Project success/failure rates in Turkey

Canser Bilir
Istanbul Sabahattin Zaim Universitesi,
Industrial Engineering Department
Halkali Cad. Kucukcekmece, Istanbul, 34303
Turkey
canser.bilir@izu.edu.tr

Elif Yafez
Istanbul Sabahattin Zaim Universitesi,
Master of Business Administration
Halkali Cad. Kucukcekmece, Istanbul, 34303
Turkey
elifyafez@gmail.com

Abstract:
In this study, the success rate of projects in Turkey is measured, and the significant factors behind the successes and the failures of those projects are ranked. To the best of our knowledge, this is the first study widely measuring the success rate of projects in Turkey. The applied methodology is adapted from the Chaos Report by Standish Group. The data for 320 projects with a total budget of approximately $640 million (around 3.6 billion Turkish lira) is collected for the analysis. The results showed that 48% of projects are completed successfully while 45% are eventually completed but either over budget, not on time, or not fully completed. The success rate of the reviewed projects is higher than the rate reported in the Chaos Report. However, the success rate of projects drops to 44% when only technology-driven projects are considered. As the project size increases, the success rate diminishes, as demonstrated in the Chaos Report. The study on the significant factors influencing the success or failure of the projects revealed that the most critical factors are the "requirement definitions", "requirement planning" and "top management support".

1. Introduction

Projects are defined as temporary endeavors to generate a unique product, service, or result [1]. Even though there have been major developments in project management over the years, the success rates of projects are still far from the desired levels [2],[3].

The number of studies focusing on project success has been increasing over the last few decades. However, most of these studies focus on either measuring project success or identifying the critical success factors of the projects with different characteristics. On the other hand, there is a limited number of studies that explicitly measure the success rates of projects even though measuring success is an essential part of the management process to develop tools, techniques, and management styles and to analyze the environmental factors that may support the success of projects with different characteristics.

In an attempt to increase the success rate of projects, it is essential to understand their success and failure rates [4]. This reality indicates a need for more studies to measure the success rates of projects with different characteristics and/or that are from different geographical locations. However, there has been no study widely analyzing the success rate of projects executed in Turkey from various industries and with different characteristics. In addition to measuring the success rates, the most critical project success factors need to be identified for projects executed in Turkey to understand the underlying factors behind their success/failure because the importance of those factors may be different for different countries. Therefore, this study aimed to measure the level of achievement of the completed projects either in the second half of 2019 or in the first half of 2020. The study also aimed to identify the significant factors behind the success and failure of the projects by analyzing the project data. An online survey method is used to obtain the data. The results are compared against similar studies to draw some conclusions.

Our contribution to the literature is threefold. First, it is the first study to measure project success rates in Turkey. By doing so, we contribute to the practitioners' understanding of success rates in different geographical regions since there is a limited number of such studies. Second, we identify how the critical success factors change in Turkey. Finally, the projects are classified into two broad categories: Technology-driven projects and non-IT-based projects. The difference in those categories' success rates helps in understanding the success rate differences in similar studies [2],[3].

The following section reviews the recent literature on project success. The applied review methodology is described in section three. Section four contains the results and the discussion of the analysis, and the article ends with conclusions and further research suggestions.

2. Background

Research on project success falls into two main categories: Studies dealing with the project success criteria and studies dealing with the critical success factors [4]. In the first category, there are many studies (e.g., [4]–[8]) discussing how the success of the projects should be measured and what criteria should be used. Even though the criteria to be used in project success measurement is quite controversial, cost, time, and quality (the iron triangle) are commonly used as the success criteria by researchers [9]. In one of the generally accepted definitions, project success is defined by the outcome criteria of the budget, schedule, performance, and client satisfaction [10]. In one of the recently published studies discussing how the success/failure rates of projects should be measured, Castro et al. [11] proposed generic project success criteria based on the quantitative surveys of 264 Brazilian project managers with different backgrounds. In another study focusing on the Information Systems (IS) projects, Pankratz and Basten [12] identified eight commonly accepted success criteria by interviewing eleven experienced project managers in Germany. Davis [6] assessed different views of project success by different groups of stakeholders and proposed a multiple stakeholder model to reconcile the different views.

In the second category of the studies, some researchers (e.g., [13]–[16]) discussed the critical success factors for projects with different characteristics. Project success factors may be defined as the input to the management system that led to the success of the project [5]. In a recent study, authors conducted a descriptive and explanatory study to

analyze the impact of 38 critical success factors compiled from the current literature on project success factors [17]. Iriarte and Bayona [18] also reviewed the relevant articles that had been published until 2017 to synthesize the most referenced critical factors in information technology (IT) projects. In another study, Siddique and Hussein [19] investigated the similarities and dissimilarities between agile-based and waterfall-based projects based on how success is perceived and managed by interviewing 32 agile practitioners in Norway. Abylova and Salykova [20] also concluded that project success factors change according to the necessities and the priorities of the projects, and they added that there is still a need for more studies investigating the critical success factors because of the changing nature of the projects through time. After classifying the success factors and identifying the impacts of the factors on project performance, Tam et al. [21] investigated the five people-factors to identify the most contributing factors to the success of the agile software development projects by surveying 216 agile practitioners. Belassi and Tukel [22] concluded that not all critical success/failure factors are applicable to all projects because of their unique nature. They also concluded that environmental factors, such as political, economic, and social, impact the project's performance and need to be understood. As the political, economic, social, and cultural factors change from one geographic region to another, analyzing the impacts of those factors in different geographic regions may help both practitioners and academicians understand the underlying environmental factors behind the success/failure of the projects in those specific regions.

On the other hand, there is a limited number of studies explicitly measuring the success rates of projects even though the measurement is an essential part of the management process to develop tools, techniques, and management styles for improvement. Some of the studies measure the success of projects with different characteristics [3],[23], and others measure the success rate of projects limited to one specific area [2],[24],[25]. Standish Group has been measuring the success and failure rates of IT projects since 1985. It publishes the results in the Chaos Report each year [2]. In their study, Hughes et al. [24] designed a construction-business-specific survey to measure the success rates of the limited number of projects in the construction business. In another study, other authors reviewed 633 projects in South Africa to measure the success/failure rates of those projects, and they compared the results against the results of the Chaos Report [26]. Palcic and Buchmeister [27] conducted an online survey among Slovenian companies in 2010 and 2011 to determine the success levels of projects regarding different factors, such as company size, project type and company-project orientation. In another study measuring success/failure rates, Okike and Mphale [28] assessed the success rates of telecommunication projects by interviewing twenty managers from six different companies. They followed the definition of project success in the Chaos Report for assessing projects. In a study from Turkey on project success, authors measured the success rates of 70 IS/IT projects to examine how the investment assessment method, project size, and employed software development methodology affect project success. However, in the study, the number of the studies was limited to only 70, and the authors never revealed the success rates of the projects in different dimensions (i.e., time, cost and scope) and in various industries [29].

In the project management success literature, there is a distinction between project management success and project success. Project management success focuses more on cost, time, and quality. On the other hand, project success is more related to the success or failure of the project's outcome [4]. A Guide to the Project Management Body of Knowledge (PMBOK), published by the Project Management Institute in project management, considers success as achieving goals successfully within the previously drawn frame. "If a project has reached its original targets set by its client, activities are carried out as it should be, and a determined problem is resolved within the limits of time, cost and quality determined before; this project can be defined as successful [1]." The same definition of project management success is adopted in the study. This is also the definition used by the Standish Group in the Chaos Report. Following this perspective, the Chaos Report classifies projects into three groups: Successful, failed, and challenged.

- Successful project: The project is completed on time and on budget with all the requirements as initially defined.
- Challenged project: The project is completed but over-budget, over the estimate, or without some initially defined functionalities.
- Failed project: The project is canceled during the development, or the outcome of the project has never been used.

3. Methodology

In order to measure the success rate of the projects in Turkey and identify the most relevant critical success factors in reviewed projects, six-step survey development, data collection, and an analysis approach are applied in the study. Figure 1 defines the steps followed in the study. In the first step, the survey form is adopted. As defined in the background section, in this study, the definition of project management success from PMBOK is adopted, and the classification scheme is adopted from the Chaos Report. In the developed survey form, there are four sections and ten questions. The English translation of the survey form is presented in Appendix A. In the first section, the data regarding the company and the industry in which the projects are executed is collected. The collected data is later used to conduct industry-based analysis after classifying the projects. In the second section of the form, the data regarding the project size and the role of the respondent in the project are collected. The third section of the survey form includes the questions measuring the project success rates: the time, the budget, and the scope to classify the projects as successful, challenged and failed. Finally, in the last section of the survey form, respondents are asked to identify up to three most critical success/failure factors from a list of project success/failure factors for the project. The Chaos Report's critical success/failure factors are used in the list of project success/failure factors with some new success/failure factors identified in the current literature on project success/failure factors.
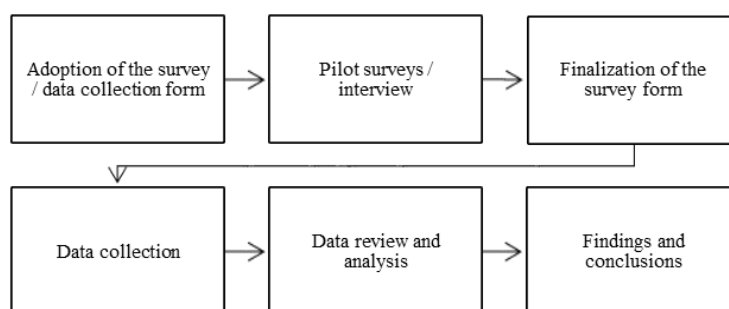

Fig. 1. The methodology applied in the study

After adopting the survey form into the study, in the second step, a limited number of face-to-face pilot interviews are conducted to ensure that the survey questions are straightforward and understood by the respondents. Then, the online survey form is finalized with the feedback gathered in pilot interviews in the third step. After finalizing the survey form, it was distributed to the potential participants, and they were asked to voluntarily fill out the survey form for each project completed in the last 12 months in which they either managed or had a significant role. The study participants are primarily members of two project management (PM) associations in Turkey: Istanbul Project Management Association and Project Management Institute — Turkey Chapter. The survey form has been sent to the members of those organizations. The survey form has also been sent to other project managers through personal and LinkedIn connections.

The data for 341 projects from various industries and over 200 organizations was collected through an online survey. Twenty-one responses are removed from the database for two reasons: There are redundant entries for the same projects, and some of the initiatives do not entirely fit the definition of the project. We eventually had data for 320 projects to conduct the analysis. In the next phase of the study, the data is classified into different groups and analyzed. Finally, the results are gathered and reviewed to generate valuable results and managerial insights. The results of the analysis are presented in the next section.

4. Results

In this section of the study, the results of the analysis are presented. First, the general statistics regarding the projects and the respondents are provided. Then, the measurement of the success/failure rates in terms of time, budget, and scope is presented. Finally, the most critical success and failure factors in the analyzed projects are presented and discussed.

4.1 General statistics for the reviewed projects

First, the general statistics regarding the reviewed projects, the companies, and the industries in which the projects are executed are presented in Table 1. As seen in the table, the data is collected from different industries, and there is a good mixture of industries to conduct an industry-based analysis of the projects. Along with the industry-based classification of the projects, other specifications of the projects and the respondents are also presented in Table 1. The dataset represents a total project budget of $641 million. The results presented in the table show that there is a good representation of the projects executed in Turkey regarding the various sizes of the projects and the companies. The table also shows that data is collected from the responsible people who have direct access to the project performance data, such as project managers or team members.

Table 1. Various specifications of the projects and respondents

Specifications	Variables	Count	Percent (%)
Industries	Banking & finance	36	11.2
	Information technologies	61	19.1
	Services	49	15.3
	Public services	38	11.9
	Telecommunications	13	4.1
	Manufacturing	58	18.1
	Misc. (engineering, health, retailing, etc.)	65	20.3
	Total	**320**	**100**
Company size	Large company (with 250+ employees or annual revenue of 125 M TL)	191	59.7
	Medium company (bw 50–250 employees or bw 25M–125M TL annual revenue)	53	16.6
	Small company (less than 50 employees and 25M TL annual revenue)	76	23.7
	Total	**320**	**100**
Project size	Very Small (Below $50K)	41	12.8
	Small (bw $50K–$250K)	56	17.5
	Medium (bw $250K–$1M)	78	24.4
	Large (bw $1M–$5M)	67	20.9
	Grand (Over $5M)	78	24.4
	Total	**320**	**100**
The role of the respondent	Project manager	171	53.4
	Project sponsor	19	5.9
	Project team members (e.g., specialist, developer, etc.)	100	31.4
	Other managers (e.g., head of project management office, functional manager, etc.)	12	3.7
	Other members (e.g., business unit, product owner, etc.)	18	5.6
	Total	**320**	**100**

4.2 Measurement of project success

Figure 2 presents the success rate of the reviewed projects. The results show that 154 (48.13%) of the reviewed projects are completed on time, on budget, and with the predefined scope (categorized as successful). On the other hand, only 22 (6.88%) projects failed, which means that the project is canceled before completion, or its output has never been used by the customer (categorized as failed). Those projects are also called "complete failure." One-hundred-forty-four of the reviewed projects are completed but over-budget, over the estimate, or without some initially defined functionalities (categorized as challenged).
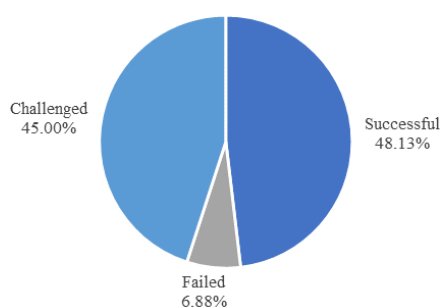

Fig. 2. Classification of the reviewed projects by their success

When the project success rate of the reviewed projects is compared with similar studies [2], [3], it can be concluded that the success rate is similar to the results of the PMI studies. However, the success rate is substantially higher than the success rate provided by the Chaos Reports. The difference may be explained by the type of projects. The Chaos Report measures the success rate of the IT-based projects only. However, in the present study, IT-based and non-IT-based projects are reviewed together.

Project success rates by industries:

How the success rates of the projects vary in different industries is also explored in the study (Figure 3). The results show that the success rate of the projects by industry varies. For example, manufacturing projects had the highest success rate at 64%, and telecommunications industry projects followed with a success rate of 54%. On the other hand, miscellaneous projects, including engineering, health, retail, and other sector projects, had the lowest success rate at 40%, which is slightly lower than banking & finance and IT projects success rates. The results are partially different from the analysis provided by Varajao et al. [30], in 2014. They concluded that software development and construction projects have similar success levels although the construction projects results are more positive in scope and time compliance.
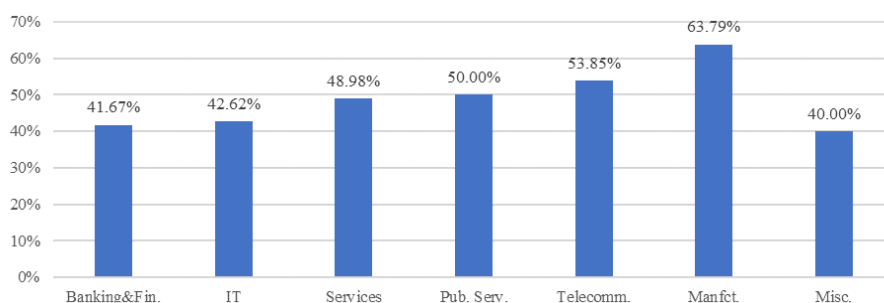

Fig. 3. The success rate of projects by industry

When the projects are classified into two broad categories, technology-driven (including IT, banking & finance, and telecommunications) and non-IT-based projects, the success rates of the projects in each category are calculated, as shown in Table 2. The table shows the difference between technology-driven and non-IT projects. That is, the project success rate is higher for non-IT projects. This may explain the significant success rate difference between the Chaos Reports (e.g., [2]) and the PMI studies (e.g., [3],[23]).

Table 2. Success rates of technology-driven vs. non-IT projects

	# of projects	Success rate (%)
Technology-driven projects	110	43.64%
Non-IT projects	210	50.48%

Project success rates by project size and company size:

The project success rate by project size and the company size with the industry breakdown (Tables 3 and 4) provide different views of project success. The success rate of the projects decreases steadily as the size of the project increases. The results support the idea that the size of the project is a critical factor in the success of a project. The project success rate decreasing as the project size increases shows that the larger the project, the lower the probability of completing the project on time, on budget, and with the predefined scope, as also concluded by Livesey [31] and Bezdrob et al. [32]. That may be explained by the increased need for team management and project management skills as the project size increases [31]. The decreasing success rate as the project size increases indicates the importance of keeping the size of the projects small whenever possible. On the other hand, an industry-specific analysis of project success rates does not identify any increasing or decreasing patterns in individual industries. This is probably because of the limited number of observations specific to each industry.

Table 3. Project success rate by project size with industry breakdown

Project size	Industry	Successful	Challenged	Failed	Total
Grand	Banking & finance	2.6%	3.8%	1.3%	7.7%
	IT	3.8%	3.8%	3.8%	11.5%
	Services	1.3%	5.1%	0.0%	6.4%
	Pub.Serv.	7.7%	3.8%	1.3%	12.8%
	Telecomm.	2.6%	1.3%	0.0%	3.8%
	Manufacturing	10.3%	3.8%	0.0%	14.1%
	Misc.	14.1%	25.6%	3.8%	43.6%
	Total	**42.3%**	**47.4%**	**10.3%**	**100.0%**
Large	Banking & finance	7.5%	4.5%	0.0%	11.9%
	IT	10.4%	13.4%	1.5%	25.4%
	Services	1.5%	9.0%	0.0%	10.4%
	Pub.Serv.	1.5%	10.4%	0.0%	11.9%
	Telecomm.	4.5%	4.5%	0.0%	9.0%
	Manufacturing	10.4%	3.0%	1.5%	14.9%
	Misc.	9.0%	7.5%	0.0%	16.4%
	Total	**44.8%**	**52,2%**	**3.0%**	**100.0%**
Medium	Banking & finance	3.8%	10.1%	1.3%	15.2%
	IT	12.7%	10.1%	1.3%	24.1%
	Services	12.7%	6.3%	0.0%	19.0%
	Pub.Serv.	3.8%	5.1%	0.0%	8.9%
	Telecomm.	1.3%	2.5%	0.0%	3.8%
	Manufacturing	10.1%	8.9%	0.0%	19.0%
	Misc.	2.5%	7.6%	0.0%	10.1%
	Total	**46.8%**	**50.6%**	**2.5%**	**100.0%**

Project size	Industry	Successful	Challenged	Failed	Total
Small	Banking & finance	5.4%	5.4%	0.0%	10.7%
	IT	8.9%	7.1%	7.1%	23.2%
	Services	8.9%	7.1%	1.8%	17.9%
	Pub.Serv.	8.9%	5.4%	1.8%	16.1%
	Telecomm.	1.8%	0.0%	0.0%	1.8%
	Manufacturing	12.5%	5.4%	0.0%	17.9%
	Misc.	7.1%	5.4%	0.0%	12.5%
	Total	**53.6%**	**35.7%**	**10.7%**	**100.0%**
	Banking & finance	5.0%	5.0%	0.0%	10.0%
	IT	2.5%	5.0%	0.0%	7.5%
	Services	17.5%	10.0%	2.5%	30.0%
Very Small	Pub.Serv.	10.0%	0,0%	0,0%	10.0%
	Telecomm.	0.0%	0.0%	0.0%	0.0%
	Manufacturing	17.5%	7.5%	5.0%	30.0%
	Misc.	7.5%	2.5%	2.5%	12.5%
	Total	**60.0%**	**30.0%**	**10.0%**	**100.0%**

Table 4. Project success rate by company size with industry breakdown

Company size	Industry	Successful	Challenged	Failed	Total
	Banking & finance	7.9%	9.4%	1.0%	18.3%
	IT	4.7%	6.3%	1.6%	12.6%
	Services	5.2%	5.2%	0.5%	11.0%
Large	Pub. Serv.	7.9%	7.9%	1.0%	16.8%
	Telecomm.	3.1%	3.1%	0.0%	6.3%
	Manufacturing	11.0%	4.2%	0.5%	15.7%
	Misc.	6.8%	12.0%	0.5%	19.4%
	Total	**46.6%**	**48.2%**	**5.2%**	**100.0%**
	Banking & finance	0.0%	0.0%	0.0%	0.0%
	IT	15.1%	5.7%	3.8%	24.5%
	Services	7.5%	3.8%	0.0%	11.3%
Medium	Pub. Serv.	7.5%	1.9%	0.0%	9.4%
	Telecomm.	0.0%	0.0%	0.0%	0.0%
	Manufacturing	15.1%	11.3%	1.9%	28.3%
	Misc.	11.3%	13.2%	1.9%	26.4%
	Total	**56.6%**	**35.8%**	**7.5%**	**100.0%**
	Banking & finance	0.0%	0.0%	1.3%	1.3%
	IT	11.8%	14.5%	5.3%	31.6%
	Services	13.2%	14.5%	1.3%	28.9%
Small	Pub. Serv.	0.0%	1.3%	0.0%	1.3%
	Telecomm.	1.3%	0.0%	0.0%	1.3%
	Manufacturing	10.5%	5.3%	1.3%	17.1%
	Misc.	9.2%	6.6%	2.6%	18.4%
	Total	**46.1%**	**42.1%**	**11.8%**	**100.0%**

An analysis of the project success rates of various company sizes may draw some conclusions. The projects carried out in medium-sized companies (annual revenue between 25 million and 125 million Turkish lira) had the highest success rate at 56.6%. The project success rates of small enterprises and large enterprises are 46.1% and 46.6%, respectively. However, no upward or downward trend as the company size increases is observed. On the other hand, as the company size increases, the failure rate of the projects decreases from 10.5% to 7.5% and then 5.2%. The change may be explained by the variety of additional resources that the large companies may provide to the projects with time or cost overruns. This indicates that the large companies are more successful in preventing overrun projects from becoming complete failures. The companies in the banking & finance, telecommunications, and public services industries are primarily large. In the IT and services industries, success rates follow the general pattern (i.e., the highest at medium-

sized). In the manufacturing industry, the success rate is highest for large companies, and, in the miscellaneous category, the success rate increases as the company size decreases.

Next, the performance of the reviewed projects in individual performance metrics (time, budget, and scope) is presented. Figure 4 shows the ratio of the projects completed within a reasonable estimated time. One hundred ninety-two out of 320 projects are completed on time without delay from the estimated project completion time. The remainder of the projects (128 out of 320) show time overruns. The reviewed projects are the least successful in terms of time. Figure 5 presents the ratio of the various levels of time overruns of the delayed 128 projects. Thirty-nine projects have a time overrun of 50% or more, and the average time overrun ratio is calculated as 14.0% for the reviewed 320 projects. The time overrun ratio is calculated as 17.0% when only the IT-based projects are considered. The ratio reported in the Chaos report was 16.6% [2].
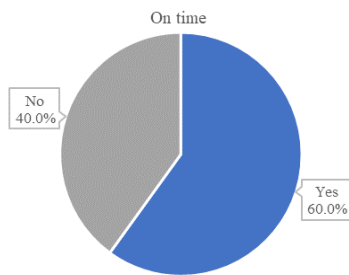
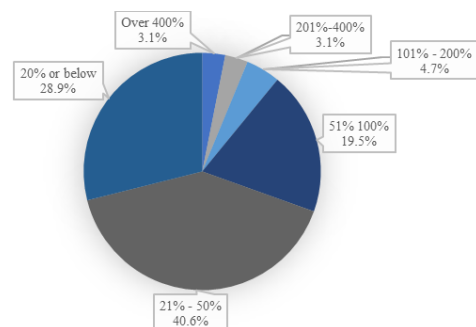Fig. 4. The ratio of projects completed within a reasonable estimated time

Fig. 5. Time overrun ratios (out of 128 projects)

Figure 6 depicts the ratio of the projects that stayed within the budget when they were completed. Two hundred thirty-one (72%) out of 320 projects stayed within the budget when they were completed. The remainder of the projects (89 out of 320) showed a cost overrun or were never completed. The success rate of the projects is higher in terms of finishing the projects within the budget than finishing them on time. Figure 7 presents the ratio of the various levels of the cost overruns. Nineteen projects have a cost overrun of 50% or more. The results also show that the average cost overrun ratio is 11.8%. The cost of that overrun is $227 million only for the reviewed projects. The ratio reported in the 2019 Chaos Report was 18.2% [2]. The difference between the ratio calculated in this study and the Chaos Report can again be explained as having non-IT-based projects in the database because the cost overrun ratio is higher (18,7%) only when IT-based projects are considered.
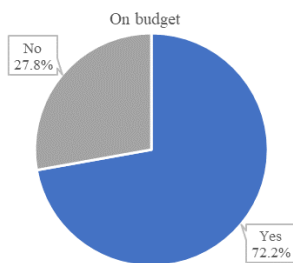

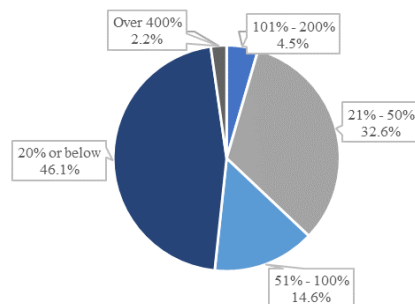Fig. 6. The ratio of the projects stayed within the budget

Fig. 7. Cost overrun ratios (out of 89 projects)

Figure 8 classifies the reviewed projects into three groups: The projects completed with the predefined scope (onscope), the projects missing at least one critical initially defined functionality (completion with missing functionality), and the projects canceled during the development or that have never been used (canceled or never used). Out of three different dimensions of the project performance, the reviewed projects are most successful in completing the projects with the predefined scope (around 84% of the projects). On the other hand, around 9% of the reviewed projects had not delivered at least one critical predefined functionality when the project was completed. Finally, around 7% of the projects had never been completed or had never been used by the customers even though the project had been completed and delivered.
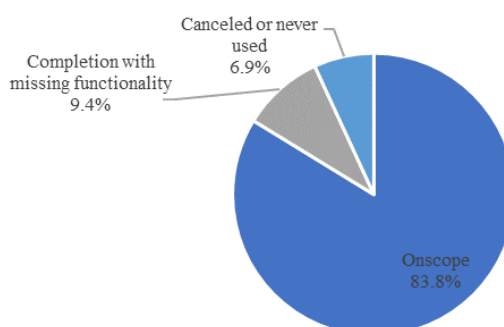

Fig. 8. Classification of projects by completion of the scope at the end of the project

4.3   Critical success factors

In the last subsection of the analysis, the study results on the most critical success and failure factors are presented. The results are based on the data collected in section four of the survey form. A list of critical success or failure factors gathered from relevant studies (mostly Chaos Reports) identified in the literature review is provided in the survey form. The list of factors is also presented in Figures 9 and 10. The respondents were asked to select up to three success factors most relevant to the reviewed project if they believed that the project was successful. Figure 9 depicts the critical success factors ranked by their ratio of appearance in the responses. The ratios provided next to the factors show the ratio of their selection as a critical success factor. According to the responses, the clear definition of the requirements is the most important critical success factor at 41.3%. Then, it is followed by proper planning (at 38.8%) and executive management support (at 31.9%). The results show similarities with similar studies in the literature; however, there are some minor differences. Even though the importance of the requirements definition is underlined in all the studies, the respondents put more importance on requirements definition in the reviewed projects. In addition, no one can ignore the importance of proper planning in project management; however, it does not appear in the list of the three most critical factors in similar studies. The respondents also believe that executive sponsorship is critical for the success of the projects, but they do not pay that much attention to the project sponsor, who is assumed to be a part of top management.

The results of the critical success factors for each industry are also presented in Appendix B.1. The industry-specific analysis also gave some conclusions. Even though "clear definition of the requirements" is the most important critical success factor when the industries are combined, the most important critical success factor is "executive management support" in the banking & finance, public services, and telecommunications industries. Project team-related factors (i.e., "hard-working, focused staff" and "competent staff") are ranked as the most critical factors in the services industry. "Proper planning" is ranked as very important in telecommunications, manufacturing, and miscellaneous industries; however, it is not ranked as one of the three most important factors in other industries.

The respondents were also asked to select up to three failure factors that are most relevant to the reviewed project if they believed that the project was not successful. Figure 10 shows the most critical factors behind the projects' failure, as identified by the participants in the study. The critical failure factors are also ranked by their ratio of appearance in the responses. The results show that the requirements definition is the most critical factor in the failure of the projects as it is in the critical success factors. One interesting result is that three out of the five most important factors behind the

failures of the projects are "unrealistic expectations," "lack of resources," and "lack of executive support." These factors are the factors that the project team or project management does not directly affect. Therefore, it can be concluded that the participants in the study believe that the factors they cannot directly control are more critical in the failure of the projects. On the other hand, the participants also confirmed the importance of managerial factors, such as "top management support," "adequate planning," "realistic expectations," "change management," etc., on the success of the projects.

Fig. 9. Critical success factors (ratio of appearance for each factor)
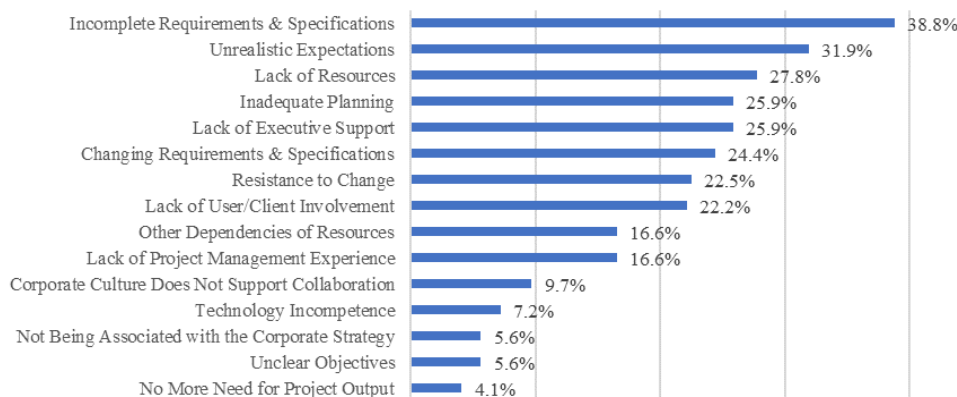

Fig. 10. Critical failure factors (ratio of appearance for each factor)

The results of the critical failure factors for each industry are also presented in Appendix B.2. Some conclusions may be drawn from the industry-based analysis. "Incomplete requirements & specifications" is generally ranked as the most critical factor or at least one of the three most important factors. Only in manufacturing industry projects is it not ranked as one of the most critical factors. In the manufacturing industry, "unrealistic expectations" is ranked as the most critical factor in the failure of the projects. "Lack of resources" is believed to be a critical factor in manufacturing and telecommunications industries, but not in banking & finance and public services industries. According to the results, "resistance to change" is a significant issue in the banking & finance, IT, services, and public services industries. However, it is not considered a critical factor in the telecommunications and manufacturing industries.

5. Conclusions and further research suggestions

This study presents the success rate of projects completed in Turkey in the second half of 2019 or the first half of 2020. The critical success and failure factors are also ranked to understand which factors are the most important in the success or failure of the reviewed projects. The study shows that around 48% of the reviewed projects are completed on time, on budget, and with the predefined scope. The study revealed a higher success rate than the Chaos Report and a somewhat lower success rate than the PMI study. When the projects were grouped into two groups, technology-driven projects and non-IT-based projects, the analysis indicated a significant success rate difference between these two groups. The non-IT-based projects had around 51% success rate; however, the IT-based projects had only a 44% success rate. The study also helps explain the significant success rate differences between the PMI study and the Chaos Report.

The success rates of different industries are also explored in the study. The results show that the success rate of the projects by industry varies, and the success rates are lower for the industries that generally have technically more complex projects, such as IT and banking & finance. On the other hand, the manufacturing or services industries have higher success rates than average. The analysis confirmed the general idea that the project success rate decreases as the project size increases. The result implies that the project size should be kept as small as possible to reduce the complexity and increase the probability of completing projects successfully.

The projects are least successful in completing the project within a reasonable estimated time (60%). They are most successful in completing the projects with the predefined scope (84%), while 72% of the projects stayed within the budget when they were completed. The average time overrun ratio for the reviewed project is 14.0%, and the average cost overrun ratio is 11.8%, which is equivalent to $227 million. This result implies that the project management teams should focus more on project scheduling and project time management.

The most critical factors identified in the study concern the requirements definition and management, which are also commonly identified critical success factors in the literature. Furthermore, the analysis showed that three out of the five most important factors behind the failures of the projects are "unrealistic expectations," "lack of resources," and "lack of executive support" on which the project team or the project management does not have a direct impact. Therefore, it can be concluded that the participants believe that the factors that they cannot directly control are significant in the failure of the projects. Moreover, the participants also confirmed the importance of the managerial factors, such as "top management support," "adequate planning," "realistic expectations," and "change management" on the success of the projects.

One major limitation of the study is that it is applied to the projects completed only in Turkey for a certain period. This study may be applied to different geographical regions in future studies. For example, the success rate of projects executed in Europe from different countries may be analyzed. Then, the success rates of various countries may be compared. In addition, in the following years, the study may be repeated to depict how the success rates change throughout the years. Another limitation of the study is that there was a limited number of observations for individual industries. The number of observations was sufficient to compare various industries' success/failure rates; however, more observations were required to analyze how the success rates change within an industry based on project size and company size. Therefore, the research may be repeated with more observations to study how the success rates change within the study as the company size and project size increase. In the analysis, there was limited information regarding the company and the project team. By collecting more information about the company and project team, such as the company culture, leadership style, and project team organizational structure, the relationship between these factors and project success may also be investigated. There is also a need for more researches investigating Turkish cultural idiosyncrasies and their impact on the project success and critical success factors.

References

[1] Project Management Institute. A Guide to the *Project Management Body of Knowledge (PMBOK Guide).* 6th ed. Newton Square, PA: Project Management Institute, 2017.

[2] The Standish Group International. Chaos Report 2019, The Standish Group International, Inc. (2019). [Online]. Available: https://www.standishgroup.com/about.

[3] Project Management Institute. *Pulse of Profession 2019.* Project Management Institute. (2018) [online]. Available: https://www.pmi.org/learning/thought-leadership/pulse

[4] L. Ika, "Project Success as a Topic in Project Management Journals," *Project Management Journal,* vol. 40, no. 4, pp. 6-19, Dec., 2009, doi:10.1002/pmj.20137.

[5] G. P. Prabhakar, "What is Project Success: A Literature Review," *International Journal of Business and Management,* vol. 3, no. 9, pp. 3-10, Sept., 2008, doi:10.5539/ijbm.v3n9p3.

[6] K. Davis, "Reconciling the views of project success: A multiple stakeholder model," *Project Management Journal,* vol. 49, no. 5, pp. 1–10, Oct., 2018, doi:10.1177/8756972818786663.

[7] R. Osei-Kyei and A.P.C. Chan, "Comparative analysis of the success criteria for public-private partnership projects in Ghana and Hong Kong," *Project Management Journal,* vol. 48, no. 4, pp. 80-92, Aug., 2017, doi:10.1177/875697281704800407.

[8] A. P. Chan, D. Scott and W. M. Edmond, "Framework of Success Criteria for Design/Build Projects," *Journal of Management in Engineering,* vol.18, no. 3, pp. 120-128, July, 2002, doi:10.1061/(ASCE)0742-597X(2002)18:3(120).

[9] R. Atkinson, "Project Management: Cost, Time and Quality, Two Best Guesses and A Phenomenon, Its Time to Accept Other Success Criteria," *International Journal of Project Management,* vol. 17, pp. 337-342. Dec., 1999, doi:10.1016/S0263-7863(98)00069-6.

[10] J. K. Pinto and D. P. Slevin, "Project Success: Definitions and Measurement Techniques," *Project Management Journal,* vol. 19, no. 1, pp. 67-72. Feb., 1988.

[11] M. S. Castro, B. Bahli, A. Barcaui and R. Figueiredo, "Does one project success measure fit all? An empirical investigation of Brazilian projects". *International Journal of Managing Projects in Business*, vol. 14, no. 4, pp. 788-805. Apr., 2021, doi:10.1108/IJMPB-01-2020-0028.

[12] O. Pankratz and D. Basten, "Ladder to success - eliciting project managers' perceptions of IS project success criteria," *International Journal of Information Systems and Project Management,* vol. 2, no. 2, pp. 5-24, June, 2014, doi:10.12821/ijispm020201

[13] T. J. Cooke Davies, "The ''real'' success factors on projects." *International Journal of Project Management,* vol. 20, no. 3, pp. 185-190, Apr., 2002, doi:10.1016/S0263-7863(01)00067-9.

[14] M. H. Nasir, S. Sahibuddin, R. Ahmad and S. S. M. Fauzi, "How the PMBOK Addresses Critical Success Factors for Software Projects: A Multi-round Delphi Study," *Journal of Software*, vol. 10, no. 15, pp. 1283-1300, Nov., 2015, doi:10.17706/jsw.10.11.1283-1300.

[15] S. Yalegama, N. Chileshe and T. Ma, "Critical success factors for community-driven development projects: A Sri Lankan community perspective," *International Journal of Project Management,* vol. 34, pp. 643-659, May, 2016, doi:10.1016/j.ijproman.2016.02.006.

[16] D. S. L. Marzagao and M. M. Carvalho, "Critical success factors for six sigma projects," *International Journal of Project Management,* vol. 34, pp. 1505-1518. Nov., 2016, doi:10.1016/j.ijproman.2016.08.005.

[17] A. C. Pacagnella, S.L. Da Silva, O. Pacifico, P.D.A. Ignacio and A.L. Da Silva, "Critical success factors for project manufacturing environments," *Project Management Journal,* vol. 50, no. 2, pp. 1-16, Apr., 2019, doi:10.1177/8756972819827670.

[18] C. Iriarte and S. Bayona, "IT projects success factors: a literature review," *International Journal of Information Systems and Project Management,* vol. 8, no. 2, pp. 49-78. June, 2020, doi:10.12821/ijispm080203.

[19] L. Siddique and B. A. Hussein, "A qualitative study of success criteria in Norwegian agile software projects from suppliers' perspective," *International Journal of Information Systems and Project Management,* vol. 4, no. 2, pp. 63-79. June, 2016, doi:10.12821/ijispm040204.

[20] V. Abylova and L. Salykova, "Critical success factors in project management: A comprehensive review," *PM World Journal,* vol. 8, no. 5, pp. 1-13. June, 2019.

[21] C. Tam, E. J. C. Moura, T. Oliveira and J. Varajão, "The factors influencing the success of on-going agile software development projects," *International Journal of Project Management,* vol. 38, pp. 165-176, Apr., 2020, doi:10.1016/j.ijproman.2020.02.001.

[22] W. Belassi and O. I. Tukel, "A new framework for determining success/failure factors in projects," *International Journal of Project Management,* vol. 14, no. 3, pp. 141-151, June, 1996, doi:10.1016/0263-7863(95)00064-X.

[23] Project Management Institute. *PMI's Pulse Of the Profession: Success Rates Rise.* Project Management Institute. (2017). [online]. Available: https://www.pmi.org/learning/thought-leadership/pulse

[24] S. W. Hughes, D. D. Tippett and W. K. Thomas, "Measuring project success in the construction industry," *Engineering Management Journal,* vol. 16, no. 3, pp. 31-37. Sept., 2004, doi:10.1080/10429247.2004.11415255.

[25] K. E. Emam and A. G. Koru, "A replicated survey of IT Software Project Failures," *IEEE Software,* vol. 25, no. 5, pp. 84-90. Sept.-Oct., 2008, doi:10.1109/MS.2008.107.

[26] R. Sonnekus and L. Labuschagne, "Establishing The Relationship Between IT Project Management Maturity And Project Success In A South African Context," *Presented at 2004 PMSA International Conference*, 10-12 May 2004, Johannesburg. South Africa, 2004.

[27] I. Palcic and B. Buchmeister, "Project Success in Slovenian Companies – Chapter 5," in *DAAAM International Scientific Book 2012*, B. Katalinic Ed., Published by DAAAM International, ISBN 978-3-901509-86-5, ISSN 1726-9687, Vienna, Austria, DOI: 10.2507/daaam.scibook.2012.05, pp. 53-64.

[28] E. U. Okike and O. Mphale, O. "Measuring ICT Project Success in Botswana Using CHAOS Report Criteria," *International Journal of Computer Science and Information Security,* vol. 14, no. 12, pp. 1056-1063. Dec., 2016.

[29] M. Ozturan, F. Gursoy and B. Ceken, "An empirical analysis on the effects of investment assessment methods on IS/IT project success," *International Journal of Information Systems and Project Management,* vol. 7, no. 4, pp. 33-52. Dec., 2019, doi:10.12821/ijispm070402.

[30] J. Varajão, C. Domingues, P. Ribeiro and A. Paiva, "Failures in software project management – are we alone? A comparison with construction industry," *Journal of Modern Project Management,* vol. 2, no. 1, pp. 22-27. May., 2014, doi:10.19255/59.

[31] P. V. Livesey, "Insights of project managers into the problems in project management," *Construction Economics and Building,* vol. 16, no. 1, pp. 90-103. Mar., 2016, doi:10.5130/AJCEB.v16i1.4600.

[32] M. Bezdrob, S. Brkic and M. Gram, "The pivotal factors of IT projects' success – Insights for the case of organizations from the Federation of Bosnia and Herzegovina," *International Journal of Information Systems and Project Management,* vol. 8, no. 1, pp. 23-41. Mar., 2020, doi:10.12821/ijispm080102.

Appendix A. Survey form

Section I. Company Information

1) Which industry is your company? *Please select one.
    ☐ Banking and Finance   ☐ Public Services   ☐ Information Technologies
    ☐ Manufacturing   ☐ Telecommunications   ☐ Other Services
    ☐ Retailing   ☐ Other: Please specify _____

2) Please specify the size of your company?
- Small company (Less than 50 employees and annual net revenue of less than 25 million TL)
- Medium size company: (Less than 250 employees and annual net revenue of 125 million TL)
- Large company (More than 250 employees or annual net revenue of more than 125 million TL)

Section II: Project General Information

3) Please specify the name of the project: Please make sure the project is not still under development
_____

4) Project budget? * Please specify one.
    ☐ Grand (Budget over $5 M)   ☐ Large (Budget between $1 M and $5 M)
    ☐ Medium (Budget between $250 K and $1 M)   ☐ Small (Budget between $50 K and $250 K)
    ☐ Very Small (Budget below $50 K)

5) What is your role in the project? *Please specify one.
    ☐ Project Manager   ☐ Project Team Member
    ☐ Project Sponsor or Business Unit Manager requested the project
    ☐ Other: please specify _____

Section III: Project Success Metrics

6) Is the project completed on time without any delay from the estimated project completion time?
    ☐ Yes → Go to 8   ☐ No → Go to 7

7) Please specify the time overrun in the project?
    ☐ 20% or below   ☐ 21% - 50%   ☐ 51% - 100%
    ☐ 101% - 200%   ☐ 201% - 400%   ☐ Over 400%

8) Is the project within the budget when it is completed?
    ☐ Yes → Go to 10   ☐ No → Go to 9

9) Please specify the cost overrun in the project?
    ☐ 20% or below   ☐ 21% - 50%   ☐ 51% - 100%
    ☐ 101% - 200%   ☐ 201% - 400%   ☐ Over 400%

10) Is the project delivered with all the specifications/functionalities previously defined in the project scope?
    ☐ Yes
    ☐ No (One or more functionalities defined in scope are not delivered when the project is completed.)
    ☐ The project has been canceled during the development or never been used.

Section IV: Project Success and Failure Factors

11) Which factors do you believe are the most critical factors in the success of the project if you consider the project successful? Please specify up to three factors from the list provided.

    - The list of the factors is provided in section appendix B.

12) Which factors do you believe are the most critical factors in the failure of the project if you do not consider the project successful? Please specify up to three factors from the list provided.

    - The list of the factors is provided in section appendix B.

Appendix B. Critical success/failure factors in various industries

B.1. Critical success factors in various industries

Critical Success Factor	Banking & Finance	IT	Services	Public Services	Telecomm.	Manufact.	Misc.	Total
Clear Statement of Requirements	30.6%	45.9%	30.6%	39.5%	38.5%	44.8%	49.2%	41.3%
Proper Planning	33.3%	31.1%	30.6%	39.5%	53.8%	43.1%	47.7%	38.8%
Executive Management Support	52.8%	24.6%	26.5%	44.7%	38.5%	32.8%	21.5%	31.9%
Hard-working, Focused Staff	36.1%	31.1%	34.7%	28.9%	23.1%	19.0%	27.7%	28.8%
User/Client Involvement	36.1%	37.7%	22.4%	18.4%	30.8%	32.8%	20.0%	28.1%
Competent Staff	13.9%	19.7%	34.7%	13.2%	23.1%	29.3%	35.4%	25.6%
Project Ownership	27.8%	24.6%	24.5%	36.8%	23.1%	20.7%	21.5%	25.0%
Project Management Expertise	5.6%	34.4%	22.4%	21.1%	7.7%	20.7%	27.7%	22.8%
Realistic Expectations	19.4%	9.8%	18.4%	5.3%	23.1%	10.3%	13.8%	13.1%
Strong Relationship Between Project and Organization Strategy	19.4%	6.6%	8.2%	10.5%	23.1%	10.3%	6.2%	10.0%
Existence of Clearly Defined Project Milestones	8.3%	6.6%	18.4%	2.6%	0.0%	10.3%	9.2%	9.1%
Collaborative Organizational Culture	5.6%	9.8%	6.1%	10.5%	7.7%	8.6%	9.2%	8.4%
Clear Vision & Objectives	8.3%	8.2%	12.2%	7.9%	0.0%	6.9%	4.6%	7.5%
Effective and Skilled Project Sponsor	2.8%	6.6%	2.0%	5.3%	7.7%	5.2%	0.0%	3.8%
Emotional Maturity	0.0%	1.6%	4.1%	2.6%	0.0%	1.7%	1.5%	1.9%

B.2. Critical failure factors in various industries

Critical Failure Factors	Banking & Finance	IT	Services	Public Services	Telecomm.	Manufact.	Misc.	Total
Incomplete Requirements & Specifications	58.3%	47.5%	34.7%	28.9%	38.5%	24.1%	41.5%	38.8%
Unrealistic Expectations	19.4%	36.1%	26.5%	26.3%	30.8%	37.9%	36.9%	31.9%
Lack of Resources	16.7%	29.5%	30.6%	15.8%	46.2%	34.5%	27.7%	27.8%
Inadequate Planning	36.1%	18.0%	32.7%	28.9%	38.5%	20.7%	23.1%	25.9%
Lack of Executive Support	41.7%	19.7%	28.6%	28.9%	38.5%	24.1%	18.5%	25.9%
Changing Requirements & Specifications	41.7%	19.7%	28.6%	28.9%	38.5%	24.1%	18.5%	25.9%
Resistance to Change	27.8%	34.4%	26.5%	26.3%	7.7%	17.2%	20.0%	24.4%
Lack of User/Client Involvement	11.1%	26.2%	20.4%	28.9%	7.7%	25.9%	23.1%	22.5%
Other Dependencies of Resources	27.8%	24.6%	24.5%	10.5%	15.4%	24.1%	21.5%	22.2%
Lack of Project Management Experience	16.7%	18.0%	8.2%	23.7%	7.7%	20.7%	15.4%	16.6%
Corporate Culture Does Not Support Collaboration	16.7%	18.0%	8.2%	23.7%	7.7%	20.7%	15.4%	16.6%
Technology Incompetence	5.6%	14.8%	8.2%	13.2%	23.1%	22.4%	26.2%	16.6%
Not Being Associated with the Corporate Strategy	11.1%	3.3%	14.3%	13.2%	15.4%	6.9%	10.8%	9.7%
Unclear Objectives	8.3%	6.6%	8.2%	2.6%	0.0%	5.2%	4.6%	5.6%
No More Need for Project Output	2.8%	6.6%	12.2%	2.6%	7.7%	1.7%	6.2%	5.6%

Biographical notes

Canser Bilir

He is an assistant professor at the Industrial Engineering Department, Istanbul Sabahattin Zaim University. He has graduated from Istanbul Technical University with a bachelor's degree in Managerial Engineering in 1997. He has a master's degree from the University of Missouri - St. Louis. He has had his Ph.D. degree from Dogus University in 2014. Since then, he has been teaching at Istanbul Sabahattin Zaim University. He has managed many strategic, IS related or academic research projects and published articles in various international journals. He has been holding the PMP certification since 2008. His main research areas are Project Management and Supply Chain Optimization.

Elif Yafez

She is a Ph.D. student at Istanbul Yildiz Technical University. She has graduated from Istanbul Technical University with a bachelor's degree in Chemical Engineering, and she has got her MBA degree from Istanbul Sabahattin Zaim University.