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AN ANALYSIS OF THE LINKS BETWEEN PROJECT SUCCESS FACTORS AND PROJECT PERFORMANCE

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ABSTRACT

Organizations not only need to adapt themselves to fast evolving environment, but also endeavor to shape it for their survival. Executing projects is one of the important practices for handling difficulties created by changes taking place. Thus, almost all organizations, at any scale, implement a number of projects simultaneously all the time. Yet, executing projects does not ensure success. Thus, in this paper, the links between project success factors and project performance and strength of the relationships between the support factors and the success factors are studied and demonstrated to shed some light on project environment.
In order to analyze all factors simultaneously, a project environment model is proposed. To test the research model, a questionnaire survey is conducted in 2012 summer and structural equation modeling (SEM) is used at analyzing stage. Analyzes showed that there four main factors which are forming project environment; these are Strategic Support (1), Operational Support (2), Project Performance (3), and Organizational Success (4). As a result of the analysis, strategic support enables more effective operational support. With effective operational support, project performance increases. Organizational success is affected by both project performance and strategic support directly, whereas the effect of operational support is indirect.
Keywords: Project performance, project success factors, SEM.

PROJE BAŞARI FAKTÖRLERİ VE PROJE PERFORMANSI ARASINDAKİ BAĞLANTILARIN BİR ANALİZİ

ÖZ

Organizasyonların sadece hızlı değişen çevrelerine adapte olma ihtiyacı yoktur, aynı zamanda çevrelerini kendi varlıklarını sürdürebilmek için değiştirme gayreti içerisindedirler. Gerçekleşmekte olan değişimlerden kaynaklanan zorluklarla baş etmekteki önemli uygulamalarından biri de projeler yürütmektir. Bu nedenle, hemen hemen farklı ölçeklerdeki tüm organizasyonlar, sürekli olarak eşanlı projeler yürütürler. Yine de projeler yürütmek başarıyı garantilemez. Bu nedenle, bu çalışmada, proje başarı faktörleri ve proje performansı arasındaki bağlantılar ve bu bağlantıların gücü araştırılmış ve proje çevresine ışık tutması amacıyla ortaya konulmuştur.
Tüm faktörleri eşanlı analiz etmek amacıyla, proje çevresi modeli önerilmiştir. Araştırma modelinin incelenmesi için, 2012 yazında bir anket çalışması gerçekleştirilmiş ve analiz aşamasında Yapısal Eşitlik Modeli (YEM) kullanılmıştır. Analizler dört faktörün proje çevresini oluşturduğunu göstermiştir. Bunlar Stratejik Destek (1), Operasyonel Destek (2), Proje Performansı (3), ve Organizasyonel Başarıdır (4). Analizlerin sonucu olarak, stratejik destek operasyonel desteğin daha etkili olmasını sağlamaktadır. Etkili bir operasyonel destekle proje performansı artar. Organizasyonel başarı hem proje performansından hem de organizasyonel destekten doğrudan etkilenirken, stratejik desteğin etkisi dolaylıdır.
Anahtar Sözcükler: Proje performansı, project başarı faktörleri, YEM.

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1. INTRODUCTION

With the advancements of technology, business and industrial environment is changing fast than it has never been before. As competition increases continuously, there has been an incredible pressure on all organizations to innovate their processes and products to improve their services and to react rapidly to changes in their environment, even governmental organizations are forced to improve their services and products. This pressure forces organizations to implement numerous projects simultaneously. Organizations execute projects to develop new products and services, and moreover to improve their capabilities. However, in such multi-project environments, managing and evaluating projects has become extremely complicated and difficult [1]–[7].

As the number of projects increased and thus projects became more complicated, project management evolved as a new professional area. Besides that, the economic crises of the 21st century have enforced organizations to be more cost sensitive. Organizations are obliged to invest only in the projects which are worth to invest. Thus, project management is not a part time job anymore, on the contrary it has a strategic importance for every competing organization [8]. Although current project management tools are good enough to deal with one project, these tools fall short in multi-project environments [9], [10]. It is a necessity for all organizations to develop an effective structure to manage and keep all projects under control from idea generation to product launch. Moreover, structured project management environment simplify deployment of best practices to organization, make project outcomes more predictable, improve management performance, and enable knowledge management. Yet, in some special cases, projects require more flexibility than a structured environment can provide. Hence, organizations need to establish a balance between structure and flexibility [11], [12].

As mentioned before, organizations have to deal with different projects simultaneously and have limited resources to carry out these projects. Resource allocation, inadequate resources, inconvenient organizational structure, and competition between organizational entities are common problems in many organizations [13], [14]. In order to keep projects in line with organizational goals, to benefit from resources efficiently, and to develop a structured environment, organizations prefer to implement project portfolio management practices [15]–[19]. Currently, success of project portfolio outpaces single projects performance [20].

Based on the existing literature, it can be claimed that executing successful projects and increasing organizational success through projects is trickier than a simple assignment or scheduling problem. In this study, we aimed to investigate project performance and supportive factors for project performance in an integrated perspective, namely project environment. In this pursuit, variables and constructs are developed and the proposed model is described in the “Main Hypothesis and Path Diagram”. In the “Methodology” section, the survey instrument is explained and the statistical test results are presented. The results are discussed in the light of existing literature in the “Discussion” section. The study is finalized with the “Conclusion” section.

2. RESEARCH MODEL AND HYPOTHESIS

Organizations still have some fundamental problems to solve in their project management environment. One of these problems is to define project performance. Time, cost, and quality are three classical KPIs (key performance indicators), which are accepted as project performance indicators. Although these KPIs are influential in the project execution phase, they lose their importance as the project is finalized and product is delivered to customer. From this point onward, satisfaction of stakeholders becomes the only critical performance indicator. Thus, project performance is a combination of both project management performance and product success [21], [22]. There are mainly two components of project performance; these are project KPIs and project success factors [23], [24].

2.1. Project Success Factors

As a component of project performance, success factors are independent factors. In other words they are inputs and can increase the success chance in case they are provided to project team. Thus, before evaluating the performance of any project, existence of success factors should be searched [25], [26]. Researchers have tried to find a way to determine the right combination of resources to secure project performance, but each project has its unique nature such as technology novelty, project complexity, and human resources devoted to project change project by project.

Novelty of knowledge base and design solutions mostly creates ambiguity and makes technological decisions hard, even more in some cases where there can be changes in project scope because of the ambiguity caused by technology novelty. As novelty enhances, rigid structures harm project performance, and flexibility becomes a requirement. Projects with high novelty start with a few inputs, but necessitate more knowledge resources and flexibility [27], [28]. On the other hand, for complex projects, structured project management methodologies are necessary to keep projects under control. Projects are becoming more complex as technological opportunities increase. For projects with high complexity; target setting, planning, coordinating, controlling, organizing, and team building turn out to be hard than projects with moderate complexity [29]. Therefore formal structure gains more importance to manage and monitor projects [28], [30], [31]. Project team is an undeniable input for all projects. Classical human resource management (HRM) does not work for project members. Employment period of these people is predefined unlike routine jobs. Besides, turnover in projects is higher than functional departments [32]–[34]. Especially in multi-national projects, team formation and managing cultural diversity within project teams becomes crucial [13], [35]–[38].

Consequently, researchers have not managed to define one for all project success factors combination, but they have been trying to understand and define the success factors to secure project success. There are many different approaches to classify and investigate project success factors. In some researches, single and multi-project success factors are studied [13], [39]. Some researchers aim to classify success factors according to source the factor or project attributes in order to develop a checklist approach [40], [41]. Some researchers assess success and failure factors in line with organizational conditions [9], [42]. In some researches these factors are considered as assets and classified as tangible and intangible groups [43]. In PMBOK 5^{th}, knowledge areas are defined and activities in these areas are given in detail. However, there is no universal classification.

Evaluating projects separately is not the most efficient approach for organizations. The main goal of organizations is to align their projects with strategic goals. Aligning strategic goals and projects has a larger context than project selection process; it needs structured project and portfolio management [20], [39]. Adopting an effective project portfolio management approach can not only align projects with organizational goals, but also increases project management maturity, and benefits gained from projects [11], [15]–[18], [44]–[46]. Availability of knowledge, effective and coherent resource allocation, and cooperation between projects are the main advantages of effective project portfolio management for effective project management [15]. Furthermore, with an effective project portfolio management approach, organizations avoid investing in projects, which do not support organizational strategies; they save their time and money, and concentrate on valuable projects [16]–[18], [46].

In this study, it is preferred to divide success factors into two groups such as "Strategic Support" and "Operational Support". Strategic support is a combination of the factors, which are valid for all projects and necessary for alignment of projects with organizational goals. On the other hand, operational support includes project specific factors and existence of necessary inputs. Strategic support enables availability of operational support. Thus, the first hypothesis is the following;

H1: Operational support is significantly related to strategic support.

2.2. Project Performance KPIs

Cost, quality, and time, named "golden triangle", are three KPIs accepted as project evaluation KPIs for decades. Yet, it is understood that KPIs can show huge deviations depending on the project life cycle phase, the perception of people evaluating projects, or its industry [30], [47]–[50]. Each organization has "organizational stakeholders", "product/market stakeholders", and "capital stakeholders". Each of these stakeholder groups has subgroups and different expectations from their organizations. Some of these subgroups involve in projects directly, and some of them are not even aware of projects. Yet, performances of projects influence satisfaction of these stakeholders directly or indirectly. Performance of projects differs not only according to stakeholders, but also according to project life cycle stage. Perception and evaluation of these groups gain or lose importance in different phases of project life cycle. Thus, there are lots of KPIs besides cost, quality, and time [51]–[56]. In PMBOK 5th, which is a worldwide accepted knowledge source for project management, success for a single project is defined by seven KPIs. Generally, it can be said that in addition to classical KPIs, satisfaction of stakeholders and contribution to organizational goals are essential project PKIs as well [51], [57]–[61]. Although it is known that existence of project success factors does not assure project success in all the studies cited under the "Project Success Factors" title, many success factors are listed and their contribution to projects presented. Hence, our second hypothesis is the following:

H2: Project performance is significantly related to operational support.

2.3. Organizational Goals and Project

Organizations execute projects to reach their goals and strategic targets. In any organization, which aligns its projects with its strategy, main intention is to enhance organizational achievements [39], [46], [62]. Organizations decide to invest in project management in case they lose their market share, when downsizing their organization, in case installing new technologies or if their profit margins are falling [3]. Thus, the success of projects should contribute to long term achievements of organizations. Shenhar and Dvir define five dimensions of project success. These are "Project Efficiency", "Team Satisfaction", "Impact on Customers", "Business Success", and "Preparing for The Future". They define project efficiency with classical project success PKIs, namely cost and time. Team satisfaction includes skill development and morale of team members. Outputs related to these two dimensions can be seized at the end of the projects. Impact on customers covers fulfillment of technical targets and customer needs. The results related to this dimension can be captured within a few months. The last two dimensions create long term effects. These are related to commercial success, market enhancement, and improvement in technological capabilities. This classification of project success shows the interaction between success of a single project and organizational strategies. Serrador and Turner searched for the correlation between project and organizational success and they demonstrated a small but positive correlation between them [63], [64]. Hence our third hypothesis is:

H3: Organizational success is significantly related to project performance.

Finally, as previously emphasized, organizational alignment is necessary both for projects and project portfolios [46], [62] .

Thus, our fourth hypothesis is:

H4: Organizational success is significantly related to strategic support.

Derived from the existing literature, it is proposed that project environment has four components, which are strategic support, operational support, project performance, and organizational success. Because there are significant relationships between these components, we have developed four hypotheses. These components and relationships are visualized in the research framework as illustrated in Fig. 1. This framework brings all hypotheses together and demonstrates proposed relationships between their components.

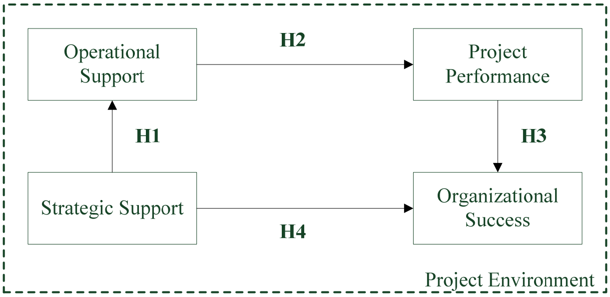

Figure 1. Project Environment

3. METHODOLOGY

3.1. Sample and Data Collection

In order to explore the components of project environment and the impacts of these components on each other empirically, a questionnaire was developed. Consequently, an online survey was conducted in 2012 within a period of four months from June to September. Invitations were sent to 1200 project management professionals, employed in the top 500 largest company identified by Istanbul Chamber of Industry, and asked to contribute to our study. In July 2012, reminders were sent. In September 2012, 226 valid returns were received. Thus, our response rate is 18%.

The survey includes questions designed to measure project performance, organizational success, availability of project success factors, and other questions aiming to recognize and understand participants and their organizations. The questions about project success factors, project success KPIs, and organizational success KPIs are answered by employing a 7-point Likert scale, in which 1 indicates extremely unsuccessful or insufficient and 7 stands for extremely successful or sufficient.

Before starting the questionnaire survey, questions were pre-tested and discussed with five professionals, dealing with projects and project management, to ensure that the wording, format, and sequencing of questions were appropriate.

The participants surveyed are employed in health care services (7.3%), communication (2.5%), basic material (10.8%), consumer services (8.8%), infrastructure (3.9%), manufacturing industry (36.1%), finance (1.3%), technology (1.3%), and other industries (28%). The respondents take place in projects, producing new outcomes at internal process level (66.4%), existing product level (63.1%), organizational level (49.1), and industry level (59.7). They assume the role of project manager (56.2 %), project coordinator (38.9%), technical staff (16.4 %), administrative staff (11.9%), department manager (26.5%), project sponsor (15%), and consultant (21.2 %). Project types that our participants are involved, are infrastructure development (38.5%), equipment development (37.2%), new product development (6.2%), service development (43.4%), research and reporting (46%), improvement in organizational structure (43.4%), process improvement (52.7%), turnkey projects (25.2%), and system installation (40.3%). These projects are implemented for other organizations (31.4%), consumers (62.8), and internal customers (73.5%). As it is seen, the sums of role percentages and project type percentages exceed 100%. This is because the participants are involved in different projects with different roles and they point out each of them. Statistical values about work and project experience are illustrated in Table 1.

The participants are also asked to provide some information about their organization, such as average duration, average budget, and average number of projects executed simultaneously in their organizations. Average project duration for 46.9% of the organizations of participants is less or equal to three months. In 34.5% of the organizations, it is between three months and one year, in 17.7% of the organizations it varies from one to three years, and for other organizations it is longer than three years. In 83.6% of the organizations, average project budget is less than 1.000.000 TL. In 59.3% of the organizations, less than 11 projects are conducted simultaneously, while 33.2% of the organizations conduct between 11 to 50 projects and 7.5% more than 50 projects. As the last question about organization, participants are requested to choose the most likely organizational structure for their organization. The responses regarding organizational structure are given in Table

Table 1. Sample Characteristics

Work and Project Experience					
	N	Min (year)	Max (year)	Average (year)	Std Dev. (year)
Work experience	226	1	36	11.85	6.266
Project Experience	225	1	30	5.63	4.767

Organizational Structures		
	Frequency	Percentage
Functional structure	72	31.9
Function intensive matrix structure	44	19.5
Project-function balanced structure	32	14.2
Project intensive matrix structure	33	14.6
Project organization	41	18.1

3.2. Measurement of Variables and Model Testing

In order to explain and analyze the relationships in the research model, two stage multi-variate data analysis is performed. Principle Component Analysis (PCA) with varimax rotation is performed separately on success factors variables and KPI variables to find out the dimensions related to success factors and KPIs. This stage is concluded by exploring internal consistency and reliability (content validity) among the items of each construct via Cronbach α [65]. Additionally, by average variance extracted (AVE), discriminant validities are verified.

In the second stage, Structural Equation Modeling (SEM) is performed. SEM is a multi-variable statistical technique, which enables the investigation of a number of relationships concurrently [66]. Thus, we preferred SEM to test our research model and used AMOS 16.0 to conduct analyses.

3.2.1. Stage 1: Factor Structures

The purpose of factor analysis is to develop scales and reduce the large number of variables to an easily manageable level. In PCA, one is preferred as the threshold value for eigenvalues and following analysis are continued with the factors having eigenvalues larger than 1.

As a result of PCA, two success factors labeled as “strategic support factor” and “operational support factor” and two performance factors labeled as “organizational performance” and “project performance” are extracted. In Table 2 and Table 3, the results of PCA, Cronbach α, and AVE values are given. All Cronbach α values are over 0.7 and AVE values over 0.6 so that they are all acceptable values.

3.2.2. Stage 2: SEM analysis

There are mainly two elements of SEM, namely observed variables and constructs. Variables are observable, whereas we cannot observe constructs, but measure them by using variables [66], [67]. In our research model, there are four components of project environment, which are verified. All constructs, variables related to constructs, estimates, standard errors, critical values and standard regression values are given in Appendix A.

Table 2. Principal Component Analysis of Success Factors

Strategic Support Factor			**Factor Loads**
Efficient communication with project customers			0.776
Customer approval			0.677
Upper management support			0.574
Alignment project targets with clear business goals			0.634
Effective planning and execution of plans			0.559
Availability of required facilities			0.530
Availability of past experience and knowledge			0.579
Eigen-values : 4.499	Cumulative % Variance Explained: 26.465	Cronbach α: 0.789	AVE: 0.69
Operational Support Factor			**Factor Loads**
Risk management for projects with strategic importance			0.508
Existence of emergency plans for projects with strategic importance			0.369
Efficient project portfolio management			0.620
Multi-disciplinary teams			0.634
Effective team building			0.708
Availability of required hardware and software			0.599
Availability of required technological resources			0.513
Availability of project management tools and techniques			0.749
Predefined project KPIs			0.699
Availability of communication channels			0.670
Eigen-values: 3.662	Cumulative % Variance Explained: 48.008	Cronbach α: 0.870	AVE: 0.68

In overall model testing, there exists a group of goodness of fit indexes in literature. Some of the indexes are compared with constant reference values whereas some are compared with alternative models. Although models are not proposed in this study, AMOS provides results for saturated and independent models. Saturated model is the one that all possible relationships are defined; on the contrary there are minimum numbers of parameters estimated in independent model. Thus, these two models stand at extreme points and any proposed model can be just between these two models [66]–[70].

In SEM, variance-covariance matrix is used in calculations. If a model fits well, there should be no statistically significant difference between the sample variance-covariance matrix and proposed variance-covariance matrix. In other words, chi-square value has to be insignificant. In our model, chi-square value is statistically significant. However, chi-square value is very sensitive to sample size so that researchers propose other goodness of fit indexes for sample size larger than 200 [66]–[70]. One of these indexes is CMIN/DF value, which is expected to be less than 5 [70]. It is 1.532 for our model. Root mean square error (RMSEA) is another important index. For this index, values lower than 0.05 represent good fitting and values lower than 0.08 are acceptable. In our model, its value is 0.049. Furthermore, AMOS provides confidence interval for $\alpha = 0.1$, and highest RMSEA value for our model is 0.057. PCLOSE values demonstrate how good RMSEA value is for representing population and it is supposed to be higher than 0.5. It is 0.597 for our model [70]. Root mean square residual (RMR) is the average value of residuals between predicted matrix and sample matrix. This value goes to infinity and it is expected to be close to zero [71], [72]. Goodness of fit index (GFI) indicates how good estimated matrix represents sample matrix. Although it is preferred to be higher than 0.9, 0.866 is an acceptable values for GFI. AGFI is the adjusted version of GFI, and the same interpretation is valid for AGFI as well [66], [68]–[71], [73].

Table 3. Principal Component Analysis of Key Performance Indicators

Organizational Success			**Factor Loads**
Increase in incomes			0.518
Increase in brand equity			0.706
Employee satisfaction			0.746
Improvement in organizational capabilities			0.760
Eigen-values: 3.195	Cumulative % Variance Explained: 29.043	Cronbach α: 0.726	AVE: 0.64
Project Performance			**Factor Loads**
Achievement in project goals			0.680
Satisfaction of project customers			0.574
Satisfaction of upper management			0.484
Reaching project budget targets			0.737
Reaching project quality targets			0.722
Reaching project schedule targets			0.529
Perception of success			0.765
Eigen-values: 2.848	Cumulative % Variance Explained: 54.932	Cronbach α: 0.853	AVE: 0.67

Yet, these constant values are accepted standard values. It should be preferred to use as many indexes as possible to test models[71], [74]. For some goodness of fit indexes, constant reference values do not exist so that index values of alternative models are compared. In Table 3, these index values are also given.

Normed Fit Index (NFI) compares goodness of fit of alternative models. Relative Fit Index (RFI), Incremental Index of Fit (IFI), Tuckey-Lewis Index (TLI), and Comparative Fit Index (CFI) are adjusted versions of NFI [69],[72], [73]. CFI provides unbiased comparison. Our model is good enough in accordance with these indexes (see Appendix B).

PRATIO is the first index to compare parsimony of alternative models. PNFI and PCFI are revised versions of NFI and CFI respectively [69]–[71]. [75]. Akaike's information criterion (AIC), Browne-Cudeck criterion (BCC), and Bayes information criterion (BIC) are other parsimony related indexes. AIC is used in comparing models consist of different numbers of constructs. Bozdogan developed CAIC, which is a more consistent version of AIC. For AIC, BCC, BIC, and CAIC the best model is the one, which has the minimum values for these indexes. Thus, our model is better than both saturated and independent models [69], [70] (see Appendix C).

The last value in goodness of fit testing is Hoelter value. This value is equal to minimum sample size to test the proposed model. For our model minimum required sample size at $\alpha = 0.01$ is 176, which is lower than our sample size. Our sample size is large enough to test our research model [70]. Goodness of fit of our research model is tested with all goodness of fit indexes available in AMOS 16.0. The results indicate that our model is acceptable.

3.2.3. Results

In Table 4, direct, indirect, and total effects of affecting constructs on affected constructs are illustrated. All relationships in the proposed model are found to be statistically significant; thus all our hypotheses are accepted. This model shows that success in project environment begins with strategic support. Strategic support enables operational support, and operational support leads to success of projects. Successful projects contribute to organizational success. When compared with other standard direct effect coefficients, effect of strategic support on organizational success seems to be low. Standard total effect coefficients vary from 0.622 to 0.9. So, it can be claimed that there are strong relationships between these constructs.

Table 4. Direct, Indirect, and Total Effects of Constructs

Direct Effect

Affecting Construct	Affected Construct	Direct Effect	Standard Direct Effect	Probability	Hypothesis
Strategic Support	Operational Support	1.007	0.882	***	H1
Operational Support	Success of projects	0.871	0.900	***	H2
Success of projects	Organizational Success	0.648	0.691	***	H3
Strategic Support	Organizational Success	0.288	0.278	0.026	H4

*** $p<0.001$

Indirect Effect

Affecting Construct	Affected Construct	Indirect Effect	Standard Indirect Effect
Strategic Support	Success of projects	0.877	0.794
Strategic Support	Organizational Success	0.568	0.549
Operational Support	Organizational Success	0.564	0.622

Total Effect

Affecting Construct	Affected Construct	Total Effect	Standard Total Effect
Strategic Support	Operational Support	1.007	0.882
Strategic Support	Success of projects	0.877	0.794
Strategic Support	Organizational Success	0.857	0.827
Operational Support	Success of projects	0.871	0.900
Operational Support	Organizational Success	0.564	0.622
Success of projects	Organizational Success	0.648	0.691

3.3. Discussion

Organizations possess both basic capabilities to sustain their presence and dynamic capabilities to support their basic capabilities[6]. Project management can be accepted as a dynamic capability with strategic importance [7]. Organizations always aim to overcome their deficiencies and benefit from the advantage of their superiorities. Yet, it can be managed only if they have successful projects. Although successful project management does not ensure successful outcomes, the relationship between these two is already known. Our aim has been to bring variables, which form project environment together to examine what factors improve project success and how project success contributes to organizational goals. According to our research model, project environment has four basic elements; these are strategic support, operational support, project performance, and organizational success.

The only external construct in our research model is strategic support. In fact, the relationship between strategy and project management has been discussed in literature by many researchers, and most of these researchers point out the need for more research in this area [43], [75]–[78]. Strategic support construct is directly related to operational support and organizational success (See Table 4). But, as it is the only external construct in our model, it affects all other factors in the model. In other words, we can claim that it forms a foundation of project environment.

Operational support construct covers variables like project management tools and techniques, technology, project specific hardware and software, which are universally available, and also risk management, portfolio management, and HR, which are project specific. Initially resource management in projects is considered as a scheduling problem and researches are concentrated on scheduling [79]–[83]. However, as experience with project related problems is accumulated, it is realized that project management is not that simple. Intangible assets has become a new research area in project management. Classical HR techniques fall short for project management as members of projects work for a predefined limited time period and turn over in projects is higher than function oriented jobs [32]–[34]. As a summary of many existing researches, it is known that competitive advantage is mostly created with no tangible assets, but intangible assets [84]. In the model development phase, grouping operational assets as tangible and intangible is considered. Some researchers advice to examine assets as tangible and intangible as well [43]. However, high correlation between tangible and intangible assets groups has not allowed us to examine these two groups separately, and it is preferred to group these variables under operational support. This result can be the evidence for the need for integrated perspective of organizations. Organizations would be considering the interaction between all resources with a holistic approach. Expected output can be produced only if all essential inputs are available. However, this is a very optimistic interpretation and has to be investigated in future researches. Operational support construct is only directly related to project performance in our research model, and coefficient of standard direct effect demonstrates a strong relationship between operational support and project performance (See Table 4).

Project performance is at the heart of this research. It is well known that defining project performance is a controversial issue in literature, as KPIs change with many different variables [2],[12]. In our model, we aimed to develop a holistic construct for project success and defined it with project specific satisfaction of stakeholders in addition to golden triangle; cost, quality, and time.

Organizational success, on the other hand, is the main target of all efforts, and it is measured by long term contributions of projects. Organizations should be successful in their projects to achieve organizational targets [84]. The significant relationship between project performance and organizational success is the main reason to conduct projects [6], [7]. Our results showed that project performance significantly improve organizational success.

The relationship between strategic support and organizational success is open to discussion. Direct effect of strategic support is lower than indirect effect. Strategic support enables the alignment of project with organizational strategies. The expected result can be produced only if expectations are defined clearly. Otherwise, success chance of projects drastically decreases. Operational support is the reflection of strategic support at project level, and conducting successful projects is essential for organizational success.

4. CONCLUSION

The interaction between project success factors and project performance has been discussed in literature. In general terms, the existence of this interaction is accepted by researchers and project management professionals, yet the structure of this interaction is still open to questioning.

With this research, the relationships between the factors are modeled and the levels of these relationships are analyzed. This approach enabled us not only to study direct effects, but also the indirect effects and the total effect. Therefore, project success factors and project performance are reexamined with a new perspective. In the future, the proposed model can be applied to more specific areas such as different type of projects or industries to gain more detailed insights.

Our model is a very straightforward one, consisting of just four constructs. However, this model brings 28 project related variables together and demonstrates their effects on each other. Project success factors and their effects on project performance is a hot topic for both project management professionals and academicians. Project management professionals can use our model as a guide to examine their project management processes and define deficiencies in their project management tools, techniques, and approach. It is illustrated with our model that variables contributing to project performance directly are highly correlated. Thus, availability of these factors should not be considered as independent issues.

Finally, our model is not specific to any industry nor restricted with predefined project characteristics, so that it can be claimed that our findings would work for all projects. Success factors defined in our model are necessary for the success of all projects. Since every project is unique, existence of some other crucial success factors, which are not included in our constructs, is undeniable, yet our model forms a basis that can be developed and customized to specific projects.

Many researchers investigate project management success factors and project performance. Each of these researchers introduces a new perspective. In this research, we aimed to synthesize these perspectives to model project environment and study the links between project performance, project success factors and organizational performance. But, for our knowledge, although these issues are discussed in many articles and other publications, there is no similar approach to model project environment or predefined constructs in literature. Thus, this research model can be improved in future researches. Our sample size is large enough to prove the statistical significance of our model, yet it is not large enough to examine in case the proposed model would change with industrial or project scale differences. With a larger sample, more detailed analysis can be performed. Our model can form a basis and open new gates to future researches.

APPENDIX

A. Constructs and Variable Loadings

Construct	Variable	Estimate	Standard Error	Critical Value	Standard Regression Value
Organizational Success	Increase in incomes	0.882	0.105	8.367	0.549
	Increase in brand equity	1.028	0.112	9.152	0.603
	Employee satisfaction	1			0.661
	Improvement in organizational capabilities	0.969	0.127	7.633	0.720
Project Performance	Achievement in project goals	0.998	0.114	8.791	0.691
	Satisfaction of project customers	1.061	0.114	9.346	0.748
	Satisfaction of upper management	1.059	0.116	9.11	0.723
	Reaching project budget targets	1			0.639
	Reaching project quality targets	0.984	0.104	9.473	0.644
	Reaching project schedule targets	0.922	0.126	7.298	0.552
	Perception of success	0.821	0.109	7.546	0.578
Strategic Support	Efficient communication with project customers	1.102	0.158	6.963	0.500
	Customer approval	0.991	0.165	5.994	0.555
	Upper management support	0.942	0.131	7.201	0.519
	Alignment project targets with clear business goals	1			0.617
	Effective planning and execution of plans	1.184	0.127	9.331	0.686
	Availability of required facilities	1.264	0.144	8.765	0.757
	Availability of past experience and knowledge	0.933	0.125	7.436	0.602
Operational Support	Risk management for projects with strategic importance	0.924	0.124	7.443	0.557
	Existence of emergency plans for projects with strategic importance	0.811	0.117	6.945	0.515
	Efficient project portfolio management	1.040	0.13	8.004	0.606
	Multi-disciplinary teams	1.081	0.13	8.304	0.72
	Effective team building	1.119	0.115	9.748	0.684
	Availability of required hardware and software	1			0.642
	Availability of required technological resources	0.925	0.092	10.048	0.629
	Availability of project management tools and techniques	1.076	0.12	8.945	0.702
	Predefined project KPIs	0.996	0.131	7.588	0.574
	Availability of communication channels	0.875	0.099	8.84	0.685

B. Goodness of Fit Indexes

Index	Proposed model	Independent model	Saturated model
NPAR	76	28	406
CMIN	505.607	3.056.489	0.000
DF	330	378	0
P	0.000	0.000	**
CMIN/DF	1.532	8.086	**
RMSEA	0.049 *(LO:0.040, HI:0.057)	0.177 *(LO:0.172, HI:0.183)	**
PCLOSE	0.597	0.000	**
RMR	0.068	0.476	0.000
GFI	0.866	0.214	1.000
AGFI	0.836	0.156	**
PGFI	0.704	0.199	**
NFI Delta 1	0.835	0	1
RFI rho 1	0.811	0	**
IFI Delta 2	0.936	0	1
TLI rho 2	0.925	0	**
CFI	0.934	0	1

* confidence interval for α=0.1
** These values cannot be calculated for saturated model

C. Parsimony Related Goodness of Fit Indexes

Index	Proposed Model	Saturated Model	Independent Model
PRATIO	0.873	0	1
PNFI	0.729	0	0
PCFI	0.816	0	0
AIC	657.607	812	3112.489
BCC	680.097	932.143	3120.775
BIC	917.567	2200.737	3208.264
CAIC	993.567	2606.737	3236.264

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