wanted to change its product process. At first it could not compete in the market because of being lagged. After than for CS4 release, bug fixing and improving quality took 25% of the two year cycle. This was a stressful time and some team members were taken to hospital. To solve these problems, increase speed to market, improve product quality and provide team collaboration, Adobe Premiere decided to use scrum methodology rather than traditional methods.

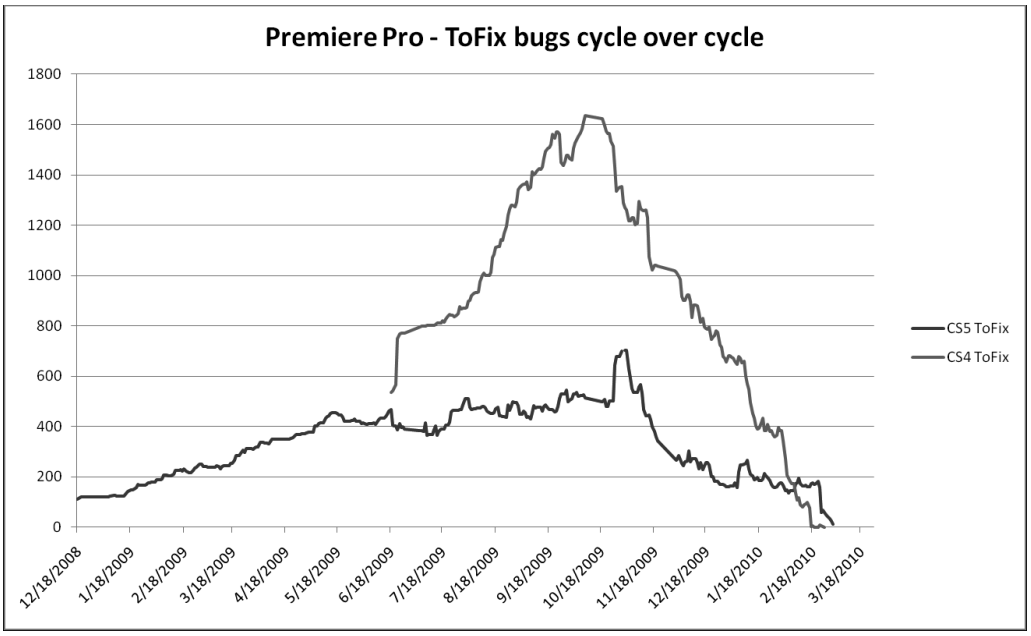
While using Scrum method, team faced some impediments:

- Communication with Remote Team Members is a real problem for them so after all searches they decided to use Adobe Connect, Adobe desktop sharing and collaboration tool. They held all the meetings using these tools.
- Breaking down Product Backlog Items into valuable items is other challenging subject. To overcome this problem, they held Q&A sessions with more professional scrum teams. They ask their questions and these sessions were brainstorming sessions for each team.
- Another problem is working is non-agile teams, companies. They did not solve this problem exactly but the problem's bad effect timely decreased.

Scrum adoption led to some improvements:

- Quality improvements can be measured by tracking bugs. Following graph shows the bugs during two cycles, CS4 and CS5. The X axis represents time in months; the Y axis represents total open defects.

Table 3-1 Premiere Pro – To fix bugs over cycle (Green, 2008)



- They made 2 surveys to measure the improvement. First survey was after 12 months later, the other was 18 months after adoption. The answers were changed. In the survey, they asked them to rate how strongly agreed with various aspiration statements on a scale of 0 (Completely Disagree) to 10 (Completely Agree).Survey Results are shown bellowing table. These results showed that timely team satisfaction increased.

Table 3-2 Premiere Pro responses to Adobe scrum survey (Green, 2008)

Statement	**Rate (12 month)**	**Rate (18 month)**
The Quality of product has improved since moving to scrum.	6.5	8.2
The Communication on the team has improved since moving to scrum.	7.2	7.83
A better product to customers since moving to scrum.	6.6	7.75

If the decision were completely up to person, the person would continue to use scrum for Premiere Pro (%Yes/%No)	77/23	80/20

- After scrum adaption adobe products more competitive in the market.

Overall Adobe satisfied after scrum adoption. (Green, 2008)

3.4. Yahoo! Scrum Adoption

To get products quickly, to create an environment flexible and adaptive to changes, Yahoo! needed a software development process. For this reason Yahoo! decided to use Scrum Methodology. The company learned scrum and made a survey about Scrum Adaption and The results were 86% of responses said yes to continue with scrum methodology. (Benefield, 2008)

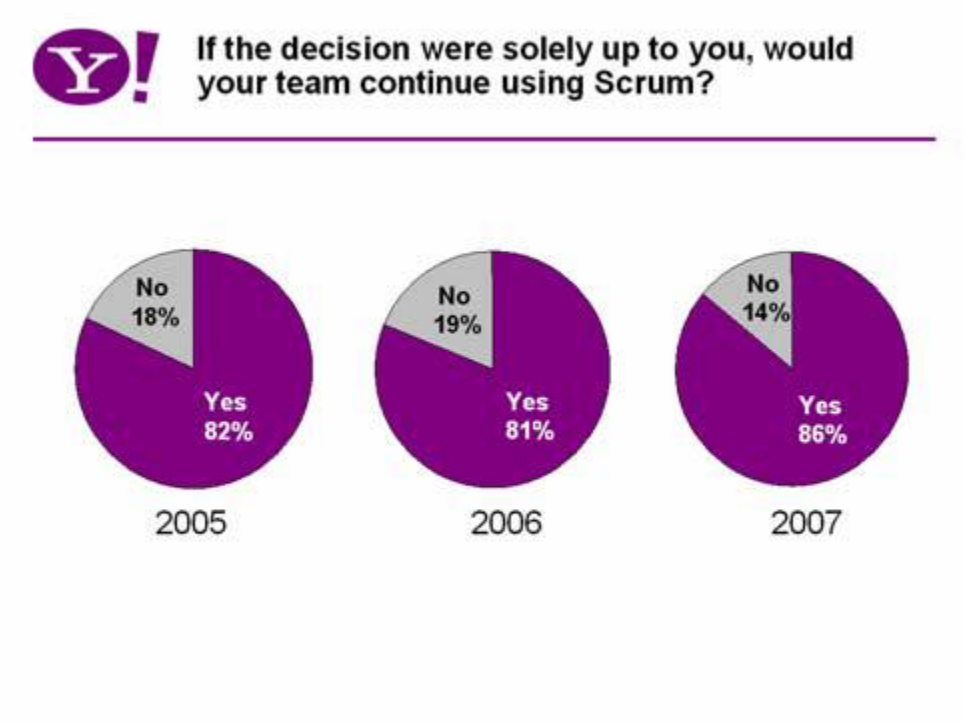


Figure 3.3 Over the past three years, the number of respondents who want to continue using scrum has remained consistent.(URL-15)

4. KUVEYT TURK INFORMATION TECHNOLOGY

4.1. General Information

Kuveyt Turk was established 1989 to make interest-free banking. It has an own IT in it. In IT department there are 8 directorates with approximately 300 staff working. The directories are:

Alternative Distributed Channels Directorate
Project Management and R&D Directorate
Main Banking Directorate
System Support Directorate
Analytic Banking Directorate
Information Security and Quality Directorate
Enterprise Architecture Directorate
Enterprise Solutions Directorate

In 2010, Kuveyt Turk was allowed to open an R&D center in IT department. Kuveyt Turk is the first bank which has R&D center.

The projects are managed by Project Management Office. Also service managers in other directorates can manage some of the projects while they managing functional teams.

4.2. Application Development Process Model

Kuveyt Turk IT department uses Waterfall methodology to create new products and make enhancements. This model guarantees project management to run projects. IT department aims that:

- To complete the project on time and on budget.
- Satisfy customer Expectations
- High Quality

Application development demands within the organization are discussed in three categories:

- Changes – Improvements, the demand is expected to take maximum 20 business days.
- Enhancement- expected to last more than the 20 business days are the demands of application development.
- Projects –The Demands which is decided Project by BTYK .Project Manager is assigned for these types of demands by Project Office and Quality Department.

4.2.1. Core Workflow

Core Business Workflow diagram shows the core workflow of the application development cycle. Outside the blue area refers to the functions carried out by the project manager. During the entire life cycle of the process Project manager is responsible for following project progress and controlling quality, changes, and risks. Project managers should be in constant communication with business departments, project committee and must inform them about the project.

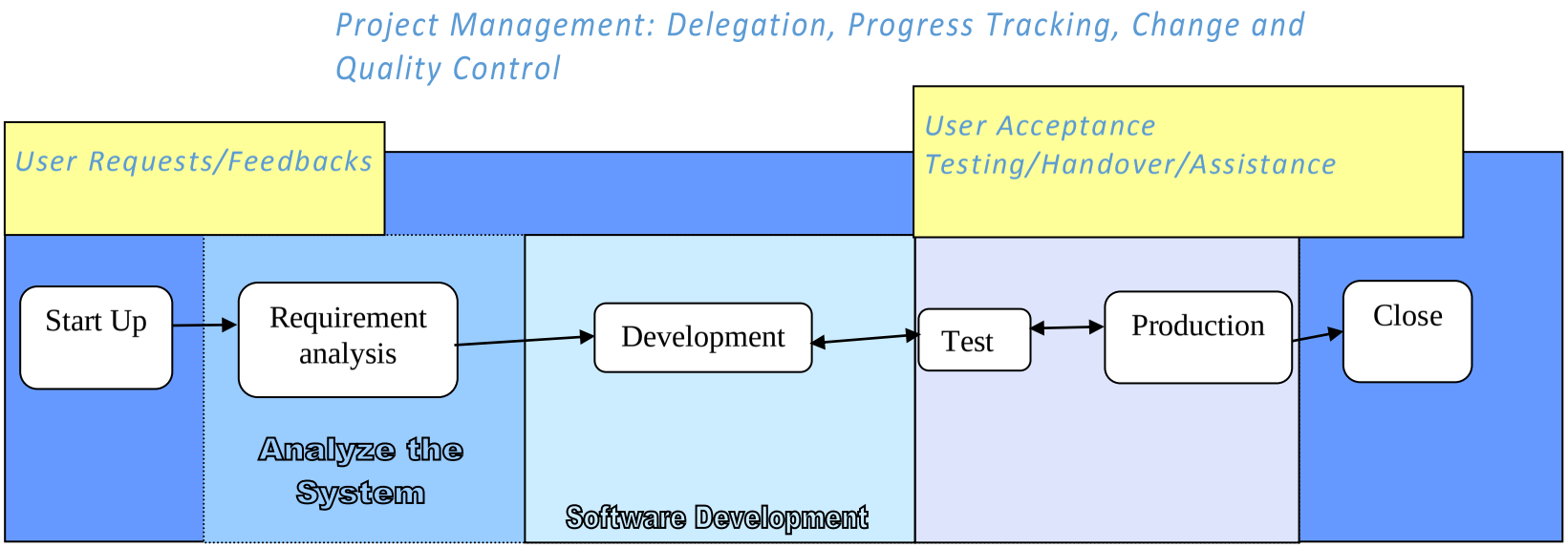


Figure 4.1 Core Workflow

4.3. Project Management

The main goal of the project management to complete the project on budget, on time and to meet customer needs. The project manager implements the following activities in his/her project:

- Evaluation of project's scope, time and cost.
- Creating Work Business Structures
- Defining roles and responsibilities of project team
- Working in coordination with resource managers and business units for person allocation and create a request about it.
- For all projects, establishing communication channels with relevant groups and managing these channels effectively.
- Organizing project meetings.
- Managing projects to meet stakeholders' expectations
- Monitoring performance, identifying emerging risks, removing impediments during the project.
- Managing team, stakeholders and suppliers in accordance with project scope and implementing necessary changes.
- Presenting project budget and other resource requirements
- Project Documentation
- Managing third party companies throughout the project.
- Archiving documents and documenting lessons learned and reporting of project performance after project closing.
- During the project monitoring team members' performance and conduct performance evaluations at the end of the project; searching about working more efficiently and effectively.
- Preparing weekly, monthly and annual activity report and following developments in the field.

4.4. Reporting and Information Flow in Project

Project reporting and information flow are made as shown below.

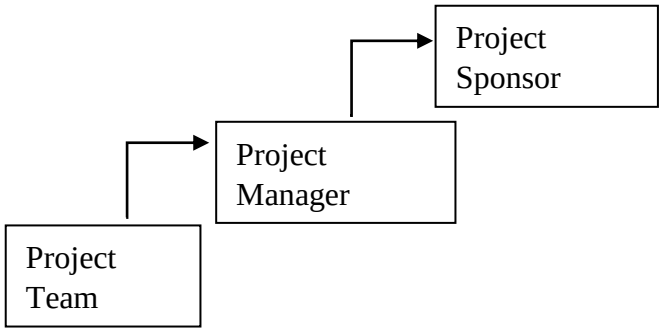


Figure 4.2 Project Management

Kuwait Turkish Information Technology Project Management consists of 5 basic main phases:

- Project Selection and Approval Process
- Planning Process
- Executing Process
- Monitoring and Controlling process
- Closing process

4.5. Scrum in Kuveyt Turk IT

Due to the recent reputation of Scrum, Kuwait Turkish IT department decided to use the scrum methodology in some software projects.On the other hand, most of the projects are executed by traditional project managament methodology.

ADK office was selected for pilot implementation, the service manager, within this office, was given the role of scrum master. Business departments have been asked for support for the scrum. Product owners were selected from business departments. Teams were trained. From August 2013 scrum began to be implemented in the form of a small teams.

5. SCRUM ADOPTION IN KUVEYT TURK

5.1. Questionnaire

At first a questionnaire was prepared with aim to measure Scrum Adoption in Kuveyt Turk. This questionnaire consists of 11 questions.30 people whose roles are scrum master, team member, product owner in the pilot scrum projects responded the questionnaire. Responses change 1 to 5. 1 is strongly disagreement, 5 is strongly agreement. Because of limitation of number of people who worked in a scrum project, Only 3 Product Owner and 3 Scrum Master responded these questions. This was the questionnaire's limitation. In this questionnaire population=sample size.

These are questions and answers:

Table 5-1 Responses of the questionnaire (5 –strongly agreement, 1-strongly disagreement)

Questions	***5***	***4***	***3***	***2***	***1***
Scrum improved 30 day quality.	7	15	6	1	1
Team goals are clearer with Scrum.	14	10	4	2	
Scrum increased collaboration and cooperation of the team.	14	8	5	2	1
Scrum improved the business value of the bank product.	4	12	9	3	2
Scrum helped reduce the amount of time wasted.	10	10	8	0	2
Overall scrum is better.	8	17	1	2	1
Management supports scrum in IT projects.	6	12	10		1
Teams are determined by balancing skills.	1	12	9	4	3
Every team member knows scrum terminology and tries to execute very well.	3	10	10	5	1
Scrum is not problem for third party companies or other teams which are related the product of sprint (increment).	2	8	10	5	5
Business departments give support scrum execution like allocating a person as a product owner for the scrum projects.	10	12	5	1	1

Only one person did not respond all questions. The average of each question result was given this blank question so it did not change the average of the results. Nobody gives all of the question 5 or 1.

Table 5-2 Product Owners' Responses to the questionnaire (5 –strongly agreement, 1-strongly disagreement)

Questions	***5***	***4***	***3***	***2***	***1***
Scrum improved 20 business day quality.	1	0	1	0	1
Team goals are clearer with Scrum.	1	1	0	1	0
Scrum increased collaboration and cooperation of the team.	2	0	0	1	0
Scrum improved the business value of the bank product.	0	1	1	1	0
Scrum helped reduce the amount of time wasted.	0	1	1	0	1
Overall scrum is better.	1	0	1	1	0
Management supports scrum in IT projects.	0	2	1	0	0
Teams are determined by balancing skills.	0	1	1	0	1
Every team member knows scrum terminology and tries to execute very well.	1	0	1	1	0
Scrum is not problem for third party companies or other teams which are related the product of sprint (increment).	0	2	0	0	1
Business departments give support scrum execution like allocating a person as a product owner for the scrum projects.	2	0	0	1	0

5.2. Analyzing Data

- **Question 1**

Scrum improved 20 business day quality.

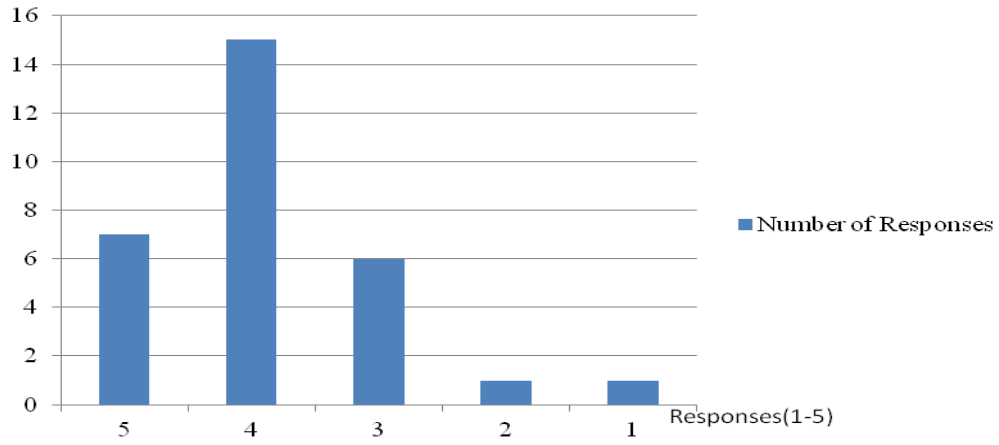


Figure 5.1 Responses of Question 1

Table 5-3 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.86	3	23.33%	50%	20%	3.33%	3.33%

The responses show that scrum teams believe that scrum improved 20 business day quality. 73.33% people gave 5 or 4 point and the average is 3.86. On the other hand, average of the Product owners' responses is 3.

- **Question 2**

Team goals are clearer with Scrum.

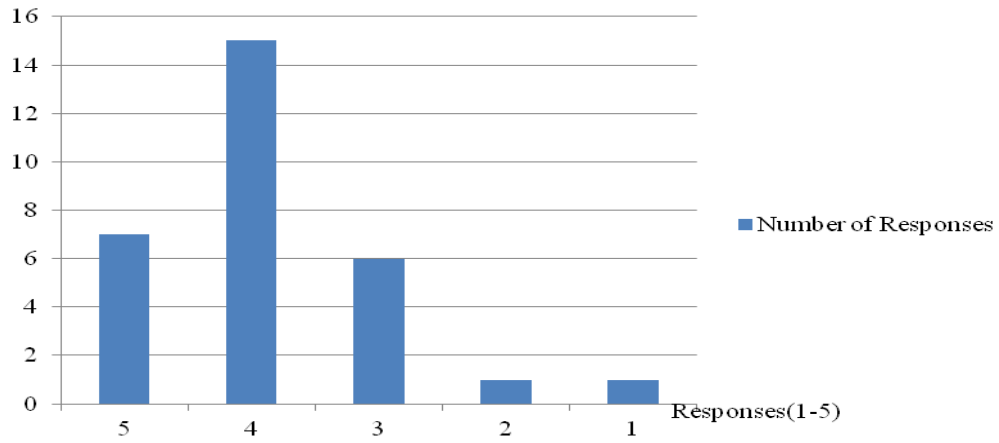


Figure 5.2 Responses of question 2

Table 5-4 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
4,2	3,67	46.67%	33.33%	13.33%	6.67%	0%

Average 4.2 says that team members say that scrum helped to clarify team goals. Average of the Product owners' responses is 3. Average of the Product owners' responses is 3,67.

- **Question 3**

Scrum helped collaboration and cooperation with the team.

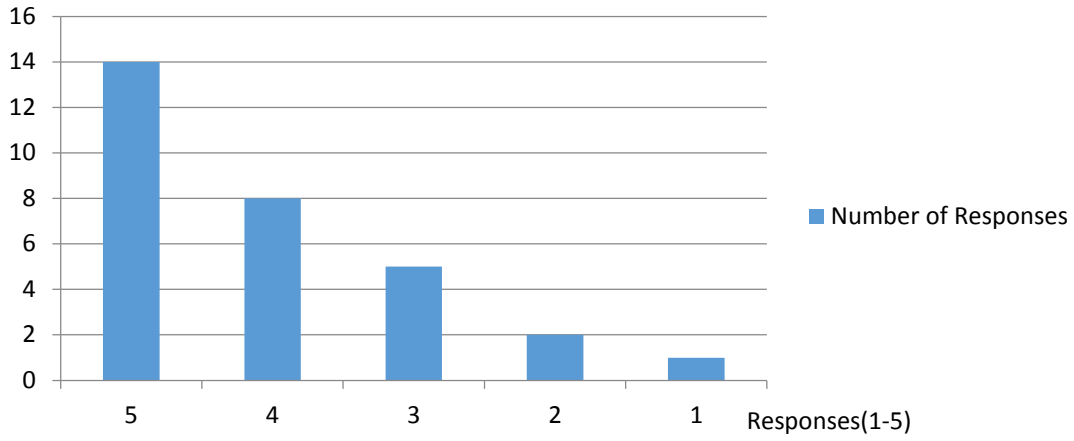


Figure 5.3 Responses of question 3

Table 5-5 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
4,06	4	46.67%	26.67%	16.67%	6.67%	3.33%

The result shows that team members work more collaborative and collectively.

- **Question 4**

Scrum improved the business value of the bank product.

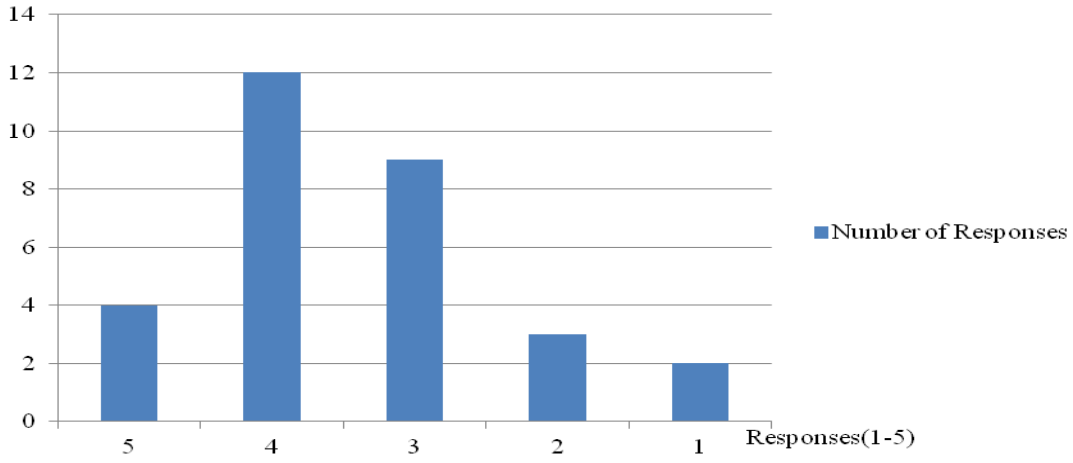


Figure 5.4 Responses of question 4

In this question, Product Owner's response was important.

Table 5-6 Responses of product owners for question 4

PO1	PO2	PO3
3	4	2

In general Product Owners who respond questionnaire are not sure that scrum enrich the product value. Other responses' average is higher than this result.

Table 5-7 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.43	3	13.33%	40%	30%	10%	6.67%

- **Question 5**

Scrum helped reduce the amount of time wasted.

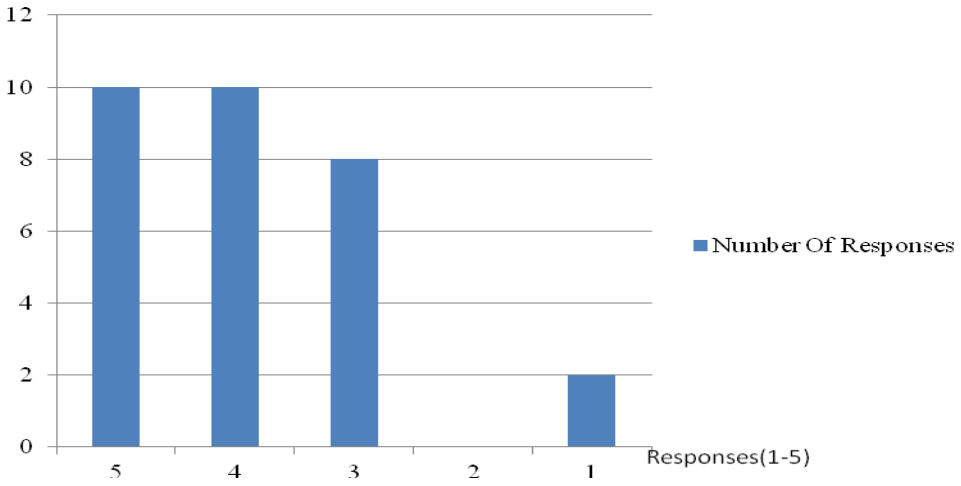


Figure 5.5 Responses of question 5

Table 5-8 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.86	2,33	33.33%	33.33%	26.67%	0%	6.67%

67% scrum staff says "Using scrum methodology provides time management."

On the other hand PO don't believe that scrum is good for time management. At first question, it can be seen also.

- **Question 6**

Overall scrum is better.

This question was essential since that it shows how people act when they are free to choose methodology to develop a product and they say they choose scrum methodology.

Table 5-9 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
4	3,33	27.59%	58.62%	3.45%	6.90%	3.45%

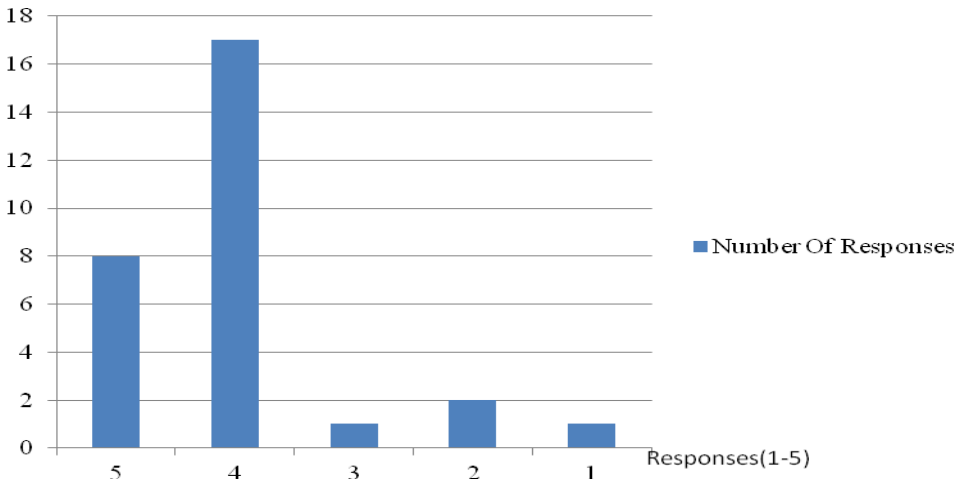


Figure 5.6 Responses of question 6

- **Question 7**

Management supports scrum in IT projects.

Management support is very essential for scrum. 60% of responders feel the management support for scrum projects. On the other hand 35% of responders are not sure (Given 3). This can be improvable area.

Table 5-10 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.76	3,67	20.69%	41.38%	34.48%	0%	3.45%

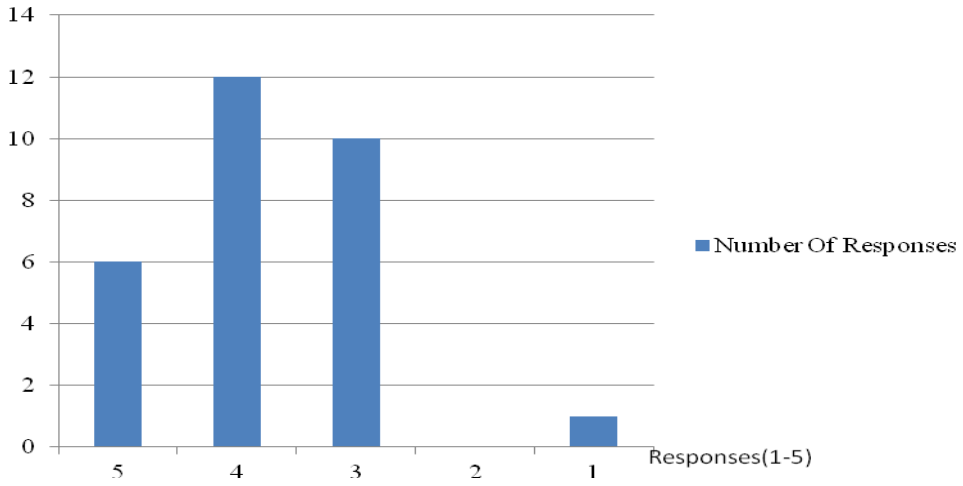


Table 5-11 Responses of question 7

- **Question 8**

Teams are determined by balancing skills.

This is a trick question. Because balancing skills is difficult for the fully functional teams. But scrum needs skill balancing.

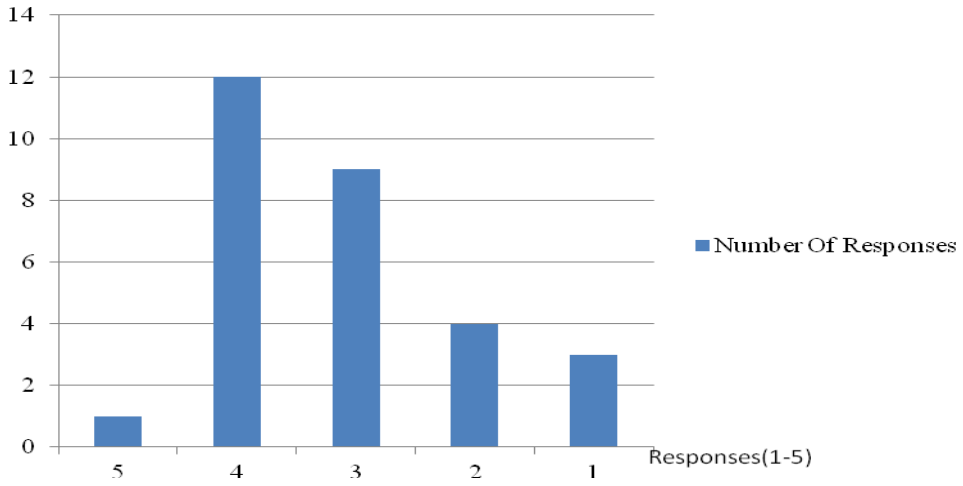


Figure 5.7 Responses of question 8

Table 5-12 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.14	2,33	3.45%	41.37%	31.03%	13.79%	10.34%

The team is not sure that scrum teams are organized according to skills. (for example overlapping skills) .POs says that teams are not organized according to skills.

- **Question 9**

Every team member knows scrum terminology and tries to execute very well.

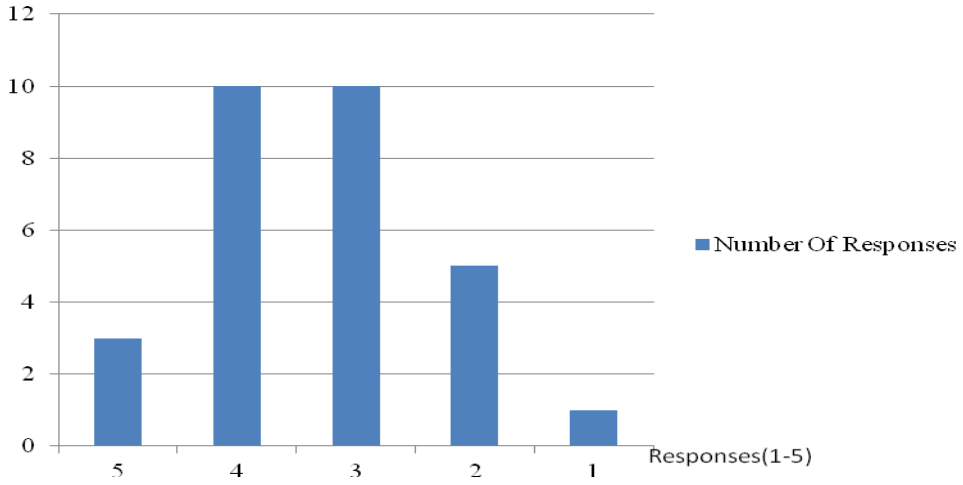


Figure 5.8 Responses of question 9

Table 5-13 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
3.31	3.33	10.34%	34.48%	34.48%	17.24%	3.45%

Although members took trainings, the organization is not sure about scrum knowledge. The POs' responses show same result. It can be because of facing difficult real world problems. The knowledge will increase in the future.

- **Question 10**

Scrum is not problem for third party companies or other teams which are related the product of sprint (increment).

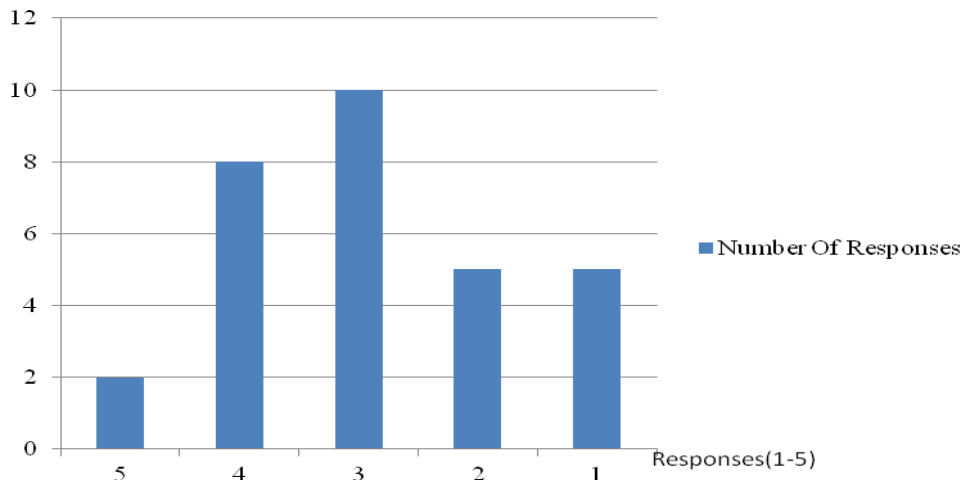


Figure 5.9 Responses of question 10

Table 5-14 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
2,9	2,67	6.67%	26.67%	33.33%	16,67%	16,67%

This has the lowest average in 11 questions. Kuveyt Turk has to create a strategy while working with non-Agile teams.

- **Question 11**

Business departments give support scrum execution like allocating a person as a product owner for the scrum projects.

The result says that Business Departments support scrum methodology for Kuveyt Turk for product development. POs and other team members agree with this result.

Table 5-15 Data analysis of responses

Average	Average of POs' Responses	Percentage Of Given 5	Percentage Of Given 4	Percentage Of Given 3	Percentage Of Given 2	Percentage Of Given 1
4	4	34,48	41,38	17,24	3,45	3,45

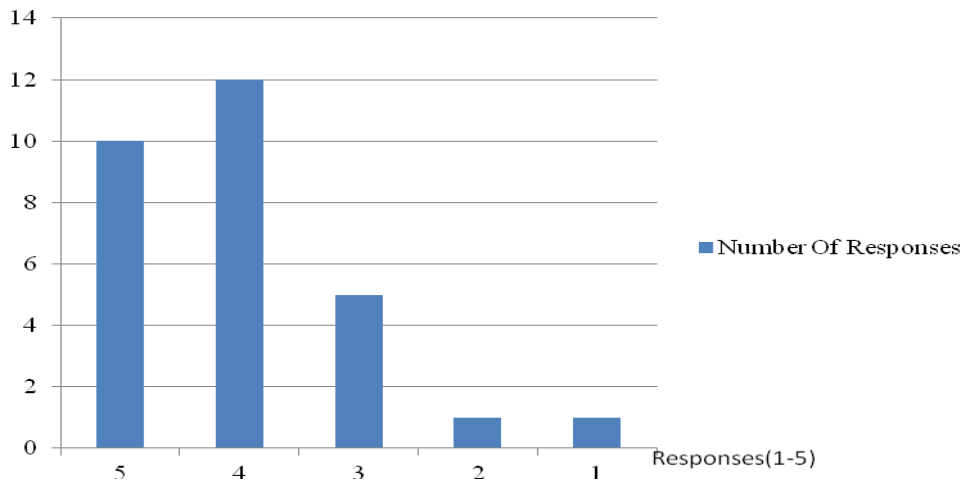


Figure 5.10 Responses of question 11

5.3. Problems with Traditional Project Management and Motivation for Scrum

Zeynep Yasemin Tekşen Altaş was interviewed about "Problems with Traditional Project Management and Motivation for Scrum". The interview is here:

- **Could you tell us a little bit of your position?**
- I am Service Manager Of Internet Mobile service. As a team, we create internet and mobile products. My main responsible is managing people and product processes.

- **When did you meet with scrum?**
- July -2013

- **How many projects you involved in as a scrum master**?
- 3 projects – Internet branch for Corporate, Easy Credit, win8 Branch projects.

- **According to you, what are the good things of traditional project management?**
- Some times making a detailed plan at the beginning of the project seems good.But I can not say good things about traditional project management.

- **What are the problems of traditional project management?**
- As I said before some times making a detailed plan at the beginning of the project seems good. On the other hand, the plan never works exactly with traditional project managements.Because of uncertainity,some projects are suspended.This is a burden for team and company.

- **If you compare scrum and traditional project management, which method do you choose, why?**
- Scrum. Step by step you see the product.Your planning faults are seen earlier.Your product quickly takes place in the market.The team more motivated.

- **Which problems did you face with during the scrum projects?**
- Operational facilities are problems. You can't response instantaneous operational

requests in scrum. Our team is also a functional team. Another problem is breaking the product into small pieces. This needs more profession about the product.

5.4. A study About Burn-Down Charts

An observation was made which was about two scrum teams' burn down charts. At early sprints there was a conflict between remaining work and ideal trend. At last sprint the difference was observed at minimum level. It shows that the adoption is a process and it evolves by time.

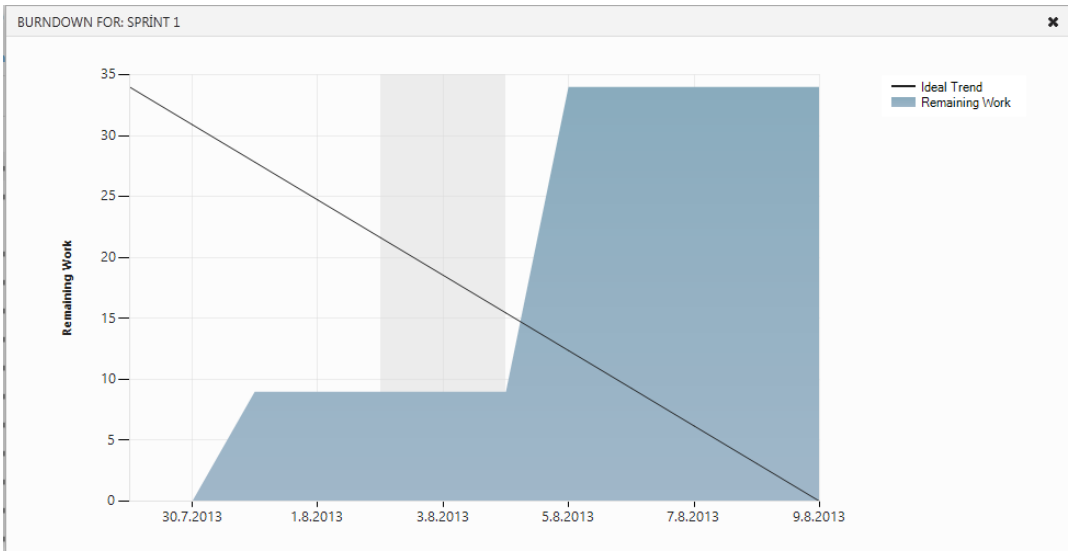


Figure 5.11 Team 1 sprint 1

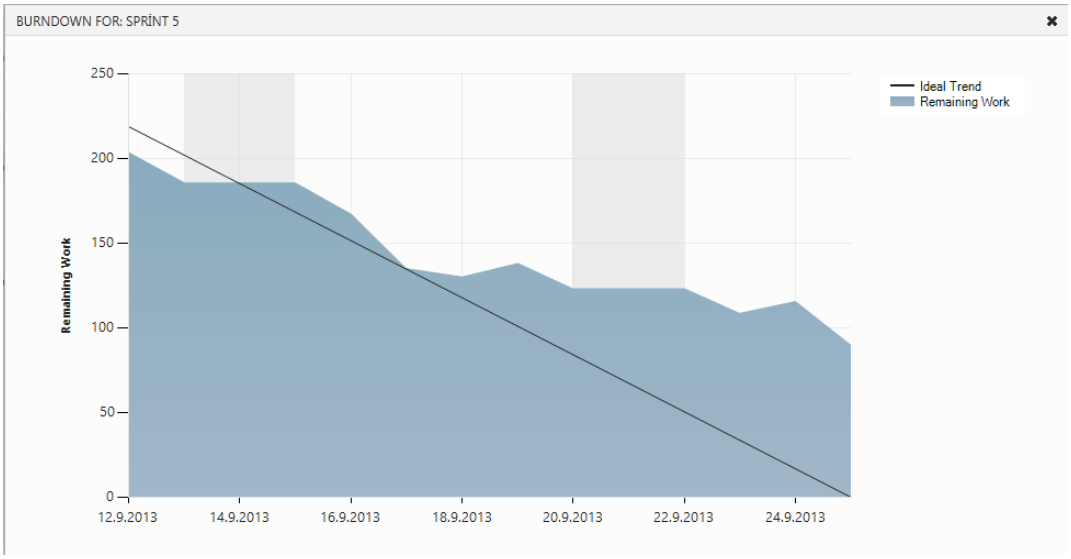


Figure 5.12 Team 1 sprint 5

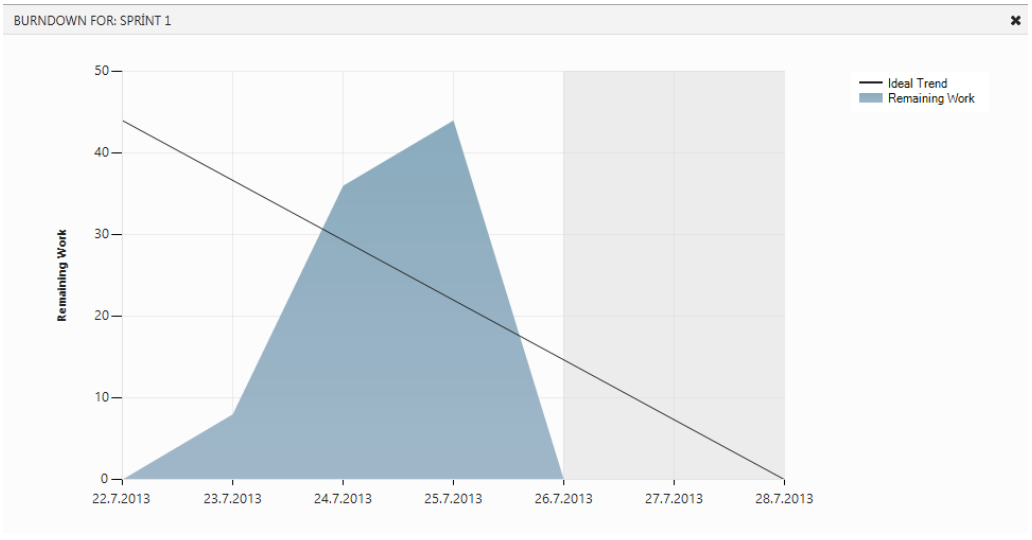


Figure 5.13 Team 2 sprint 1

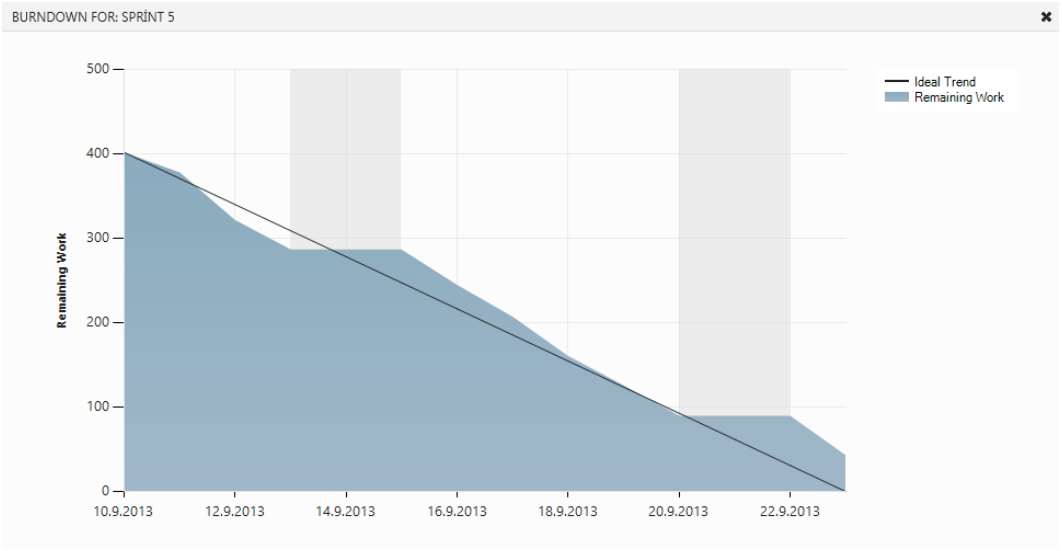


Figure 5.14 Team 2 sprint 5

According to these graphs at the sprint 1 both of the teams' plans are not ideal plans. At the beginning of the sprint 1, sprint backlog was not prepared well. At the middle of the sprint more works were taken to the sprint backlog so a conflict between ideal trend and remaining work occurred.

But At Sprint 5 the difference is very small so ideal trend and remaining work fitted each other.

5.5. Velocity as a KPI for Two Scrum Teams

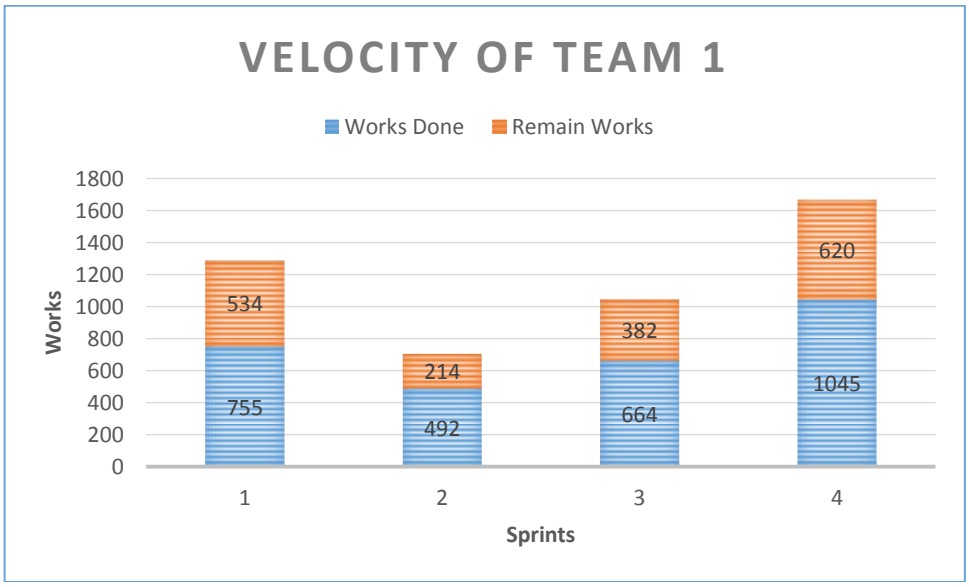


Figure 5.15 Velocity of Team I

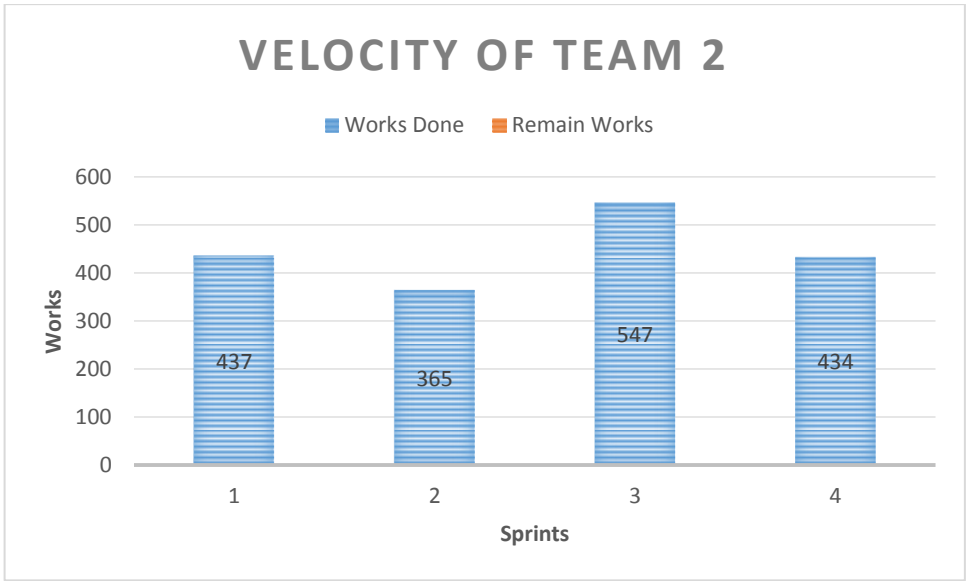


Figure 5.16 Velocity of Team II

5.5.1 Analyzing Data

Team 2 completed all the works which was committed before the sprints, on the other hand team 1 never completed its committed works.

V = ∑ of original estimates of all accepted work

Focus Factor = Velocity ÷ Work Capacity

The focus factor is expected approximately at 0.80.

Table 5-16 Data of Sprints

TEAM 1	**Sprint 1**	**Sprint 2**	**Sprint 3**	**Sprint 4**
Work Capacity	755 + 534 =1289	492 + 214 = 706	664 + 382 = 1046	1045 + 620 = 1665
Velocity	755	492	664	1045
Focus Factor	755 / 1289=0.59	492/706=0.70	664/1046=0.63	1045/1665 =0.63
TEAM 2	**Sprint 1**	**Sprint 2**	**Sprint 3**	**Sprint 4**
Work Capacity	437	365	547	434
Velocity	437	365	547	434
Focus Factor	437/437=1	365/365=1	547/547=1	434/434=1

If the graphs are analyzed, velocity of Team 1 is very low. Possible reasons for this situation:

- The team overestimates the work capacity.
- Unplanned works(Sutherland, Downey,2012)

On the other hand, team 2‘s estimations are 100%. The problems of team 1 were searched and it was found that the team 1 is operational group and its support/bug is very high. The burden of the support work is on 4 people. To solve this problem of team 1, sprint 4 data is used.

Table 5-17 Daily Support/Bug Request of Last Sprint

	Daily Support/Bug Request of Last Sprint
Person 1	*5*
Person 2	*3*
Person 3	*4*
Person 4	*4*

C_{T1} =1665 story points/month

C_{T1} is the work capacity of team 1, composed of 12 people. This number is determined from historical data (It was estimated in sprint planning meeting by team members.) Team 1 exactly estimated that each person could complete approximately 140 story points. Story point is the effort unit. The unit of work capacity is also "story point".

D_{T1} =C_{T1}/ M*N M= (Number of Work Day in a Month)

D_{T1}= 1665 / (20 *N) N is the number of people in the team.

D_{T1}= 7 story points.

D_{T1} is the estimated daily effort in story points for each person.

d_{Bug}=16

d_{Bug} is the average number of daily bugs.

b = 6 bugs. b is the number of bugs that will be served by 1 person in 1 day. This number is based on interviews with help desk members and support people of the team.

$V_{T1b} = D_{T1} * M * d_{Bug} / b$

$V_{T1b} = 7 * 20*16/6$

V_{T1b} = 373 story points

V_{T1b} is the effort which was used for the bugs.

V_{T1} =1045 story points

$F_e = (V_{T1} + V_{T1b})/ C_{T1}$

$F_e = (1045+373)/1665$

$F_e = 0.85$

F_e is the expected focus factor, if the team spends time to work on its responsibilities instead of bug support. 0.85 is closer to optimum value which is 0.80.

Team 2 should take risk to reach 0.80 value. Possible result of taken this step is that team performance may increase.

To find the ideal capacity of the team following formula is used.

$\mathbf{F_{ideal}=V_{T2}/(C_{T2}+C_{extra})}$

$\mathbf{F_{ideal}}$: Ideal focus factor which is 0.80

$\mathbf{V_{T2}}$: Velocity of Team 2 in sprints.

$\mathbf{C_{T2}}$: Estimated Capacity for the current sprint.

$\mathbf{C_{extra}}$**:** This is the extra capacity which will make the focus factor approximately 0.80 after adding sprint capacity**.**

Table 5-18 Calculating Extra Capacity of Team 2

For Sprint 1:	**For Sprint 2:**
$0.80=437/ (437 + C_{extra})$ $0.80*437 + 0.80* C_{extra} =437$ $C_{extra} = (437 – (0.80*437))/0.80$ C_{extra}=109 story points $C_{T2} = 109 + 437$ = 546 story points	$0.80=365/ (365+ C_{extra})$ $0.80*365 + 0.80* C_{extra} =365$ $C_{extra} = (365 – (0.80*365))/0.80$ C_{extra}=91 story points $C_{T2} = 91 + 365$ = 456 story points
For Sprint 3:	**For Sprint 4:**
$0.80=547/ (547+ C_{extra})$ $0.80*547+ 0.80* C_{extra} =547$ $C_{extra} = (547– (0.80*547))/0.80$ C_{extra}=136 story points $C_{T2} = 136 + 547$ = 683 story points	$0.80=434/ (434+ C_{extra})$ $0.80*434+ 0.80* C_{extra} =434$ $C_{extra} = (434– (0.80*434))/0.80$ C_{extra}=109 story points $C_{T2} = 109 + 365$ = 543 story points
Average capacity =(546+456+683+543)/4 = 557 story points	

Team 2 can take average 557 story points work capacity per sprint.

6. CONCLUSION AND COMMENTS

This research was conducted using literature, a questionnaire and an interview. In literature section all the key information was given about scrum and several case studies was examined. This was seen that each company which started to use scrum methodology had almost same problems with traditional project managements and same motivation to try scrum.

The interview showed that Kuveyt Turk has some planning problems when waterfall method is used to develop product. Sometimes some projects are suspended because of uncertainty. There is a competition out of the door and Kuveyt Turk has to compete with other competitors. Since that following two items are main important qualities:

- Speed of product development
- Product quality

In interview, Mrs. Altaş said the product evaluation was seen step by step. When the nature of scrum is thought, in every sprint the team creates a potentially releasable work so that if the product owner believes the product should take place in the market, the potentially releasable work can take place in the market before the end of the all sprints. Scrum allows it. Kuveyt Turk can use scrum in the light of this aspect.

In the pilot application, Kuveyt Turk IT uses functional teams as scrum teams. The interview and the study of "velocity as a KPI" showed that the teams can't find the staff who makes operational facilities. To solve this problem Kuveyt Turk IT has to separate functional and project teams. In Intel case study, following lessons which might be used by Kuveyt Turk are pointed:

- Kuveyt Turk might keep the functional team because the deep knowledge develops in functional teams and they might do operational facilities, this provides scrum team to focus on project.
- To allocate some team members over scrum teams, Kuveyt Turk might create Cross-functional Scrums.
  (Elwer, 2008)

As a large organization Kuveyt Turk needs Project Management Office. In Yahoo case yahoo built relationships and identifying the common goals that project management office and scrum teams were focused on achieving. This needs a high motivation and management support in organization.

The questionnaire was about team scrum adoption, management/business departments' support and working with non-agile teams. The questionnaire results show that %85 of responses are satisfied with using scrum methodology and business departments support the scrum by allocating Product Owners. 3 product owners agree that overall scrum is better.

On the other hand management support and working with non-agile teams are study areas for Kuveyt Turk IT. Since this process is a pilot application, the management support cannot be seen easily but starting a pilot application is a sign of management support. If feedbacks are positive, In Kuveyt Turk IT, software development method will be moved to scrum. Scrum roles must be defined by Human Resources department. These roles might be modified accordance with Kuveyt Turk structure. Intel case study might be a reference: The Company defined extra roles like:

- Transients
- Conduits
- Story Owners
- Technical Owners

Clarity makes people more motivated.

Adobe Premiere faced with non-agile team problem but the company did not find a real solution. For Kuveyt Turk case, scrum teams and non-agile teams might adjust their schedule accordance with scrum sprints. It needs more communication.

In the light of these aspects, using Scrum methodology for Kuveyt Turk IT will be a good experience and after some organizational changes, Kuveyt Turk IT might use Scrum methodology for the projects which have high uncertainty. Kuveyt Turk might use following flow chart to measure performance and improve it.

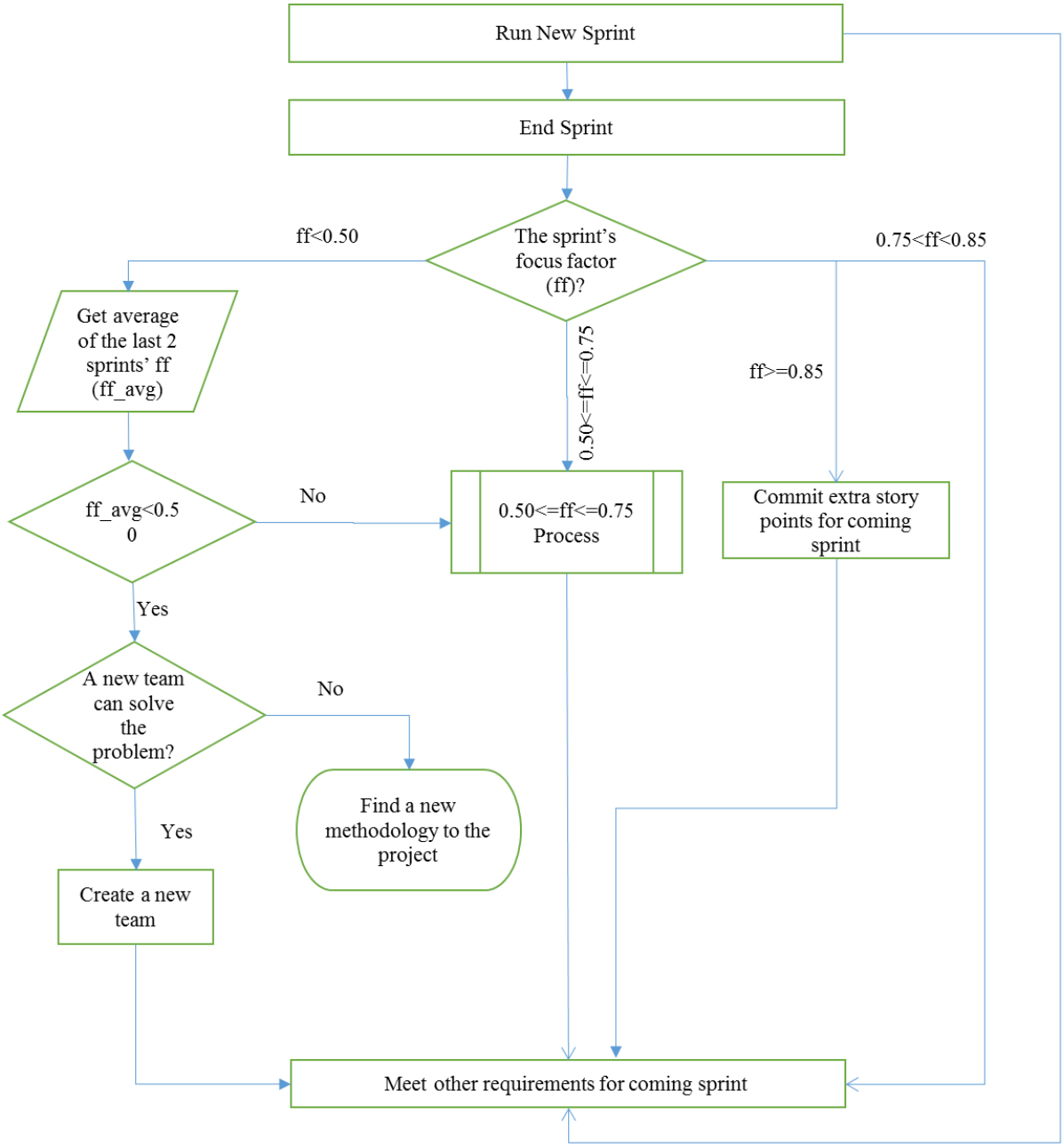


Figure 6.1 Flow chart of improvements based on focus factor

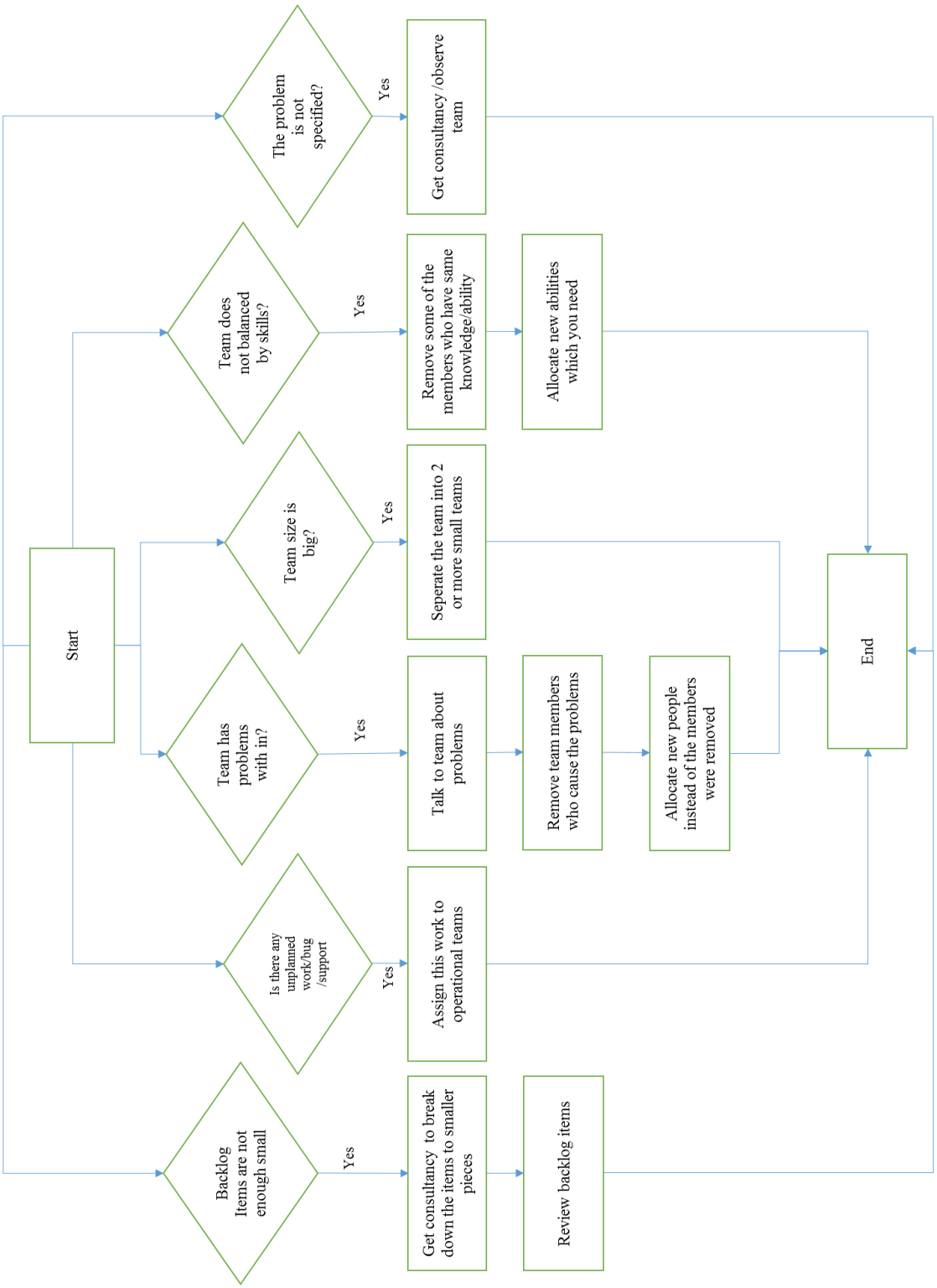


Figure 6.2 Process of 0.50<FF<=0.75

Figure 6.1 describes that according to calculated FF what action should be taken by the scrum master since increasing performance is his / her responsibility. If FF is between 0.75 and 0.85 , the result is good and take no action. If FF<0.50 then the scrum master should look average of the last two sprints' FF. If the average is smaller than 0.50, it shows that there is a serious problem. If he/she can create a new team,he should do otherwise other methodology should be searched which is more suitable to the team than scrum. If the average of the two sprints' FF is bigger than 0.50 , this situtation explained for (Figure 6.2.). If FF>0.85 , it says that the team does not take risk.To increase team's performance , the team should commit extra story points for upcoming sprint.

Figure 6.2 designed for meeting the need the state of 0.50<=FF<=0.75 and FF<0.50 but the average of the last two sprints' FF>0.50 condition. The possible reasons why FF 's not between 0.75 and 0.85:

- Backlog items are not simple enough.
- Unplanned works / support
- Team may have communication problems
- Team size may be a problem (Is it big)?
- The team is not balanced by skills.

If the team's problem is based on one of the above reasons, then the scrum master may use flow chart in figure 6.2. If she/he can't determine what is the problem then he/she should get consultancy.

REFERENCES

Benefield, 2008," Rolling out Agile in a Large Enterprise", http://www.controlchaos.com/storage/scrum-articles/YahooAgileRollout.pdf (2014, April 5)

Cohn, (2009), *Succeeding with Agile: Software Development Using Scrum*, Boston: Addison-Wesley Professional

Cohn, (2007)," Six Attributes of a Good Scrum Master", http://www.scrumalliance.org/community/articles/2007/february/leader-of-the-band (2014, April 5)

Elwer, (2008)," Agile Project Development at Intel: A Scrum Odyssey" http://scrumtrainingseries.com/Intel-case-study.pdf (2014, May 5)

Green, (2008)," How an agile approach enabled success in a hyper-competitive landscape " http://blogs.adobe.com/agile/files/2012/08/Adobe-Premiere-Pro-Scrum-Adoption-How-an agile-approach-enabled-success-in-a-hyper-competitive-landscape-.pdf

Hirotaka and Nonaka, (1986), "The New Product Development Game", http://hbr.org/1986/01/the-new-new-product-development-game/ar/1 (2013, Dec 12)

Judy and Krumins-Beens, (2008), "Great Scrums Need Great Product Owners: Unbounded Collaboration and Collective Product Ownership", *Proceedings of the 41st Hawaii International Conference on System Sciences*, Jan 7-10 Hawai, USA.

Kath, 2010,"Scrum: Value Driven Software Development", http://www.tarkia.com/blog/2010/03/11/scrum-value-driven-software-development/ (2013, Feb 10)

Krishnamurthy, Venkatesh, "A Brief History of Scrum", http://www.techwell.com/2012/10/brief-history-scrum (2013, Dec 10)

Levison, (2008)," Can Product Owner and Scrum Master be Combined?", http://www.infoq.com/news/2008/12/scrum-master-product-owner (2014, May 3)

Mulder and Vliet, (2008)," Case study: Distributed Scrum Project for Dutch Railways", http://www.infoq.com/articles/dutch-railway-scrum (2014, May 5)

Pichler, (2010), *Agile Product Management with Scrum: Creating Products that Customers Love*, Boston: Addison-Wesley Professional

Schwaber and Sutherland, (1991, 2013),"Scrum Guide"

Https://www.scrum.org/Portals/0/Documents/Scrum%20Guides/2013/Scrum-Guide.pdf#zoom=100 (2013, July 20)

Sutherland, (2012),"Nut, Bolts, and Origins of an Agile Framework", http://jeffsutherland.com/ScrumPapers.pdf (2013, Dec 10)

URL-1, Agile Tools, URL: http://www.agiletools.net, Accessed on: 2013, Dec 15

URL-2 Net Objectives, URL: www.netobjectives.com, Accessed on: 2013, Dec 15

URL-3, Scrum Alliances, URL: http://www.scrumalliance.org , Accessed on: 2013, Dec 10

URL-4, (2014) Rugby game graphic, URL: http://www.crystalgraphics.com/powerpictures/Image.Search.Details.asp?product=cg4p5372454c&title=best-color-sport-silhouette-isolatio , Accessed on: 2014, April 15

URL-5, agile development with scrum, URL: http://agile-team.com/media/5667/agile-team_and_scrum.pdf , Accessed on: 2014, April 15

URL-6, Scrum roles & Stakeholders, URL: http://www.scrum-institute.org/Scrum_Roles_The_Scrum_Team.php , Accessed on: 2014, Feb 10

URL 7, Scrum events, URL: http://www.meraevents.com/blog/2013/10/24/scrumalliance-approved-agile-and-scrum/, Accessed on: 2014, May 8

URL-8, Sprint retrospective, URL: http://www.mountaingoatsoftware.com/agile/scrum/sprint-retrospective/ , Accessed on: 2014, April 15

URL-9, Product backlog, URL: http://www.mountaingoatsoftware.com/agile/scrum/product-backlog, Accessed on: 2014, May 1

URL-10, Simple product backlog, URL: http://agilesoftwaredevelopment.com/scrum/simple-product-backlog , Accessed on: 2014, March 10

URL-11, Sprint backlog, URL: http://www.methodsandtools.com/archive/atddreadysprintbacklog.php , Accessed on: 2014, May 8

URL-12, Performance Metrics for Agile SCRUM Process,
URL: http://josephvargheese.wordpress.com/2013/02/17/1000-performance-metrics-for-agile-scrum-process/ Accessed on: 2014, July 14

URL-13, Velocity, URL: http://i.msdn.microsoft.com/dynimg/IC361370.png
Accessed on: 2014, July 14

URL-14, Scrum Metrics for Hyperproductive Teams: How They Fly like Fighter Aircraft,
URL: http://scrum.jeffsutherland.com/2010/10/scrum-metrics-for-hyperproductive-teams.html , Accessed on: 2014, July 11

URL-15, Over the past three years, the number of respondents who want to continue using scrum has remained consistent, URL:http://www.controlchaos.com/storage/scrum-articles/YahooAgileRollout.pdf, Accessed on: 2014, May 8

CV

Gülname KIR was born in Trabzon, 1982. She graduated from Bahçeşehir University Computer Engineering department in 2004. She is a software engineer and she works in Kuveyt Turk Information Technologies. Her interest area is internet banking technology.