AGILE VERSUS TRADITIONAL APPROACHES TO INFORMATION TECHNOLOGY PROJECT MANAGEMENT: A COMPARISON OF CRITICAL SUCCESS FACTORS

HATİCE ERGÜDER

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The thesis of Hatice Ergüder

has been approved by:

Prof. Meltem Özturan
(Thesis Advisor)

Prof. Hande Türker

Assoc. Prof. Mehmet Nafiz Aydın
(External Member)

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ABSTRACT

Agile Versus Traditional Approaches to Information Technology Project Management: A Comparison of Critical Success Factors

In parallel to the emerging number of information technology projects in the companies and the development of new methodologies for the project management, choosing the right methods and knowing the influencers of project become critical for the companies. In order to finalize the projects successfully, factors effecting the project success need to be known by project professionals. Therefore, critical success factors concept is studied by different researchers. The main objective of this study is to analyze the critical success factors for information technology projects that are managed either with traditional and agile project management approaches and identify the similarities and differences of critical success factors between them. Critical success factors analyzed before by different researchers are searched in the literature and theoretical model and hypotheses are formulated based on the items found in the literature. In addition to success factors, project and company demographics are collected for 178 different projects. For analysis, multiple regression, ANOVA and t-tests are used. As a result, four factors are identified as critical success factor for information technology projects; project criticality, project team, project management process and project development process. Project team and project development process are identified as critical success factors for traditional project management. Project criticality and project management process are identified as critical success factors for agile project management. Details of findings and limitations are explained at the end of the study for academicians, researchers and project professionals.

ÖZET

Bilgi Teknolojileri Proje Yönetiminde Çevik ve Geleneksel Yaklaşımlar: Kritik Başarı Faktörlerinin Karşılaştırılması

İşletmelerde ortaya çıkan bilgi teknolojileri projelerinin sayısı ve proje yönetimi için yeni metodolojilerin geliştirilmesine paralel olarak, doğru proje yönetim metodolojilerini seçmek ve projeyi etkileyen kritik başarı faktörlerini dikkate şirketler için kritik hale gelmiştir. Projeleri başarıyla sonuçlandırmak için, proje başarısını etkileyen faktörlerin proje uzmanları tarafından bilinmesi gerekir. Bu nedenle, kritik başarı faktörleri kavramı farklı araştırmacılar tarafından incelenmektedir. Bu çalışmanın temel amacı, geleneksel ve çevik proje yönetimi yaklaşımlarıyla yönetilen bilgi teknolojileri projeleri için kritik başarı faktörlerini analiz etmek ve kritik başarı faktörlerinin geleneksel ve çevik proje yönetimi yaklaşımları arasındaki benzerlik ve farklılıkları tespit etmektir. Farklı araştırmacılar tarafından daha önce analiz edilen kritik başarı faktörleri literatürde araştırılmış ve literatürde yer alan maddelere dayanarak teorik model ve hipotezler oluşturulmuştur. Başarı faktörlerine ek olarak, 178 farklı proje için proje ve firma demografisi toplanmıştır. Analiz için çoklu regresyon, ANOVA ve t-testleri kullanılmıştır. Sonuç olarak, dört faktör bilgi teknolojileri projeleri için kritik bir başarı faktörü olarak ortaya çıkmıştır; projenin kritikliği, proje ekibi, proje yönetimi süreci ve proje geliştirme süreci. Geleneksel proje yönetimi için proje ekibi ve proje geliştirme süreci kritik başarı faktörleri olarak belirlenmiştir. Çevik proje yönetimi içinse; proje kritikliği ve proje yönetimi süreci kritik başarı faktörleri olarak tespit edilmiştir. Çalışmanın sonunda akademisyenler, araştırmacılar ve proje uzmanları için bulguların ve kısıtlamaların detayları açıklanmıştır.

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ABBREVIATIONS

ASD: Agile Software Development

CSF: Critical Success Factor

FDD: Feature Driven Development

IT: Information Technology

PB: Product Backlog

SDLC: Software Development Life Cycle

TSD: Traditional Software Development

XP: Extreme Programming

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CHAPTER 1
INTRODUCTION

In parallel to the increasing value of information technologies in the companies, information technology (IT) projects gain importance. Companies rely on the IT projects in order to add value to the business processes (Hamad, Fadhil, Rasul, 2018). This results in investing companies especially on software or IT projects. Some of them are being successful however, some of them fail. There are different reasons behind that such as not adding a value to the processes, over budgeting in projects or not being on time (Ahimbisibwe, Cavana, Daellenbach, 2015). Many causes can be listed in order to explain the success and failures in the IT projects. Nevertheless, since most of these causes are related with the project management techniques, IT project management concept should be introduced at first.

Correspondingly with the increasing number of IT projects, end to end management of the projects becomes crucial and different management tools, methods, processes are introduced. Some methodologies such as PMI, PRINCE 2, some frameworks such as traditional and agile or some methods classified waterfall, scrum, kanban etc. are the essentials in IT project management.

According to Stankovic, Nikolic, Djordjevic and Cao (2013), not only project management but also process is also important for the success of the projects. There are different factors such as involvement of stakeholders in the project and environmental issues that may influence the project development. All of them affect the success and failure of the projects. In today's word, the dynamics in the environmental factors change very rapidly and in order to manage them, their effects should be known very clearly (Stankovic, Nikolic, Djordjevic & Cao, 2013). Knowing the factors that affect the results of the projects will improve the gains of

companies from IT projects. These factors will be evaluated in this research and they will be named as critical success factors (CSF). In this context there are different investigations and surveys about the failures and success of projects since 1967 until today (Jørgensen, 2016).

Related to factors, in Turkey various project management tools and techniques are used that may affects project success. Besides, there are a lot of environmental factors that could affect companies and projects. Therefore, this study is done in order to show the effects of CSFs on IT project management and to guide the experts in Turkey on project management area. CSFs are analyzed regarding the selected project management approach, traditional or agile, and results are compared for both. As a result, this study can be a reference for the IT project managers who want to implement successful IT projects either with traditional approach or agile approach.

The question which is tried to be answered in this research is the similarities and differences between the critical success factors in traditional managed and agile managed IT projects. In order to analyze this, a literature review is done and CSFs used in traditional and agile project management are searched and compared. Consequently, 232 CSF items are listed from the literature. This search provides a basis for the survey answered by IT project managers from different sectors in the industry. The results and findings of this study will set light to the project managers in order to succeed in the projects by paying attention to the CSFs. Knowing the factors which affect the project's success provides a gain in terms of effective project outcomes for the companies and profitable customer relations in the long term (Niazi et al., 2016). According to Kouzari, Gerogiannis, Stamelos and Kakarontzas (2015, July) in addition to success in the project, companies can manage their resource

usage and as a result they can improve their financials by considering the CSFs for projects.

This study embraces the following parts: The second section of this study interprets the basic concepts in IT project management and introduces traditional project management and agile project management concepts. A comparison between traditional and agile is done in order to supply a basis for explaining the relationship between traditional project management CSFs and agile project management CSFs. Third section gives a visual view of the theoretical model developed for the analysis and provides a basis for hypotheses. All factors used in the theoretical model are described in this section. Fourth section includes the survey design and distribution process details. Fifth section interprets the detailed analysis and findings according to the survey results. The verification of hypotheses and further analysis are explained and supported with analysis tables. As a result of these analysis, CSFs in traditional and agile project management are determined and explained in this section. Not only differences but also parallelism of CSFs between two methodologies are presented in this section. Next section includes the summary of the results and the study which gives an outline for the researchers who are working on CSFs concepts. In the last section, recommendations and possible enhancements are noted for the researchers for future analysis.

CHAPTER 2
LITERATURE REVIEW

Since the objective of this paper is to represent the critical success factors concepts for the IT professionals in order to simplify their project management processes and demonstrate them the important factors for project success, a search in the literature about the IT project management including details of traditional and agile management approaches, comparison between two approaches and CSFs analyzed before by different researchers. The primary goal of literature search is to collect CSFs for IT project management in the literature and show a summary of factors by grouping them as traditional and/or agile.

2.1 IT project management

Since every IT project has its own features and requirements, IT project management processes may vary from project to project. Due to this variance, finding the right project management method for each project becomes a big concern for IT project managers (Redlarski, 2018, September). It is proposed by Redlarski that project management method has an influence on the final success of the project. Hence, it becomes more critical to find the right project management methodology regarding with the project specifications. When looking at the different methodologies in IT project management, traditional and agile methodologies come forward and a mix of these two methodologies is also applicable (Redlarski, 2018, September). Since these are main methodologies, there are different methods under these main topics. All of them will be covered under the literature review.

Project management covers a lot of barriers during the project execution such as resource, time and budget limitations, scope and purpose alignments and other environmental factors (Pinto & Prescott, 1988). Because of the fact that companies confront with several problems during their daily operations or mostly in project implementations, they need the project management techniques and methodologies to overcome these problems. The more companies and project managers are familiar with project management methodologies, the more the usage of these methodologies increases (Jovanovic & Beric, 2018).

Before analyzing the factors in different project management methodologies, the concepts and pillars of these methodologies will be introduced. In general, those methodologies are summarized under Software Development Life Cycle (SDLC). Although it is named as software development, it provides a basis for software project management by reason of each software development is an IT project. According to Fatima and Gupta (2018) software development is not a process that includes only coding but also it covers the before coding and after coding phases as well. Hence, it has different steps from end to end. Prior models before SDLC concept are focused on the final steps of IT projects such as testing and error corrections. However, SDLC concentrates on all steps faced during project from beginning to end (Kumar, Rashid, 2018). A model for SDLC is shown in Figure 1. According to this model, SDLC has four main steps such as analyse, design, coding and testing, respectively. All of these steps follow each other and it is described as a cycle without having sharp beginning and end points.

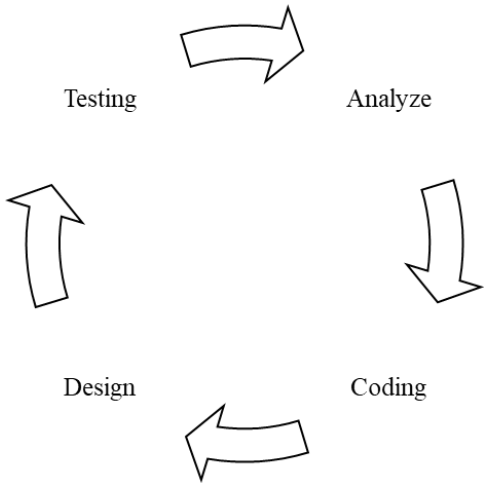

Fig 1. SDLC phases (Kumar & Rashid, 2018)

According to various researchers, number of steps in SDLC process can be differ. As an example, Kumar and Rashid (2018) summarize the process with four steps such as analyse, design, coding and testing. On the other hand, Fatima and Gupta (2018) mention six different steps like feasibility analysis, requirement gathering, designing, coding, software testing and integration, maintenance and operation as visualized in Figure 2.

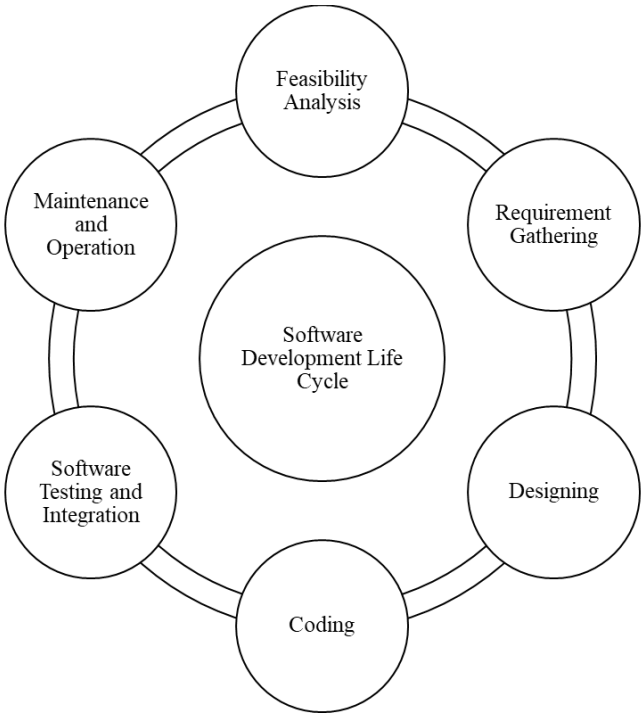

Fig 2. SDLC phases (Fatima & Gupta, 2018)

SDLC covers both the agile and traditional methodologies (Sharma, Sarkar, Gupta, 2012). Agile project management doesn't suggest a different life cycle than SDLC. However, the essential difference between project life cycle in traditional and agile is the length of the SDLC cycles. It proposes to implement cycles in agile project management with shorter terms and more than one cycle (Hamad, Fadhil, Rasul, 2018).

A lot of techniques, tools or rules can be used for the project management however some of them come forward both in literature and in practice. PMI, IPMA, APM, YUPMA and PRINCE 2 can be given as examples to popular project management techniques. The main issue associated with these techniques is they are not used for only IT project management but also, they provide a general perspective for project management in every area (Jovanovic & Beric, 2018). Nevertheless, they are very common in IT project management. It is crucial to choose the appropriate technique(s) depending on the nature of the project. In order to define the nature of the project, project is needed to be analyzed deeply. Moreover, all project management techniques are needed to be understood in terms of application details. In this way, correct matching of project and technique can be achieved (Jovanovic & Beric, 2018).

2.1.1 Traditional project management

When looking at the background of traditional project management, it is seen that traditional project management is used for large projects especially emerged for military forces (Jovanovic & Beric, 2018). It shows that the initial usage is not IT related projects however when the practice in IT is compared, the features of the projects are familiar. Traditional methods are used mostly in large scaled IT projects.

Traditional project management is usually called as classic project management. It mainly focuses on the planning of project and planning the steps in the whole cycle. However, during the execution of these steps, it is not usual to back a prior step. It estimates the whole project duration assuming the sequential steps. Therefore, it becomes harder to manage changing user needs when using traditional project management (Redlarski, 2018, September). Cram and Marabelli (2018) mention that traditional methodology focuses mostly on step by step process progression. Each step appear in SDLC cycle follows the next step and having a clear and straightforward process helps to track the progress easier. It is easier to determine the total cost and time of the project. Moreover, in traditional methods documentation is easier to follow due to its phases.

There are different models developed for traditional project management methodology. According to Kumar and Rashid (2018) frequently used ones of methods are classical waterfall model, iterative waterfall model, prototyping model, incremental model, spiral model, V-model and RAD model.

2.1.2 Agile project management

Agile is emerged as a new term in the system development sector in 2001 after a group of people published the Agile Manifesto. Before that, some techniques and concepts of agile such as extreme programming or scrum were applicable without having the term “agile”. In time, its meaning becomes larger and agile is used not only for a rapid development methodology but also for IT project management aspect. (Poth et. al., 2019)

Since the technology industry changes rapidly change, project management methods need to adapt themselves to this change. Therefore, agile project

management was emerged and gained a leading role in the industry (Stankovic, Nikolic, Djordjevic & Cao, 2013). There are different causes for companies to transform their project management method from traditional to agile: need for speeding up the project deliveries, need for being align with business and need for better skills for change management (West & Wilson, 2016). Kouzari, Gerogiannis, Stamelos and Kakarontzas (2015, July) explain the reasons for applying agile method as need for being fast, need for creating cheap solutions and need for being able to meet customer requirements without having any dependency. Kouzari et. al., (2015) clarify that agile is a requirement for companies which want to create an improvement in the processes and create more revenue as a result of improving the processes. It means that agile is usable not only for project management but also for process improvement and software development as well. Companies need to be informed about the advantages of being and working agile in order to be able to survive in a competitive environment.

In agile project management, the most important thing is the customer and the requirements of customers. Therefore, it focuses mostly on customer. Projects are divided into sprints and each sprint is designed according to the feedbacks of customer. (Sharma, Sarkar, Gupta, 2012). In addition to this, prioritization of the tasks and features in the project are also dependent on the demands of the customers. It helps to deliver working prototypes to the customers within defined time intervals (Trimble & Webster, 2013, January). In the literature it is focused mostly on the iterative and customer centric approach of the agile. Nevertheless, there are different aspects that make agile a preferred method for the projects. Sharma, Sarkar and Gupta (2012) mention that agile projects can have independent modules which can make the development easier, agile projects can minimize the risks of the projects

because of its easiness in adoption and agile projects are more collaboration based, not only with customers but also within the project team.

Besides the advantages of the agile project management and software development stated above, there are some drawbacks of agile methods. Since agile enables to change the requirements every time, it can cause a problem for defining the scope of the project. This results in wasting time in the development phase. Another problem is defined as not providing the enough documentation for the project. If the must documents are not prepared, development team or the users could have difficulties by adopting to the project. And lastly, adoption of the development team can be difficult because of frequent changes. Some requirement changes can cause changes in codes and it can be unmanageable for the developers (Sharma, Sarkar, Gupta, 2012).

Utilization of agile project management can differ on different phases of the project. Until 2014, the phase in which most agile practice has been done is unit testing of the projects (60%) and it is expected to grow. DevOps, continuous deployment and automated testing are the phases following unit testing respectively in the frame of agile project management utilization (West & Wilson, 2016). Although the utilization of agile methodology differs in phases, agile project management follows also the same processes with traditional project management. As followed in each project; planning, analysis, design, development, testing and maintenance of the project are considered in agile project management as well. The distinctive point in agile is executing all of these steps in an iterative way (Sharma, Sarkar, & Gupta, 2012).

Agile includes different application techniques such as extreme programming, Scrum, feature driven development etc. (Sharma, Sarkar, Gupta, 2012). Beside these

techniques, lean software development, kanban and crystal are also the used techniques for applying agile (Stankovic, Nikolic, Djordjevic & Cao, 2013). According to Sharma et. al. (2012) most used methodologies in agile are listed and detailed as following:

- Extreme Programming (XP): In XP, the project is divided into different small projects and allowed the changes in the requirements. Most of the requirements are collected at the beginning and the development cycles are planned according to the requirements. (Sharma, Sarkar, Gupta, 2012).
- Scrum: In scrum technique, not all the requirements are collected at the beginning of the project. It can change any time. Therefore, product backlog (PB) term is very critical in the scrum. PB consists of the list of product features for the specified sprint Sharma, Sarkar, Gupta, 2012). Sprint is the name of a single cycle in the agile project time plan and at the end of each sprint a minimum product is developed for presenting to the customer (Saleh, Huq, Rahman, 2019). Final product is developed at the end of several sprints.
- Feature Driven Development (FDD): In FDD, requirements are collected at the beginning of the project and then they are classified according to the related features. Different groups of features are composed and developments are done based on these groups (Sharma, Sarkar, Gupta, 2012).
- Kanban: Kanban technique helps to control the number of work in progress tasks in the project and provides an advantage to control the workforce required for the tasks. It proposes to use Kanban board and flow of tasks can be tracked easily through Kanban board (Saleh, Huq, Rahman, 2019).

All of these techniques have common characteristics such as multiple iterations and customer feedbacks yet their implementation processes are different than each other.

2.2 Comparison between traditional and agile project management

Before focusing on the differences between traditional and agile project management, it will be helpful to see the preference rates of these two methods. According to the West and Wilson (2016), in parallel to the increase in the development projects, usage of agile project management is also increasing. This causes a decrease in the usage of traditional project management. The results of the study done by West and Wilson in 2016 represents the status of preferred project management methods: Waterfall is 45%, agile is 37%, iterative 14%, lean 3%, other 1%. According to Hobbs and Petit (2017), utilization areas of traditional and agile project management methods differ in terms of the size and type of the project. On the one hand, traditional project management methods are used in big and one-time projects such as military or production projects one the other hand agile project management methods are used in smaller and change required IT projects. Additionally, Jovanovic and Beric (2018) emphasize that agile project management methods are more effective and applicable on IT related projects.

On the other hand, since the aim of this study to investigate the project management methods in IT projects, it is important to focus one of the pillars of IT projects: software development. Agile software development approach is gained importance between developers as time passes and different models with different aims and techniques has emerged due to this shift (Aitken & Ilango, 2013, January). Aitken and Ilango emphasizes the comparison of two methods as well. According to

their research results, Traditional Software Development is based on the processes but Agile Software Development based on the communication with users. Change management is difficult in traditional software development (TSD) since it has a defined scope at the beginning of the development. Therefore, changing some requirements becomes difficult. However, in agile software development (ASD) the requirements are determined incrementally and in each incremental phase some needs can be changed. Therefore, change management process is easier in ASD. This difference is mostly related with requirements gathering process. In TSD, all requirements are determined at the beginning but in ASD requirements are collected in intervals. Another difference is the end product submission approach: in TSD, it is not common to show the software to end users without finalizing it. After the product is wholly finished, it is submitted to the end users. In ASD, product is shown at different times to the end users and the working functions are tested by the end users. All differences are not related with the development phases. One of the other differences is about the development team's structure. In TSD, development team is dependent on the project leader's guidance. On the other side, in ASD teams are self-governing, they can decide without having any dependency (Aitken & Ilango, 2013, January). All of these dissimilarities are mainly for software development cycles but they can also be valid for overall project management because the main step in IT project managements is the development of the software. Hence, it is an expected situation to see the same factors in project management as well. Furthermore, all the variances mentioned above have been experienced by a team during a real project. Trimble and Webster (2013, January) mention the NASA's Johnson Space Center project and how the agile management of this project is brought the success. Changing from a traditional approach to an agile approach provide some learnings

such as being close to customer, being fast to customer requirement changes, having a faster testing process, having opportunity to get customer feedbacks on time, being faster for resource planning and having more satisfied customers. All these learnings prove that the theoretical advantages of agile are acceptable and usable in practice.

The differences between traditional and agile project management can be used as an advantage in some projects because it is also possible to use traditional and agile project management methodologies in a mixed way. According to Redlarski (2018), it is an advantage to utilize the benefits of two methodologies. This mix methodology is called as hybrid methodology. It is still under discussion which methodology is better for a successful project management and for successful project outcomes. Thus, hybrid methodologies are seen more useful for project management despite they cause some unclear situations in terms of responsibility delegation or execution (Cram & Marabelli, 2018).

2.3 Critical success factors

From early years, the success of projects was tried to be analyzed by some researchers. However, in those days the details of the success were not deeply researchable. After some years, researching the main effects of success on the projects and the project outcomes gained importance. Therefore, researchers developed different frameworks in order to analyze it empirically (McLeod, MacDonell, 2011). As stated by Stankovic, Nikolic, Djordjevic and Cao in 2013, critical success factors context was presented by Rockart in 1979 to provide an insight to managers in their projects. First attempts on the research of success factors were not on IT related projects. They were especially on the organizational issues such as management, change, process etc. According to McLeod and MacDonell,

(2011), at the beginning of 2000's a combination of project and IT was introduced with a model. Since all researchers developed his/her own model for their research, there are different frameworks on the literature. Some of them focus on some point, some of them take one aspect or some of them are outdated. As a result of this reality, McLeod and MacDonell (2011), developed their model which includes institutional context, process and content which were considered in studies of previous researchers and added people as a new aspect.

Besides the empirical studies conducted for the analysis of factors effecting project success, there are some real examples as well in this area. One of them is the agile transformation process of Salesforce.com. They experienced both the waterfall and agile project management methodologies and it is much emphasized that there should be some conditions in order to be successful such as top management support, training, team organization and clearness (Fry, Greene, 2007). These are the factors examined by some researchers with the help of surveys or observational techniques. Some research considers project success topics in the framework of special projects. In this context, Niazi (2015) analyzed the success of software process improvement projects in terms of the success criteria since these are the mostly failed projects according to his research. Although the context of the study is limited with a special project, the results are similar with other projects. The main factors that affect the success in software improvement projects are the top management support and willingness of the team to participate to the project (Niazi, 2015).

According to Chow and Cao (2008), it is important to know the success and failure causes of IT projects in order to eliminate the non-value-added time and increase the productivity. Therefore, the factors that have an impact on the results of the study are named as CSFs. Chow and Cao analyzed the factors under some

categories like management, people, process, technology. On the other hand, it is clearly defined by West and Wilson (2016) that culture change, team work method change and lack of practice are the first three difficulties which stand in front of the agile project management execution.

Despite of being analyzed the CSFs in different research, it is seen that analysis doesn't cover the general picture, the results are specific to an organization. It means it may not be possible to create a set of CSFs for all IT projects (Pinto & Prescott, 1988). In addition to that, it is also critical to know which CSF has influence on which step of the project because Pinto and Prescott (1988) say that factors are effective on not only total project success, they could have effect on some phases of the project. Moreover, some researchers don't focus on the factors that affect the project success but they focus on the factors that causes to the failure of projects. The research of Fatima and Gupta (2018) is an example for that. Their results present that user participation, undefined and changing requirements, time constraints and project team governance are the key elements which may cause the failure of project. It shows that it doesn't make any difference which perspective is considered for the analysis. Success and failure of the projects is a very common topic for numerous researchers.

While searching the CSFs in the literature, some of the factors are analyzed by different researchers in different times. Support of top management, colocation of team members, authorization of team members, motivation of team members, experience of team members, culture of organization, communication between team members, user support, training of team members and users, feedbacks from team members and users are the most analyzed CSF items by different researchers. All of the items found in the literature are listed in Appendix A in Table A1, Table A2 and

Table A3. All items are listed under different tables because some of them are evaluated CSFs for both method, some of them are evaluated for only traditional or for only agile. In Appendix A, Table A1 indicates the 136 common CSF items considered in traditional and agile project management. Table A2 shows the CSF items for only traditional and Table A3 indicates the CSF items for only agile.

CHAPTER 3

THEORETICAL MODEL

This chapter of the study includes the theoretical model and hypotheses for the different IT project management approaches. There are one theoretical model and seven different hypotheses for the CSFs for project success to be analyzed for different IT project management approaches. Theoretical model including all hypotheses is illustrated in Figure 3.

3.1 Theoretical model for IT project success

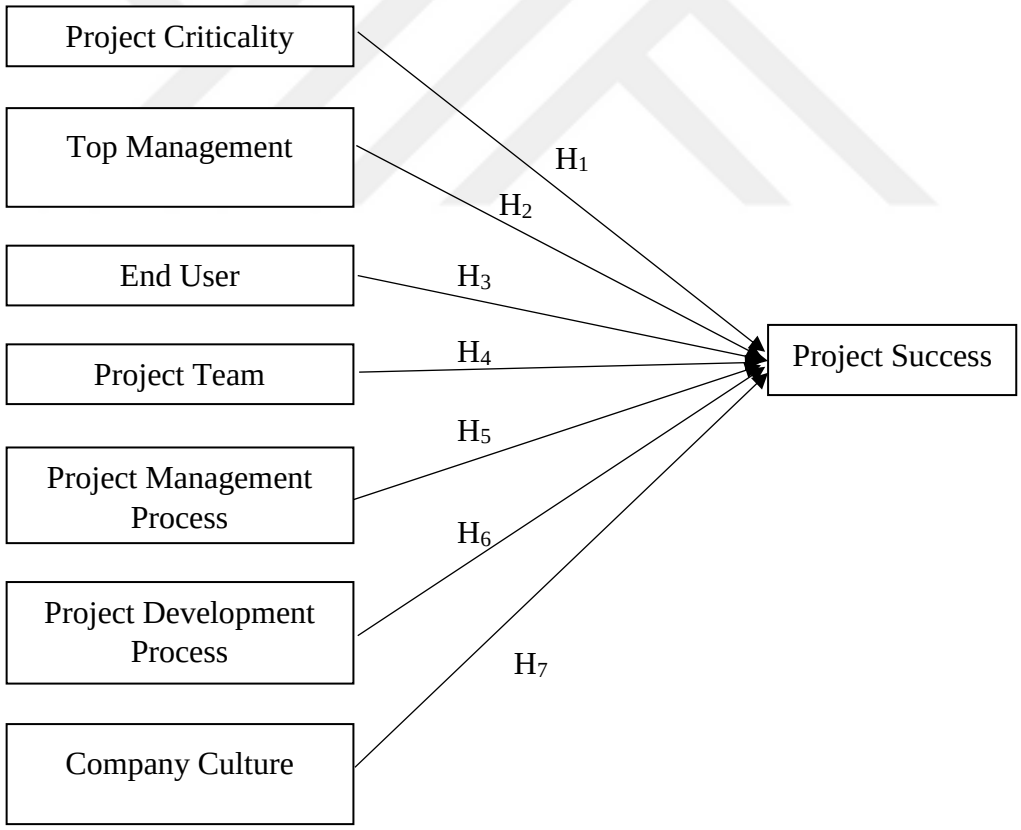

Fig 3. Theoretical Model

3.2 Hypotheses for IT project success

There are seven different hypotheses for the CSFs for IT project success. They are based on the theoretical model developed for identifying the CSFs in different IT project management methodologies.

Hypothesis 1 (H_1): Project criticality is a CSF for IT projects.

Hypothesis 2 (H_2): Top management is a CSF for IT projects.

Hypothesis 3 (H_3): End user is a CSF for IT projects.

Hypothesis 4 (H_4): Project team is a CSF for IT projects.

Hypothesis 5 (H_5): Project management process is a CSF for IT projects.

Hypothesis 6 (H_6): Project development process is a CSF for IT projects.

Hypothesis 7 (H_7): Company culture is a CSF for IT projects.

CHAPTER 4
METHODOLOGY

Since the aim of this study is to clarify the CSFs and their effects on project success for different IT project management methodologies and identify if there is a difference or similarity between factors affecting the success for IT different project management methodologies. For this purpose, a survey research is conducted between project managers from different sectors. In this survey, mainly the questions about general information for the project such as budget, duration, number of employees, number of departments, scope and also for the company such as operating years, yearly turnover and number of employees are asked. Besides these, survey questions which measure the effects of seven CSFs considering the items listed in Table A4 in Appendix A are asked.

4.1 Survey preparation

The survey is prepared after literature search because for the survey questions some references are needed from the literature. In the literature search, CSFs for traditional project management and agile project management are searched and identified. More than twenty resources are searched and all items for each CSFs are collected. In addition to CSF, project success criteria and project performance indicators are also defined.

In total 232 CSF items are collected from the literature by considering agile and traditional project management methodologies. Afterwards, the items which are similar are considered as one item, and as a result, 118 different items are remained in the list. Among those 118 items, some of the items which are covered by other

items; such as organizational properties, work dynamics, process action teams are also eliminated from the list. Finally, the remaining 66 items are categorized under seven CSFs.

After the list is finalized, all items converted into a question in the survey. Before dissemination of the survey, survey is pretested with three different respondents. All testers are working as IT project managers in different sectors. Survey is shared with them and an interview with each of these testers is done. According to the results, the following changes are made in the survey:

- Wording of some questions
- Arrangement of questions
- Compulsory/optional questions
- Increasing the items sector list
- Increasing the items department list
- Adding company demographic questions

After these changes, the survey is finalized and opened to the responses. CSFs asked in the survey by using the related items are listed in the Table A4 in Appendix A.

Survey is prepared in Turkish since the target of the survey is IT project managers in Turkey. Turkish version of the survey can be found in Appendix B. However, for this study, survey is translated into English. English version of the survey can be found in Appendix C.

Below sections explain how the survey is prepared, how its structure is and how it is distributed.

4.2 Structure of survey

The survey consists of 9 pages including the first page which explains the aim of study and owners of the study. In the second page, project management expertise of the respondent is asked by using a nominal scale which consists of “Yes” and “No”. It is required to have an IT project management expertise in order to continue to the survey questions. If the respondent has no expertise on IT project management, then the survey is finished. For the respondent who has the project management expertise, survey continues with the following sections.

The survey consists of 4 different sections: Questions related to project characteristics, CSFs, project success metrics and company demographics. In the first section, seven questions are created with the aim of understanding the project characteristics such as project budget, project duration, number of employees work on the project, number of departments involved to the project, project management method, scope of the project and target department(s) which involved to this project. Questions for project budget, project time, number of employees work on the project, number of departments involved to the project are prepared in ordinal scale. Questions for project management method, scope of the project, department(s) require(s) this project are prepared in nominal scale.

In the second section, by using the items, questions for each CSF are asked in order to measure their level of existence and acceptance in the project. In total 55 questions are asked in this section. First question is about the criticality of the project for the company. Other questions are related to top management, end user, project team, project management process and project development process. All questions are prepared in a 5-points Likert scale: “Strongly Disagree”, “Disagree”, “Neutral”, “Agree” and “Strongly Agree”. Since not all projects have a software development

process, except project development process questions, all other questions are required to be answered.

In the third section, project success metrics are asked in one section which has five sub questions and which has a 5-point Likert scale: “Strongly Disagree”, “Disagree”, “Neutral”, “Agree” and “Strongly Agree”. The aim of these questions is to understand how successful the project is. Project success is evaluated under five different metrics, cost, budget, scope, satisfaction and alignment. In Appendix C, all questions related with the top management factor items, end user factor items, project team factor items, project management process factor items, project development process factor items questions and project success metrics items can be reviewed.

In the fourth and last section, six questions are asked in order to collect demographic data of the company in which project is executed and company culture question with three sub-questions is asked. Questions in this section are as following: organization structure of the company which has nominal scale, organization culture of the company with 5-points Likert scale, project management method preferences of the company which has interval scale, company sector which has nominal scale, operating years of the company which has ordinal scale, number of employees in the company which has ordinal scale and yearly gross profit of the company which has ordinal scale.

All items asked in the survey are listed in Appendix D in Table D1 including the scale and the source of the item from literature search

4.3 Distribution of survey

The survey is distributed by using convenience sampling method. Survey is sent to the IT project managers in different sectors and companies in Turkey by using personal relations. Other than that, it is published in LinkedIn in order to reach more respondents who have different demographics. All responses are collected digitally, no paper-based methods are used. In total, 247 responses were collected for the survey within 2 months. Although 247 responses collected, not all the answers are convenient to use for analysis. 21 of the respondents have no project management experience. It means they cannot answer the questions. When looking at the remaining 226 of responses, 48 of them were incomplete. It means respondents don't complete all of the questions. Therefore, incomplete or partial completed survey responses are removed from the analysis. As a result, 178 responses are used in further analysis.

CHAPTER 5
ANALYSIS AND FINDINGS

In this chapter results of the exploratory analysis of survey responses are represented and it is discussed whether the hypotheses listed in Chapter 3 are supported or not. Before representing the results of the analysis, questions are reviewed and analyses are done in SPSS.

Firstly, descriptive statistics for project characteristics and company demographics are determined. Secondly, multiple regression method for hypotheses testing, ANOVA and t-test for explanatory analysis are used. Results of the tests are explained in each section and hypotheses approvals or rejects are clearly interpreted.

5.1 Descriptive findings

In the first part of survey project budget, project duration, number of employees worked in project, number of departments involved to project, project management method used in project, scope of project, departments categories which require this project are asked. In the last part of survey, company sector year, company employee number, company annual turnover, company organization structure, company project management preference and company sector questions are asked. For each of them descriptive findings are listed in next tables.

In Table 1 budget distribution of projects are classified. According to this, most of the projects evaluated in the survey have the budget more than 500,000 TL with 44%. Then, it is followed by projects having budget less than 250,000 TL with 43%. There is a small portion of projects with budget between 251,000 and 500,000

TL (12%). It means projects are distributed almost equally according to their budget less than 250,000 TL and more than 500,000 TL.

Table 1. Project Budget Distribution

Planned budget	Frequency	%
< 50,000 TL	34	19%
51,000 – 250,000 TL	43	24%
251,000 – 500,000 TL	22	12%
501,000 – 750,000 TL	18	10%
> 750,000 TL	61	34%

Table 2 depicts the distribution of projects according to their total duration. More than half of the projects take more than 6 months. So, we can conclude that most of the projects evaluated in the survey are long projects compared to number of projects less than 6 months.

Table 2. Project Duration Distribution

Planned duration	Frequency	%
< 3 months	32	18%
3 - 6 months	52	29%
> 6 months	94	53%

In Table 3, it is clearly seen that 88% of the projects are done with more than 3 employees.

Table 3. Employee Number Distribution

Number of employees worked	Frequency	%
< 3	21	12%
Between 3 - 6	79	44%
> 6	78	44%

Table 4 shows that how many departments involved to the projects. There is almost an equal distribution between scales of 1-2 departments and 3-4 departments. However, number of projects done with 5 and more departments are less than others.

Table 4. Department Number Distribution

Number of departments involved	Frequency	%
1 - 2 department	64	36%
3 - 4 departments	67	38%
5 and more departments	47	26%

In Table 5 distribution of project management methodologies used in projects is presented. Three responses were given as “Other” by respondents, they are counted as traditional project management because in detail they were methods of traditional project management.

As a result, most of the projects are managed with traditional project management methodology. Then it is followed by projects in which both agile and traditional methodology were used together. It means that 33% of projects are managed by hybrid methodology. After these results, CSFs in hybrid project methodology is also considered for analyses. Lastly, agile project management methodology has 25% of the total answers. Because of the fact that this survey is answered by project managers only in Turkey, it can be concluded as usage of agile project management is still low in companies in Turkey.

Table 5. Project Management Method used in Projects

PM method used	Frequency	%
Traditional	75	42%
Hybrid	58	33%
Agile	45	25%

High percentage of projects 90% have at least an integration or connection with other systems in the company. It makes the projects more complex and longer compared to projects which have no connection. Table 6 summarizes the frequency of projects with no connection, several connections and many connections with other systems.

Table 6. Project Scope

Project Scope	Frequency	%
It has no connection with other systems and projects.	18	10%
It has several connections with other systems and projects.	84	47%
It has many connections with other systems and projects.	76	43%

Table 7 is composed for showing the list of departments which require this project. Ten different departments are captured and there is "Other" option as well since some departments are selected once and they are collected under "Other" category. Projects are developed mostly for sales department with 19%, it is followed by marketing, finance, supply chain, production and HR with 14%, 13%, 12%, 12% and 10% respectively. Table 12 shows that a lot of different departments from shop floor to back office are covered within the survey.

Table 7. Department Categories of Projects

Target department of project	Frequency	%
Sales	73	19%
Marketing	54	14%
Finance	52	13%
Supply Chain	48	12%
Production	47	12%
HR	38	10%
R & D	38	10%
IT	17	4%
Operation	5	1%
Corporate Communication	3	1%
Other	15	4%

Following tables Table 8, Table 9 and Table 10 are related with the demographics of the companies of respondents. According to the data, most of the companies (47%) are operating more than 25 years in the sector. It means that respondents of the survey are generally from long-lived companies. There is a small number of companies (3%) with less than 3 years. These companies are most

probably startup companies in IT sector. Results of number of employees in the company and annual turnover of the company are very similar to company operating year. Most of the companies have the greatest number of employees with more than 250 employee and most annual turnover more than 50,000,000 TL. These results verify that respondents are from big and high-volume companies.

Table 8. Company Sector Year Distribution

Sector years	Frequency	%
< 3 years	8	4%
Between 3 - 10 years	27	15%
Between 11 - 25 years	58	33%
Between 26 - 50 years	29	16%
> 50 years	56	31%

Table 9. Company Employee Number Distribution

Number of employees	Frequency	%
< 50	20	11%
Between 50 - 100	28	16%
Between 101 - 250	25	14%
Between 251 - 500	14	8%
> 500	91	51%

Table 10. Company Annual Turnover Distribution

Annual turnover	Frequency	%
< 1,000,000 TL	11	6%
Between 1,000,000 – 10,000,000 TL	13	7%
Between 11,000,000 – 50,000,000 TL	22	12%
Between 51,000,000 – 100,000,000 TL	11	6%
> 100,000,000 TL	78	44%
N/A	43	24%

Besides company characteristics, organization structure of the company is asked. The results show that almost half of the companies have the functional organization structure which is not very suitable for agile project management since agile project management requires more cross functional organizations and teams.

Matrix and project-based organization structures are equal. Additionally, there is an "Other" answer which is detailed as "All of them".

When answers of project management method selection and company organization structure are compared, the consistency between answers of two questions can be easily detected. As functional organization structure has the 49%, traditional project management selection has 42% because functional structures are more inclined to traditional project management. By looking project-based organization structure with 25% it becomes clear why agile project management methodology has the same percent of answers 25%. In agile project management it is expected that teams to work cross-functional and come together for a specific purpose or project. Table 11 shows the results of the company organization structure preferences of the respondents.

Table 11. Company Organization Structure Distribution

Organization structure	Frequency	%
Functional	88	49%
Matrix	45	25%
Project based	44	25%
Other	1	1%

Table 12 is prepared for showing the list of sectors that the companies are operating. 11 different departments are captured and there is "Other" option as well since some sectors are selected once and they are collected under "Other" category. Companies are at most from IT sector since the initial purpose of the study is determining the CSFs of agile and traditional project management methodologies in IT projects. Thus, it is prioritized to send the survey to IT companies and the result data verify this. However, since the survey is distributed by using snowball technique, there are several sectors in the list. It is critical for reaching to IT project managers from different sectors in order to create a more reliable result data. Sectors

are mostly from IT with 35% it is followed by FMCG, telecommunication, holding, finance and health with 13%, 10%, 17%, 6% and 6% respectively.

Table 12. Company Sector Distribution

Company sector	Frequency	%
IT	63	35%
FMCG	23	13%
Telecommunication	17	10%
Holding	12	7%
Finance	11	6%
Health	10	6%
Consultancy	9	5%
Energy	5	3%
Production	6	3%
Aviation	4	2%
Defense Industry	3	2%
Other	15	8%

In the last part of the survey, project management method used in the company in general is asked. The results are shown in Table 13. In parallel to the results of project PM methodology, company PM preference is also mostly on traditional methodologies. Agile and hybrid methodology selections are almost equal for the companies.

Table 13. Mean Value of Company Project Management Preference

Project Management Method	Mean (over 5)	Std. Deviation
Traditional	3.49	1.48
Agile	2.66	1.54
Hybrid	2.39	1.75

Table 14 shows the mean value of respondents' answers for project criticality. It is above 3.00. Hence, we can conclude that projects evaluated in this survey are critical projects for the company.

Table 14. Mean Value of Project Criticality

Factors	Mean (over 5)	Std. Deviation
Criticality of the project for company processes and / or policies	3.69	0.83

Table 15 shows the mean value of respondents' answers for top management items. According to the results, top management support has the highest value with 4.03 compared to top management participation and top management knowledge. In total, all of them are above the 3.00 over 5.00.

Table 15. Mean Value of Top Management Factor Items

Factors	Mean (over 5)	Std. Deviation
Top management support was received during the project.	4.03	0.78
The participation of top management in the project was high.	3.50	0.99
Top management had information about the applied project management methodology.	3.43	1.07

Table 16 shows the mean value of respondents' answers for end user factor items. There are differences between the mean values item to item. End user information about the project scope item has the most mean value (3.82) but end user information about the PM methodology has the lowest mean value (2.67). Mean values of end user commitment, end user's training and end user participation have the similar mean values 3.67; 3.67 and 3.62 respectively. End user experience has mean value of 3.02 which shows that experience level of end users is in the middle range of scale.

Table 16. Mean Value of End User Factor Items

Factors	Mean (over 5)	Std. Deviation
The commitment of end users to the project was high.	3.67	0.91
The participation of end users to the project was high.	3.69	0.95
End users had information about the project.	3.82	0.93
End users had experience about the project.	3.02	1.07
End users had knowledge about the applied project management methodology.	2.67	0.98
Enough training was given to end users.	3.67	0.96

Table 17 shows the mean value of respondents' answers for project team factor items. In total, 20 different items are asked and only two of them have the mean value above 4.00; project team expertise level and the existence of communication technologies for project team. They are followed by project team commitment level, existence of knowledge/experience sharing technologies for project team, project team's face to face meeting tendency and project team's physical office conditions adequateness are the items that have the highest mean values like 3.98; 3.97; 3.94 and 3.93, respectively. On the other hand, project team's communication outside of the working hours and reward systems used for project team have the lowest mean values of 2.91 and 2,53. Mean values of other items change between 3.20 and 3.80.

Table 17. Mean Value of Project Team Factor Items

Factors	Mean (over 5)	Std. Deviation
The project team was able to make independent decisions during the project.	3.25	0.99
The project team had the authority to take responsibility in order to proceed the project.	3.70	0.82
The project team was highly motivated throughout the project.	3.72	0.89
The commitment of project team to the project was high.	3.98	0.79
The project team members relied on each other.	3.87	0.85
There was transparency between project team members.	3.79	0.86
The project team came together in social activities outside of work.	2.91	1.09
The project team made daily meetings and informed each other about the process.	3.33	1.08
The project team carried out their meetings face to face.	3.94	0.82
The project team had expertise about the project.	4.04	0.81
The project team had experience about the project.	3.86	0.89
The project team received adequate technical training.	3.60	0.98
The project team worked at the same location throughout the project.	3.31	1.20
The physical conditions of the project team's work environment were enough (Office equipment, meeting rooms, etc.).	3.93	0.83
The work environment of the project team was in accordance with the ergonomic conditions.	3.83	0.91
The working environment of the project team was quiet enough.	3.39	1.07
The working hours of the project team were flexible.	3.55	1.18
There were enough in-house technologies for communication of project team.	4.10	0.91
The project team had adequate technologies in the company for sharing knowledge and experience.	3.97	0.94
Rewards systems were used in the work of the project team.	2.53	1.18

Table 18 shows the mean value of respondents' answers for project management process factor items. In total, 22 different items are asked and only two of them have the mean value above 4.00; risk management level in the project and clearness of project objectives. All of the items have the mean values bigger than 3.00. Thus, it can be concluded that all items are in a good level in the projects. The mean value of resistance level to project in the company is low, it means that there is not a high resistance in the companies. Additionally, piloting of the project with the mean value of 3.12 is also low when compared to other items.

Table 19 shows the mean value of respondents' answers for project development process factor items. This question was not mandatory, therefore missing answers are replaced in SPSS by inserting the mean value. Mean values of each item are high and very close to each other.

Table 20 shows the mean value of respondents' answers for company culture factor items. Although company innovation level is high (mean value of 3.79), resistance to change has a low value. It means companies are very open to innovations without having a high level of resistance.

Table 21 shows the mean value of respondents' answers for process success items. Project success is measured with five different items. All items have a mean value above 3.00 but when a comparison made between items, project scope changes has the lowest mean value. Customer satisfaction level is the highest mean value.

Table 18. Mean Value of Project Management Process Factor Items

Factors	Mean (over 5)	Std. Deviation
The objectives of the project were clear.	4.16	0.81
There was alignment between project objectives and company objectives.	3.96	0.90
The success criteria of the project were obvious.	3.84	0.97
Quality measurement was carried out regularly in the project.	3.28	1.10
Sufficient work was done to identify project requirements.	3.84	0.94
Changes in project requirements were managed correctly.	3.66	1.01
Project risks were managed correctly.	3.45	1.05
The project process was systematically monitored.	3.81	0.92
The project was followed in accordance with the project management methodology applied.	3.86	0.87
There were enough technologies in the company to follow the project process.	3.80	1.07
Version control technologies in the company were available to track project versions.	3.66	1.05
Company policies and procedures were followed during the project.	4.08	0.78
Documentation was enough in the project process.	3.61	1.05
The project process is owned by the company.	3.88	0.85
The feedback received from the project team was taken into consideration during the project.	3.97	0.76
Feedback from end users was taken into consideration during the project.	3.88	0.92
At the end of the project. the process and outputs were evaluated.	3.87	0.85
Enough workforce resources were allocated for the project.	3.59	0.95
Adequate budget was allocated for the project.	3.74	0.96
External consultancy support was received for the project.	3.23	1.42
The resistance to the change resulted from project was high.	3.06	1.18
The project was piloted.	3.12	1.33

Table 19. Mean Value of Project Development Process Factor Items

Factors	Mean (over 5)	Std. Deviation
The coding standards were complied with during the project development process.	3.85	0.84
Software development standards were followed during the project development process.	3.90	0.80
In the project development process, module and integration tests were done adequately.	3.86	0.85

Table 20. Mean Value of Company Culture Factor Items

Factors	Mean (over 5)	Std. Deviation
The company is innovative and open to innovation.	3.79	0.94
The company does not avoid taking risks.	3.16	1.05
Resistance to change in the company is high.	2.81	1.08

Table 21. Mean Value of Project Success Items

Factors	Mean (over 5)	Std. Deviation
The project was completed in accordance with the calendar.	3.24	1.25
The project was completed in accordance with the budget.	3.57	1.07
Customer satisfaction was high at the end of the project.	3.82	0.94
At the end of the project, compliance with business objectives was achieved.	4.03	0.85
The scope of the project remained unchanged.	3.00	1.20

In addition to mean and standard deviation results of CSF item questions, answer details are listed in Appendix E. Table E1 shows answer details for project criticality factor question, Table E2 shows answer details for top management factor items questions, Table E3 shows answer details for end user factor items questions, Table E4 shows answer details for project team factor items questions, Table E5

shows answer details for project management process factor items questions, Table E6 shows answer details for project success criteria questions, Table E7 shows answer details for project development process factor items questions, Table E8 shows answer details for company culture factor items questions, Table E9 shows answer details for company project management preference questions.

5.2 Internal consistency of scales

Reliability analysis is done for the items measured with 5-points Likert scaled items in order to evaluate their internal consistency in each category. Cronbach's alpha is used for the measurement and limit value for Cronbach's alpha is defined as 0.70.

In order to provide consistency limit, one item from "Top Management" and one item from "Company Culture" is removed because removed items causes an inconsistency. Normally, both of them have three items but after removing one item, their items decrease to two. Since they are removed from the items, they are not used in further analysis. After these eliminations, in Table 22 all Cronbach's alpha values are listed and all of them are above 0.70 limit.

Table 22. Reliability of Factors

Factors	Number of Items	Cronbach's Alpha
Top Management	2	0.70
End User	6	0.81
Project Team	20	0.86
Project Management Process	22	0.88
Project Development Process	3	0.94
Company Culture	2	0.71
Project Success	5	0.82

Since Cronbach's Alpha values are equal or higher than 0.70 for each factor, it can be summarized that all factors are measured successfully with related items. Therefore, mean values of each category is calculated by using the mean values of each related items. Overall means of each category is used in the multiple regression analysis which will be explained in next section. With the same method, project success is also used as a single factor by calculating the mean values of five different items.

5.3 Multiple regression analysis

Multiple regression analysis is used to examine the CSFs in traditional, agile and hybrid methodologies. Before conducting the multiple regression test, responses are separated for traditional, agile and hybrid project management methodology selection. As a result, 75 responses are used for CSF analysis in traditional project management, 45 responses are used for CSF analysis in agile project management, 58 responses are used for CSF analysis in hybrid project management.

5.3.1 Multiple regression for factors in traditional project management

Table 23 shows the summary of regression model for factors and project success in traditional project management and Table 24 shows the ANOVA values for factors and project success in traditional project management.

Significance level of F value in Table 26 is lower than the acceptable significance level 0.05. Therefore, there is a relationship between factors and project success. R and R square values are bigger than 0.00 and Durbin Watson value is in ideal range.

Table 23. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.755[a]	.570	.525	.63448	2.094

a. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture
b. Dependent Variable: Project Success

Table 24. Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	35.740	7	5.106	12.683	.000[b]
	Residual	26.972	67	.403		
	Total	62.711	74			

a. Dependent Variable: Project Success
b. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture

Table 25 shows the significance values of each factor with respect to project success. Factors with significance level bigger than 0.05 can be accepted as in a relation with the project success. Project team and project development process factors have significance levels 0.014 and 0.002 and beta values 0.672 and 0.406 respectively. It means that project team and project development process factors have a positive impact on the project success.

According to the results, H_4 and H_6 are supported. However, H_1, H_2, H_3, H_5, H_7 are rejected because regression results are insignificant for project criticality, top management, end user, project management process and company culture.

Table 25. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.079	.620		-1.742	.086
	Project Criticality	-.038	.105	-.034	-.359	.721
	Top Management	.064	.136	.056	.470	.640
	End User	.040	.112	.034	.353	.725
	Project Team	.672	.266	.392	2.527	.014
	Project Management Process	.183	.263	.117	.695	.489
	Project Development Process	.406	.127	.336	3.207	.002
	Company Culture	-.084	.088	-.086	-.957	.342

a. Dependent Variable: Project Success

In the literature, Niazi (2015) mentions that training and mentoring of team and staff involvement are CSFs for project success in traditional project management. These are the single items which is asked in our survey under project team category. Additionally, McLeod and MacDonell (2011) analyzed that project team has an impact on the project outcomes. In traditional project management, the involvement of end users is not so high. After requirement collection is completed, all responsibility is taken by the project team. Until the project is finished, project team performs tasks. Thus, their effects are high in the project success. Moreover, McLeod and MacDonell (2011) emphasize that standard development method selection is also an influencer on project outcomes. All of them support our analysis results for traditional project management.

5.3.2 Multiple regression for factors in agile project management

Table 26 shows the summary of regression model for factors and project success in agile project management and Table 27 shows the ANOVA values for factors and project success in agile project management.

F value with significance level 0.006 in Table 29 is acceptable according to the significance level limit 0.05. Therefore, there is a relationship between factors and project success. R and R square values are bigger than 0.00. Durbin Watson value is not very high but it is still in ideal range.

Table 26. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2	.627[a]	.393	.278	.57696	1.921

a. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture
b. Dependent Variable: Project Success

Table 27. Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	7.968	7	1.138	3.419	.006[b]
	Residual	12.317	37	.333		
	Total	20.284	44			

a. Dependent Variable: Project Success
b. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture

Table 28 shows the significance values of each factor with respect to project success. Project criticality and process management process factors have significance levels 0.041 and 0.020 and beta values -0.290 and 0.506 respectively. It means that project criticality and project management process factors have an impact on the

project success but project criticality affects the success negatively, project management process affects positively.

Table 28. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	1.289	.876		1.472	0.150
	Project Criticality	-.290	.137	-.338	-2.122	0.041
	Top Management	.205	.178	.222	1.152	0.257
	End User	.284	.162	.272	1.750	0.088
	Project Team	-.359	.200	-.322	-1.796	0.081
	Project Management Process	.506	.209	.361	2.423	0.020
	Project Development Process	.196	.140	.202	1.395	0.515
	Company Culture	.084	.127	.103	.658	0.171

a. Dependent Variable: Project Success

According to the results, H_1 and H_5 are supported. However, H_2, H_3, H_4, H_6, H_7 are rejected because regression results are insignificant for top management, end user, project team and project development process and company culture.

Guidance during the project, monitoring the project process, feedback collection are the factors which affects the project success (Kouzari, et al., 2015). These items are covered in our model under project management process factor. Since agile project management requires continuous feedbacks from customers, creating versions and managing the versions, project pilots, project management process factor becomes a critical factor for the success. Similarly, project management process is found by Chow and Cao (2008) as CSF in agile project

management. These are the similar results to our multiple regression analysis results for the agile project management. Additionally, according to the findings of Ahimbisibwe, Cavana and Daellenbach (2015) project criticality is seen a CSF mostly in agile project management. According to our results, project criticality is a negative influencer for the project success. It means, the more critical the project for the company, the less likely it is to fail.

5.3.3 Multiple regression for factors and hybrid project management

Table 29 shows the summary of regression model for factors and project success in hybrid project management and Table 30 shows the ANOVA values for factors and project success in hybrid project management.

In Table 35 F value with 5.211 with significance value 0.000 is lower than the significance limit 0.05. Therefore, there is a relationship between factors and project success. R and R square values are bigger than 0.00 and Durbin Watson value is still in ideal range.

Table 29. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
3	.649[a]	.422	.341	.61540	2.074

a. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture
b. Dependent Variable: Project Success

Table 30. Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	13.815	7	1.974	5.211	.000[b]
	Residual	18.936	50	.379		
	Total	32.751	57			

a. Dependent Variable: Project Success
b. Predictors: (Constant), Project Criticality, Top Management, End User, Project Team, Project Management Process, Project Development Process, Company Culture

Table 31 shows the significance values of each factor with respect to project success. Project team and process management process factors have significance levels 0.045 and 0.004 and beta values 0.675 and 0.736 respectively. It means that project team and project management process factors have a positive impact on the project success.

Table 31. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	-.673	.971		-.694	.491
	Project Criticality	-.004	.103	-.004	-.035	.972
	Top Management	-.111	.123	-.113	-.907	.369
	End User	-.042	.155	-.032	-.273	.786
	Project Team	.675	.328	.304	2.058	.045
	Project Management Process	.736	.247	.483	2.981	.004
	Project Development Process	-.065	.073	-.104	-.889	.378
	Company Culture	-.062	.120	-.066	-.516	.608

a. Dependent Variable: Project Success

According to the results, H_4 and H_5 are supported. However, H_1, H_2, H_3, H_6, H_7 are rejected because regression results are insignificant for project criticality, top management, end user, project management process and project development process and company culture. Project team and project management process are the success factors in hybrid project management.

After analyzing the results of regression for hybrid methodology, it is seen that one of the CSFs is same with the CSFs in traditional project management and the other one is same with the CSFs in agile project management. It is supported by results of the previous analyses and also discussions in literature. Since hybrid methodology is a combination of traditional and agile project management, it is not surprising to see similar success factors with traditional and agile methodologies.

5.4 ANOVA and t-test analyses

In order to check if there are differences between different groups of project budget, of project duration, of number of employees worked in project, of number of departments involved in the project and of project scopes with respect to project success, one-way ANOVA and t-test are used.

For the first five of the factors, responses are separated according to traditional, agile and hybrid project management methodology selection. As a result, 75 responses are used for traditional project management, 45 responses are used for agile project management, 58 responses are used for hybrid project management. For last two test, project management methodology selection and company organization structure, all responses are used together.

Moreover, one-way ANOVA test is used to check the homogeneity of variances between traditional, agile and hybrid methodologies with respect to project success. The relationship between company organization structure and project success is analyzed as well by using ANOVA test.

5.4.1 ANOVA and t-test Analysis for Project Budget and Project Success

Although there are five different groups in the survey for project budget question, distribution of answers is different between groups. In order to make a successful ANOVA and t-test analyses, number of responses in the groups should be close to each other. Therefore, first two groups and last three groups are merged for the analysis. As a result, two different groups are formed. Thus, independent sample t-test is used.

Levene's test for equality of variances with significance value 0.840 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project budget regarding project success in traditional project management. Table 32 shows that significance level of 0.346 is above the limit of 0.05 which means that there is no significant difference between groups of project budget with respect to project success in traditional project management. Therefore, project budget has no significant impact on project success in traditional project management.

Table 32. T-test for Project Budget Limits in Traditional Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
< 250.000 TL	39	3.57	0.041	0.840	0.901	0.346
> 251.000 TL	36	3.37				

For agile project management, first two groups and last three groups are merged, as well; because distribution of answers is different between groups. As a result, two different groups are formed. Thus, independent sample t-test is used.

Levene's test for equality of variances with significance value 0.286 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different group of project budgets regarding project success in agile project management. Table 33 shows that significance level of 0.680 is above the limit of 0.05 which means that there is no significant difference between groups of project budget with respect to project success in agile project management. Therefore, project budget has no significant impact on project success in agile project management.

Table 33. T-test for Project Budget Limits in Agile Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
< 250.000 TL	23	3.67	1.170	0.286	-0.416	0.680
> 251.000 TL	22	3.75				

In hybrid project management, first two groups and last three groups are merged in the analysis because distribution of answers is different between groups. As a result, two different groups are formed. Thus, independent sample t-test is used.

Levene's test for equality of variances with significance value 0.582 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project budget regarding project success in hybrid project management. Table 34 shows that significance level of 0.094 is above the limit of 0.05 which means that there is no significant difference between groups of project budget with respect to project success in hybrid project management.

Therefore, project budget has no significant impact on project success in hybrid project management.

Table 34. ANOVA Test for Project Budget Limits in Hybrid Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
< 750.000 TL	30	3.63	0.307	0.582	1.704	0.094
> 751.000 TL	28	3.29				

As a summary, t-test results point out that project budget has no effect on project success when three different IT project management methodologies are considered.

5.4.2 ANOVA and t-test analysis for project duration and project success

Although there are three different groups in the survey for project duration question, distribution of answers is different between groups. Therefore, first two groups are merged for traditional project management. As a result, two different groups are formed. Thus, independent sample t-test is used in traditional project management.

Levene's test for equality of variances with significance value 0.774 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project durations regarding project success in traditional project management. Table 35 shows that significance level of 0.178 is above the limit of 0.05 which means that there is no significant difference between groups of project duration with respect to project success in traditional project management. Therefore, project duration has no significant impact on project success in traditional project management.

Table 35. T-test for Project Duration in Traditional Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
≤ 6 months	42	3.60	0.083	0.774	1.360	0.178
> 6 months	33	3.32				

In agile project management, numbers of responses are close to each other in each group. Therefore, there is no need for merging groups. Since there are three different groups, ANOVA analysis is applied.

Levene's test for equality of variances with significance value 0.678 shows that groups do not significantly differ in variances; therefore, the ANOVA test can be applied in order to control if there is a significant difference between different groups of project duration regarding project success in agile project management. Table 36 shows that significance level of 0.672 is above the limit of 0.05 which means that there is no significant difference between groups of project duration with respect to project success in agile project management. Therefore, project duration has no significant impact on project success in agile project management.

Table 36. ANOVA Test for Project Duration in Agile Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
< 3	11	3.87				
Between 3 - 6	16	3.66	0.393	0.678	0.402	0.672
> 6	18	3.66				

For analyzing the results in hybrid project management, first two groups are merged because distribution of answers is different between groups. As a result, two different groups are formed. Thus, independent sample t-test is used in hybrid project management.

Levene's test for equality of variances with significance value 0.131 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project duration regarding project success in hybrid project management. Table 37 shows that significance level of 0.236 is above the limit of 0.05 which means that there is no significant difference between groups of project duration with respect to project success in hybrid project management. Therefore, project duration has no significant impact on project success in hybrid project management.

Table 37. T-test for Project Duration in Hybrid Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
≤ 6 months	15	3.67	2.348	0.131	1.198	0.236
> 6 months	43	3.40				

As a summary, ANOVA and t-test results point out that project duration has no effect on project success when three different IT project management methodologies are considered.

5.4.3 ANOVA and t-test analysis for number of employees and project success

For analyzing the significance between number of employees worked in the project and project success in different project management methodologies, both ANOVA and t-test analyses are used.

In traditional project management, distribution of responses is close to each other. Therefore, there is no need for merging groups. Since there are three different groups, ANOVA analysis is used.

Levene's test for equality of variances with significance value 0.119 shows that groups do not significantly differ in variances; therefore, ANOVA test can be applied in order to control if there is a significant difference between groups of number of employees worked in project regarding project success in traditional project management. Table 38 shows that significance level of 0.843 is above the limit of 0.05 which means that there is no significant difference between groups of number of employees with respect to project success in traditional project management. Therefore, number of employees worked in the project has no significant impact on project success in traditional project management.

Table 38. ANOVA Test for Number of Employees in Traditional Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
< 3 employees	12	3.33				
Between 3 – 6 employees	35	3.51	2.194	0.119	0.172	0.843
> 6 employees	28	3.50				

In agile project management, answers are grouped again for making a meaningful analysis. Therefore, first two groups are merged because distribution of answers is different between groups. As a result, two different groups are formed. Thus, independent sample t-test is applied in agile project management.

Levene's test for equality of variances with significance value 0.202 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between groups of number of employees worked in project regarding project success in agile project management. Table 39 shows that significance level of 0.559 is above the limit of 0.05 which means that there is no significant difference between

groups of number of employees with respect to project success in agile project management. Therefore, number of employees has no significant impact on project success in agile project management.

Table 39. T-test for Number of Employees in Agile Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
≤ 6 employees	28	3.66	1.676	0.202	-0.589	0.559
> 6 employees	17	3.79				

In hybrid project management, first two groups are merged because distribution of answers is different between groups. Thus, independent sample t-test is applied in agile project management.

Levene's test for equality of variances with significance value 0.454 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between groups of number of employees worked in project regarding project success in hybrid project management. Table 40 shows that significance level of 0.243 is above the limit of 0.05 which means that there is no significant difference between groups of number of employees with respect to project success in hybrid project management. Therefore, number of employees has no significant impact on project success in hybrid project management.

Table 40. T-test for Number of Employees in Hybrid Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
≤ 6 employees	25	3.60	0.569	0.454	1.180	0.243
> 6 employees	33	3.36				

As a summary, ANOVA and t-test results point out that number of employees has no effect on project success when three different IT project management methodologies are considered.

5.4.4 ANOVA analysis for number of departments and project success

Table 41 shows the results of one-way ANOVA analysis to test difference in project success in traditional project management between different groups of number of departments involved in the project. Levene's test for equality of variances shows that groups do not significantly differ in variances; hence, one-way ANOVA test can be used. One-way ANOVA results with an F value 0.862 and significance level 0.426 indicate that there is no significant difference between groups of number of departments with respect to project success in traditional project management. Therefore, number of departments has no significant impact on project success in traditional project management.

Table 41. ANOVA Test for Number of Departments in Traditional Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
1 - 2 department	32	3.53				
3 - 4 departments	27	3.58	0.389	0.679	0.862	0.426
5 and more departments	16	3.21				

Table 42 shows the results of one-way ANOVA analysis to test difference in project success in agile project management between different groups of number of departments involved in the project. Levene's test for equality of variances shows that groups do not significantly differ in variances; hence, one-way ANOVA test can be used. One-way ANOVA results with an F value 0.258 and significance level

0.774 indicate that there is no significant difference between groups of number of departments with respect to project success in agile project management. Therefore, number of departments has no significant impact on project success in agile project management.

Table 42. ANOVA Test for Number of Departments in Agile Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
1 - 2 department	17	3.80				
3 - 4 departments	15	3.63	0.741	0.483	0.258	0.774
5 and more departments	13	3.69				

Table 43 shows the results of one-way ANOVA analysis to test difference in project success in hybrid project management between different department numbers involved in the project. Levene's test for equality of variances shows that groups do not significantly differ in variances; hence, one-way ANOVA test can be used. One-way ANOVA results with an F value 0.913 and significance level 0.407 indicate that there is no significant difference between groups of numbers of departments with respect to project success in hybrid project management. Therefore, number of departments has no significant impact on project success in hybrid project management.

Table 43. ANOVA Test for Number of Departments in Hybrid Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
1 - 2 department	15	3.69				
3 - 4 departments	25	3.39	1.661	0.199	0.913	0.407
5 and more departments	18	3.38				

As a summary, ANOVA results point out that number of departments has no effect on project success when three different IT project management methodologies are considered.

5.4.5 ANOVA and t-test analysis for project scope and project success

Project scope is asked in three different groups in the survey. However, in the analysis part first two groups are merged for traditional project management because distribution of answers is different between groups. Thus, independent sample t-test is used in traditional project management.

Levene's test for equality of variances with significance value 0.102 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project scope regarding project success in traditional project management. Table 44 shows that significance level of 0.534 is above the limit of 0.05 which means that there is no significant difference between groups of project scope with respect to project success in traditional project management. Therefore, project scope has no significant impact on project success in traditional project management.

Table 44. T-test for Project Scope in Traditional Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
It has several connections with other systems and projects.	43	3.53	2.739	0.102	0.625	0.534
It has many connections with other systems and projects.	32	3.40				

For agile project management, first two groups are merged because distribution of answers is different between groups. Levene's test for equality of variances with significance value 0.552 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project scope regarding project success in agile project management. Table 45 shows that significance level of 0.961 is above the limit of 0.05 which means that there is no significant difference between groups of project scope with respect to project success in agile project management. Therefore, project scope has no significant impact on project success in agile project management.

Table 45. T-test for Project Scope in Agile Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
It has several connections with other systems and projects.	28	3.71	0.359	0.552	-0.050	0.961
It has many connections with other systems and projects.	17	3.72				

For hybrid project management, first two groups are merged because distribution of answers is different between groups. Levene's test for equality of variances with significance value 0.082 shows that groups do not significantly differ in variances; therefore, the independent samples t-test can be applied in order to control if there is a significant difference between different groups of project scope regarding project success in hybrid project management. Table 46 shows that significance level of 0.899 is above the limit of 0.05 which means that there is no significant difference between groups of project scope with respect to project success

in hybrid project management. Therefore, project scope has no significant impact on project success in hybrid project management.

Table 46. T-test for Project Scope in Hybrid Project Management

	n	Mean (over 5)	Test of Homogeneity of Variances		t-test for Equality of Means	
			Levene Statistic	Sig.	t	Sig.
It has several connections with other systems and projects.	31	3.48	3.139	0.082	0.127	0.899
It has many connections with other systems and projects.	27	3.45				

As a summary, t-test results point out that project scope has no effect on project success when three different IT project management methodologies are considered.

5.4.6 ANOVA analysis for project management method selection and project success

When different project management methodologies are compared with respect to project success, ANOVA test is applied since there different methodologies are grouped. Levene's statistics with significance value of 0.089 is above 0.05; hence, there is not a difference in variances of project management method types with respect to project success. On the other side, significance level of ANOVA test shows that there is no significant difference between groups of different project management methods with respect to project success. Therefore, project management methodology has no significant impact on project success. Table 47 show the results of ANOVA test for project management methodologies with respect to project success.

Table 47. ANOVA Test for Project Management Methodology Types

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
Hybrid	58	3.47				
Traditional	75	3.48	2.450	0.089	1.455	0.236
Agile	45	3.71				

5.4.7 ANOVA analysis for company organization structure and process success

Table 48 shows that the ANOVA test results of company organization structure types with respect to project success. Since “Other” type is selected very low by respondents, “Other” option is regrouped with “Project Based” type in SPSS.

Results show that significance level of Levene’s statistic value (0.511) is bigger than 0.05 and significance level of ANOVA test (0.067) is bigger than 0.05 as well. It is not an acceptable level for the ANOVA test. It means that there is no significant difference between groups of different company organization structures with respect to project success. Therefore, company organization structure has no significant impact on project success.

Table 48. ANOVA Test for Company Organization Structure Types

	n	Mean (over 5)	Test of Homogeneity of Variances		ANOVA	
			Levene Statistic	Sig.	F	Sig.
Project Based	45	3.61				
Functional	88	3.40	0.707	0.511	2.740	0.067
Matrix	45	3.72				

CHAPTER 6
CONCLUSION

This research aims to identify the CSFs in different IT project management approaches and analyze similarities or differences of CSFs between different IT project management approaches. For achieving this purpose, CSFs in literature are searched, a survey for project managers is prepared and analysis by using SPSS for survey responses is done.

In the literature, various sources and samples are searched and CSF items for IT projects are collected. The main keywords used for search are critical success factor, project success, project failures, agile project management and traditional project management. The items found in the literature are listed, filtered and grouped in order to provide a meaningful shortlist which contains project budget, project duration, number of employees worked in the project, number of departments involved in the project, project scope, project criticality, top management, end user, project team, project management process, project development process and company culture.

All the components explained above formulates the theoretical framework of the study and hypotheses. In order to analyze the acceptability of the hypotheses, a survey is prepared for the analyses. Quantitative data collection method is considered while preparing the survey. Survey is distributed among the project managers and leaders in Turkey and 178 different responses are considered for analyses. While analyzing the responses, descriptive statistics, reliability analysis, multiple regression, independent samples t-test and one-way ANOVA methods are used.

Projects evaluated in the survey have mostly high budgets with more than 500,000 TL and duration with more than six months with 44% and 53% percentages respectively. Their project management methodologies are at most traditional (42%), which is followed by hybrid (33%) and at least agile (25%). Since all survey respondents are project managers from Turkey, these result helps us to make a conclusion that agile project management methodology usage is still low in Turkey. Instead of using pure agile, project leaders prefer to use hybrid methodology as a combination of traditional and agile methodologies. Company demographics show that companies involve to the survey are operating more than 20 years and their turnover is more than 50,000,000 TL. Their sectors are mostly IT, FMCG and telecommunication.

CSFs determination regarding to different IT project management methodologies is done by using multiple regression analysis. Seven different CSFs are considered in the analysis; project criticality, top management, end user, project team, project management process, project development process and company culture. In traditional project management, project team and project development process are found as influencers on the project success. In agile project management, project criticality and project management process affect the project success. In hybrid project management, factors are project team and project management process. It means that one factor is derived from traditional project management and the other factor is derived from agile project management for hybrid methodology.

Other methods used in the analyses are one-way ANOVA test and independent samples t-test. For exploratory study, several analyses are done in order to check if there are differences between different groups of project budget, of project duration, of number of employees worked in project, of number of

departments involved in the project and of project scopes with respect to project success. All responses are grouped according to the project management methodologies and ANOVA or t-test methods are used according to the numbers of different groups. According to the results, none of the items have a significant relationship with project success.

Additionally, effect of project management methodology selection on project success and effect of company organization structure on project success is examined as well. It is observed that they have no significant relationship with project success.

These results help to make a conclusion and suggestion for project managers and leaders in IT sector. Project managers who prefer to use traditional project management approach in their projects, they need to care on the project team and project development process factors. For agile project management approach, factors are changing: project criticality and project management process factors become important for the project success. It means project managers should consider them. Instead of using pure traditional or pure agile approaches, project managers can choose to use hybrid project management approach. In this case, project managers should consider project team and project management process factors for becoming successful in the projects.

CHAPTER 7
LIMITATION AND RECOMMENDATION

This study is done to analyze CSFs in the traditional and agile project management methodologies in IT projects. Although a lot of aspects are considered during literature search, survey and analysis parts, there are some limitations of the study. Firstly, the study is limited with the project managers in Turkey. The results of the study reflect the experiences and insights of project managers in Turkey. Secondly, top management and company culture CSF items are limited and it is difficult to measure them. It causes to have a lower level of reliability.

It is recommended for further research to apply the same analysis in different countries and compare the results of the countries. If this study is expanded to the project managers outside the Turkey, the results can be changed because of the cultural and behavioral differences between countries and companies. Besides, this study can be conducted with project managers in different sectors as well. The results can be compared between sectors and types of projects. Instead of using convenience sampling method, more statistical sampling methods can be used in order to collect the survey responses. Regarding with the top management and company culture measurements, number of items can be increased and new measurement approaches can be developed. Lastly, in order to check whether the respondents are using traditional, agile or hybrid methods correctly, deep dive questions could be asked in further researches.

APPENDIX A

CRITICAL SUCCESS FACTOR ITEMS TABLES

Table A1. Common CSFs for Agile and Traditional PM

CSF	Source
Project Team Commitment	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Team commitment and structure	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Developers	McLeod, L., & MacDonell, S. G. (2011)
Project Team	McLeod, L., & MacDonell, S. G. (2011)
Reward System	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Leadership	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Guidance	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Strong Executive Support	Chow, T., & Cao, D. B. (2008)
Top Level Management Support	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Committed Sponsor or Manager	Chow, T., & Cao, D. B. (2008)
Senior Management Commitment	Niazi, M. (2015)
Executive Support	Rainer, A., & Hall, T. (2002)
Higher Management Support	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Management Support	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Management Involvement and Support	Livermore, J. A. (2008)
Business Sponsors Involvement	Forrester Consulting. (2012)
Staff Involvement	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Employee's Support	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Team Members with High Competence and Expertise	Chow, T., & Cao, D. B. (2008)
Project Team's Expertise with SDM	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Staff Experience	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Experience Level of Team	Sheffield, J., & Lemétayer, J. (2013)
Project Team's Expertise with the Task	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Existing Knowledge	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Project managers' skills	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Implementer's Role	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Knowledgeable Managers in Agile	Chow, T., & Cao, D. B. (2008)
Technical Training	Chow, T., & Cao, D. B. (2008)
Training and Coaching	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Training	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Monitoring	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Monitoring and Controlling	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)

Monitoring and Feedback	Pinto, J. K., & Prescott, J. E. (1988)
Reviews-Feedback	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Cooperative Organizational Culture	Chow, T., & Cao, D. B. (2008)
Face to Face Communication Culture	Chow, T., & Cao, D. B. (2008)
Organizational Culture	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Working Environment	Cho, J. J. (2010)
Environmental Conditions	McLeod, L., & MacDonell, S. G. (2011)
Organizational structure	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Organizational Properties	McLeod, L., & MacDonell, S. G. (2011)
Instability in the Organizational Environment	Sheffield, J., & Lemétayer, J. (2013)
Work dynamics	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Process Action Teams	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Relative Project Size	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Project Nature	Chow, T., & Cao, D. B. (2008)
Project Type	Chow, T., & Cao, D. B. (2008)
Developing Software for Internet or intranet applications	Livermore, J. A. (2008)
Project Schedule	Chow, T., & Cao, D. B. (2008)
Project Criticality	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Project Characteristics	McLeod, L., & MacDonell, S. G. (2011)
Project Scope, Goals and Objectives	McLeod, L., & MacDonell, S. G. (2011)
Urgency	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Defined Project Scope	Chow, T., & Cao, D. B. (2008)
Project Complexity	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Project Mission	Pinto, J. K., & Prescott, J. E. (1988)
Project Schedule/Plan	Pinto, J. K., & Prescott, J. E. (1988)
Low Project Criticality	Sheffield, J., & Lemétayer, J. (2013)
Budget Size	Jørgensen, M. (2016)
Contract Type	Jørgensen, M. (2016)
Low Project Size	Sheffield, J., & Lemétayer, J. (2013)
Communication Focus with Daily Meetings	Chow, T., & Cao, D. B. (2008)
Communication	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Internal Project Communication	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Communication and Transparency	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Communication System	Cho, J. J. (2010)
Collaboration Teams on Distributed Teams to Share	Forrester Consulting. (2012)
Collaboration	Cho, J. J. (2010)
Social Interaction	McLeod, L., & MacDonell, S. G. (2011)
Social Loafing	Cho, J. J. (2010)
Information and Knowledge Sharing System	Cho, J. J. (2010)
Shared knowledge	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Motivation of Team	Chow, T., & Cao, D. B. (2008)
Motivation of Developers	Baddoo, N., & Hall, T. (2002)

Motivation of Project Manager	Baddoo, N., & Hall, T. (2002)
Estimating Tools	Rainer, A., & Hall, T. (2002)
Automated Tools Support	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012).
Bug Tracking System and Management Tool	Cho, J. J. (2010)
Automation	Rainer, A., & Hall, T. (2002)
Automate requirements Management for Version Control etc.	Forrester Consulting. (2012)
Information system	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Technology	McLeod, L., & MacDonell, S. G. (2011)
Technological Uncertainty	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Progress Tacking Mechanism	Chow, T., & Cao, D. B. (2008)
Version Control Systems	Cho, J. J. (2010)
Consistent Measures for Quality	Forrester Consulting. (2012)
Measurements	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Staff Time and Resources	Niazi, M. (2015)
Resources	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Providing Development Team Access to External Resources	Livermore, J. A. (2008)
Change Management Skills	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Management of Change	McLeod, L., & MacDonell, S. G. (2011)
Specification Changes	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Commitment to Change	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Customer Commitment	Chow, T., & Cao, D. B. (2008)
Customer with Authority	Chow, T., & Cao, D. B. (2008)
Client Involvement	Jørgensen, M. (2016)
Client Consultation	Pinto, J. K., & Prescott, J. E. (1988)
Client Support	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
User Participation	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Customer Involvement	Cho, J. J. (2010)
Engaging People	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
User Support	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Financial Structures	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Projects with up-front Cost Evaluation Done	Chow, T., & Cao, D. B. (2008)
Return on Investment	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Cost assessment	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Cost-benefit Analysis	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Requirements Determination	McLeod, L., & MacDonell, S. G. (2011)
Requirements Management	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Requirement specification	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Requirements Uncertainty	Sheffield, J., & Lemétayer, J. (2013)
Trust and Confidence	Cho, J. J. (2010)
Trust building	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Procedural Empowerment	Sheffield, J., & Lemétayer, J. (2013)
Standards and Procedures	Rainer, A., & Hall, T. (2002)
Supportive Policies	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)

Regular Delivery of Software	Chow, T., & Cao, D. B. (2008)
Delivering most important features first	Chow, T., & Cao, D. B. (2008)
Implementation Methodology	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Interdependency among Modules	Cho, J. J. (2010)
Incremental cycles	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Agile Practices	Jørgensen, M. (2016)
Use of a Standard Method	McLeod, L., & MacDonell, S. G. (2011)
Development Methodologies	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Customer Training and Education	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
User Training	McLeod, L., & MacDonell, S. G. (2011)
Agile Style Work Environment	Chow, T., & Cao, D. B. (2008)
Organizations where Agile Methodology is universally accepted	Chow, T., & Cao, D. B. (2008)
Choosing and Customizing the Agile Approach	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Agile Software Development Methodology Selection	Livermore, J. A. (2008)
Agile Oriented Requirement Management Process	Chow, T., & Cao, D. B. (2008)
Agile Oriented Project Management Process	Chow, T., & Cao, D. B. (2008)
Scrum Framework	Cho, J. J. (2010)
Physical Facilities	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Roles and Responsibilities	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)

Table A2. CSFs for Traditional PM

CSF	Source
Collocation of Whole Team	Chow, T., & Cao, D. B. (2008)
Collocation of Teams	West, M., Wilson N. (2016)
Colocation of the Project Team Members	Sheffield, J., & Lemétayer, J. (2013)
Collocating the Development Team	Livermore, J. A. (2008)
Customer Relationships	Chow, T., & Cao, D. B. (2008)
Collaborative Business Relationships with Customers	West, M., Wilson N. (2016)
Close Customer Collaboration	Sheffield, J., & Lemétayer, J. (2013)
Self-Organizing Teamwork	Chow, T., & Cao, D. B. (2008)
Project Team Empowerment	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Project Team's Composition	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Team Autonomy	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Size of the Cooperation or Development Team	Livermore, J. A. (2008)
Lack of Accountability	Cho, J. J. (2010)
Low Power Distance	Sheffield, J., & Lemétayer, J. (2013)
Team Management	Cho, J. J. (2010)

Customer Experience	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
End User Experience	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Documentation	Chow, T., & Cao, D. B. (2008)
Coding Standards	Chow, T., & Cao, D. B. (2008)
Hiring or Retaining Agile Developers	West, M., Wilson N. (2016)
Developing New HR Job Descriptions	West, M., Wilson N. (2016)
Alignment between IT and Business	West, M., Wilson N. (2016)
Mindset and Alignment	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Integration Testing	Chow, T., & Cao, D. B. (2008)
Unit and Integration Testing	Cho, J. J. (2010)
Level of Entrepreneurship	Sheffield, J., & Lemétayer, J. (2013)
Level of Risk-taking Willingness	Sheffield, J., & Lemétayer, J. (2013)
Piloting	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Formal Code Review	Cho, J. J. (2010)
Projects with up-front Risk Analysis Done	Chow, T., & Cao, D. B. (2008)
Agility Supported by the Customer	Sheffield, J., & Lemétayer, J. (2013)
Project Estimates on Historical Projects	Forrester Consulting. (2012)

Table A3. CSFs for Agile PM

CSF	Source
Vision and Mission	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Company Vision	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Benefits and Goals	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Company Success	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Long Term Business Success	Savolainen, P., Ahonen, J. J., & Richardson, I. (2012)
Short Term Business Success	Savolainen, P., Ahonen, J. J., & Richardson, I. (2012)
Software Process Improvement Success	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
Level of Project Planning	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Managing the SPI Project	Niazi, M. (2015)
Project Management	McLeod, L., & MacDonell, S. G. (2011)
Defined SPI Implementation Strategy	Niazi, M. (2015)
SPI Awareness	Niazi, M. (2015)
Awareness	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
External Consultants	Rainer, A., & Hall, T. (2002)
Consultancy	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)
External Agents	McLeod, L., & MacDonell, S. G. (2011)
Reviews	Rainer, A., & Hall, T. (2002)
Inspections	Rainer, A., & Hall, T. (2002)
Project Post-mortems	Rainer, A., & Hall, T. (2002)
Internal Process Ownership	Rainer, A., & Hall, T. (2002)
Internal Leadership	Rainer, A., & Hall, T. (2002)
Customer satisfaction	Savolainen, P., Ahonen, J. J., & Richardson, I. (2012)
Shared goals	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Client Acceptance	Pinto, J. K., & Prescott, J. E. (1988)

Benefit Management Processes	Jørgensen, M. (2016)
Cultural awareness	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Customer awareness	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Time to delivery	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Technical Tasks	Pinto, J. K., & Prescott, J. E. (1988)
Trouble Shooting	Pinto, J. K., & Prescott, J. E. (1988)
Metrics	Rainer, A., & Hall, T. (2002)
Tailoring of Processes	Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012)

Table A4. CSFs and Items in the Survey

CSF	Items
Project Criticality	Project Criticality
Top Management	Top Management Support
	Top Management Participation
	Top Management Knowledge on PM
End User	End Users Commitment
	End Users Participation
	End Users Knowledge on Project
	End Users Experience
	End Users Knowledge on PM
	End Users Training
Project Team	Team Autonomy
	Team Authority
	Team Motivation
	Team Commitment
	Trust
	Transparency
	Social Interaction
	Daily Meetings
	Face to Face Meetings
	Team Expertise
	Team Experience
	Technical Training
	Colocation
	Working Environment
	Ergonomics
	Quietness
	Working Hours
	Communication System
	Knowledge Sharing System
	Reward System
Project Management Process	Objective
	Alignment
	Metrics

	Quality Measurement
	Requirements Management
	Change Management
	Risk Analysis
	Progress Tacking Mechanism
	Implementation Methodology
	Progress Tacking System
	Version Control Systems
	Standards and Procedures
	Documentation
	Internal Process Ownership
	Project Teams Feedback
	End Users Feedback
	Project Post-Mortems
	Human Resource
	Economic Resource
	Consultancy
	Commitment to Change
	Piloting
Project Development Process	Coding Standards
	Development Standards
	Unit and Integration Testing
Company Culture	Innovativeness of Company
	Risk Taking Willingness of Company
	Resistance to Change of Company

APPENDIX B

QUESTIONNAIRE (TURKISH)

Değerli Katılımcı,

Bu anket bilgi teknolojileri projelerinde geleneksel ve çevik proje yönetimi kritik başarı faktörlerini incelemek ve karşılaştırmak amacıyla düzenlenmiştir. Çalışma akademik bir araştırma olup Boğaziçi Üniversitesi Yönetim Bilişim Sistemleri Bölümü Yüksek Lisans Programı öğrencisi Hatice Ergüder'in Prof. Dr. Meltem Özturan danışmanlığında yürüttüğü tezi kapsamında gerçekleştirilmektedir.

Anketi yanıtlamak için BT proje yöneticisi olarak görev almış olmanız gerekmektedir.

Ankette kimlik ve iletişim bilgileriniz istenmeyecek ve yanıtlarınız gizli tutulacaktır.

Zaman ayırdığınız için teşekkür ederiz.

1. Daha önce hiç BT projesi yönettiniz mi?

Evet _____
Hayır _____

Aşağıdaki soruları, yönettiğiniz son projeyi göz önünde bulundurarak yanıtlayınız.

2. Projenin planlanan bütçesi ne kadardı?

50.000 TL' den az _____

51.000 - 250.000 TL _____

251.000 - 500.000 TL _____

501.000 - 750.000 TL _____

750.000 TL' den fazla _____

3. Projenin planlanan süresi ne kadardı?

   3 aydan az _____

   3 - 6 ay _____

   6 aydan fazla _____

4. Projede çalışan personel sayısı ne kadardı?

   3 kişiden az _____

   3 - 6 kişi arası _____

   6 kişiden fazla _____

5. Projenin geliştirme sürecinde kaç departman yer almaktaydı?

   1 - 2 departman _____

   3 - 4 departman _____

   5 ve daha fazla departman _____

6. Projede hangi proje yönetim metodu kullanılmıştır?

   Çevik (Agile) _____

   Geleneksel (Waterfall) _____

   Hibrit _____

   Diğer (lütfen belirtin) _____

7. Aşağıdakilerden hangisi proje kapsamını en iyi şekilde tanımlar?

   Diğer sistem ve projelerle bağlantısı yoktur. _____

   Diğer sistem ve projelerle birkaç bağlantısı vardır. _____

   Diğer sistem ve projelerle birçok bağlantısı vardır. _____

8. Proje hangi departman/departmanlar için geliştirilmiştir? (Birden fazla seçeneği işaretleyebilirsiniz.)

   Üretim _____

   Tedarik Zinciri _____

   Satış _____

   Pazarlama _____

   İnsan Kaynakları _____

   Finans _____

   Ar-Ge _____

   Diğer (lütfen belirtin) _____

9. Projenin şirket süreçleri ve/veya politikaları için kritiklik seviyesi nedir?

   Çok Düşük _____

   Düşük _____

   Orta _____

   Yüksek _____

   Çok Yüksek _____

10. Aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Proje süresince üst yönetimin desteği alındı.					
Üst yönetimin projeye katılımı yüksekti.					
Üst yönetimin uygulanan proje yönetim metodolojisi hakkında bilgisi vardı.					

11. Aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Son kullanıcıların projeye bağlılığı yüksekti.					
Son kullanıcıların projeye katılımı yüksekti.					
Son kullanıcıların proje hakkında bilgisi vardı.					
Son kullanıcıların proje hakkında deneyimi vardı.					
Son kullanıcıların uygulanan proje yönetim metodolojisi hakkında bilgisi vardı.					
Son kullanıcılara yeterli eğitim verildi.					

12. Aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Proje ekibi proje sürecinde bağımsız karar alabiliyordu.					
Proje ekibinin proje sürecini ilerletebilmek için sorumluluk alma yetkisi vardı.					
Proje ekibinin proje süresince motivasyonu yüksekti.					
Proje ekibinin projeye bağlılığı yüksekti.					
Proje ekip üyeleri birbirlerine güveniyordu.					
Proje ekip üyeleri arasında şeffaflık vardı.					
Proje ekibi iş dışında sosyal aktivitelerde bir araya geliyordu.					

Proje ekibi günlük toplantılar yaparak birbirlerini süreç hakkında bilgilendiriyordu.					
Proje ekibi toplantılarını yüz yüze gerçekleştiriyordu.					
Proje ekibinin proje konusu üzerinde uzmanlığı vardı.					
Proje ekibinin proje konusu üzerinde deneyimi vardı.					
Proje ekibine yeterli teknik eğitim verildi.					
Proje ekibi proje süresince aynı lokasyonda çalıştı.					
Proje ekibinin çalışma ortamının fiziksel şartları yeterliydi (Ofis ekipmanları, toplantı odaları vb.)					
Proje ekibinin çalışma ortamı ergonomik koşullara uygundu.					
Proje ekibinin çalışma ortamı yeteri kadar sessizdi.					
Proje ekibinin çalışma saatleri esnekti.					
Proje ekibinin iletişim kurması için yeterli şirket içi teknolojiler mevcuttu.					
Proje ekibinin bilgi ve deneyim paylaşımı için yeterli şirket içi teknolojiler mevcuttu.					
Proje ekibinin çalışmalarında ödüllendirme sistemlerinden faydalanıldı.					

13. Aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Projenin hedefleri belliydi.					
Proje hedefleri ve şirket hedefleri arasında uyumluluk vardı.					
Projenin başarı ölçütleri belliydi.					
Projede kalite ölçümlemesi düzenli olarak yapılıyordu.					
Proje isterlerinin belirlenmesi için yeterli çalışma yapıldı.					
Proje isterlerinin değişimleri doğru bir şekilde yönetildi.					
Proje riskleri doğru bir şekilde yönetildi.					
Proje süreci sistematik bir şekilde takip edildi.					
Proje, uygulanan proje yönetim metodolojisine uygun olarak takip edildi.					
Proje sürecini takip etmek için yeterli şirket içi teknolojiler mevcuttu.					

Proje versiyonlarını takip etmek için yeterli şirket içi versiyon kontrol teknolojileri mevcuttu.					
Proje süresince şirket politika ve prosedürlerine uyuldu.					
Proje sürecinde dokümantasyon yeterli seviyede yapıldı.					
Proje süreci şirket içinde sahiplenildi.					
Proje süresince proje ekibinden gelen geri bildirimler dikkate alındı.					
Proje süresince son kullanıcılardan gelen geri bildirimler dikkate alındı.					
Proje sonunda sürecin ve çıktıların değerlendirmesi yapıldı.					
Proje için yeterli iş gücü kaynağı ayrıldı.					
Proje için yeterli bütçe ayrıldı.					
Proje için dışarıdan danışmanlık desteği alındı.					
Projenin getirdiği değişime karşı direnç yüksekti.					
Proje pilot olarak uygulandı.					

14. Projede yazılım geliştirme süreci varsa, aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Proje geliştirme sürecinde kodlama standartlarına uyuldu.					
Proje geliştirme sürecinde yazılım geliştirme standartlarına uyuldu.					
Proje geliştirme sürecinde modül ve entegrasyon testleri yeterli şekilde yapıldı.					

15. Aşağıdaki ifadelere katılım derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Proje takvime uygun olarak tamamlandı.					
Proje bütçeye uygun olarak tamamlandı.					
Proje sonunda müşteri memnuniyeti yüksekti.					
Proje sonunda iş hedeflerine uyum sağlandı.					
Proje kapsamına sadık kalındı ve kapsamda değişiklik yapılmadı.					

Aşağıdaki soruları şirketinizi göz önünde bulundurarak yanıtlayınız.

16. Aşağıdaki ifadelere katılma derecenizi belirtiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Şirket yenilikçidir ve inovasyona açıktır.					
Şirket risk almaktan kaçınmaz.					
Şirkette değişime karşı direnç yüksektir.					

17. Şirketinizde organizasyon yapısı aşağıdakilerden hangisine en yakındır?

Matris _____

Fonksiyonel _____

Proje bazlı _____

Diğer (lütfen belirtin) _____

18. Aşağıdaki proje yönetim metotlarını genel olarak ne derece kullandığınızı belirtiniz. (1: En Düşük, 5: En Yüksek)

	Kullanılmıyor	1	2	3	4	5
Çevik (Agile)						
Geleneksel (Waterfall)						
Hibrit						

19. Şirketiniz hangi sektörde faaliyet göstermektedir?

Bilgi Teknolojileri _____

Telekomünikasyon _____

İnşaat _____

Finans _____

Enerji _____

Danışmanlık _____

Sağlık _____

Hızlı Tüketim _____

Diğer (lütfen belirtin) _____

20. Şirketiniz aynı sektörde kaç yıldır faaliyet göstermektedir?

3 yıldan az _____

3 - 10 arası _____

11 - 25 arası _____

26 - 50 arası _____

50 yıldan fazla _____

21. Şirketinizin çalışan sayısı kaçtır?

50'den az _____

50 - 100 arası _____

101 - 250 arası _____

251 - 500 arası _____

500'den fazla _____

22. Şirketinizin yıllık cirosu ne kadardır?

1.000.000 TL' den az _____

1.000.000 - 10.000.000 TL arası _____

11.000.000 - 50.000.000 TL arası _____

51.000.000 - 100.000.000 TL arası _____

100.000.000 TL' den fazla _____

Fikrim yok _____

APPENDIX C

QUESTIONNAIRE

Dear Participant,

This survey is designed to examine and compare the critical success factors of traditional and agile project management in information technology projects. The study is an academic research conducted by Hatice Ergüder who is a master student in Boğaziçi University Management Information Systems Department under the advisory of Prof. Dr. Meltem Özturan.

You must have worked as an IT project manager to respond to the survey.

Your identity and contact information will not be requested and your responses will be kept confidential.

Thank you for your time.

1. Have you ever managed an IT project?

Yes _____
No _____

Answer the following questions by considering the last project you managed.

2. What was the planned budget of the project?

Less than 50,000 TL _____

51,000 – 250,000 TL _____

251,000 – 500,000 TL _____

501,000 – 750,000 TL _____

More than 750,000 TL _____

3. What was the planned duration of the project?

Less than 3 months _____

3 - 6 months _____

More than 6 months _____

4. What was the number of employees working on the project?

Less than 3 _____

Between 3 - 6 _____

More than 6 _____

5. How many departments were involved in the project development process?

1 - 2 department _____

3 - 4 departments _____

5 and more departments _____

6. Which project management method was used in the project?

Agile _____

Waterfall _____

Hybrid _____

Other (please indicate) _____

7. Which of the following best describes the scope of the project?

   It has no connection with other systems and projects. _____

   It has several connections with other systems and projects. _____

   It has many connections with other systems and projects. _____

8. For which department / departments has the project been developed? (You can check more than one option.)

   Production _____

   Supply Chain _____

   Sales _____

   Marketing _____

   HR _____

   Finance _____

   R & D _____

   Other (please indicate) _____

9. What is the criticality of the project for company processes and / or policies?

   Very Low _____

   Low _____

   Medium _____

   High _____

   Very High _____

10. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Top management support was received during the project.					
The participation of top management in the project was high.					
Top management had information about the applied project management methodology.					

11. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The commitment of end users to the project was high.					
The participation of end users to the project was high.					
End users had information about the project.					
End users had experience about the project.					
End users had knowledge about the applied project management methodology.					
Enough training was given to end users.					

12. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The project team was able to make independent decisions during the project.					
The project team had the authority to take responsibility in order to proceed the project.					
The project team was highly motivated throughout the project.					
The commitment of project team to the project was high.					

The project team members relied on each other.					
There was transparency between project team members.					
The project team came together in social activities outside of work.					
The project team made daily meetings and informed each other about the process.					
The project team carried out their meetings face to face.					
The project team had expertise about the project.					
The project team had experience about the project.					
The project team received adequate technical training.					
The project team worked at the same location throughout the project.					
The physical conditions of the project team's work environment were sufficient (Office equipment, meeting rooms, etc.).					
The work environment of the project team was in accordance with the ergonomic conditions.					
The working environment of the project team was quiet enough.					
The working hours of the project team were flexible.					
There were enough in-house technologies for communication of project team.					
The project team had adequate technologies in the company for sharing knowledge and experience.					
Rewards systems were used in the work of the project team.					

13. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The objectives of the project were clear.					
There was alignment between project objectives and company objectives.					
The success criteria of the project were obvious.					
Quality measurement was carried out regularly in the project.					

Enough work was done to identify project requirements.					
Changes in project requirements were managed correctly.					
Project risks were managed correctly.					
The project process was systematically monitored.					
The project was followed in accordance with the project management methodology applied.					
There were enough technologies in the company to follow the project process.					
Version control technologies in the company were available to track project versions.					
Company policies and procedures were followed during the project.					
Documentation was enough in the project process.					
The project process is owned by the company.					
The feedback received from the project team was taken into consideration during the project.					
Feedback from end users was taken into consideration during the project.					
At the end of the project, the process and outputs were evaluated.					
Enough workforce resources were allocated for the project.					
Adequate budget was allocated for the project.					
External consultancy support was received for the project.					
The resistance to the change resulted from project was high.					
The project was piloted.					

14. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The coding standards were complied with during the project development process.					
Software development standards were followed during the project development process.					
In the project development process, module and integration tests were done adequately.					

15. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The project was completed in accordance with the calendar.					
The project was completed in accordance with the budget.					
Customer satisfaction was high at the end of the project.					
At the end of the project, compliance with business objectives was achieved.					
The scope of the project remained unchanged.					

Answer the following questions regarding with your company.

16. Indicate your degree of participation in the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The company is innovative and open to innovation.					
The company does not avoid taking risks.					
Resistance to change in the company is high.					

17. Which organization structure is the closest to your company?

Matrix _____

Functional _____

Project based _____

Other (please indicate) _____

18. Indicate to what extent you use the following project management methods in general. (1: Lowest, 5: Highest)

	Not Used	1	2	3	4	5
Agile						
Waterfall						
Hybrid						

19. In which sector does your company operate?

Information Technologies _____

Telecommunication _____

Construction _____

Finance _____

Energy _____

Consultancy _____

Health _____

Fast Consuming _____

Other (please indicate) _____

20. How long has your company been in the same sector?

Less than 3 years _____

Between 3 - 10 years _____

Between 11 - 25 years _____

Between 26 - 50 years _____

More than 50 years _____

21. What is the number of employees in your company?

Less than 50 _____

Between 50 - 100 _____

Between 101 - 250 _____

Between 251 - 500 _____

More than 500 _____

22. What is the annual turnover of your company?

Less than 1,000,000 TL _____

Between 1,000,000 – 10,000,000 TL _____

Between 11,000,000 – 50,000,000 TL _____

Between 51,000,000 – 100,000,000 TL _____

More than 100,000,000 TL _____

N/A _____

APPENDIX D

SURVEY QUESTIONS DETAILS TABLE

Table D1. Survey Question Details

Item	Scale	Question Number	Source
Budget Size	Ordinal	2	Jørgensen, M. (2016)
Project Schedule	Ordinal	3	Chow, T., & Cao, D. B. (2008)
The Size of the Cooperation or Development Team	Ordinal	4	Livermore, J. A. (2008)
The Size of the Cooperation or Development Team	Ordinal	5	Livermore, J. A. (2008)
Agile Oriented Project Management Process	Nominal	6	Chow, T., & Cao, D. B. (2008)
Project Complexity	Nominal	7	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Project Type	Nominal	8	Chow, T., & Cao, D. B. (2008)
Project Criticality	Interval	9	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Top Management Support	Interval	10.1	Pinto, J. K., & Prescott, J. E. (1988)
Management Involvement and Support	Interval	10.2	Livermore, J. A. (2008)
Knowledgeable Managers in Agile	Interval	10.3	Chow, T., & Cao, D. B. (2008)
Customer Commitment	Interval	11.1	Chow, T., & Cao, D. B. (2008)
User Participation	Interval	11.2	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Customer awareness	Interval	11.3	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Customer Experience	Interval	11.4	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Agility Supported by the Customer	Interval	11.5	Sheffield, J., & Lemétayer, J. (2013)
User Training	Interval	11.6	McLeod, L., & MacDonell, S. G. (2011)
Team Autonomy	Interval	12.1	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Process Action Teams	Interval	12.2	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Motivation of Team	Interval	12.3	Chow, T., & Cao, D. B. (2008)
Project Team Commitment	Interval	12.4	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Trust and Confidence	Interval	12.5	Cho, J. J. (2010)
Communication and Transparency	Interval	12.6	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Social Interaction	Interval	12.7	McLeod, L., & MacDonell, S. G. (2011)
Communication Focus with Daily Meetings	Interval	12.8	Chow, T., & Cao, D. B. (2008)

Face to Face Communication Culture	Interval	12.9	Chow, T., & Cao, D. B. (2008)
Team Members with High Competence and Expertise	Interval	12.10	Chow, T., & Cao, D. B. (2008)
Experience Level of Team	Interval	12.11	Sheffield, J., & Lemétayer, J. (2013)
Technical Training	Interval	12.12	Chow, T., & Cao, D. B. (2008)
Colocation of the Project Team Members	Interval	12.13	Sheffield, J., & Lemétayer, J. (2013)
Working Environment	Interval	12.14	Cho, J. J. (2010)
Physical Facilities	Interval	12.15	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Physical Facilities	Interval	12.16	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Physical Facilities	Interval	12.17	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Communication System	Interval	12.18	Cho, J. J. (2010).
Information and Knowledge Sharing System	Interval	12.19	Cho, J. J. (2010)
Reward System	Interval	12.20	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Project Scope, Goals and Objectives	Interval	13.1	McLeod, L., & MacDonell, S. G. (2011)
Alignment between IT and Business	Interval	13.2	West, M., Wilson N. (2016)
Metrics	Interval	13.3	Rainer, A., & Hall, T. (2002)
Consistent Measures for Quality	Interval	13.4	Forrester Consulting. (2012)
Requirements Management	Interval	13.5	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Change Management Skills	Interval	13.6	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)
Projects with up-front Risk Analysis Done	Interval	13.7	Chow, T., & Cao, D. B. (2008)
Progress Tacking Mechanism	Interval	13.8	Chow, T., & Cao, D. B. (2008)
Implementation Methodology	Interval	13.9	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Information system	Interval	13.10	Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September)
Version Control Systems	Interval	13.11	Cho, J. J. (2010)
Standards and Procedures	Interval	13.12	Rainer, A., & Hall, T. (2002)
Documentation	Interval	13.13	Chow, T., & Cao, D. B. (2008)
Internal Process Ownership	Interval	13.14	Rainer, A., & Hall, T. (2002)
Reviews-Feedback	Interval	13.15	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Reviews-Feedback	Interval	13.16	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
Project Post-mortems	Interval	13.17	Rainer, A., & Hall, T. (2002)
Staff Time and Resources	Interval	13.18	Niazi, M. (2015)

Resources	Interval	13.19	Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July)
External Consultants	Interval	13.20	Rainer, A., & Hall, T. (2002)
Commitment to Change	Interval	13.21	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Piloting	Interval	13.22	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)
Coding Standards	Interval	15.1	Chow, T., & Cao, D. B. (2008)
Development Methodologies	Interval	15.2	Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015)Management, 28(1), 7-33.
Unit and Integration Testing	Interval	15.3	Cho, J. J. (2010)
Organizational Structure	Nominal	16	Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016)
Organizations where Agile Methodology is universally accepted	Interval	17.1	Chow, T., & Cao, D. B. (2008)
Level of Risk-taking Willingness	Interval	17.2	Sheffield, J., & Lemétayer, J. (2013)
Commitment to Change	Interval	17.3	Dikert, K., Paasivaara, M., & Lassenius, C. (2016)

APPENDIX E

FREQUENCY TABLES

Table E1. Project Criticality Factor Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
Criticality of the project for company processes and / or policies	Frequency	0	10	68	68	32	178
	Percent	0%	6%	38%	38%	18%	100%

Table E2. Top Management Factor Items Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
Top management support was received during the project.	Frequency	0	11	18	104	45	178
	Percent	0%	6%	10%	58%	25%	100%
The participation of top management in the project was high.	Frequency	4	29	43	78	24	178
	Percent	2%	16%	24%	44%	13%	100%
Top management had information about the applied project management methodology.	Frequency	7	34	37	75	25	178
	Percent	4%	19%	21%	42%	14%	100%

Table E3. End User Factor Items Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
The commitment of end users to the project was high.	Frequency	2	23	32	96	25	178
	Percent	1%	13%	18%	54%	14%	100%
The participation of end users to the project was high.	Frequency	2	25	30	91	30	178
	Percent	1%	14%	17%	51%	17%	100%
End users had information about the project.	Frequency	4	15	27	95	37	178
	Percent	2%	8%	15%	53%	21%	100%
End users had experience about the project.	Frequency	10	56	47	51	14	178
	Percent	6%	31%	26%	29%	8%	100%
End users had knowledge about the applied project management methodology.	Frequency	20	61	57	37	3	178
	Percent	11%	34%	32%	21%	2%	100%
Enough training was given to end users.	Frequency	4	20	36	88	30	178
	Percent	2%	11%	20%	49%	17%	100%

Table E4. Project Team Factor Items Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
The project team was able to make independent decisions during the project.	Frequency	6	46	30	90	6	178
	Percent	3%	26%	17%	51%	3%	100%
The project team had the authority to take responsibility in order to proceed the project.	Frequency	2	21	20	121	14	178
	Percent	1%	12%	11%	68%	8%	100%
The project team was highly motivated throughout the project.	Frequency	3	18	30	101	26	178
	Percent	2%	10%	17%	57%	15%	100%
The commitment of project team to the project was high.	Frequency	2	7	24	105	40	178
	Percent	1%	4%	13%	59%	22%	100%
The project team members relied on each other.	Frequency	4	7	33	99	35	178
	Percent	2%	4%	19%	56%	20%	100%
There was transparency between project team members.	Frequency	3	14	29	104	28	178
	Percent	2%	8%	16%	58%	16%	100%
The project team came together in social activities outside of work.	Frequency	19	50	44	58	7	178
	Percent	11%	28%	25%	33%	4%	100%
The project team made daily meetings and informed each other about the process.	Frequency	10	37	32	82	17	178
	Percent	6%	21%	18%	46%	10%	100%
The project team carried out their meetings face to face.	Frequency	2	13	14	113	36	178
	Percent	1%	7%	8%	63%	20%	100%
The project team had expertise about the project.	Frequency	2	8	19	101	48	178
	Percent	1%	4%	11%	57%	27%	100%
The project team had experience about the project.	Frequency	2	16	25	97	38	178
	Percent	1%	9%	14%	54%	21%	100%
The project team received adequate technical training.	Frequency	4	25	37	85	27	178
	Percent	2%	14%	21%	48%	15%	100%
The project team worked at the same location throughout the project.	Frequency	10	50	20	70	28	178
	Percent	6%	28%	11%	39%	16%	100%
The physical conditions of the project team's work environment were enough (Office equipment, meeting rooms, etc.).	Frequency	1	10	32	92	43	178
	Percent	1%	6%	18%	52%	24%	100%
The work environment of the project team was in accordance with the ergonomic conditions.	Frequency	3	13	34	89	39	178
	Percent	2%	7%	19%	50%	22%	100%
	Frequency	6	37	42	67	26	178

The working environment of the project team was quiet enough.	Percent	3%	21%	24%	38%	15%	100%
The working hours of the project team were flexible.	Frequency	9	37	17	77	38	178
	Percent	5%	21%	10%	43%	21%	100%
There were enough in-house technologies for communication of project team.	Frequency	4	8	18	84	64	178
	Percent	2%	4%	10%	47%	36%	100%
The project team had adequate technologies in the company for sharing knowledge and experience.	Frequency	3	13	23	86	53	178
	Percent	2%	7%	13%	48%	30%	100%
Rewards systems were used in the work of the project team.	Frequency	36	64	37	29	12	178
	Percent	20%	36%	21%	16%	7%	100%

Table E5. Project Management Process Factor Items Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
The objectives of the project were clear.	Frequency	2	7	13	94	62	178
	Percent	1%	4%	7%	53%	35%	100%
There was alignment between project objectives and company objectives.	Frequency	4	8	28	90	48	178
	Percent	2%	4%	16%	51%	27%	100%
The success criteria of the project were obvious.	Frequency	4	20	15	100	39	178
	Percent	2%	11%	8%	56%	22%	100%
Quality measurement was carried out regularly in the project.	Frequency	9	40	43	64	22	178
	Percent	5%	22%	24%	36%	12%	100%
Enough work was done to identify project requirements.	Frequency	5	13	25	97	38	178
	Percent	3%	7%	14%	54%	21%	100%
Changes in project requirements were managed correctly.	Frequency	7	18	35	86	32	178
	Percent	4%	10%	20%	48%	18%	100%
Project risks were managed correctly.	Frequency	9	25	44	77	23	178
	Percent	5%	14%	25%	43%	13%	100%
The project process was systematically monitored.	Frequency	4	13	32	93	36	178
	Percent	2%	7%	18%	52%	20%	100%
The project was followed in accordance with the project management methodology applied.	Frequency	4	10	27	103	34	178
	Percent	2%	6%	15%	58%	19%	100%
There were enough technologies in the company to follow the project process.	Frequency	6	20	26	77	49	178
	Percent	3%	11%	15%	43%	28%	100%
	Frequency	5	26	30	80	37	178

Version control technologies in the company were available to track project versions.	Percent	3%	15%	17%	45%	21%	100%
Company policies and procedures were followed during the project.	Frequency	2	5	20	100	51	178
	Percent	1%	3%	11%	56%	29%	100%
Documentation was enough in the project process.	Frequency	7	22	38	77	34	178
	Percent	4%	12%	21%	43%	19%	100%
The project process is owned by the company.	Frequency	1	12	34	91	40	178
	Percent	1%	7%	19%	51%	22%	100%
The feedback received from the project team was taken into consideration during the project.	Frequency	0	9	27	102	40	178
	Percent	0%	5%	15%	57%	22%	100%
Feedback from end users was taken into consideration during the project.	Frequency	4	13	24	96	41	178
	Percent	2%	7%	13%	54%	23%	100%
At the end of the project, the process and outputs were evaluated.	Frequency	3	10	30	100	35	178
	Percent	2%	6%	17%	56%	20%	100%
Enough workforce resources were allocated for the project.	Frequency	2	28	35	89	24	178
	Percent	1%	16%	20%	50%	13%	100%
Adequate budget was allocated for the project.	Frequency	5	15	35	89	34	178
	Percent	3%	8%	20%	50%	19%	100%
External consultancy support was received for the project.	Frequency	32	31	14	66	35	178
	Percent	18%	17%	8%	37%	20%	100%
The resistance to the change resulted from project was high.	Frequency	20	42	41	58	17	178
	Percent	11%	24%	23%	33%	10%	100%
The project was piloted.	Frequency	27	41	17	69	24	178
	Percent	15%	23%	10%	39%	13%	100%

Table E6. Project Success Criteria Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
The project was completed in accordance with the calendar.	Frequency	12	54	23	57	32	178
	Percent	7%	30%	13%	32%	18%	100%
The project was completed in accordance with the budget.	Frequency	7	29	27	85	30	178
	Percent	4%	16%	15%	48%	17%	100%
Customer satisfaction was high at the end of the project.	Frequency	6	9	34	91	38	178
	Percent	3%	5%	19%	51%	21%	100%
	Frequency	4	6	19	101	48	178

At the end of the project, compliance with business objectives was achieved.	Percent	2%	3%	11%	57%	27%	100%
The scope of the project remained unchanged.	Frequency	15	62	30	50	21	178
	Percent	8%	35%	17%	28%	12%	100%

Table E7. Project Development Process Factor Items Answer Distribution

Factors		0	1.00	2.00	3.00	4.00	5.00	Total
The coding standards were complied with during the project development process.	Frequency	14	0	14	34	77	39	178
	Percent	8%	0%	8%	19%	43%	22%	100%
Software development standards were followed during the project development process.	Frequency	14	0	12	30	83	39	178
	Percent	8%	0%	7%	17%	47%	22%	100%
In the project development process, module and integration tests were done adequately.	Frequency	13	3	10	29	87	36	178
	Percent	7%	2%	6%	16%	49%	20%	100%

Table E8. Company Culture Factor Items Answer Distribution

Factors		1.00	2.00	3.00	4.00	5.00	Total
The company is innovative and open to innovation.	Frequency	5	12	35	89	37	178
	Percent	3%	7%	20%	50%	21%	100%
The company does not avoid taking risks.	Frequency	7	47	51	56	17	178
	Percent	4%	26%	29%	31%	10%	100%
Resistance to change in the company is high.	Frequency	17	61	50	39	11	178
	Percent	10 %	34%	28%	22%	6%	100%

Table E9. Company Project Management Preference Answer Distribution

Project Management Method		Not Used	1.00	2.00	3.00	4.00	5.00	Total
Agile	Frequency	22	27	20	47	45	17	178
	Percent	12%	15%	11%	26%	25%	10%	100%
Waterfall	Frequency	17	3	11	42	55	50	178
	Percent	10%	2%	6%	24%	31%	28%	100%
Both	Frequency	45	18	15	41	40	19	178
	Percent	25%	10%	8%	23%	22%	11%	100%

REFERENCES

Ahimbisibwe, A., Cavana, R. Y., & Daellenbach, U. (2015). A contingency fit model of critical success factors for software development projects: A comparison of agile and traditional plan-based methodologies. *Journal of Enterprise Information Management, 28*(1), 7-33.

Aitken, A., & Ilango, V. (2013, January). *A comparative analysis of traditional software engineering and agile software development.* 46th Hawaii International Conference on System Sciences, Wailea, Maui, HI USA. doi: 10.1109/HICSS.2013.31

Baddoo, N., & Hall, T. (2002). Motivators of software process improvement: an analysis of practitioners' views. *Journal of Systems and Software, 62*(2), 85-96.

Cho, J. J. (2010). *An exploratory study on issues and challenges of agile software development with scrum* (Doctoral Dissertation). Retrieved from https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1595&context=etd

Chow, T., & Cao, D. B. (2008). A survey study of critical success factors in agile software projects. *Journal of Systems and Software, 81*(6), 961-971.

Cooper, R. G. (2017). Idea-to-launch gating systems: better, faster, and more agile: Leading firms are rethinking and reinventing their idea-to-launch gating systems, adding elements of agile to traditional stage-gate structures to add flexibility and speed while retaining structure. *Research-Technology Management, 60*(1), 48-52.

Cram, W. A., & Marabelli, M. (2018). Have your cake and eat it too? Simultaneously pursuing the knowledge-sharing benefits of agile and traditional development approaches. *Information & Management*, 55(3), 322-339.

Dikert, K., Paasivaara, M., & Lassenius, C. (2016). Challenges and success factors for large-scale agile transformations: A systematic literature review. *Journal of Systems and Software, 119*, 87-108.

Fatima, A., & Gupta, S. (2018). Critical analysis on various software development models. *International Journal of Advanced Research in Computer Science, 9* (Special Issue 2), 157.

Forrester Consulting. (2012). Agile software development and the factors that drive success. Retrieved from https://www.enterpriseinnovation.net/whitepaper/agile-software-development-and-factors-drive-success

Fry, C., & Greene, S. (2007, August). *Large scale agile transformation in an on-demand world.* Agile Conference (AGILE), 2007 (pp. 136-142). IEEE.

Hamad, D. R., Fadhil, D. S., & Rasul, A. I. (2018). IT project management techniques for development professionals. *International Journal of Computer Engineering and Information Technology*, *10*(9), 175-179.

Jørgensen, M. (2016). A survey on the characteristics of projects with success in delivering client benefits. *Information and Software Technology*, *78*, 83-94.

Jovanovic, P., & Beric, I. (2018). Analysis of the available project management methodologies. *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, *23*(3), 1-13.

Kettunen, P. (2009). Adopting key lessons from agile manufacturing to agile software product development—A comparative study. *Technovation*, *29*(6), 408-422.

Kouzari, E., Gerogiannis, V. C., Stamelos, I., & Kakarontzas, G. (2015, July). *Critical success factors and barriers for lightweight software process improvement in agile development: A literature review.* Software Technologies (ICSOFT), 10th International Joint Conference (Vol. 1, pp. 1-9). IEEE.

Kumar, M., & Rashid, E. (2018). An efficient software development life cycle model for developing software project. *International Journal of Education and Management Engineering*, *8*(6), 59.

Livermore, J. A. (2008). Factors that significantly impact the implementation of an agile software development methodology. *Journal of Software*, *3*(4), 31-36.

McLeod, L., & MacDonell, S. G. (2011). Factors that affect software systems development project outcomes: A survey of research. *ACM Computing Surveys (CSUR)*, *43*(4), 24.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005). Challenges of migrating to agile methodologies. *Communications of the ACM*, *48*(5), 72-78.

Niazi, M. (2015). A comparative study of software process improvement implementation success factors. *Journal of Software: Evolution and Process*, *27*(9), 700-722.

Niazi, M., Mahmood, S., Alshayeb, M., Qureshi, A. M., Faisal, K., & Cerpa, N. (2016). Toward successful project management in global software development. *International Journal of Project Management*, *34*(8), 1553-1567.

Norton D. (2016). Bimodal in an agile everywhere world [Web log post]. Retrieved from https://blogs.gartner.com/david_norton/2016/09/30/bimodal-in-an-agile-everywhere-world/

Pinto, J. K., & Prescott, J. E. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management*, *14*(1), 5-18.

Poth, A., Sasabe, S., Mas, A., & Mesquida, A. L. (2019). Lean and agile software process improvement in traditional and agile environments. *Journal of Software: Evolution and Process*, 31(1), e1986.

Rainer, A., & Hall, T. (2002). Key success factors for implementing software process improvement: a maturity-based analysis. *Journal of Systems and Software*, *62*(2), 71-84.

Rainer, A., & Hall, T. (2003). A quantitative and qualitative analysis of factors affecting software processes. *Journal of Systems and Software*, *66*(1), 7-21.

Redlarski, K. (2018, September). *Hard lessons learned: A model that facilitates the selection of methods of IT project management.* Federated Conference on Computer Science and Information Systems (FedCSIS) (pp. 979-983). IEEE.

Saleh, S. M., Huq, S. M., & Rahman, M. A. (2019, February). *Comparative study within scrum, kanban, XP focused on their practices.* International Conference on Electrical, Computer and Communication Engineering (ECCE) (pp. 1-6). IEEE.

Savolainen, P., Ahonen, J. J., & Richardson, I. (2012). Software development project success and failure from the supplier's perspective: A systematic literature review. *International Journal of Project Management*, *30*(4), 458-469.

Sharma, S., Sarkar, D., & Gupta, D. (2012). Agile processes and methodologies: A conceptual study. *International Journal on Computer Science and Engineering*, *4*(5), 892.

Sheffield, J., & Lemétayer, J. (2013). Factors associated with the software development agility of successful projects. *International Journal of Project Management*, *31*(3), 459-472.

Sommer, A. F., Dukovska-Popovska, I., & Steger-Jensen, K. (2014, September). *Agile product development governance–on governing the emerging scrum/stage-gate hybrids.* IFIP International Conference on Advances in Production Management Systems, Ajaccio, France (pp. 184-191). Springer Berlin Heidelberg.

Stankovic, D., Nikolic, V., Djordjevic, M., & Cao, D. B. (2013). A survey study of critical success factors in agile software projects in former Yugoslavia IT companies. *Journal of Systems and Software*, *86*(6), 1663-1678.

Sulayman, M., Urquhart, C., Mendes, E., & Seidel, S. (2012). Software process improvement success factors for small and medium Web companies: A qualitative study. *Information and Software Technology*, *54*(5), 479-500.

Trimble, J., & Webster, C. (2013, January). *From traditional, to lean, to agile development: Finding the optimal software engineering cycle.* System Sciences (HICSS), 46th Hawaii International Conference (pp. 4826-4833). IEEE.

West, M., Wilson N. (2016) Survey analysis: How agile in the enterprise stumbles, evolves, then succeeds [Web log post]. Retrieved from https://www.gartner.com/en/documents/3263417

Wilson N. (2016). Planning an agile project [Web log post]. Retrieved from https://www.gartner.com/en/documents/3467417