



DETERMINATION OF PROJECT MANAGEMENT TECHNIQUE USING AHP DECISION-MAKING IN PROJECTS

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Received: June 09, 2022

Accepted: August 15, 2022

Published: December 01, 2022

Abstract:

This study presents the Analytical Hierarchy Process (AHP) as a potential decision-making method of project management techniques in international trade project management. Forms created by AHP method with the involvement of 7 employees, including administrative and technical project managers and project planning supervisors working in the Project Management Organization of a leading engineering and technology company in Turkey, were collected by in-depth interview technique. After the consistency analysis, the final project management technique analysis was made.

According to the findings obtained in the study, Result Orientation, Delivery Performance Competence and Installation Cost Efficiency were evaluated as the 3 most important criteria when deciding on the project management technique; that, the decision makers will apply in project management. It is possible to mention that AGILE project management is the most preferred technique. In future studies, the effect of creating an ideal project management technique framework in project management organizations can be examined based on the sequence of techniques revealed in this study and their superiorities.

Keywords:

Project Management Techniques, AHP, Decision-Making

1. Introduction

The selection of management techniques in projects requires appropriate success criteria due to the uncertainty of the available information. Manageability, ease of use, customer orientation, technological compatibility, resource efficiency, results orientation, reliability, delivery performance competence, installation cost efficiency and execution cost efficiency are critical factors involved in the selection process.

Since the decision-making process analysis includes different project success criteria in the selection of project management techniques, it is necessary to evaluate the importance level of each criterion and the weight of each alternative according to these criteria.

The most effective selection approach for project management techniques is possible by considering multiple project success criteria simultaneously (Şimşek & Kasapoğlu, 2006). In this study; the AHP model, which is a multi-criteria decision-making method, was used for the selection of the most appropriate project management technique in a

1.1. International Trade and Project Management Techniques

The exchange of goods and services has increased day by day, increasing the trade volumes between countries, and this has emerged as a determinant phenomenon in the development of international trade and international relations (Şeker, 2020). The main target in standardization and adaptation strategies; by making comparisons between the local market and international projects and administrative processes, revealing the differences and forming strategies for making up these differences (Sayar, 2019). The company, which develops its project management technique with each new project, has to create a strategy to be permanent in the new market by adapting the base time, quality and

resource management framework components in investment and the selection of project management techniques in international markets.

There are many theoretical and practical management techniques suggestions and applications in project management. The most known and widely used project management techniques are: Waterfall, AGILE, Kanban, PERT, and CPM.

1.1.1. Waterfall

In the waterfall model, the document, which is basically the output of each stage, is taken as the input of the next stage (Farrell, 2008). The model does not cope well with changes, requires a lot of rework, and causes unpredictable quality and cost problems due to late-stage control (Sommerville, 2011).

1.1.2. AGILE

AGILE method is a project management technique in which an intense communication and cooperation is established between project stakeholders. It is an iterative and constantly evolving chain of processes that can be adapted to meet changing needs in a timely manner, resulting in high-quality deliveries that are cost-effective (Ambler, 2005).

1.1.3. Kanban

Kanban Technique focuses on turning these negative situations into gain opportunities by aiming to reveal the inefficiencies in the workflow processes and working on these inefficient areas in terms of development.

1.1.4. PERT

In the PERT (Project Evaluation and Review Technique) method; it is aimed to manage the uncertainties in the project by using statistical methods that will enable analytical estimating the most optimistic, pessimistic and probable estimations. Each activity has the earliest and latest start and finish times and delay times (Schleip & Schleip, 1972).

1.1.5. CPM

CPM method determines the project lead time using the relationships between project activities in a network structure. In a project network, there is at least one path that takes the longest time. This is called the critical path. The critical path is the most time-consuming sequential path of activities required to complete the project. The length of the project is equal to the critical path (Taghipour, Seraj, Amin, & Changiz, 2020).

1.2. Project Success Criteria Used in Evaluation of Project Management Techniques

In this study, Ease of Management, Ease of Use, Customer Orientation, Technological Compatibility, Resource Efficiency, Result Orientation, Reliability, Delivery Performance Competence, Installation Cost Efficiency and Execution Cost Efficiency were determined as the project success criteria in evaluation of project management techniques.

1.2.1. Ease of Management

Project management tools provide ease of management for the applications used to define and plan project activity steps, assign resources, determine the start and end dates of the steps, follow the workflow processes, and make changes related to tasks and resources much more flexible. (Ömürbek, Makas, & Ömürbek, 2015).

1.2.2. Ease of Use

Most of the Project Management tools are complex, large-scale methods of managing quite large projects and teams. (Laudon & Laudon, 2013). In the meaning of ease of use; the number of activities in the project, the size of the organization, the first year of use of the project management tool and its scope are confessed as the main factors in determining the appropriate technique. (Liberatore & Pollack-Johnson, 2003).

1.2.3. Customer Orientation

The main reason of customer orientation in organizations is keeping existing customers and gaining new customers (Abdullah, Şenbabaoğlu, & Dölarslan, 2016). In the studies, it has been emphasized that customer-oriented structures are ahead of their current competitors in terms of meeting the needs of the customers and developing the products that the customers really needs (Brady & Cronin Jr, 2001).

1.2.4. Technological Compatibility

Companies have to regularly develop new products, technologies and services in order to continue their development in the global arena where competition is high (Akman & Alkan, 2006). Technological compatibility refers to adapting the first innovations to customer needs encountered in the market by following a technology-oriented approach (Harms & Thomas, 2008).

1.2.5. Resource Efficiency

An efficient structure obtained in resources; positively affects production volume and final quality (Wilkinson, 2005).

1.2.6. Result Orientation

Result orientation in project management also determines the quality and reliability of the completed projects (Chen, Chen, & Li, 2005). Result orientation means meeting the desired output within the cost program and technical performance requirements at the end of the project and in the following period (Kotnour, 2000).

1.2.7. Reliability

The requirements defined at the beginning of the Project Development processes must be defined by the customer and these needs must be applicable with the appropriate mechanisms determined (Gencer & Kayacan, 2017).

1.2.8. Delivery Performance Competence

Setting certain standards for the project deliveries, it is of great importance especially when the main purpose of project management is to complete the projects within the planned time and within the budget regardless of the sector. (von Wangenheim, da Silva, Buglione, Scheidt, & Prikladnicki, 2010).

1.2.9. Installation Cost Efficiency

The difference in project management tool features and price ranges especially compels project managers to choose the appropriate tool for the project they are carrying out (Ahmad & Laplante, 2006). The development processes in the project management tools complicate the project phases and create weaknesses in successful completion of the projects. (Nalbant, 2015).

1.2.10. Execution Cost Efficiency

Planning, management and control processes of project activities in order to reach performance, cost and time targets represent project management in a holistic sense (Adamaszek, Czumaj, Englert, & Række, 2011). Failure to properly manage the cost of project management, which is one of the main project success criteria, may cause projects to fail (Coşkun, 2012).

2. Method

2.1. The Research Model

Previous studies in the literature on the subject have been observed as the studies including handling and comparison of two project techniques, emphasis on detailed success competence of project management techniques, and analyzes made with a commercialized and distinctive project management approach.

In this study, unlike other studies, it is aimed to make a significant contribution to the future studies on the investment management and process of entering a new market in the international trade based on different project

success criteria especially customer orientation. Results were obtained according to the rankings created by the experts in the project management area in different sectors and different work flow processes by using the AHP technique and by determining the tendencies of the employees.

H0: The most important project management technique will be the Waterfall, according to the ranking that will be formed as a result of the project implementations in the Project Management Organizations Universe.

H1: The least important project management technique will be the PERT, according to the ranking that will be formed as a result of the project implementations in the Project Management Organizations Universe.

H2: The AHP is a method that can be used in the selection of project management technique that can be applied in project management organizations by obtaining effective and efficient information and creating a result-oriented framework.

H3: Quantitative decision-making methods can be used in the project management technique selection process to be applied in the Project Management Organizations Universe.

H4: The study shall create an analytical, systematic and academic framework for future studies on this subject.

3. The Universe, Sample and Research Group

The general target of this study is the project management organizations of private companies operating in the field of international trade. The specific target of the study is the Project Management Organization of the selected engineering and technology company.

Matrices filled by people directly involved in project technical management, project administrative management, project planning and execution activities, selected using the non-probabilistic judgmental (intentional) sampling method in the study universe, are presented.

The main reason for the selection of the stated company within the generally determined working universe; This company, which has national and international project management practices in different sectors, seeks project management techniques that can produce more effective and result-oriented outputs institutionally and continuously in the relevant project processes, and has the competence infrastructure to apply these techniques effectively.

3.1. Data Collection Tools

Using the AHP multi-criteria decision-making method, 7 employees determined by using “Depth Interview” entered data into the forms and the final ranking was created with consistency checks in the method process. Depth Interview is a data collection technique that interprets why and how the structure of the relationships by the open-ended questions (Tekin & Tekin, 2006).

3.2. Data Collection and Processing

By using the Saaty multi-criteria decision-making approach AHP method, the comparison matrix was normalized and the weight matrix (w) was obtained by averaging the rows. After the weights were calculated, their correlation with the comparison matrix was checked. If conflicting, the resulting weights were not used. First of all, the vector λ_{max} , which provides the equality, was obtained (Saaty, 1980) (Saaty & Kearns, 2014).

Then, CI (Consistency Index), RI (Randomness Index), and CR (Consistency Ratio) were obtained. In the AHP method, a $CR < 0.1$ indicates that the application is consistent. If $CR > 0.1$, the entered severity scale data should be re-evaluated. The relative importance weights of the project success criteria and the alternatives were created. Afterwards, the result was found by multiplying the relative importance weights of the alternative matrix and the project success criteria (Şahin, 2007)

3.3. Analysis of The Data

The ranking resulting from the evaluation of 5 project management techniques determined in the AHP method flow according to 10 different project success criteria. The ranking resulting from the cross-evaluation of 10 success criteria determined in the AHP method flow. The ranking resulting from the independent evaluation of 5 project techniques by the participants. At the end of the study, the common effects of three separate data streams were analyzed.

4. Findings

4.1. Analysis of AHP Matrices and Findings

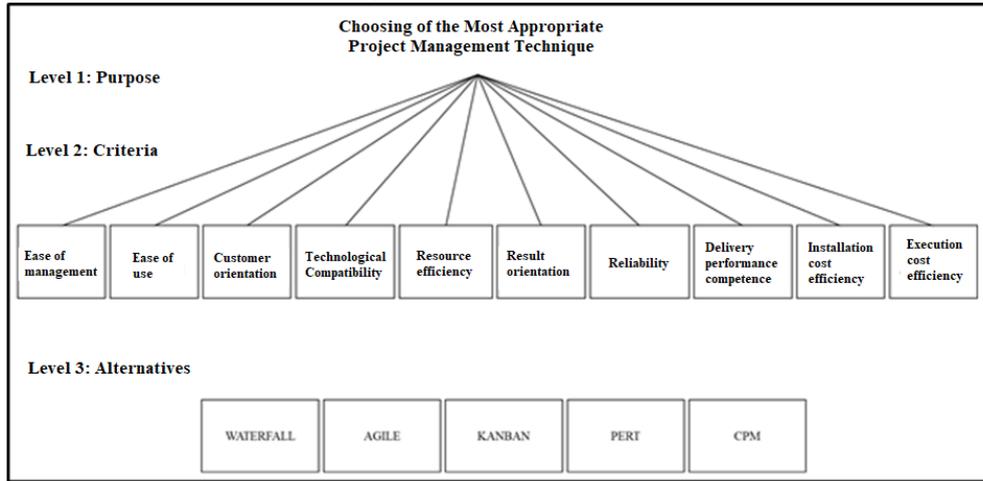


Figure 1. Project Management Hierarchy

Figure 1 shows the developed project management hierarchy. The number of consistent AHP matrices detected is 77. Only consistent results were included in the study. In the table below, the w (weight) values of consistent AHP matrices are calculated separately and their geometric averages are taken on the basis of the project success criteria and their summary form is shown according to the project management techniques.

Table 1. Summary of AHP results

Project Management Techniques	Ease of Management	Ease of Use	Customer Orientation	Technological Compatibility	Resource Efficiency	Result Orientation	Reliability	Delivery Performance Competence	Installation Cost Efficiency	Execution Cost Efficiency
WATERFALL	0,12	0,07	0,07	0,08	0,07	0,12	0,07	0,08	0,06	0,08
AGILE	0,17	0,25	0,45	0,27	0,27	0,32	0,49	0,43	0,20	0,45
KANBAN	0,19	0,10	0,11	0,14	0,17	0,18	0,13	0,14	0,26	0,20
PERT	0,13	0,32	0,08	0,10	0,14	0,10	0,12	0,11	0,20	0,11
CPM	0,12	0,14	0,14	0,18	0,14	0,09	0,12	0,15	0,12	0,07

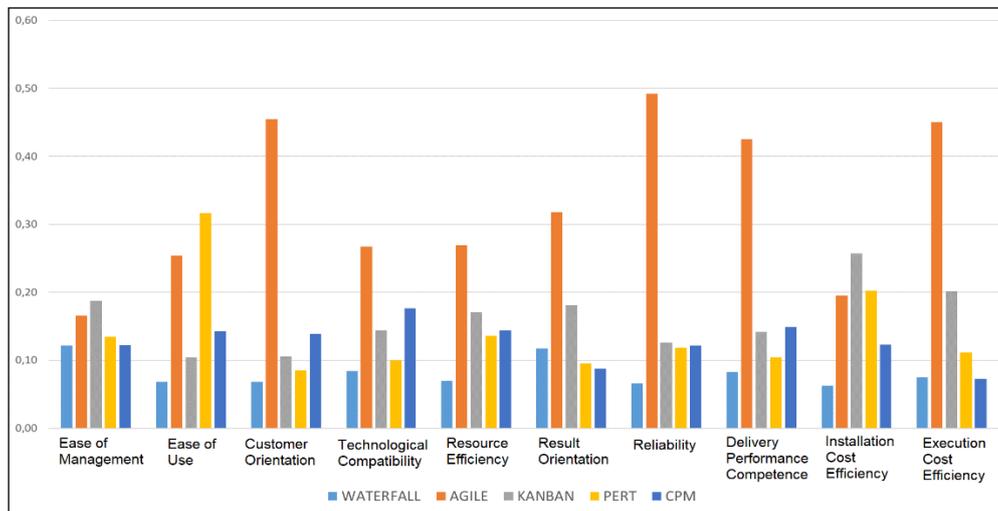


Figure 2. AHP Matrix Figure Chart

AGILE project management technique has been determined as the least important in terms of ease of management criteria compared to all other success criteria. The most important project management technique in terms of ease of management has been the Kanban technique. With the selection of Kanban technique, it is clearly seen that there will be a positive effect in ease of management.

In terms of ease of use criterion, Waterfall has been one of the techniques determined as weak importance according to the all other success criteria. On the other hand, it is clearly seen that there will be a positive effect in terms of ease of use with the selection of PERT.

In respect to customer orientation criteria, AGILE project management technique has been well ahead of other techniques with a clear distinction. From the aspect of technological compatibility AGILE and CPM have been the most important. It can be said that the prominence of AGILE technique was expected, especially with the intense use of technology behind it and the benefits of stakeholder communication it provides.

AGILE has emerged as the project management technique with the highest importance in terms of resource efficiency criteria. Regarding results orientation criteria, AGILE approach which aims to reach project deliverables through repetitive processes by increasing the level of communication between stakeholders, distinguished from the other techniques, was evaluated. From the point of Delivery Performance Competence; AGILE and CPM project management techniques have emerged as the two most important techniques. In the criterion of Installation Cost Efficiency; for the first time Kanban technique has been evaluated at the highest level of importance. In terms of Execution Cost Efficiency, AGILE has emerged as the technique with the highest importance, while CPM at the lowest level compared to the ranking in all other criteria.

These results are the findings revealed by the AHP matrices, which is the first evaluation scale. Therefore, they shall not be considered as final results.

4.2. Analysis of Project Success Criteria Matrix and Findings

In addition to the AHP Matrices, the project success criteria matrices were also evaluated among themselves, and the second group of scale data was created. The number of determined consistent criteria matrix is 7. It is expected that the new criterion scale will make a consistent contribution to the total analysis. Table 2 and Figure 3 shows the criterion with the importance percentage and weight ratings of project success criteria.

Table 2. Project Success Criteria Matrix Weights Table

KRİTERLER	W1	W2	W3	W4	W5	W6	W7	GEOMETRİK ORTALAMA	YÜZDE DAĞILIM
YÖNETİM KOLAYLIĞI	0,04	0,04	0,04	0,04	0,04	0,03	0,02	0,03	3%
KULLANIM KOLAYLIĞI	0,12	0,13	0,14	0,12	0,14	0,11	0,02	0,10	9%
MÜŞTERİ ODAKLILIK	0,09	0,09	0,09	0,11	0,10	0,08	0,04	0,08	7%
TEKNOLOJİK UYUMLULUK	0,05	0,05	0,06	0,06	0,06	0,06	0,05	0,05	5%
KAYNAK VERİMLİLİĞİ	0,05	0,05	0,06	0,05	0,07	0,06	0,24	0,07	6%
SONUÇ ODAKLILIK	0,22	0,22	0,22	0,22	0,13	0,23	0,21	0,21	18%
GÜVENİLİRLİK	0,07	0,08	0,09	0,08	0,08	0,09	0,15	0,09	8%
TESLİMAT PERFORMANSI YETKİNLİĞİ	0,22	0,19	0,17	0,16	0,16	0,19	0,17	0,18	16%
KURULUM MALİYETİ VERİMLİLİĞİ	0,16	0,15	0,17	0,15	0,13	0,22	0,16	0,16	14%
YÜRÜTME MALİYETİ VERİMLİLİĞİ	0,14	0,16	0,16	0,15	0,12	0,17	0,19	0,15	14%

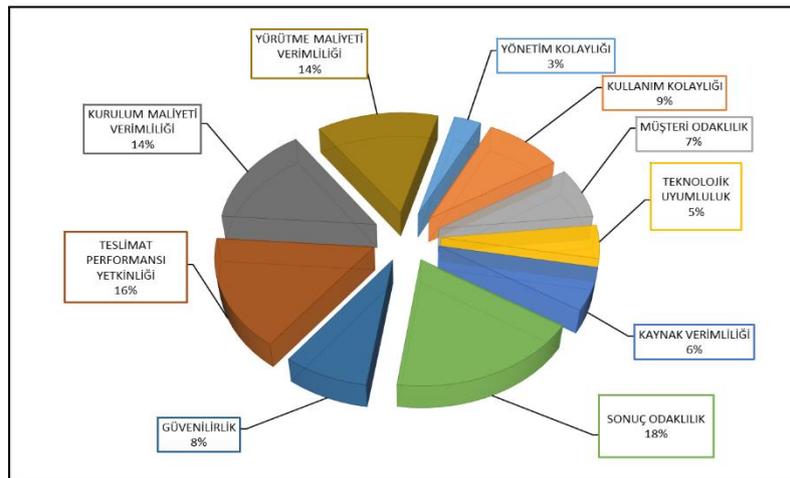


Figure 3. Project Success Criteria Matrix Result Chart

4.3. Analysis of Project Management Techniques Matrix and Findings

The project management techniques matrix is an additional study that was given as the third evaluation scale and does not include the consistency test differently from the two group evaluation scale studies performed in the previous sections.

It is the process of inclusion of the findings that obtained as a result of the evaluations by the same participants in terms of the frequency and preference of the 5 different project management techniques and their effects on the project success.

Each participant formed the weight of the project management techniques matrix by giving a value between 1 and 5 in terms of the preference rate and effect on project success on the main project management techniques groups. Then, the project management techniques matrices were evaluated by taking the geometric averages of the weights of the mentioned project management techniques.

Table 3. Project Management Techniques Evaluation Results

PROJE YÖNETİM TEKNİKLERİ	K1	K2	K3	K4	K5	K6	K7	GEOMETRİK ORTALAMA	YÜZDE DAĞILIM
WATERFALL	15,00	10,00	25,00	12,00	15,00	20,00	20,00	16,01	31%
AGILE	20,00	15,00	20,00	16,00	10,00	20,00	25,00	17,39	34%
KANBAN	4,00	6,00	2,00	9,00	8,00	9,00	6,00	5,66	11%
PERT	4,00	2,00	2,00	6,00	16,00	16,00	9,00	5,80	11%
CPM	9,00	2,00	9,00	6,00	16,00	6,00	6,00	6,62	13%

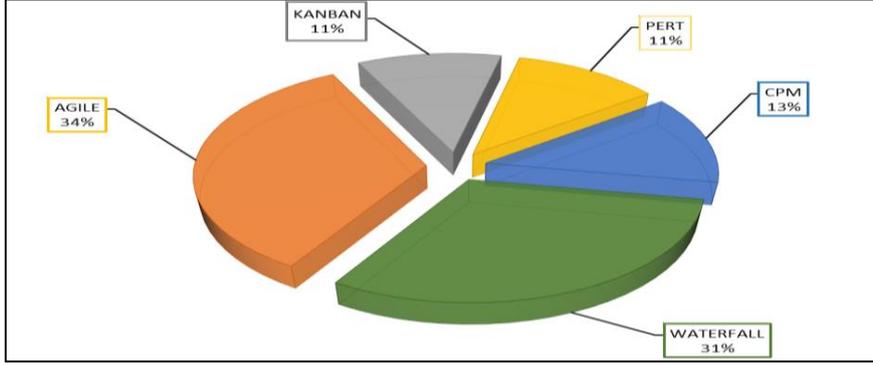


Figure 4. Project Management Techniques Evaluation Chart

The results of the project management techniques matrix are given both on the table and in the chart. The ranking and percentages of the mentioned project management techniques are shown in Figure 4.

4.4. Findings of The Comparative Analysis

To reach the Comparative Analysis level, the analyzes made in three different areas as;

- First analysis area; AHP matrices
- Second analysis area; Project Success Criteria matrices,
- As a final analysis, Project Management Techniques matrices

Although there is a clear ranking and evaluation finding in each analysis area, revealing the final analysis finding that includes all analyzes has been important in terms of reaching more precise and meaningful results from different perspectives, especially in the study target.

The results were obtained by multiplying the ranking values of the main project management techniques determined on the basis of success criteria and adding them separately with each other. The graphic representation of the final results is as follows.

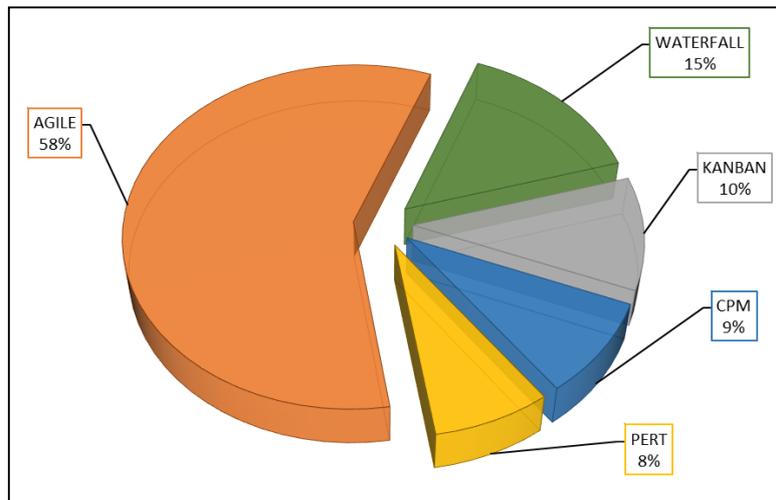


Figure 5. Company's Final Project Management Techniques Chart

In the final graphic, there are remarkable differences between the results from separated analysis areas and the final analysis results, especially in the technical order.

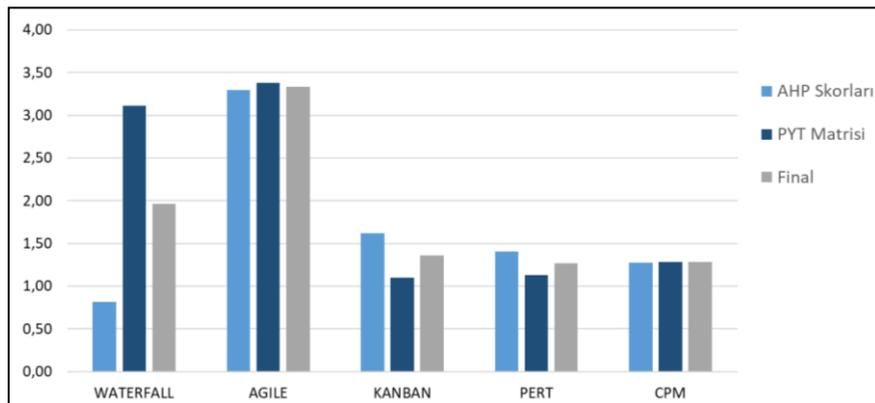
Within the scope of this study, it was thought that Waterfall project management technique would be the most important project management technique group, but this hypothesis could not be confirmed. Because the most important project management technique group for the company has been the AGILE technique by far (58%). Waterfall technique, on the other hand, took the second place with a percentage of 15% in order of importance.

It was predicted that PERT project management technique would be the least important and this prediction was confirmed with a significance level of 8%.

It was expected that AHP is the method that can be used in the selection of project management techniques shall be applied in organizations for obtaining effective and efficient information and creating a result-oriented framework. This prediction has been confirmed according to the results.

In the project management technique selection process to be applied in the universe of project management organizations, it was foreseen that quantitative decision-making methods could be used. This foresight was confirmed, since the information obtained with the AHP model are verifiable, systematic and consistent.

With this result, a usable application area has been opened to decision makers and project management technique users in analysis areas similar to this study.

**Figure 6. Comparative Results Graph**

5. Conclusion, Discussion and Recommendations

The existing project organizations of companies that are actively involved in International Trade play important roles in both managing their investments and entering new markets. In this context, it has a great importance to choose the appropriate project management technique for management of current projects, and the acquisition and execution of future projects.

Result orientation, delivery performance competence and installation cost efficiency criteria are also the success criteria that play a role in the selection of the most suitable technique for the project in question in addition to technical selection factors such as the type of projects, country of business, communication between project stakeholder.

The main reason why the AGILE project management technique ranks first in the company's project organization is that the technique in question is considered much superior to other techniques according to the Result Orientation criterion. It has been evaluated by the participants that the AGILE technique is a more suitable technique for result-oriented, with its ability to produce a flexible output, contrary to the detailed steps framework of the Waterfall technique. Financial, calendar and material deliveries are very important in the success of the project and especially in increasing customer satisfaction levels. In terms of delivery performance competence, the AGILE technique, which

is structured to respond quickly to changes in the project process, has surpassed Waterfall and Kanban techniques with a serious difference in evaluation. Again, when considered in the context of the Delivery Performance Competency criterion, Waterfall and Kanban techniques were evaluated at lower levels than the AGILE technique in responding to changing demands. The main reason for this situation is the project steps that are created beforehand in both techniques and are structured relatively less flexibly. Regarding installation cost efficiency, Waterfall technique's need for a higher installation cost compared to the AGILE technique was also reflected in the final ranking preferences.

As a result of the analysis, the CPM technique, which is in the last place, is a technique that only focuses on the critical processes of the project in a limited way, and it has not been evaluated as preferable from the point of the result orientation, delivery, and installation cost expected from an ideal project management technique.

The main reason why PERT technique, which is based on the logical and preconditional structuring of activities at the beginning of the project, emerged as the least preferred technique by the participants; It has emerged that it is not preferred especially in terms of result-oriented and delivery performance criteria.

These findings reveal an analytical framework that can be used in the business world and academia for the choice of project management technique in the next step. The findings show that companies aiming to stand out from their competitors in terms of results-oriented and delivery performance competency criteria, will find the opportunity of developing their ability to both produce faster project deliveries and dynamically adapt to the scope, calendar and cost changes experienced during the project process by using the AGILE Project Management technique. Besides, companies can also include the Waterfall technique in their project organizations, especially with the aim of increasing their delivery performance.

In future academic studies, the effect of creating an ideal project management technique framework can be examined based on the sequence of project management techniques revealed in this study and the superiority of each technique according to a certain project success criterion. Besides; It will be beneficial for the literature to make new publications with different analysis constructs that will be reconstructed in terms of the situation in different sectors, the size of the project organizations, and the approaches of the customers.

References

- Abdullah, B., Şenbabaoglu, E., & Dölerslan, E. Ş. (2016). İşletmelerin müşteri odaklılık ve müşteri tatmini düzeylerinin güven oluşumuna etkisi: müşteri boyutunda bir değerlendirme. *Ankara Üniversitesi SBF Dergisi*, 71(4), 1267-1289.
- Adamaszek, A., Czumaj, A., Englert, M., & Räcke, H. (2011). Almost tight bounds for reordering buffer management. Paper presented at the Proceedings of the forty-third annual ACM symposium on Theory of computing, pp. 607-616.
- Ahmad, N., & Laplante, P. A. (2006). Software project management tools: making a practical decision using AHP. Paper presented at the 2006 30th Annual IEEE/NASA Software Engineering Workshop.
- Akman, G., & Alkan, A. (2006). Tedarik Zinciri Yönetiminde Bulanık AHP yöntemi kullanılarak tedarikçilerin performansının ölçülmesi: Otomotiv Yan Sanayinde bir uygulama. *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi*, 5(9), 23-46.
- Ambler, S. W. (2005). Disciplined Agile Software Development: Definition. *Consultado el*, 13.
- Belton, V. (1986). A comparison of the analytic hierarchy process and a simple multi-attribute value function. *European journal of operational research*, 26(1), 7-21.
- Brady, M. K., & Cronin Jr, J. J. (2001). Customer orientation: Effects on customer service perceptions and outcome behaviors. *Journal of service Research*, 3(3), 241-251.
- Chen, K., Chen, K., & Li, R.-K. (2005). Suppliers capability and price analysis chart. *International Journal of Production Economics*, 98(3), 315-327.
- Coşkun, O. (2012). Proje yönetim teknikleri ve uygulamalı incelenmesi. *Fen Bilimleri Enstitüsü*,
- Farrell, A. (2008). Selecting a software development methodology based on organizational characteristics. *Citeseer*,
- Gencer, C., & Kayacan, A. (2017). Yazılım proje yönetimi: Şelale modeli ve çevik yöntemlerin karşılaştırılması. *Bilişim Teknolojileri Dergisi*, 10(3), 335-352.

- Gündüz, İ. O., Akduğan, Ö. Ü. U., Sönmezler, G., & Uzunoglu, S. (2019). Türkiye’de Kdv Hasılatı İle Kredi Kartı Ve Banka Kartı Kullanımı Arasındaki İlişki Üzerine Ampirik Bir Analiz.
- Harms, R., & Thomas, M. (2008). Don’t rest on your laurels: An inquiry into the barriers to highly innovative follow-up innovation in NTB. *International Journal of Technology Intelligence and Planning*, 4(1), 39-54.
- Kamal, M. (2001). Al-Subhi Al-Harbi. Application of the AHP in project management. *International journal of project management*, 19(1), 19-27.
- Kotnour, T. (2000). Organizational learning practices in the project management environment. *International Journal of Quality & Reliability Management*.
- Laudon, K. C., & Laudon, J. P. (2013). *Management Information Systems 13e. XIV. IBANESS İktisat, İşletme ve Yönetim Bilimleri Kongreleri Serisi-Plovdiv/Bulgaristan 06-07 Haziran 2020.*
- Liberatore, M. J., & Pollack-Johnson, B. (2003). Factors influencing the usage and selection of project management software. *IEEE transactions on Engineering Management*, 50(2), 164-174.
- Nalbant, S. (2015). Yazılım Geliştirme Sürecinin Verimliliğini Arttırmak: Bir Bilgi Sistemi Önerisi. *EMO-I. Ulusal Yazılım Mühendisliği Sempozyumu Bildirileri*, 23-25.
- Ömürbek, N., Makas, Y., & Ömürbek, V. (2015). AHP ve TOPSIS yöntemleri ile kurumsal proje yönetim yazılımı seçimi. *Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*(21), 59-83.
- Saaty, T. L. (1980). The analytic hierarchy process (AHP). *The Journal of the Operational Research Society*, 41(11), 1073-1076.
- Saaty, T. L., & Kearns, K. P. (2014). *Analytical planning: The organization of system (Vol. 7): Oxford: Pergamon Press.*
- Sayar, R. (2019). *Uluslararası Finansal Krizler Ve Uluslararası Ticarete Etkileri. Ekin Basım Yayın Dağıtım.*
- Schleip, W., & Schleip, R. (1972). *Planning & Control in Management: The German RPS System: Vdi Verlag, P. Peregrinus Ltd.*
- Sommerville, I. (2011). *Software engineering 9th Edition. ISBN-10, 137035152, 18. Pearson Press.*
- Şahin, A. (2007). *Yalın Üretimde Analitik Hiyerarşi Modeli’nin Uygulanabilirliği. Unpublished Master’s Thesis. Gazi University, Institute of Social Sciences, Department of Business.*
- Şeker, A. (2020). Türkiye’de İhracat ve Yatırım Teşvikleri Arasındaki İlişki: ARDL Sınır Testi. *MANAS Sosyal Araştırmalar Dergisi*, 9(4), 2311-2326.
- Şimşek, U. T., & Kasapoğlu, Ö. A. (2006). Analitik Hiyerarşi Prosesi Tekniği İle Bir Proje Yönetimi Uygulaması. *Öneri Dergisi*, 7(25), 141-149.
- Taghipour, M., Seraj, F., Amin, M., & Changiz, D. (2020). Evaluating CCPM method versus CPM in multiple petrochemical projects. *Management*, 3(3), 1-20.
- Tekin, H. H., & Tekin, H. (2006). Nitel Araştırma Yönteminin Bir Veri Toplama Tekniği Olarak Derinlemesine Görüşme. *İstanbul University Journal of Sociology*, 3(13), 101-116.
- Von Wangenheim, C. G., da Silva, D. A., Buglione, L., Scheidt, R., & Prikladnicki, R. (2010). Best practice fusion of CMMI-DEV v1. 2 (PP, PMC, SAM) and PMBOK 2008. *Information and software technology*, 52(7), 749-757.
- Wilkinson, A. (2005). Downsizing, rightsizing or dumbsizing? Quality, human resources and the management of sustainability. *Total Quality Management and Business Excellence*, 16(8-9), 1079-1088.