

THE REPUBLIC OF TURKEY
İSTANBUL KÜLTÜR UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

**Examining The New Business Opportunities Via Multi-Criteria
Decision-Making Approaches**

MASTER OF SCIENCE THESIS
BY: ASEM HRESEH

Department: Industrial Engineering
Program: Engineering Management

Supervisor: Assist. Prof. Duygun Fatih Demirel

June 2021

THE REPUBLIC OF TURKEY
İSTANBUL KÜLTÜR UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

**Examining The New Business Opportunities Via Multi-Criteria
Decision-Making Approaches**

M.Sc. Thesis

By: ASEM HRESEH

1900001484

Date of submission: 20.05.2021

Date of defence examination: 10.06.2021

**Supervisor and Chairperson: Assist. Prof. Duygun Fatih
Demirel**

Members of Examining Committee: Assist. Prof. İlayda Ülkü

**Assist Prof. Eylül Damla Gönül
Sezer**

June 2021

ACKNOWLEDGEMENT

I would like to express my gratitude to all those who gave me the possibility to complete this study. I want to thank Kultur University, which gave me the opportunity to complete my master's study in the specialization that I always thought about, and I want to thank all the teachers who gave me the knowledge I need to complete my study, and in particular the head of the Engineering Management Department Prof. Dr. Fadime Üney Yüksektepe, the assistant head of the department Assist. Prof. Zeynep Gergin and the direct supervisor on my thesis Assist. Prof. Duygun Fatih Demirel and all faculty members. Also, I will not forget to thank my family and friends for their constant support at all times.

Date: 20.05.2021

ASEM HRESEH

TABLE OF CONTENTS

ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF SYMBOLS	vii
ÖZET.....	viii
ABSTRACT.....	ix
1. INTRODUCTION	1
1.1. Thesis Statement.....	2
1.2. The Content of the Study.....	2
2. LITERATURE REVIEW	4
2.1. Analytic Hierarchy Process	5
2.2. The Techniques for Order Preference by Similarity to an Ideal Solution.....	8
2.3. Business Opportunities.....	9
2.4. AHP-TOPSIS Combined Approaches.....	12
3. METHODOLOGY	13
3.1. TOPSIS For Experts	13
3.2. AHP For Alternatives	15
3.3. Usage of TOPSIS and AHP in this Study	18
4. IMPLEMENTATION AND RESULTS.....	19
4.1. TOPSIS Implementation	19
4.2. AHP Implementation.....	22
5. CONCLUSION.....	33
REFERENCES.....	35

LIST OF TABLES

Table 3 .1: Saaty's Scale of Importance Intensities.....	16
Table 3 .2: Random Index Table.....	17
Table 4 .1: Experts Comparison.....	20
Table 4 .2: Normalized Matrix.....	20
Table 4 .3: Weighted Normalized Matrix	21
Table 4 .4: Euclidean Distance.....	21
Table 4 .5: Experts Weights	22
Table 4 .1: Criteria, Sub-Criteria And Their Explanation.....	24
Table 4 .2: First Level Criteria.....	26
Table 4 .3: Second Level Criteria (Sub-Criteria).....	26
Table 4 .4: Global Weights Of Sub-Criteria	27
Table 4 .5: Weights Of investments From The View-Point Of The Sub-Criterion ...	28
Table 4 .6: Allover Score	29
Table 4 .7: Final Weights Of Investments Based On Expert 1	30
Table 4 .8: Final Weights Of Investments Based On Expert 2	30
Table 4 .9: Final Weights Of Investments Based On Expert 3	30
Table 4 .10: Final Weights Of Investments Based On Expert 4	31
Table 4 .11: Final Weights Of Investments Based On Expert 5	31
Table 4 .12: Final Weights Of Investments Based On Expert 6	31
Table 4 .13: Final Weights Of Investments Based On Expert 7	32
Table 5 .1: Final Decision	33

LIST OF FIGURES

Figure 2 .1: Project Selection Methods.....	5
Figure 3 .1: Case Analysis	13
Figure 4 .1: AHP Structure	23



LIST OF SYMBOLS

W Criterion weight

A Normal matrix which represents the importance between main criteria

B Normal matrix which represents the importance between sub-criteria

C Normal matrix which represents the importance between alternatives

X normalized pair-wise comparison matrix



Üniversite : İstanbul Kültür Üniversitesi
Enstitü : Lisansüstü Eğitim Enstitüsü
Anabilim Dalı : Endüstri Mühendisliği
Programı : Mühendislik Yönetimi
Tez Danışmanı : Assist. Prof. Duygun Fatih Demirel
Tez Türü ve Tarihi : Yüksek Lisans – 10.06.2021

ÖZET

Yeni İş Fırsatlarının Çok Amaçlı Karar Verme Yaklaşımlarıyla İncelenmesi

ASEM HRESEH

Bu çalışma, literatürde sıkça kullanılan Analitik Hiyerarşi Süreci ve TOPSIS yöntemlerine dayanan çok kriterli karar verme (MCDM) yaklaşımını uygulayarak en iyi yatırım fırsatını belirlemeyi amaçlamaktadır. Çalışma boyunca MCDM kavramı tartışılmış ve çeşitli sektörlerde en çok kullanılan yöntemler ve uygulamaları anlatılmıştır. Ayrıca bu yöntemlerin başlıca faydaları incelenmiştir. Çalışma kapsamında beş farklı yatırım fırsatı göz önünde bulundurularak aralarındaki en iyi seçim Analitik Hiyerarşi Sürecine göre belirlenmektedir. Bahsedilen bu belirleme süreci için alanlarında uzman yedi kişinin görüşü alınmış ve her birinin genel karar üzerine etkisi TOPSIS yöntemine göre belirlenmiştir. Böylece iki yöntemin sonuçları birleştirilerek, en iyi yatırım fırsatının seçilmesinde MCDM yaklaşımlarının nasıl kullanılabileceğine dair bariz bir yol haritası oluşturulmuştur.

Anahtar Kelimeler: MCDM, AHP, TOPSIS, the new business opportunities.

Bilim Dalı Sayısal Kodu: 90602

University : İstanbul Kültür University
Institute : Institute of Graduate Studies
Department : Industrial Engineering
Program : Engineering Management
Supervisor : Assist. Prof. Duygun Fatih Demirel
Degree Awarded and Date : MS – 10.06.2021

ABSTRACT

Examining The New Business Opportunities Via Multi-Criteria Decision-Making Approaches

ASEM HRESEH

This study aims to determine the best investment opportunity using a multi-criteria decision-making (MCDM) approach based on famous Analytic Hierarchy Process and TOPSIS methods. Throughout the study, the concept of MCDM is discussed, and the most used methods and their applications in several sectors are explained. In addition, the major benefits of these methods are examined. After that, considering five different investment opportunities, the best choice between them is determined based on the Analytic Hierarchy Process. For this task, seven management professionals' opinions are taken, and each of them are evaluated based on the TOPSIS method. Finally, an obvious image is created in selecting the best investment opportunity and how to employ MCDM approaches in this process.

Keywords: MCDM, AHP, TOPSIS, the new business opportunities.

Science Code: 90602

1. INTRODUCTION

Multi-criteria decision-making (MCDM) is one of the most important topics that engineers rely on in their working lives when there are so many options available. Engineers often face issues with multiple options and aspects, and they must choose from among them the best solutions and the best alternatives available. For example, the project manager must choose the best supplier based on the required criteria, and the factory manager must choose the best equipment that serves the industry that he performs within the specified criteria. These small examples represent how many situations are faced each day and the best decision which is suitable for each one should be chosen. And in our case, the best investment opportunity must be determined among several alternatives.

Finding the best sector of investment is one of the most important issue for a lot of investors; because many of them have more than one option to invest. So, there must be a way to find the best option among the available alternatives. The multi-criteria decision-making approach is a good method for selecting the best investment. (Kucińska-Landwójtowicz et al., 2020)

Multi Criteria Decision Making permits dynamic in different semi-organized activities to settle on choices that are precise, suitable, and steady with the condition of the issue. One significant factor in deciding various measures is the weight value, which is weighted by the few partners. (Salo & Hämäläinen, 2010)

Multi Criteria Decision Making has a main goal which is to solve problems related to decision-making. Therefore, MCDM is the method which is used to choose the best alternative among others by understanding the situation, dividing it to smaller parts, analyze each part and integrating the parts to produce the best solution by taking into consideration the qualitative and quantitative factors of all probable options. (Majumder & Saha, 2016)

1.1. Thesis Statement

This study discusses the existence of more than one investment opportunity. These opportunities must be studied in detail and everything that affects them in terms of profits, costs and others must be identified. To be fair and accurate, the opinions of seven experts in several fields were taken to assess the importance of all investments. The criteria set for them are analyzed through the AHP method. And the opinions of experts are evaluated based on their previous experience, their academic achievement and other determinants through TOPSIS method.

After completing this study, it is expected that the reader will be able to understand how to choose the appropriate project for his/her requirements within the required criteria. Moreover he/she will be able to understand the basic idea of the concept of multi-criteria decision making, its causes, and its uses. He/She should have a good picture of some of its basic methods. Finally, he/she will be able to know how to benefit from the opinions of experts in the field of investment on influencing the final decision that he takes.

In other words, this study is a detailed study to determine which of the investment opportunities are the best among the available investments. A hierarchy of the problem is built, the main goal is determining the best investment. The main criteria are set in choosing the project and detailing each of the criteria separately and explaining and discussing them in detail. There are five main criteria and sixteen sub-criteria. The importance of each of them is determined in relation to the projects based on seven experts. Based on the above-mentioned flow, the best project will be determined among the five investment opportunities.

1.2. The Content of the Study

This study includes five main sections. the introduction section mentions the main objective of this study and the expected results after its completion, the importance of choosing the best project, and finally an overview of this thesis. In the second section, it talks about the existing studies in this field and the link of this study with many previous studies, and its uniqueness in presenting this topic in this way. Third, there is an explanation of the method in which the problem is analyzed and solved. The fourth section contains a detailed numerical analysis based on the

methodologies used. Finally, the contents of this study are summarized and the methods used to reach the main goal, which is selecting the best investment opportunities.



2. LITERATURE REVIEW

Multi-criteria decision-making is a process discovered when selecting the course of action to ensure that the right decision is chosen under several similar goals for conflicting goals at the same time. There is no need to search for a decision. It may be the right decision in front of us without the need for trials and experiments. On the other hand, there are many options that are identified without being able to make a reliable decision due to the inability to choose the right one, which is the reason for creating new ways to facilitate this process. (Velasquez & Hester, 2013)

The multi-criteria decision-making (MCDM) witnessed a great deal of use that led to a significant increase in its application branches, as a result of the development of new methods and the improvement of the old. Many experiments have been made that may help in making relative decision-making on different cases with advantages and disadvantages, and the validity of using it over time.

Because of the great development of technology in the previous two centuries, it led to the creation of many separate and specific methods to apply the multi-criteria decision-making, which will give us the result of appropriate applications and the applications that did not achieve the purpose. (Pekkaya, 2015)

There are many methods that are used in selecting an appropriate project, and multi-criteria decision-making is considered one of the most important of these methods. There are many studies that dealt with MCDM, and many considered it a good way to determine the appropriate investment when there are several options. Kucińska-Landwójtowicz et al. (2020) explained these methods in a detailed way. This study is concerned with how to employ one of these methods, which is the MCDM, in the process of selecting the best project.

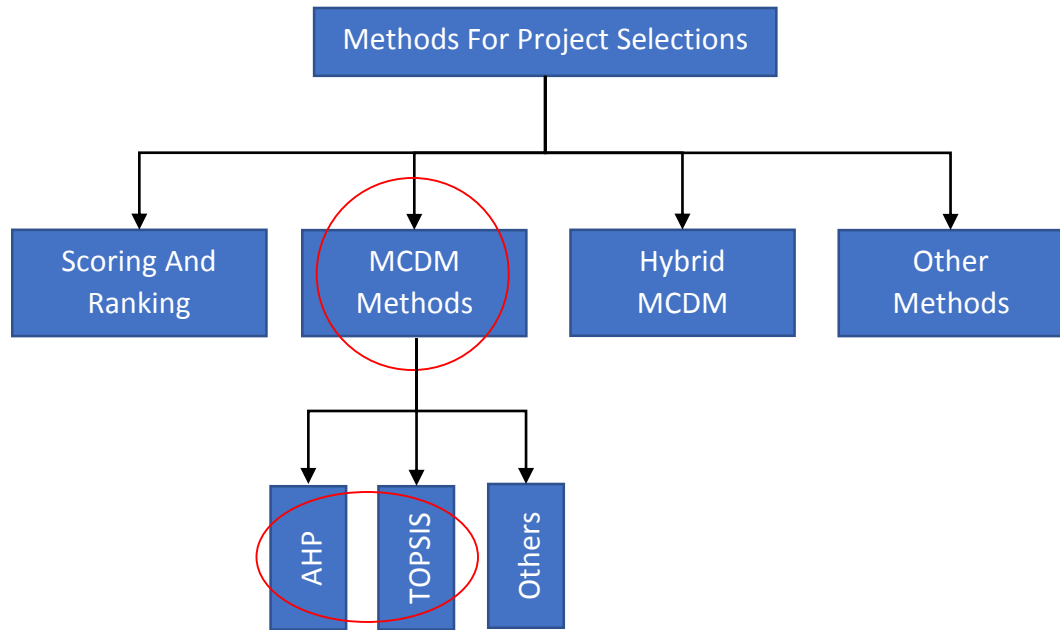


Figure 2.1: Project Selection Methods

Figure 2.1 indicates the methods of selection projects (Kucińska-Landwójtowicz et al., 2020). In this study, the multi-criteria decision-making approaches will be the methodology used to determine the best investment among the existing options.

2.1. Analytic Hierarchy Process

AHP has an extraordinary ability to make and analyze decisions and has practical applications in different situation of life. Thomas Saaty introduced this technique in 1980s , it is expressed as the solving of complex problem (Phudphad et al., 2017). Measurements are derived from double-level comparisons that allow for less discrepancy in the outcome. This method is based on solving the problem of intrinsic value. Which is accomplished by simple steps. First, it is the structuring of elements in groups that are classified from criteria, priorities and alternatives, and then making bilateral comparisons in each group, and last but not least, the calculation is done in terms of similarity and coherence, and finally the alternatives evaluated in proportion to the result of the comparison, and therefore right decision can be achieved. Several experiments have been used in this way. The hierarchy depends on three main foundations which are the hierarchy and has three levels of goal, criteria, alternatives. The second basis is to determine meaning, stability (Velasquez & Hester, 2013). This

method has many advantages compared to other methods, but its disadvantages revolve around its hierarchical form and contradict the criteria with alternatives.

It is one of the most used methods by decision-makers and researchers, and for evaluating alternatives the definition of criteria and the calculation of their weight are two principles in this method, although there is little focus on them. The main objective of this theory and study is to review real cases of the literature methodology that was applied in (APH), where it evaluates how standards are defined and measured. (Zorpas & Saranti, 2016)

AHP is a method that relies on the decisions of experts to derive primary measures and the measurement process is done through pairwise comparisons, and it has been classified as one of the most common decision-making tools that have multiple-use criteria, in addition to that it is considered a simple and effective method for that it is used by experts and researchers. (Wolnowska & Konicki, 2019)

According to bibliometric research, it was found that the number of MCDM-related publications is significantly increasing. This phenomenon could probably be considered to lead to a related growth focused on AHP and evolutionary optimization. (Russo & Camanho, 2015)

In other words the main functions of the AHP methodology are the constructing of pairwise comparison matrix, doing some measurements and calculations, at the end checking the consistency.

Saaty has kept handling the complexity of multi-criteria decision-making. All the different factors that affect the decision are determined and arranged in homogeneous groups of factors, and the result is reached by obtaining measures in the ratio scale by comparing those factors with those pairs. Each factor is weighed in the hierarchical method in the processes of comparing everything to its original factor and to the priorities. Weights will be found through the hierarchy by multiplying the priority of the hierarchical factor at each level of the priority of the factor to which the first, which is the original factor, is related. Although AHP has an analytical name because it separates the abstract entity into its constituent elements, this method is important because of its ability to measure and synthesize many factors in the hierarchy, and several studies have been written on how to use this method and others on special aspects of the roads. (Saaty, 1987)

However, the aim of this article is to assess how the AHP and TOPSIS methods are applied in practice and in particular to practice how standards are defined and measured. Methodology development literature on real cases may be reviewed.

For comparisons, we need a size of numbers that demonstrates how frequently more significant or prevailing one component is over another component concerning the measure or on the other hand property concerning which they are looked at (Saaty, 2008). Decision-makers must know and characterize the issue, need, and reason for the choices and rules so as to have the option to settle on a decent choice and assess the measures and choices that must be taken.

Among the purposes that are considered important is to define the priorities of the criteria themselves in order to balance the priorities of alternatives and add all the criteria required to obtain the total ranks required for alternatives. Several steps should be taken of this method. First of all, the problem is defined and analyzed so that it will be clarified. Second, the AHP structure should be constructed, then the comparison matrices of each criterion and sub-criteria are constructed. So that each of their weights are found out. The diameter of each matrix must be 1. The upper triangle is solved by experts that means they determine the importance of each criterion by taking the consideration of the other criteria. The lower triangle is upside down from the upper one. After that the weights of the criteria are calculated. Then the decision must be checked. This stage is very important because it clarifies the results of AHP that are practices and whether these results are compatible and consistent with expectations. It is imperative that gaps between models and expectations be avoided at the end. It is necessary to record the reasons that supported how the decision-making was completed, and the importance of these records lies as a justification for the processor for thinking about whether in the future that leads to the development and improvement of decision-making processes. (Leal & Eugenio, 2020; Skovranek et al., 2010)

Although the hierarchical method of problem analysis is an old theory, it still proves itself until this day, there are many modern studies based on the hierarchical system in analyzing and solving the problem. There are many studies to choose the best alternative among several alternatives, depending on the hierarchical analysis such as selecting the best software program based on AHP approach (Kaur & Bhatia, 2015), project management softwares selection (Kutlu, et al., 2014), selecting a team

leader (Muhisn et al., 2015), selecting industrial robots for milling applications (Breaza et al., 2017), selection of business funding proposals (Wiratno et al., 2015). Also, Mushtaha et al. (2020) applied this method to study the possibility of living in some tourist districts. And In Algeria, site selection wind-powered hydrogen refueling station was done by AHP-GIS method (Messaoudi, et al., 2019). An external strategic analysis of the selected organization was done using this method by Bartusková and Kresta (2015). Moreover, Aşchilean et al., (2017) selected the optimum technology for rehabilitating pipes in the water distribution systems using this method. Comfort measures were also evaluated based on the AHP approach (Benmoussa et al., 2019). An analysis of the causes of traffic accidents has been studied using this method (Jianfeng et al., 2016). Mani et al., (2014) also conducted a study of the supplier selection process using social sustainability by AHP. Also in the solar energy field, Balo and Şağbanşua (2016) conducted a detailed study to select the best solar panel for the photovoltaic system. Moreover, this method has been used to measure the efficiency of some institutions as well, as happened in Mexico (Altamirano-Corro & Peniche-Vera, 2014), and there are many other studies based on the AHP approach in various fields.

2.2. The Techniques for Order Preference by Similarity to an Ideal Solution

TOPSIS method works by arranging choice variations as far as their closeness to the pattern that will be the most wanted variation, it will be done by decreasing the separation with the pattern called the best ideal solution and increasing the separation to the anti-pattern the worst ideal solution, and the distances between these will be calculated to put the ranking of each alternative (Piwowski et al., 2018). After the experiments, it is clear that it is very easily programmable, but it does not take into account features, and it is difficult to distinguish between features and maintain consistency it was used in design, engineering and marketing. (Wang et al., 2016)

How could any issue be analyzed by this method? First of all the objectives of the case should be defined. Then, the criteria that measure the success should be defined. After that, each criterion should be weighted and all options will be listed. Finally, the options will be rated to decide the best alternative. (Yadav et al., 2019)

Multi-criteria decision-making methods could be used for determining a lot of things and to make decisions in various cases, like selecting the best location for a project or the best alternative in many projects or the best site to construct a railway station (Yücel & Taşabat, 2019). Moreover, it could be used for selecting the best product in this time to put in markets or for helping new investors to decide what is the best sector to invest in, so with multi-criteria decision-making choices will not be limited to one area, many fields can be thought in.

Also, TOPSIS method is one of the most important methods adopted in choosing the most appropriate option among a group of options, and it is also very effective because of its ease and the ability to understanding. And there are many studies that have relied on TOPSIS and fuzzy TOPSIS approaches of multi-criteria decision-making methods to choose the best alternative from among a group of suggested alternatives and from these studies are hospital site selection (Senvar et al., 2016), supplier selection towards uncertain and unavailable information (Sureeyatanapas et al., 2018), an extension of TOPSIS for group decision making (Shih et al., 2007), selecting a fixed seismic shelter for evacuation in cities (Chu & Su, 2012), and many kinds of these studies which are focusing on selecting the best alternative.

2.3. Business Opportunities

This part talks about different investment opportunities in several sectors. In view of the large number of sectors in which it is possible to invest, it was necessary to study the markets and what the customer and the consumer would need to meet these needs. Due to the literature of business and investment, a lot of focus has been observed in the restaurant sector and the food sector in general. Kharlamova, (2014) described it as a safe investment when he studied the Ukrainian market. Halim et al. (2019) also designed a marketing strategy for restaurants, believing that it is one of the important investment sectors. Díaz-Puche et al. (2020) has made a multi-level assessment of the profitability of restaurants in the European market as a good investment. Also, the restaurant store management process has been studied as it is very important in this sector (Tanizaki et al., 2020). Qashou and Saleh (2018) has done a detailed study of the implementation of electronic marketing for restaurants in Palestine. Also, the agricultural sector is an important sector in the food market (Newman & Tarp, 2020).

And also, one of the important sectors for investment at the present time is the field of information technology. There is a great increase in the demand for this type of investment to keep pace with the developments of the modern era, where Khallaf (2012) explained some of the intangible results of investment in the field of information technology and also outlined the economic benefits expected from these investments. Marthandan and Tang (2010) also explained the process of evaluating the commercial value of information services, and it was found that there is lots of money spent on these services, so it is good to invest in such a sector. Also, the relationship between information technology companies and their close association with telecommunications companies has been evaluated, which leads to increased profits for both (Skorupinska & Torrent-Sellens, 2014). Information technology companies also have a significant impact on the performance of other companies, and this indicates the strength of this investment sector (Haewon et al., 2016). In addition to this, Dedrick et al. (2013) studied the impact of investments in the field of information technology on increasing the productivity of many countries in addition to the experience gained from working in this sector. Purwita and Subriadi (2019) also has studied more than one way to invest in the field of information technology and evaluated each of them.

From another point of view, the entertainment sector is considered one of the most important investment sectors, as it targets all age groups, each according to its interest. For example, cinemas and television are among the most important investments in this sector because of their impact on the economy and increasing societal awareness (İncekara et al., 2013). In Turkey, for example, Hobikoğlu & Çetinkaya (2015) has studied the economic impacts of cultural industries such as cinema and others. And as Cummins et al. (2020) indicated that the investors in the online business have many facilities such as loans and others. Also, Schwenzow et al. (2021) showed the impact of social media on individuals and the possibility of investing in them and earning a lot of money. Moreover, there are areas of entertainment that affect the economy of entire countries because they have a great impact on internal and external tourism (Chan, 2011). And there are many other entertainment investment sectors such as gyms, Internet broadcasting platforms and online games. It is a good idea to invest in developing sectors.

In addition to the above good investment opportunities, there is also a large sector that many investors are looking for, which is the textile and ready-to-wear clothing sector. Oliveira et al. (2016) made a survey on the process of textile in Brazil because of the great benefits on the economic side. Also, Batista et al. (2016) made 211 questionnaires on Brazilian textile companies to create frameworks for joint action, believing in the effectiveness of this sector on the economic level. Huq et al. (2016) have also studied the capabilities of the social management of the clothing industry to develop this process to reach a more organized and more profitable business. The trade agreement between Asia and the Pacific, known as (APTA), which promotes intra-regional trade between the countries of the region, has also demonstrated the importance of the textile industry in improving the economic situation (Agarwal et al., 2017). Partzsch and Kemper (2019) also expected that the increasing demand for cotton to produce more ready-to-wear clothes may lead to a revolution in the field of fashion. All these information confirm the importance of this sector and its important role in raising the economic level of individuals and countries.

Also, the construction and real estate sector should not be forgotten because of its great impact on the economic situation, as it is no less important than any of the above-mentioned sectors. Cagli (2019) referred to a unique phenomenon, which is the explosive behavior in the Turkish real estate market, which indicates the high demand for this type of investment and the strong competition in the market. Morozova et al. (2015) also conducted a research in which they clarify the process of a quantitative survey of real estate and the cost involved in establishing and restoring it, as they are sure of the profitability of this project. Given the importance of this sector, a study of the criteria for the opinions of experts who study and analyze real estate investment opportunities has been studied (Zimmermann & Eber, 2017). Navarro-García and Madrid-Guijarro (2016) also made a specialized study to determine the reliability of accounting information for real estate and construction companies in Spain due to its importance and impact on the country's economy. Geipele and Kauškale (2013) also emphasized the role of the real estate market in the development and progress of countries and focused on economic development. All this justifies the investment process in this type of sector.

2.4. AHP-TOPSIS Combined Approaches

In general, it is possible to find a common approach to decision-making based on the use of more than one method to solve the problem and choose the appropriate alternative. There are many recent studies based on this approach of decision-making, such as selection of an industrial boiler for a soda-ash production plant (Hasnain et al., 2020), evaluation and selection of open-source EMR software packages (Zaidan, et al., 2015), selection of reverse logistics service provider (Jayant et al., 2014), Supplier selection of an Indian heavy locomotive manufacturer (Kumar et al., 2016), study on the status evaluation of urban road intersections traffic congestion (Yua et al., 2013), A hybrid approach for analyzing e- SCM performance (Tyagi et al., 2014) and many others.

As it can be seen from the reviewed research, there are many studies available on several topics with common approaches, and many methods have also been developed to study the best options. But according to our knowledge, a detailed study has not been obtained to study how to choose the best investment at the present time through multi-criteria decision-making approaches, therefore, this topic has been selected and this increases the possibility of comparing investment projects between each other through reliable and understandable methods.

3. METHODOLOGY

This study examines new business opportunities via multi-criteria decision-making approaches. What is to be done is can be described by following the hierarchical approach in determining the preference between these investments by following the hierarchical steps. Also, seven specialists will be identified and a comparison will be made between them through the TOPSIS method, based on specific criteria and steps. Figure 3.1 is analyzing the overall situation :

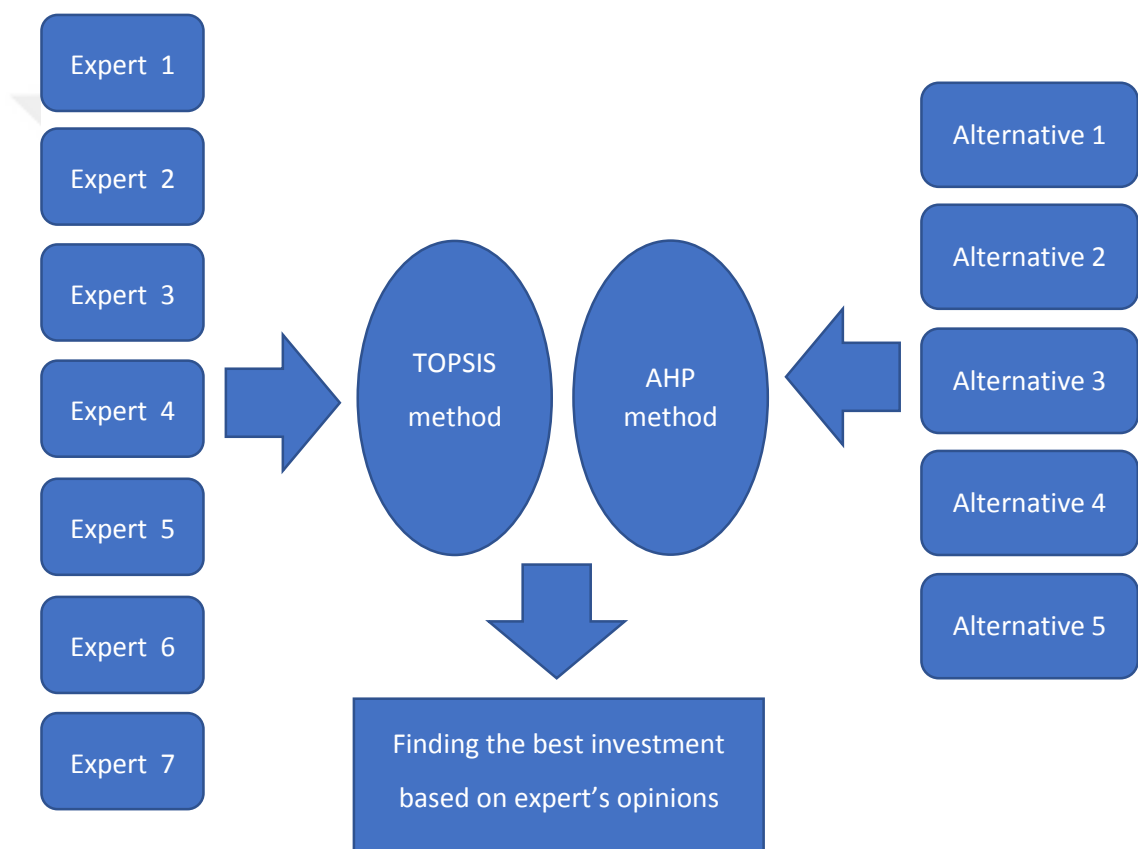


Figure 3.1: Case Analysis

Figure 3.1 clarifies the case analysis of the study.

3.1. TOPSIS For Experts

This process is necessary to be able to know the weight of influence of each expert in making the final decision. The first step in this method is to calculate the normalized matrix $\bar{X}_{ij}$ by the following formula:

$$\bar{X}_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^n X_{ij}^2}} \quad (3.1.1)$$

where “ X_{ij} ” is the intersection of each alternative: “ i ” with each criterion “ j ”. Then the weighted normalized matrix V_{ij} will be calculated by this formula:

$$V_{ij} = \bar{X}_{ij} \times W_j \quad (3.1.2)$$

Where “ W_j ” is the weight of each criterion.

Now the best and worst condition for the experts will be determined:

$$Best = (\min(V_{ij} | i = 1, 2, 3, \dots, n) | j \in J^-), (\max(V_{ij} | i = 1, 2, 3, \dots, n) | j \in J^+) \equiv V_j^+$$

$$Worst = (\max(V_{ij} | i = 1, 2, 3, \dots, n) | j \in J^-), (\min(V_{ij} | i = 1, 2, 3, \dots, n) | j \in J^+) \equiv V_j^-$$

where,

$J^+ = (j = 1, 2, 3, \dots, m | j)$ associated with the positive impact criteria.

$J^- = (j = 1, 2, 3, \dots, m | j)$ associated with the negative impact criteria.

The best-worst ideal solution will be found for each criterion by choosing the maximum value for the best and the minimum value for the worst. After that, the Euclidean distance will be calculated from the ideal best and the ideal worst by the following formulas:

$$S_i^+ = \left[\sum_{j=1}^m (V_{ij} - V_j^+)^2 \right]^{0.5} \quad (3.1.3)$$

$$S_i^- = \left[\sum_{j=1}^m (V_{ij} - V_j^-)^2 \right]^{0.5} \quad (3.1.4)$$

where,

S_i^+ : the distance between expert i and the best condition.

S_i^- : the distance between expert i and the worst condition.

Finally, the similarity to the worst condition will be calculated of each expert by the following formula:

$$P_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad (3.1.5)$$

where,

$P_i = 1$ if the expert has the best condition.

$P_i = 0$ if the expert has the worst condition.

After these steps, the extent of each expert's influence on the final decision can be determined based on the specified criteria.

3.2. AHP For Alternatives

In this section, It will be explained how to creat 22 matrices for each of the experts. A comparison will be made between each of the main criteria between each other. Then the sub-criteria will be compared between each other. Finally, the five-investment opportunities will be compared between each other from the point of view of each standard separately. Each of these comparison matrices will be filled by the seven experts. In the implementations and results section, an example of each matrix and its solution will be given. The complete matrices will be attached to the appendices section.

First, a hierarchical structure of the problem will be created with the identification of the primary goal. There will be four levels of the hierarchical structure, the first level that represents the main goal of the structure, which is to determine the best investment opportunity. The second level will contain the main criteria for choosing the best project. The third level will contain the sub-criteria for each of the main criteria found in the previous level. And finally, the fourth level will contain the five investment opportunities that were discussed in the literature review.

A comparison will be made and the relative importance of each of the criteria will be determined with respect to the goal. the comparison matrix will be created with the help of saaty's scale.

Table 3.1: Saaty's Scale of Importance Intensities

Intensity of importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Demonstrated importance
9	Absolute importance
2,4,6,8	Intermediate values

Table 3.1 indicates the scale of importance intensities by Saaty's study, where the numbers here are showing the strength of impact between each comparison.

The size of matrix depends on the number of criteria, for example when there are five criteria the matrix A_{ij} will be 5*5 matrix. The values in the comparison matrix depend upon the experts. The diagonal of the matrix must be 1.

$$A = \begin{bmatrix} 1 & a_{12} & a_{13} & \dots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & \dots & \dots \\ \frac{1}{a_{13}} & \dots & 1 & \dots & \dots \\ \dots & \dots & \dots & 1 & \dots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & \dots & 1 \end{bmatrix} \quad (3.1)$$

The normalized pair wise matrix X_{ij} will be calculated by dividing each value of the column by the sum of its own column as Equation (3.2) shows that.

$$X_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (3.2)$$

The criteria weights will be calculated by taking the average of all normalized values of each row.

$$W_{ij} = \frac{\sum_{j=1}^n X_{ij}}{n} \quad (3.3)$$

Where, (n) is the number of compared elements.

After that the consistency should be calculated to check if the calculated weights are correct or not. To check the consistency, the first comparison matrix which was obtained by the expert will be inserted. Then each values of each column will be multiplied by the criteria weights of that column. After that the weighted sum vales will be calculated by taking the sum of each value of each row. Then a ratio of each weighted sum value over the criteria weight of that column will be calculated in a separate column. The average of that column will be calculated to get the value of λ_{max} . Next the consistency index will be calculated by the following formula:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3.4)$$

where,

λ_{max} : is the largest eigenvalue of the matrix.

n : the number of compared elements.

If $\lambda_{max} = n$, the matrix is completely consistent but if $\lambda_{max} > n$ then the consistency ratio (CR) shall be calculated by the following equation:

$$R = \frac{CI}{RI} \quad (3.2.5)$$

where “ RI ” is the random index which will be found in the random index table:

Table 3.2: Random Index Table

n	1-2	3	4	5	6	7	8	9
RI	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Table 3.2 indicates the random index that Saaty mentioned in his study. Where it is the consistency index of randomly generated pairwise matrix. If the value of consistency ratio is less than 0.1 then it could be assumed that the matrix is consistent. After that, the values of the calculated weights are approved.

All matrices are calculated in this way and the process is repeated on the matrices of each expert. In the end, each investment project will have its own weight, based on the opinions of the seven experts. All experts' opinions will be taken into consideration to be able to define the best investment more precisely.

3.3. Usage of TOPSIS and AHP in this Study

In this section, it is explained how to use each method separately and how to link these two methods with each other to get benefit from them to reach our main goal. Where the TOBIS method is used in assessing the importance of each expert in the decision-making process, based on the previously mentioned determinants. Finally, the percentage of each expert that influences the final decision is reached.

As for AHP method, the hierarchical structure is constructed, the top level is the main objective of the study which is choosing the best project. The second level contains the five investment opportunities that were previously explained. The third level consists of the main criteria for each of the investment opportunities. The last level contains the sub-criteria for each of the main criteria to reach the best result. Section 4.2 clarifies all the main criteria and sub-criteria and explains them in detail. Finally, this study combines these two methods to reach the final decision which is determining the best investment based on expert opinions.

4. IMPLEMENTATION AND RESULTS

In this section, the case will be analyzed and actual results will be found. The aim of this study is to find the best investment when there is more than one alternative. In the literature review, more than one popular investment opportunity has been mentioned at the present time, and the best one of them will be determined based on expert opinion. The sectors that will be studied are the food sector, the entertainment sector, the textile and ready-to-wear sector, the technology and information sector, and finally the real estate and construction sector. As for the experts who were hired to create comparison matrices, they are seven experts specializing in several engineering and administrative fields in order to reach a better and more accurate decision, so that the final decision is not based on a single viewpoint. As for the main criteria and sub criteria in choosing the best investment, they will be discussed in a special table in the problem hierarchical analysis section.

TOPSIS and AHP methods will be used for analyzing the case. TOPSIS method was chosen to evaluate the opinions of experts because of its ease of handling, speed in performance, and programmability. Also, there is a very important feature of this method, which is that the number of steps remains the same regardless of the number of alternatives. AHP was chosen to select the best investment opportunity because its uses are wide and effective. Also, every part of this process has an essential role in influencing the final decision-making process. It has flexibility in dealing because it is based on the hierarchical structure, so it is easy to define main and sub-criteria to make a better decision. Finally, it depends on decisions issued by several experts, so it is good to evaluate the decision from several aspects.

4.1. TOPSIS Implementation

For better results, seven experts from several sectors have been hired, but the qualifications of each of them differ, so each one of them must be evaluated and the weight of his influence on the final decision must be known. Table 4.1 is giving the details of each expert.

Each expert will have four criteria to compare with the others, the criteria will be as the following: job position, years of experience, performance and educational

degree. In TOPSIS method each criterion shall have its own weight as shown in the table:

Table 4.1: Experts Comparison

	Non-benefit	benefit	benefit	benefit
Weight	0.25	0.25	0.3	0.2
Criteria	Job Position	Years Of Experience	Performance	Educational Attainment
Expert 1	5	6	6	7
Expert 2	6	7	8	7
Expert 3	2	26	9	7
Expert 4	2	30	9	7
Expert 5	4	6	6	8
Expert 6	3	12	10	8
Expert 7	5	4	5	7

Table 4.1 indicates that each of job position, performance and educational degree is ranking from 1 to 10 as shown below: for job position 1 is the highest rank, for performance and educational degree 10 is the highest rank. Note that: in the Benefit columns the highest number is best choice and the non-benefit is the opposite.

The normalized matrix will be calculated by Equation (3.1) and Table 4.2 shows the results:

Table 4.2: Normalized Matrix

	Job Position	Years Of Experience	Performance	Educational Attainment
Expert 1	0.54233	0.14565	0.34757	0.43412
Expert 2	0.65079	0.16992	0.46343	0.43412
Expert 3	0.21693	0.63115	0.52136	0.43412
Expert 4	0.21693	0.72825	0.52136	0.43412
Expert 5	0.43386	0.14565	0.34757	0.49614
Expert 6	0.27501	0.27847	0.48622	0.41422
Expert 7	0.45835	0.09282	0.24311	0.36245

Table 4.2 shows the normalized matrix. Then the weighted normalized matrix is calculated by Equation (3.2) and results are shown in Table 4.3:

Table 4.3: Weighted Normalized Matrix

	Job Position	Years Of Experience	Performance	Educational Attainment
Expert 1	0.13558	0.03641	0.10427	0.08682
Expert 2	0.16270	0.04248	0.13903	0.08682
Expert 3	0.05423	0.15779	0.15641	0.08682
Expert 4	0.05423	0.18206	0.15641	0.08682
Expert 5	0.10847	0.03641	0.10427	0.09923
Expert 6	0.06875	0.06962	0.14586	0.08284
Expert 7	0.11459	0.02321	0.07293	0.07249

Table 4.3 shows the weighted normalized matrix. After finding the best and worst ideal from each column, Euclidean distance is calculated by equation (3.3) and (3.4) as shown in Table 4.4:

Table 4.4: Euclidean Distance

Si+	Si-
0.17522	0.04580
0.17805	0.07033
0.02726	0.19248
0.01240	0.21018
0.16393	0.06937
0.11504	0.12809
0.19121	0.04811

Table 4.4 shows Euclidean distance. Finally, Equation (3.5) will be applied and the weight of each expert will be found as showing below:

Table 4.5: Experts Weights

	Pi	Weight
Expert 1	0.20720	0.06212
Expert 2	0.28314	0.08488
Expert 3	0.87595	0.26259
Expert 4	0.94427	0.28307
Expert 5	0.29735	0.08914
Expert 6	0.52683	0.15793
Expert 7	0.20103	0.06026

Table 4.5 indicates the goal of this step which is finding the weight of each expert and determine the impact of each of them in the final decision-making.

4.2. AHP Implementation

This research deals with five investment opportunities in several sectors. These sectors are the leading sectors at the present time, and many investors and capital owners do not know how to decide the best choice. These sectors are IT and technology, entertainment sector, food sector, textile and ready to wear clothing and the construction and real state. This part will analyze these sectors and determine the most important criteria and then define the sub-criteria for each of the criteria and finally, the extent of the impact of all the criteria will be determined on each of the projects. Figure 4.1 shows the AHP structure:

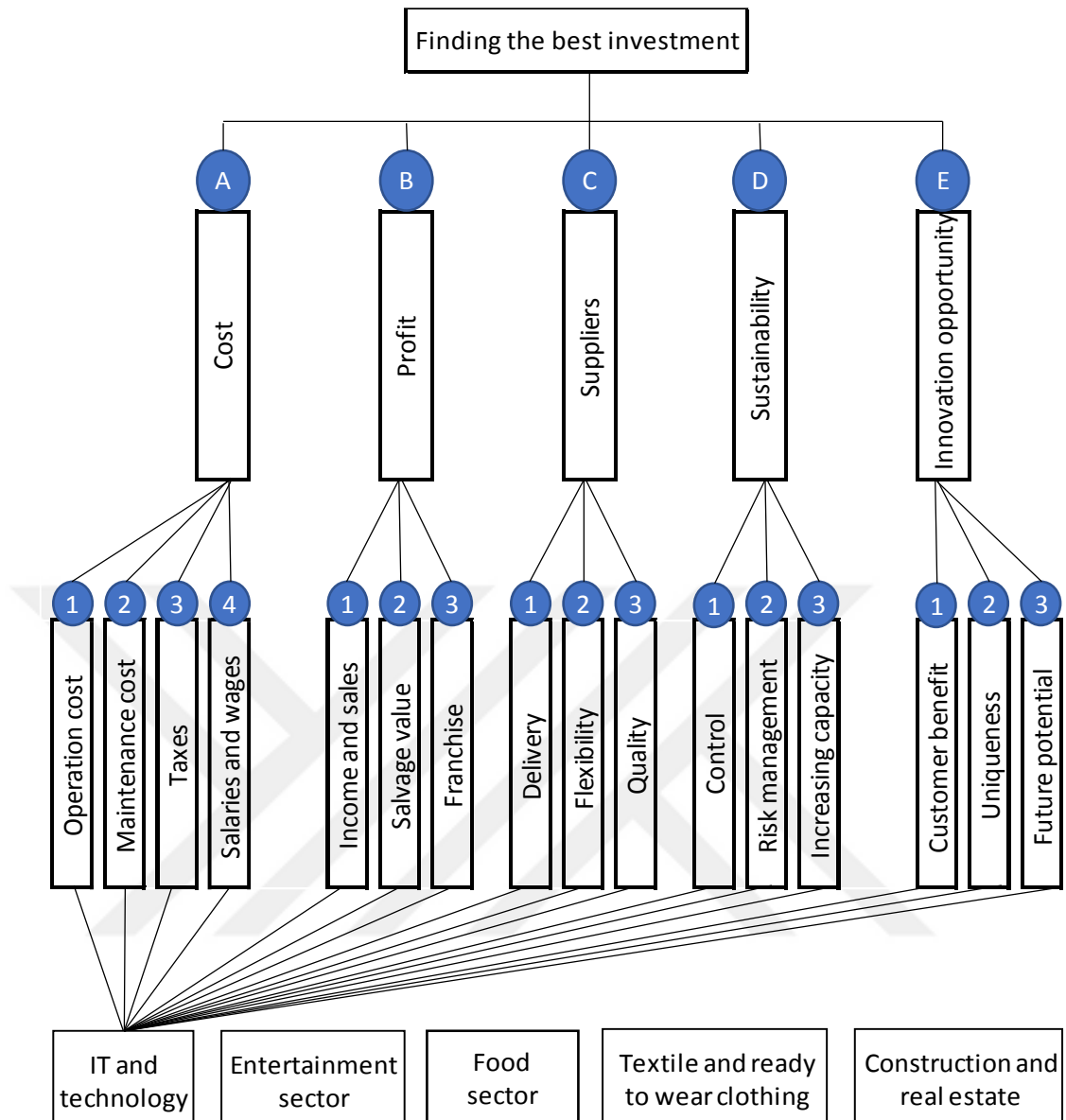


Figure 4.1: AHP Structure

Based on the above, the hierarchical structure will be analyzed based on Saaty's study in 1986. As an example, the importance between the criteria will be determined from the point of view of the first expert and move forward until we reach the decision of this expert and then the decisions of all experts will be organized to reach the best decision.

Table 4.1: Criteria, Sub-Criteria And Their Explanation

Criteria	Sub-criteria	Explanation
Cost	Operation Cost	They are all the costs that the project needs to start working, which include the prices of machines, rent and the set-up cost of the work.
	Maintenance Cost	They are the costs required to keep the business going.
	Taxes	They are all matters related to financial obligations to ensure the legal conduct of business with the state.
	Salaries & Wages	Financial obligations with employees and workers owed to them.
Profit	Income & Sales	The financial inputs for the project from sales and profits.
	Salvage Value	Financial inputs coming from selling equipment instead of destroying it upon completion of its use.
	Franchise	Financial return for using the trade name.
Suppliers	Delivery	The time which the suppliers take since order to delivery and delivery on time.
	Flexibility	The ability of the suppliers to meet needs in case the demand changes.
	Quality	The quality of the required materials and their compliance with the agreed standards.
Sustainability	Control	The ability to adjust the available resources in proportion to the project's continuity.
	Risk Management	The ability to control and manage resources in difficult times to enable survival and continuity.
	Increasing Capacity	Increase productivity when necessary in line with market requirements to ensure project continuity.
Innovation opportunities	Customer Benefit	It generates a strong motivation for innovation opportunities.
	Uniqueness	Possession of a particular good or service that no one owns and discrimination in it is an important reason for innovation.
	Future Potential	Looking ahead and keeping up with developments and modernity.

Table 4.1 explains all criteria, sub-criteria and the explanations for all of them.

The pair wise comparison matrix of first level criteria (main criteria) from the point view of expert 1 will be as following:

$$A_{exp1} = \begin{array}{cc|cc|cc|cc} & \text{Cost} & \text{Prof.} & \text{Supp.} & \text{Sust.} & \text{Inn. oppor.} & & \\ \hline & 1 & 2 & 5 & 1 & 3 & & \\ & 1/2 & 1 & 3 & 1/2 & 2 & & \\ & 1/5 & 1/3 & 1 & 1/4 & 1/2 & & \\ & 1 & 2 & 4 & 1 & 3 & & \\ & 1/3 & 1/2 & 2 & 1/3 & 1 & & \\ \hline & & & & & & \text{Cost} & \\ & & & & & & \text{Profit} & \\ & & & & & & \text{Suppliers} & \\ & & & & & & \text{Sustainability} & \\ & & & & & & \text{Inn. oppor.} & \end{array} \quad (4.1)$$

Now the normalized pair-wise comparison matrix will be calculated by applying Equation (3.2) by dividing each value on the matrix by the summation of each own column as following:

$$= \begin{array}{cc|cc|cc|cc} & \text{cost} & \text{prof.} & \text{supp.} & \text{Sus.} & \text{Inn. oppor.} & & \text{criteria weight} \\ \hline & 0.329 & 0.342 & 0.333 & 0.324 & 0.315 & & \\ & 0.164 & 0.171 & 0.200 & 0.162 & 0.210 & & \\ & 0.065 & 0.057 & 0.066 & 0.081 & 0.052 & & \\ & 0.329 & 0.342 & 0.266 & 0.324 & 0.315 & & \\ & 0.109 & 0.085 & 0.133 & 0.108 & 0.105 & & \\ \hline & & & & & & \text{cost} & 0.3292 \\ & & & & & & \text{profit} & 0.1818 \\ & & & & & & \text{suppliers} & 0.0647 \\ & & & & & & \text{Sust.} & 0.3159 \\ & & & & & & \text{Inn. oppor.} & 0.1085 \end{array}$$

The average of each row will be the weight of criteria if the matrix is consistence so that consistency ratio must be checked by Equation 3.5. To calculate consistency, λ_{max} must be caculated by finding the average of $\frac{\text{weighted sum value}}{\text{criteria weight}}$ for all criteria weights as below:

$$= \begin{array}{cc|cc|cc|cc} & \text{cost} & \text{prof.} & \text{supp.} & \text{Sust.} & \text{Inn. oppoo.} & \text{weighted sum} & \frac{\text{sum}}{\text{weight}} \\ \hline \text{cost} & 0.329 & 0.342 & 0.333 & 0.324 & 0.315 & 1.6574 & 5.0349 \\ \text{profit} & 0.164 & 0.171 & 0.200 & 0.162 & 0.210 & 0.9153 & 5.0350 \\ \text{supp.} & 0.065 & 0.057 & 0.066 & 0.081 & 0.052 & 0.3243 & 5.0134 \\ \text{sust.} & 0.329 & 0.342 & 0.266 & 0.324 & 0.315 & 1.5927 & 5.0426 \\ \text{inn.} & 0.109 & 0.085 & 0.133 & 0.108 & 0.105 & 0.5437 & 5.0133 \end{array}$$

$$\lambda_{max} = \text{Avg.} \frac{\text{weighted sum value}}{\text{criteria weight}} = 5.0279 \quad (4.2)$$

Now the consistency index will be calculated by Equation 3.4.

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{5.0279 - 5}{5 - 1} = 0.00697 \quad (4.3)$$

After that consistency ratio will be calculated by Equation 3.2.5.

$$CR = \frac{CI}{RI} = \frac{0.00697}{1.12} = 0.00622 < 0.1 \quad (4.4)$$

The random index RI comes from Table 3.2. since the consistency ratio < 0.1 so the pair-wise comparison matrix is consistent so that weights of first-level criteria are given as follows in Table 4.2:

Table 4.2: First Level Criteria

Cost	0.329194921
Annual Profit	0.181790443
Suppliers	0.06469125
Sustainability	0.315861587
Innovation Opportunities	0.108461799

Now matrix B will be obtained to calculate the weights of sub-criteria of the criterion (Cost). Also, all the weights of other sub-criteria will be calculated by the same way. In total five matrices will be obtained. For explanation the first one will be inserted.

$$B_{exp1} = \begin{vmatrix} \text{Operation} & \text{Main.} & \text{Taxes} & \text{Salaries} \\ 1 & 2 & 3 & 2 \\ 1/2 & 1 & 2 & 1 \\ 1/3 & 1/2 & 1 & 1/3 \\ 1/2 & 1 & 3 & 1 \end{vmatrix} \begin{matrix} \text{Operation cost} \\ \text{Maintenance cost} \\ \text{Taxes} \\ \text{Salaries and wage} \end{matrix} \quad (4.5)$$

Table 4.3: Second Level Criteria (Sub-Criteria)

Operation Cost	0.416971917
Maintenance Cost	0.222374847
Taxes	0.110500611
Salaries & Wages	0.250152625

Table 4.3 indicates the weights of the sub-criteria of the (Cost) criterion. After finishing all sub-criteria. Global weights of criteria will be calculated as shown below:

Table 4.4: Global Weights Of Sub-Criteria

Weights of Criteria	Local Weights of Sub-Criteria	Global Weights of Criteria
$W_A = 0.32919$	$W_{A1} = 0.41697$	$W_A * W_{A1} = 0.13727$
	$W_{A2} = 0.22237$	$W_A * W_{A2} = 0.07320$
	$W_{A3} = 0.11050$	$W_A * W_{A3} = 0.03638$
	$W_{A4} = 0.25015$	$W_A * W_{A4} = 0.08235$
$W_B = 0.18179$	$W_{B1} = 0.55714$	$W_B * W_{B1} = 0.10128$
	$W_{B2} = 0.12262$	$W_B * W_{B2} = 0.02229$
	$W_{B3} = 0.32024$	$W_B * W_{B3} = 0.05822$
$W_C = 0.06469$	$W_{C1} = 0.44286$	$W_C * W_{C1} = 0.02865$
	$W_{C2} = 0.16984$	$W_C * W_{C2} = 0.01099$
	$W_{C3} = 0.38730$	$W_C * W_{C3} = 0.02506$
$W_D = 0.31586$	$W_{D1} = 0.53896$	$W_D * W_{D1} = 0.17024$
	$W_{D2} = 0.16378$	$W_D * W_{D2} = 0.05173$
	$W_{D3} = 0.29726$	$W_D * W_{D3} = 0.09389$
$W_E = 0.10846$	$W_{E1} = 0.38730$	$W_E * W_{E1} = 0.04201$
	$W_{E2} = 0.16984$	$W_E * W_{E2} = 0.01842$
	$W_{E3} = 0.44286$	$W_E * W_{E3} = 0.04803$

Table 4.4 indicates the global weight of each sub-criterion for expert 1 which will effect on each of the weights of the next level. The abbreviations in the table are shown in the AHP structure (Figure 4.1). Where, (W) is the weight. (A, B, ..., E) represent the main criteria. (1, 2, 3, 4) represent the sub-criteria

After that the weights of all investments will be calculated by comparing the investments with each other according to each sub-criterion multiplied with its global weight. So that sixteen matrices will be obtained. The first matrix from the (Operation cost) point of view is shown below:

$$C_{exp1} = \begin{vmatrix} IT & Entert. & Food & Texti. & Construc. \\ 1 & 1/2 & 1/4 & 1/3 & 1/2 \\ 2 & 1 & 1/4 & 1 & 1 \\ 4 & 4 & 1 & 3 & 2 \\ 3 & 1 & 1/3 & 1 & 2 \\ 2 & 1 & 1/2 & 1/2 & 1 \end{vmatrix} \begin{matrix} IT \\ Entertainment \\ Food sector \\ Textile \\ Construction \end{matrix} \quad (4.6)$$

Table 4.5: Weights Of investments From The View-Point Of The Sub-Criterion

IT & Technology	0.010739858
Entertainment Sector	0.020107065
Food Sector	0.05812395
Textile & ready to Wear Clothing	0.02759882
Construction & Real Estate	0.020695344

So, in Table 4.5 the weights of the investments were calculated from the view-point of the (operation cost) sub-criterion. The weights of the investments from all sub-criteria point of views have to be calculated similarly. Table 4.6 shows all the weights:

Table 4.6: Allover Score

Sub-criteria	IT & Tec.	Entertainment Sector	Food Sector	Textile	Construction & Real Estate
Operation Cost	0.01074	0.02011	0.05812	0.02760	0.02070
Maintenance Cost	0.02198	0.01172	0.00727	0.02051	0.01172
Taxes	0.00208	0.00707	0.00459	0.00723	0.01541
salaries & wages	0.02599	0.01231	0.00814	0.00562	0.03030
Income & sales	0.00563	0.01390	0.01493	0.02444	0.04238
Salvage value	0.00157	0.00381	0.00322	0.00467	0.00902
Franchise	0.00438	0.00878	0.02269	0.01436	0.00801
Delivery	0.00252	0.00217	0.00854	0.00555	0.00987
Flexibility	0.00065	0.00075	0.00250	0.00236	0.00473
Quality	0.00597	0.00199	0.00633	0.00442	0.00633
Control	0.05011	0.00991	0.03493	0.01500	0.06028
Risk Management	0.01512	0.00593	0.00811	0.00631	0.01627
Increasing Capacity	0.00999	0.00804	0.03711	0.02424	0.01452
Customer Benefit	0.00476	0.00472	0.01704	0.01044	0.00505
Uniqueness	0.00284	0.00253	0.00868	0.00304	0.00132
Future Potential	0.01004	0.00647	0.02491	0.00338	0.00324
Sum	0.17438	0.12020	0.26710	0.17918	0.25914

Table 4.6 indicates the scores of all the sub-criteria for all the investments. Now the final weights of investments based on expert 1 are as following:

Table 4.7: Final Weights Of Investments Based On Expert 1

Investment	Weight	Rank
IT & technology	0.174381276	4
Entertainment Sector	0.1202049	5
Food Sector	0.267097761	1
Textile & Ready to Wear Clothing	0.179177693	3
Construction & Real Estate	0.259138371	2

Table 4.7 shows the final decision of expert 1, It appears that the food sector has the highest rank among other investments, it means that expert 1 believes that the food sector is the best choice to invest.

In the same way, the final decision for each expert will be found. For illustration, the tables will be included that contain the final weights for investments from the viewpoint of each expert as following:

Table 4.8: Final Weights Of Investments Based On Expert 2

Investment	Weight	Rank
IT & technology	0.230760724	2
Entertainment Sector	0.104806023	5
Food Sector	0.137252326	4
Textile & Ready to Wear Clothing	0.157188392	3
Construction & Real Estate	0.369992535	1

Table 4.8 indicates the ranking of the investments based on expert 2 point of view and he believes that construction and real estate sector is the best choice.

Table 4.9: Final Weights Of Investments Based On Expert 3

Investment	Weight	Rank
IT & technology	0.309926953	1
Entertainment Sector	0.126327046	4
Food Sector	0.187428025	3
Textile & Ready to Wear Clothing	0.120579794	5
Construction & Real Estate	0.255738183	2

Table 4.9 shows the ranking of the investments based on expert 3 point of view and he believes that IT and technology sector is the best choice.

Table 4.10: Final Weights Of Investments Based On Expert 4

Investment	Weight	Rank
IT & technology	0.149916927	5
Entertainment Sector	0.175547225	4
Food Sector	0.237199862	2
Textile & Ready to Wear Clothing	0.18067582	3
Construction & Real Estate	0.256660166	1

Table 4.10 shows the ranking of the investments based on expert 4 point of view and he believes that construction and real estate is the best investment.

Table 4.11: Final Weights Of Investments Based On Expert 5

Investment	Weight	Rank
IT & technology	0.168463506	5
Entertainment Sector	0.203924508	3
Food Sector	0.225377609	1
Textile & Ready to Wear Clothing	0.184283345	4
Construction & Real Estate	0.217951032	2

Table 4.11 indicates the weights of investments and their ranks from the point of view of expert 5 and he believes that the food sector is the best choice to invest.

Table 4.12: Final Weights Of Investments Based On Expert 6

Investment	Weight	Rank
IT & technology	0.310334679	1
Entertainment Sector	0.156034662	5
Food Sector	0.188934232	2
Textile & Ready to Wear Clothing	0.183270842	3
Construction & Real Estate	0.161425585	4

Table 4.12 shows the rank of each investment from the viewpoint of expert 6 and it is obvious that he believes that the best investment is the IT and technology.

Table 4.13: Final Weights Of Investments Based On Expert 7

Investment	Weight	Rank
IT & technology	0.099770301	5
Entertainment Sector	0.170334238	4
Food Sector	0.211090795	2
Textile & Ready to Wear Clothing	0.313970011	1
Construction & Real Estate	0.204834655	3

Table 4.13 shows the ranking of the investments based on expert 7 point of view and he believes that textile and ready to wear clothing is the best investment.

It is clear after analyzing the project that there is a difference between the opinions of the experts, and this is a very normal thing. Each one of them sees in a different perspective from the other and this is the thing that justifies the existence of different projects in life.

5. CONCLUSION

The aim of this study is to determine the best investment by multi-criteria decision-making approaches. In this study, the concept of multi-criteria decision-making and some of its most common methods were discussed and explained in detail. After that, the literature related to MCDM and its used methods were reviewed. The literature related to the selection of various investment opportunities was also studied and the projects to be studied were identified. Then, the methodology that the research followed was explained and how to employ the TOPSIS method and the analytical hierarchy process in the decision-making process. Seven experts were hired to take more than one opinion in the decision-making process. TOPSIS assessed the opinions of the experts responsible for the decision-making process, and the AHP analyzed the main problem based on the seven experts. Finally, this section will present and discuss the results obtained as shown in Table 5.1:

Table 5.1: Final Decision

Expert	Experts Weight	IT Sector	Entertainment Sector	Food Sector	Textile Sector	Construction Sector
expert 1	0.0621	0.1744	0.1202	0.2671	0.1792	0.2591
expert 2	0.0849	0.2308	0.1048	0.1373	0.1572	0.3700
expert 3	0.2626	0.3099	0.1263	0.1874	0.1206	0.2557
expert 4	0.2831	0.1499	0.1755	0.2372	0.1807	0.2567
expert 5	0.0891	0.1685	0.2039	0.2254	0.1843	0.2180
expert 6	0.1579	0.3103	0.1560	0.1889	0.1833	0.1614
expert 7	0.0603	0.0998	0.1703	0.2111	0.3140	0.2048
Final decision		0.2243	0.1523	0.2073	0.1716	0.2446

Table 5.1 shows the final results of all the investments dealt with in this study from the point of view of the seven experts who were hired. And it is clear that the construction sector is the one that has the highest weight, it means that it is the best sector for investment. The technology and information sector also has a good weight and is close to the construction sector, which means that it is also a good investment.

These results obtained from the detailed study of the markets are a good indicator for those willing to invest, especially when compared to the pioneering investments these days.

In the future, the criteria that are relied upon in determining the best investment may differ, and there may be new sectors for investment. But this study helped to understand the practical reality of the investment opportunities. It can serve as a guide for some future studies that review the process of selecting new business opportunities. It is possible to conduct different studies on the subject of investment opportunities and the methods of comparison between them. For example, a new methodology can be devised with a different working technique to evaluate the proposed investments. Also, it is possible in the future that these investments will be ineffective, so the market and its requirements must be studied in order to be able to take the appropriate decision and select the best investment.

In conclusion, we must not forget the importance of supply and demand on our decisions related to investment matters and on the sectors to be invested in. Especially since the needs of the market vary from time to time and that the demand for these sectors is affected by place and time. It is possible that the Turkish market at the present time is flourishing in sectors the aforementioned, while some of the competitive markets are flourishing in different sectors. At the same time, it is possible for the local market to develop and become a leader in different areas, so the demand on the markets will change for something else, and accordingly, we must keep pace with development and modernity to be able to meet the needs of the market and move forward to the top.

REFERENCES

- Agarwal, V., Kaur, R., & De, D. (2017). Scenario Analysis of Textile Industry in Asia-Pacific Trade Agreement (APTA). *Procedia Computer Science*, 122, 685-690. doi:<https://doi.org/10.1016/j.procs.2017.11.424>
- Altamirano-Corro, A., & Peniche-Vera, R. (2014). Measuring the Institutional Efficiency Using DEA and AHP. *Journal of Applied Research and Technology*, 12(1), 63-71. doi:[https://doi.org/10.1016/S1665-6423\(14\)71606-2](https://doi.org/10.1016/S1665-6423(14)71606-2)
- Aşchilean, I., Badea, G., Giurca, I., Naghiu, G., & Iloaie, F. (2017). Choosing the Optimal Technology to Rehabilitate the Pipes in Water Distribution Systems Using the AHP Method. *Energy Procedia*, 112, 19-26. doi:<https://doi.org/10.1016/j.egypro.2017.03.1109>
- Balo, F., & Şağbanşua, L. (2016). The Selection of the Best Solar Panel for the Photovoltaic System Design by Using AHP. *Energy Procedia*, 100, 50-53. doi:<https://doi.org/10.1016/j.egypro.2016.10.151>
- Bartusková, T., & Kresta, A. (2015). Application of AHP Method in External Strategic Analysis of the Selected Organization. *Procedia Economics and Finance*, 30, 146-154. doi:[https://doi.org/10.1016/S2212-5671\(15\)01278-2](https://doi.org/10.1016/S2212-5671(15)01278-2)
- Batista, P., Lisboa, J., Augusto, M., & Almeida, F. (2016). Effectiveness of business strategies in Brazilian textile industry. *Revista de Administração*, 51(2), 225-239. doi:<https://doi.org/10.5700/rausp1236>
- Benmoussa, K., Laaziri, M., Khouliji, S., Kerkeb, M., & El Yamami, A. (2019). AHP-based Approach for Evaluating Ergonomic Criteria. *Procedia Manufacturing*, 32, 856-863. doi:<https://doi.org/10.1016/j.promfg.2019.02.294>
- Breaza, R., Bologaa, O., & Racza, S. (2017). Selecting industrial robots for milling applications using AHP. *Procedia Computer Science*, 122, 346–353. <https://doi.org/10.1016/j.procs.2017.11.379> adresinden alındı
- Cagli, E. (2019). Explosive behavior in the real estate market of Turkey. *Borsa Istanbul Review*, 19(3), 258-263. doi:<https://doi.org/10.1016/j.bir.2018.10.002>

- Chan, V. (2011). The Impact of the Global Financial Crisis on the Entertainment Tourism Industry: A Financial Engineering Case Study of Macao from 2007 to 2010. *Systems Engineering Procedia*, 1, 323-329. doi:<https://doi.org/10.1016/j.sepro.2011.08.049>
- Chu, J., & Su, Y. (2012). The Application of TOPSIS Method in Selecting Fixed Seismic Shelter for Evacuation in Cities. *Systems Engineering Procedia*, 3, 391-397. <https://doi.org/10.1016/j.sepro.2011.10.061> adresinden alındı
- Cummins, M., Bhaird, C., Rosati, P., & Lynn, T. (2020). Institutional investment in online business lending markets. *International Review of Financial Analysis*, 71, 101542. doi:<https://doi.org/10.1016/j.irfa.2020.101542>
- Dedrick, J., Kraemer, K., & Shih, E. (2013). Information Technology and Productivity in Developed and Developing Countries. *Journal of Management Information Systems*, 30, 97-122. doi:10.2753/MIS0742-1222300103
- Díaz-Puche, M., Fernández-Miguélez, S., Campos-Soria, J., & Fernández-Gámez, M. (2020). Multilevel assessment of restaurant profitability: Evidence with European data. *Data in Brief*, 30, 105426. doi:<https://doi.org/10.1016/j.dib.2020.105426>
- Geipele, I., & Kauškalē, L. (2013). The Influence of Real Estate Market Cycle on the Development in Latvia. *Procedia Engineering*, 57, 327-333. doi:<https://doi.org/10.1016/j.proeng.2013.04.044>
- Haewon, L., Hanbyeol, C., Junyeong, L., Jinyoung, M., & Heeseok, L. (2016). Impact of IT Investment on Firm Performance Based on Technology IT Architecture. *Procedia Computer Science*, 91, 652-661. doi:<https://doi.org/10.1016/j.procs.2016.07.164>
- Halim, K., Halim, S., & Felecia. (2019). Business Intelligence for Designing Restaurant Marketing Strategy: A Case Study. *Procedia Computer Science*, 161, 615-622. doi:<https://doi.org/10.1016/j.procs.2019.11.164>
- Hasnain, S., Ali, M., Akhter, J., Ahmed, B., & Abbas, N. (2020). Selection of an industrial boiler for a soda-ash production plant using analytical hierarchy process and TOPSIS approaches. *Case Studies in Thermal Engineering*, 19. <https://doi.org/10.1016/j.csite.2020.100636> adresinden alındı

- Hobikoğlu, E., & Çetinkaya, M. (2015). In Innovative Entertainment Economy Framework, Economic Impacts of Culture Industries: Turkey and Hollywood Samples. *Procedia - Social and Behavioral Sciences*, 195, 1435-1442. doi:<https://doi.org/10.1016/j.sbspro.2015.06.440>
- Huq, F., Chowdhury, I., & Klassen, R. (2016). Social management capabilities of multinational buying firms and their emerging market suppliers: An exploratory study of the clothing industry. *Journal of Operations Management*, 46, 19-37. doi:<https://doi.org/10.1016/j.jom.2016.07.005>
- İncekara, A., Şener, S., & Hobikoğlu, E. (2013). Economic Evaluation of the Film Industry in Terms of Strategic Management within the Scope of the Creative Innovative Industries: The Case of Turkey. *Procedia - Social and Behavioral Sciences*, 99, 636-647. doi:<https://doi.org/10.1016/j.sbspro.2013.10.534>
- Jayant, A., Gupta, P., Garg, S., & Khan, M. (2014). TOPSIS-AHP Based Approach for Selection of Reverse Logistics Service Provider: A Case Study of Mobile Phone Industry. *Procedia Engineering*, 97, 2147-2156. <https://doi.org/10.1016/j.proeng.2014.12.458> adresinden alındı
- Jianfeng , X., Zhonghao, Z., Wei, L., & Quan , W. (2016). A Traffic Accident Causation Analysis Method Based on AHP-Apriori. *Procedia Engineering*, 137, 680-687. doi:<https://doi.org/10.1016/j.proeng.2016.01.305>
- Kaur, B., & Bhatia, R. (2015). Prioritizing Parameters for Software Project Selection using Analytical Hierarchical Process. *International Journal of Computer Applications*, 118, 36-40. doi:10.5120/20729-3088
- Khallaf, A. (2012). Information technology investments and nonfinancial measures: A research framework. *Accounting Forum*, 36(2), 109-121. doi:<https://doi.org/10.1016/j.accfor.2011.07.001>
- Kharlamova, G. (2014). Investment Security of Industries: Rating Assessment (Case of Ukraine). *Procedia Economics and Finance*, 16, 657-668. doi:[https://doi.org/10.1016/S2212-5671\(14\)00854-5](https://doi.org/10.1016/S2212-5671(14)00854-5)
- Kumar, R., Padhi, S., & Sarkar, A. (2016). Supplier selection of an Indian heavy locomotive manufacturer: An integrated approach using Taguchi loss function,

- TOPSIS, and AHP. *IIMB Management Review*, 31(1), 78-90.
<https://doi.org/10.1016/j.iimb.2018.08.008> adresinden alındı
- Kutlu, B., Bozanta, A., Ates, E., Erdogan, S., Gokay, O., & Kan, N. (2014). Project Management Software Selection Using Analytic Hierarchy Process Method. *International Journal of Applied Science and Technology*, 4.
- Leal, & Eugenio, J. (2020). AHP-express: A simplified version of the analytical hierarchy process method. *MethodsX*, 7.
<https://doi.org/10.1016/j.mex.2019.11.021> adresinden alındı
- Majumder, M., & Saha, A. (2016). *Feasibility Model of Solar Energy Plants by ANN and MCDM Techniques*. Springer, Singapore. doi:<https://doi.org/10.1007/978-981-287-308-8>
- Mani, V., Agrawal, R., & Sharma, V. (2014). Supplier selection using social sustainability: AHP based approach in India. *International Strategic Management Review*, 2(2), 98-112.
doi:<https://doi.org/10.1016/j.ism.2014.10.003>
- Marthandan, G., & Tang, C. (2010). Information systems evaluation: an ongoing measure. *International Journal of Business Information Systems*, 336 - 353.
doi:<https://dx.doi.org/10.1504/IJBIS.2010.035049>
- Messaoudi, D., Settou, N., Negrou, B., Rahmouni, S., Settou, B., & Mayou, I. (2019). Site selection methodology for the wind-powered hydrogen refueling station based on AHP-GIS in Adrar, Algeria. *Energy Procedia*, 162, 67-76.
doi:<https://doi.org/10.1016/j.egypro.2019.04.008>
- Morozova, T., Bokovaya, N., & Khazieva, L. (2015). System Approach to the Surveying of Real Estate in Scheduling of Repair and Construction Works. *Procedia Engineering*, 117, 1090-1096.
doi:<https://doi.org/10.1016/j.proeng.2015.08.241>
- Muhisn, Z., Mazni, O., & Mazida, A. (2015). Team Leader Selection by Using an Analytic Hierarchy Process (AHP) Technique. *Journal of Software*, 10, 1216-1227. doi:10.17706/jsw.10.10.1216-1227
- Mushtaha, E., Alsyouf, I., Al Labadi, L., Hamad, R., Khatib, N., & Al Mutawa, M. (2020). Application of AHP and a mathematical index to estimate livability in

- tourist districts. *Frontiers of Architectural Research*, 9(4), 872-889. doi:<https://doi.org/10.1016/j.foar.2020.04.001>
- Navarro-García, J., & Madrid-Guijarro, A. (2016). Real economic activity and accounting information in Spanish construction and real estate firms. *Revista de Contabilidad*, 19(1), 21-30. doi:<https://doi.org/10.1016/j.rcsar.2014.10.002>
- Newman, C., & Tarp, F. (2020). Shocks and agricultural investment decisions. *Food Policy*, 94, 101810. doi:<https://doi.org/10.1016/j.foodpol.2019.101810>
- Oliveira , M., Abreu, M., Filho, J., & Leocádio, A. (2016). Relationship between eco-innovations and the impact on business performance: an empirical survey research on the Brazilian textile industry. *Revista de Administração*, 51(3), 276-287. doi:<https://doi.org/10.1016/j.rausp.2016.06.003>
- Partzsch, L., & Kemper, L. (2019). Cotton certification in Ethiopia: Can an increasing demand for certified textiles create a ‘fashion revolution’? *Geoforum*, 99, 111-119. doi:<https://doi.org/10.1016/j.geoforum.2018.11.017>
- Pekkaya. (2015). Career Preference of University Students: An Application of MCDM Methods. *Procedia Economics and Finance*, 23, 249-255. doi:[https://doi.org/10.1016/S2212-5671\(15\)00486-4](https://doi.org/10.1016/S2212-5671(15)00486-4)
- Phudphad, K., Watanapa, B., & Krath, W. (2017). Rankings of the security factors of human resources information system (HRIS) influencing the open climate of work: using analytic hierarchy process (AHP). *Procedia Computer Science*, 111, 287-293. <https://doi.org/10.1016/j.procs.2017.06.065> adresinden alındı
- Piwowarski, M., Miłaszewicz , D., Łatuszyńska , M., Borawski, M., & Nermend , K. (2018). TOPSIS and VIKOR methods in study of sustainable development in the EU countries. *Procedia Computer Science*, 126, 1683-1692. doi:<https://doi.org/10.1016/j.procs.2018.08.109>
- Purwita, A., & Subriadi, A. (2019). Information Technology Investment: In Search of The Closest Accurate Method. *Procedia Computer Science*, 161, 300-307. doi:<https://doi.org/10.1016/j.procs.2019.11.127>
- Qashou, A., & Saleh, Y. (2018). E-marketing implementation in small and medium-sized restaurants in Palestine. *Arab Economic and Business Journal*, 13(2), 93-110. doi:<https://doi.org/10.1016/j.aebj.2018.07.001>

- Rudnik, K., Bocewicz, G., Kucińska-Landwójtowicz, A., & Czabak-Górska, I. (2020, December 13). Ordered fuzzy WASPAS method for selection of improvement projects. *Expert Systems with Applications*.
<https://doi.org/10.1016/j.eswa.2020.114471> adresinden alındı
- Russo, R., & Camanho, R. (2015). Criteria in AHP: a Systematic Review of Literature. *Procedia Computer Science*, 55, 1123 – 1132.
<https://doi.org/10.1016/j.procs.2015.07.081> adresinden alındı
- Saaty. (1987). THE ANALYTIC HIERARCHY PROCESS-WHAT IT IS AND HOW IT IS USED. *Pergamon Journals Ltd*, 9, 161-176.
[https://doi.org/10.1016/0270-0255\(87\)90473-8](https://doi.org/10.1016/0270-0255(87)90473-8) adresinden alındı
- Saaty. (2008). Decision making with the analytic hierarchy process. *Int. J. Services Sciences*, 1, 83-98. doi:10.1504/IJSSCI.2008.017590
- Salo, A., & Hämäläinen, R. (2010). Multicriteria Decision Analysis in Group Decision Processes. 269-283. doi:https://doi.org/10.1007/978-90-481-9097-3_16
- Schwenzow, J., Hartmann, J., Schikowsky, A., & Heitmann, M. (2021). Understanding videos at scale: How to extract insights for business research. *Journal of Business Research*, 123, 367-379.
doi:<https://doi.org/10.1016/j.jbusres.2020.09.059>
- Senvar, O., Otay, I., & Bolturk, E. (2016). Hospital Site Selection via Hesitant Fuzzy TOPSIS. *IFAC-PapersOnLine*, 49(12), 1140-1145.
doi:<https://doi.org/10.1016/j.ifacol.2016.07.656>
- Shih, H.-S., Shyur, H.-J., & Lee, E. (2007). An extension of TOPSIS for group decision making. *Mathematical and Computer Modelling*, 45, 801-813.
<https://doi.org/10.1016/j.mcm.2006.03.023> adresinden alındı
- Skorupinska, A., & Torrent-Sellens, J. (2014). ICT, Innovation and Productivity: Evidence from Eastern European Manufacturing Firms. *Journal of the Knowledge Economy DWP*, 14.
- Skovranek, T., Hudymáčová, M., Benková, M., & Pócsová, J. (2010). Supplier selection based on multi-criterial AHP method. *Acta Montanistica Slovaca*, 249-255.

- Sureeyatanapas, P., Sriwattananusart, K., Niyamosoth, T., Sessomboon, W., & Arunyanart, S. (2018). Supplier selection towards uncertain and unavailable information: An extension of TOPSIS method. *Operations Research Perspectives*, 5, 69-79. <https://doi.org/10.1016/j.orp.2018.01.005> adresinden alındı
- Tanizaki, T., Hoshino, T., Shimmura, T., & Takenaka, T. (2020). Restaurants store management based on demand forecasting. *Procedia CIRP*, 88, 580-583. doi:<https://doi.org/10.1016/j.procir.2020.05.101>
- Tyagi, M., Kumar, P., & Kumar, D. (2014). A Hybrid Approach using AHP-TOPSIS for Analyzing e-SCM Performance. *Procedia Engineering*, 97, 2195-2203. <https://doi.org/10.1016/j.proeng.2014.12.463> adresinden alındı
- Velasquez, M., & Hester, P. (2013). An Analysis of Multi-Criteria Decision Making Methods. *International Journal of Operations Research*, 10, 56-66.
- Wang, P., Zhu, Z., & Wang, Y. (2016). A novel hybrid MCDM model combining the SAW, TOPSIS and GRA methods based on experimental design. *Information Sciences*, 27-45. doi:<https://doi.org/10.1016/j.ins.2016.01.076>
- Wiratno, S., Latiffianti, E., & Wirawan, K. (2015). Selection of business funding proposals using analytic network process: a case study at a venture capital company. *Procedia Manufacturing*, 4, 237 – 243. <https://doi.org/10.1016/j.promfg.2015.11.037> adresinden alındı
- Wolnowska, A., & Konicki, W. (2019). Multi-criterial analysis of oversize cargo transport through the city, using the AHP method. *Transportation Research Procedia*, 39, 614-623. doi:<https://doi.org/10.1016/j.trpro.2019.06.063>
- Yadav, V., Karmakar, S., Kalbar, P., & Dikshit, A. (2019). PyTOPS: A Python based tool for TOPSIS. *SoftwareX*, 9, 217-222. doi:<https://doi.org/10.1016/j.softx.2019.02.004>
- Yua, J., Wang, L., & Gong, X. (2013). Study on the Status Evaluation of Urban Road Intersections Traffic Congestion Base on AHP-TOPSIS Modal. *Procedia - Social and Behavioral Sciences*, 96, 609 – 616. <https://doi.org/10.1016/j.sbspro.2013.08.071> adresinden alındı

- Yücel, N., & Taşabat, S. (2019). The Selection of Railway System Projects with Multi Criteria Decision Making Methods: A Case Study for Istanbul. *Procedia Computer Science*, 158, 382-393. doi:<https://doi.org/10.1016/j.procs.2019.09.066>
- Zaidan, A., Zaidan, B., Al-Haiqi, A., Kiah, M., Hussain, M., & Abdulnabi, M. (2015). Evaluation and selection of open-source EMR software packages based on integrated AHP and TOPSIS. *Journal of Biomedical Informatics*, 390-404. <https://doi.org/10.1016/j.jbi.2014.11.012> adresinden alındı
- Zimmermann, J., & Eber, W. (2017). Criteria on the Value of Expert's Opinions for Analyzing Complex Structures in Construction and Real Estate Management. *Procedia Engineering*, 196, 335-342. doi:<https://doi.org/10.1016/j.proeng.2017.07.208>
- Zorpas, A., & Saranti, A. (2016). Multi-criteria analysis of sustainable environmental clean technologies for the treatment of winery's wastewater. *Int. J. Global Environmental Issues*, 15, 151–168.

APPENDIX A_ ALL MATRICES OF EXPERT 1

Table A.1: Pair-wise Comparison Matrix for Main Criteria

Main Criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	2.00	5.00	1.00	3.00
annual profit	0.50	1.00	3.00	0.50	2.00
suppliers	0.20	0.33	1.00	0.25	0.50
Sustainability	1.00	2.00	4.00	1.00	3.00
Innovation probability	0.33	0.50	2.00	0.33	1.00

Table A.2: Pair-wise Comparison Matrix for Cost

Cost	Operation cost	Maintenance cost	Taxes	salaries and wages
Operation cost	1.00	2.00	3.00	2.00
Maintenance cost	0.50	1.00	2.00	1.00
Taxes	0.33	0.50	1.00	0.33
salaries and wages	0.50	1.00	3.00	1.00

Table A.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	4.00	2.00
Salvage value	0.25	1.00	0.33
Franchise	0.50	3.00	1.00

Table A.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	3.00	1.00
Flexibility	0.33	1.00	0.50
Quality	1.00	2.00	1.00

Table A.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	3.00	2.00
Risk management	0.33	1.00	0.50
Increasing capacity	0.50	2.00	1.00
sum	1.83	6.00	3.50

Table A.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	2.00	1.00
uniqueness	0.50	1.00	0.33
Future potential	1.00	3.00	1.00

Table A.7: Pair-wise Comparison Matrix for Operation cost viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.25	0.33	0.50
Entertainment	2.00	1.00	0.25	1.00	1.00
Food sector	4.00	4.00	1.00	3.00	2.00
Textile	3.00	1.00	0.33	1.00	2.00
Construction	2.00	1.00	0.50	0.50	1.00

Table A.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	3.00	1.00	2.00
Entertainment	0.50	1.00	2.00	0.50	1.00
Food sector	0.33	0.50	1.00	0.50	0.50
Textile	1.00	2.00	2.00	1.00	2.00
Construction	0.50	1.00	2.00	0.50	1.00

Table A.9: Pair-wise Comparison Matrix for Taxes viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.25	0.50	0.20	0.20
Entertainment	4.00	1.00	2.00	1.00	0.33
Food sector	2.00	0.50	1.00	0.50	0.50
Textile	5.00	1.00	2.00	1.00	0.25
Construction	5.00	3.00	2.00	4.00	1.00

Table A.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	4.00	5.00	0.50
Entertainment	0.33	1.00	2.00	3.00	0.33
Food sector	0.25	0.50	1.00	1.00	0.50
Textile	0.20	0.33	1.00	1.00	0.20
Construction	2.00	3.00	2.00	5.00	1.00

Table A.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.20	0.17
Entertainment	2.00	1.00	2.00	0.33	0.25
Food sector	3.00	0.50	1.00	1.00	0.33
Textile	5.00	3.00	1.00	1.00	0.50
Construction	6.00	4.00	3.00	2.00	1.00

Table A.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.33	0.20
Entertainment	2.00	1.00	1.00	1.00	0.50
Food sector	3.00	1.00	1.00	0.50	0.25
Textile	3.00	1.00	2.00	1.00	0.50
Construction	5.00	2.00	4.00	2.00	1.00

Table A.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.20	0.33	0.50
Entertainment	2.00	1.00	0.50	0.50	1.00
Food sector	5.00	2.00	1.00	2.00	3.00
Textile	3.00	2.00	0.50	1.00	2.00
Construction	2.00	1.00	0.33	0.50	1.00

Table A.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.33	0.50	0.25
Entertainment	1.00	1.00	0.33	0.25	0.20
Food sector	3.00	3.00	1.00	2.00	1.00
Textile	2.00	4.00	0.50	1.00	0.50
Construction	4.00	5.00	1.00	2.00	1.00

Table A.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.20	0.25	0.17
Entertainment	1.00	1.00	0.33	0.25	0.20
Food sector	5.00	3.00	1.00	1.00	0.50
Textile	4.00	4.00	1.00	1.00	0.33
Construction	6.00	5.00	2.00	3.00	1.00

Table A.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	2.00	1.00
Entertainment	0.50	1.00	0.33	0.20	0.33
Food sector	1.00	3.00	1.00	2.00	1.00
Textile	0.50	5.00	0.50	1.00	0.50
Construction	1.00	3.00	1.00	2.00	1.00

Table A.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	2.00	4.00	0.50
Entertainment	0.20	1.00	0.33	0.50	0.20
Food sector	0.50	3.00	1.00	2.00	1.00
Textile	0.25	2.00	0.50	1.00	0.20
Construction	2.00	5.00	1.00	5.00	1.00

Table A.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	2.00	3.00	1.00
Entertainment	0.50	1.00	1.00	0.50	0.33
Food sector	0.50	1.00	1.00	2.00	0.50
Textile	0.33	2.00	0.50	1.00	0.33
Construction	1.00	3.00	2.00	3.00	1.00

Table A.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.25	0.33	0.50
Entertainment	0.50	1.00	0.33	0.33	0.50
Food sector	4.00	3.00	1.00	2.00	3.00
Textile	3.00	3.00	0.50	1.00	2.00
Construction	2.00	2.00	0.33	0.50	1.00

Table A.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.25	0.50	1.00
Entertainment	1.00	1.00	0.33	0.33	1.00
Food sector	4.00	3.00	1.00	2.00	3.00
Textile	2.00	3.00	0.50	1.00	2.00
Construction	1.00	1.00	0.33	0.50	1.00

Table A.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.33	0.50	2.00
Entertainment	0.50	1.00	0.25	1.00	3.00
Food sector	3.00	4.00	1.00	4.00	5.00
Textile	2.00	1.00	0.25	1.00	2.00
Construction	0.50	0.33	0.20	0.50	1.00

Table A.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.25	3.00	4.00
Entertainment	0.50	1.00	0.20	2.00	3.00
Food sector	4.00	5.00	1.00	6.00	5.00
Textile	0.33	0.50	0.17	1.00	1.00
Construction	0.25	0.33	0.20	1.00	1.00

APPENDIX B_ ALL MATRICES OF EXPERT 2

Table B.1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	2.00	3.00	1.00	6.00
annual profit	0.50	1.00	4.00	0.50	5.00
suppliers	0.33	0.25	1.00	0.50	4.00
Sustainability	1.00	2.00	2.00	1.00	6.00
Innovation probability	0.17	0.20	0.25	0.17	1.00

Table B.2: Pair-wise Comparison Matrix for Costs

Costs	Operation cost	Maintenance cost	Taxes	salaries and wages
Operation cost	1.00	5.00	7.00	3.00
Maintenance cost	0.20	1.00	5.00	1.00
Taxes	0.14	0.20	1.00	0.50
salaries and wages	0.33	1.00	2.00	1.00

Table B.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	8.00	6.00
Salvage value	0.13	1.00	0.50
Franchise	0.17	2.00	1.00

Table B.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	5.00	1.00
Flexibility	0.20	1.00	0.25
Quality	1.00	4.00	1.00

Table B.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	1.00	1.00
Risk management	1.00	1.00	2.00
Increasing capacity	1.00	0.50	1.00

Table B.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	2.00	0.33
uniqueness	0.50	1.00	0.25
Future potential	3.00	4.00	1.00

Table B.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	3.00	1.00	2.00
Entertainment	0.50	1.00	2.00	0.50	2.00
Food sector	0.33	0.50	1.00	0.50	0.50
Textile	1.00	2.00	2.00	1.00	2.00
Construction	0.50	0.50	2.00	0.50	1.00

Table B.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	6.00	5.00	2.00
Entertainment	0.20	1.00	2.00	1.00	0.50
Food sector	0.17	0.50	1.00	0.50	0.50
Textile	0.20	1.00	2.00	1.00	1.00
Construction	0.50	2.00	2.00	1.00	1.00

Table B.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	7.00	6.00	4.00
Entertainment	0.20	1.00	1.00	2.00	2.00
Food sector	0.14	1.00	1.00	0.50	0.50
Textile	0.17	0.50	2.00	1.00	2.00
Construction	0.25	0.50	2.00	0.50	1.00

Table B.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	3.00	5.00	0.50
Entertainment	1.00	1.00	3.00	4.00	0.50
Food sector	0.33	0.33	1.00	2.00	0.25
Textile	0.20	0.25	0.50	1.00	0.20
Construction	2.00	2.00	4.00	5.00	1.00

Table B.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	2.00	2.00	0.50
Entertainment	0.33	1.00	0.50	1.00	0.20
Food sector	0.50	2.00	1.00	2.00	0.50
Textile	0.50	1.00	0.50	1.00	0.20
Construction	2.00	5.00	2.00	5.00	1.00

Table B.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	6.00	2.00	1.00	0.50
Entertainment	0.17	1.00	0.50	0.50	0.10
Food sector	0.50	2.00	1.00	2.00	0.50
Textile	1.00	2.00	0.50	1.00	0.50
Construction	2.00	10.00	2.00	2.00	1.00

Table B.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	1.00	1.00	3.00
Entertainment	0.25	1.00	0.25	0.25	1.00
Food sector	1.00	4.00	1.00	1.00	2.00
Textile	1.00	4.00	1.00	1.00	3.00
Construction	0.33	1.00	0.50	0.33	1.00

Table B.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	0.50	1.00	0.20
Entertainment	0.25	1.00	0.20	0.50	0.11
Food sector	2.00	5.00	1.00	2.00	1.00
Textile	1.00	2.00	0.50	1.00	0.50
Construction	5.00	9.00	1.00	2.00	1.00

Table B.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.50	0.33	0.11
Entertainment	2.00	1.00	0.50	0.33	0.50
Food sector	2.00	2.00	1.00	0.50	1.00
Textile	3.00	3.00	2.00	1.00	0.50
Construction	9.00	2.00	1.00	2.00	1.00

Table B.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	7.00	1.00	2.00	0.50
Entertainment	0.14	1.00	0.33	0.50	0.11
Food sector	1.00	3.00	1.00	0.50	0.50
Textile	0.50	2.00	2.00	1.00	0.20
Construction	2.00	9.00	2.00	5.00	1.00

Table B.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	5.00	2.00	0.50
Entertainment	0.20	1.00	1.00	0.50	0.20
Food sector	0.20	1.00	1.00	1.00	0.33
Textile	0.50	2.00	1.00	1.00	0.50
Construction	2.00	5.00	3.00	2.00	1.00

Table B.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	1.00	0.11
Entertainment	0.50	1.00	0.50	0.50	0.11
Food sector	1.00	2.00	1.00	0.50	0.11
Textile	1.00	2.00	2.00	1.00	0.11
Construction	9.00	9.00	9.00	9.00	1.00

Table B.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	0.50	0.50	0.11
Entertainment	0.20	1.00	0.25	0.25	0.11
Food sector	2.00	4.00	1.00	1.00	0.25
Textile	2.00	4.00	1.00	1.00	0.25
Construction	9.00	9.00	4.00	4.00	1.00

Table B.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	1.00	1.00	0.50
Entertainment	0.25	1.00	0.25	0.25	0.11
Food sector	1.00	4.00	1.00	1.00	0.50
Textile	1.00	4.00	1.00	1.00	0.50
Construction	2.00	9.00	2.00	2.00	1.00

Table B.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	1.00	0.50	0.20
Entertainment	1.00	1.00	1.00	0.50	0.20
Food sector	1.00	1.00	1.00	0.50	0.10
Textile	2.00	2.00	2.00	1.00	0.50
Construction	5.00	5.00	10.00	2.00	1.00

Table B.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	1.00	1.00	1.00
Entertainment	0.33	1.00	1.00	0.50	1.00
Food sector	1.00	1.00	1.00	0.50	1.00
Textile	1.00	2.00	2.00	1.00	0.50
Construction	1.00	1.00	1.00	2.00	1.00

APPENDIX C_ ALL MATRICES OF EXPERT 3

Table C.1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	2.00	5.00	0.20	0.20
annual profit	0.50	1.00	2.00	0.33	0.33
suppliers	0.20	0.50	1.00	0.17	0.20
Sustainability	5.00	3.00	6.00	1.00	2.00
Innovation probability	5.00	3.00	5.00	0.50	1.00

Table C.2: Pair-wise Comparison Matrix for Costs

Costs	Operation cost	Maintenance cost	Taxes	salaries and wages
Operation cost	1.00	0.25	0.20	0.25
Maintenance cost	4.00	1.00	0.50	1.00
Taxes	5.00	2.00	1.00	1.00
salaries and wages	4.00	1.00	1.00	1.00

Table C.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	9.00	2.00
Salvage value	0.11	1.00	0.25
Franchise	0.50	4.00	1.00

Table C.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	0.20	0.20
Flexibility	5.00	1.00	0.90
Quality	5.00	1.11	1.00

Table C.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	5.00	4.00
Risk management	0.20	1.00	1.00
Increasing capacity	0.25	1.00	1.00

Table C.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	0.20	0.50
uniqueness	5.00	1.00	3.00
Future potential	2.00	0.33	1.00

Table C.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	0.20	0.25	0.13
Entertainment	5.00	1.00	1.00	1.25	0.33
Food sector	5.00	1.00	1.00	0.50	0.33
Textile	4.00	0.80	2.00	1.00	0.50
Construction	8.00	3.00	3.00	2.00	1.00

Table C.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	2.00	2.00	1.00
Entertainment	1.00	1.00	2.00	2.00	1.00
Food sector	0.50	0.50	1.00	1.00	2.00
Textile	0.50	0.50	1.00	1.00	0.50
Construction	1.00	1.00	0.50	2.00	1.00

Table C.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	0.20	0.25	0.20
Entertainment	5.00	1.00	0.50	2.00	1.00
Food sector	5.00	2.00	1.00	2.00	1.00
Textile	4.00	0.50	0.50	1.00	0.50
Construction	5.00	1.00	1.00	2.00	1.00

Table C.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	2.00	3.00	3.00
Entertainment	0.33	1.00	0.50	1.00	1.00
Food sector	0.50	2.00	1.00	2.00	2.00
Textile	0.33	1.00	0.50	1.00	0.50
Construction	0.33	1.00	0.50	2.00	1.00

Table C.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	3.00	6.00	1.00
Entertainment	0.25	1.00	0.50	2.00	0.17
Food sector	0.33	2.00	1.00	3.00	0.50
Textile	0.17	0.50	0.33	1.00	0.17
Construction	1.00	6.00	2.00	6.00	1.00

Table C.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	2.00	0.20	0.25
Entertainment	5.00	1.00	7.00	1.00	2.00
Food sector	0.50	0.14	1.00	0.13	0.25
Textile	5.00	1.00	8.00	1.00	1.00
Construction	4.00	0.50	4.00	1.00	1.00

Table C.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	0.13	0.20	0.20
Entertainment	5.00	1.00	0.50	1.00	1.00
Food sector	8.00	2.00	1.00	7.00	3.00
Textile	5.00	1.00	0.14	1.00	1.00
Construction	5.00	1.00	0.33	1.00	1.00

Table C.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.13	0.20	0.50
Entertainment	2.00	1.00	0.20	0.20	1.00
Food sector	8.00	5.00	1.00	2.00	2.00
Textile	5.00	5.00	0.50	1.00	1.00
Construction	2.00	1.00	0.50	1.00	1.00

Table C.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	4.00	4.00	5.00
Entertainment	0.20	1.00	2.00	1.00	0.25
Food sector	0.25	0.50	1.00	1.00	0.25
Textile	0.25	1.00	1.00	1.00	0.33
Construction	0.20	4.00	4.00	3.00	1.00

Table C. 16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	4.00	1.00
Entertainment	0.50	1.00	0.50	2.00	0.25
Food sector	1.00	2.00	1.00	4.00	4.00
Textile	0.25	0.50	0.25	1.00	0.25
Construction	1.00	4.00	0.25	4.00	1.00

Table C.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	6.00	2.00	4.00	1.00
Entertainment	0.17	1.00	0.50	1.00	0.33
Food sector	0.50	2.00	1.00	3.00	1.00
Textile	0.25	1.00	0.33	1.00	0.50
Construction	1.00	3.00	1.00	2.00	1.00

Table C.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.50	1.00	0.20
Entertainment	2.00	1.00	1.00	2.00	0.33
Food sector	2.00	1.00	1.00	2.00	0.25
Textile	1.00	0.50	0.50	1.00	0.20
Construction	5.00	3.00	4.00	5.00	1.00

Table C.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	4.00	5.00	1.00
Entertainment	0.20	1.00	1.00	1.00	0.20
Food sector	0.25	1.00	1.00	2.00	0.25
Textile	0.20	1.00	0.50	1.00	0.20
Construction	1.00	5.00	4.00	5.00	1.00

Table C.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	1.00	2.00	0.50
Entertainment	0.25	1.00	0.33	0.50	0.13
Food sector	1.00	3.00	1.00	2.00	0.17
Textile	0.50	2.00	0.50	1.00	0.20
Construction	2.00	8.00	6.00	5.00	1.00

Table C.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	3.00	2.00	4.00
Entertainment	0.33	1.00	2.00	1.00	2.00
Food sector	0.33	0.50	1.00	0.50	3.00
Textile	0.50	1.00	2.00	1.00	3.00
Construction	0.25	0.50	0.33	0.33	1.00

Table C.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	3.00	5.00	1.00
Entertainment	0.20	1.00	0.50	1.00	0.33
Food sector	0.33	2.00	1.00	2.00	0.50
Textile	0.20	1.00	0.50	1.00	0.20
Construction	1.00	3.00	2.00	5.00	1.00

APPENDIX D_ ALL MATRICES OF EXPERT 4

Table D. 1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	0.50	1.00	1.00	2.00
annual profit	2.00	1.00	2.00	2.00	4.00
suppliers	1.00	0.50	1.00	1.00	4.00
Sustainability	1.00	0.50	1.00	1.00	3.00
Innovation probability	0.50	0.25	0.25	0.33	1.00

Table D.2: Pair-wise Comparison Matrix for Costs

Costs	operation cost	maintenance cost	taxes	salaries and wages
Operation cost	1.00	3.00	5.00	4.00
Maintenance cost	0.33	1.00	2.00	1.00
Taxes	0.20	0.50	1.00	1.00
salaries and wages	0.25	1.00	1.00	1.00

Table D.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	6.00	5.00
Salvage value	0.17	1.00	0.50
Franchise	0.20	2.00	1.00

Table D.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	0.50	0.20
Flexibility	2.00	1.00	0.50
Quality	5.00	2.00	1.00

Table D.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	5.00	2.00
Risk management	0.20	1.00	0.50
Increasing capacity	0.50	2.00	1.00

Table D.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	3.00	4.00
uniqueness	0.33	1.00	2.00
Future potential	0.25	0.50	1.00

Table D.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	0.13	0.17	0.13
Entertainment	5.00	1.00	2.00	3.00	1.00
Food sector	8.00	0.50	1.00	2.00	0.33
Textile	6.00	0.33	0.50	1.00	0.50
Construction	8.00	1.00	3.00	2.00	1.00

Table D.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	5.00	5.00	0.50
Entertainment	0.33	1.00	3.00	3.00	0.50
Food sector	0.20	0.33	1.00	1.00	0.33
Textile	0.20	0.33	1.00	1.00	0.25
Construction	2.00	2.00	3.00	4.00	1.00

Table D.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.20	0.20	0.13
Entertainment	3.00	1.00	0.50	0.50	0.50
Food sector	5.00	2.00	1.00	2.00	0.50
Textile	5.00	2.00	0.50	1.00	0.33
Construction	8.00	2.00	2.00	3.00	1.00

Table D.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	2.00	2.00	0.33
Entertainment	0.50	1.00	1.00	0.50	0.50
Food sector	0.50	1.00	1.00	2.00	0.50
Textile	0.50	2.00	0.50	1.00	0.50
Construction	3.00	2.00	2.00	2.00	1.00

Table D.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.25	0.33	0.33
Entertainment	1.00	1.00	1.00	0.33	0.50
Food sector	4.00	1.00	1.00	1.00	1.00
Textile	3.00	3.00	1.00	2.00	1.00
Construction	3.00	2.00	1.00	1.00	1.00

Table D.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.20	5.00	0.50	0.50
Entertainment	5.00	1.00	8.00	4.00	2.00
Food sector	0.20	0.13	1.00	0.33	0.50
Textile	2.00	0.25	3.00	1.00	0.50
Construction	2.00	0.50	2.00	2.00	1.00

Table D.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.30	0.20	0.20	0.33
Entertainment	3.33	1.00	0.50	1.00	1.00
Food sector	5.00	2.00	1.00	2.00	2.00
Textile	5.00	1.00	0.50	1.00	5.00
Construction	3.00	1.00	0.50	0.20	1.00

Table D.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.13	0.13	0.50
Entertainment	3.00	1.00	0.50	1.00	1.00
Food sector	8.00	2.00	1.00	3.00	3.00
Textile	8.00	1.00	0.33	1.00	1.00
Construction	2.00	1.00	0.33	1.00	1.00

Table D.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	1.00	0.50	2.00
Entertainment	2.00	1.00	1.00	1.00	3.00
Food sector	1.00	1.00	1.00	2.00	6.00
Textile	2.00	1.00	0.50	1.00	2.00
Construction	0.50	0.33	0.17	0.50	1.00

Table D.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	2.00	2.00	0.50
Entertainment	0.33	1.00	1.00	2.00	0.50
Food sector	0.50	1.00	1.00	1.00	1.00
Textile	0.50	0.50	1.00	1.00	0.50
Construction	2.00	2.00	1.00	2.00	1.00

Table D.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	2.00	2.00	1.00
Entertainment	0.20	1.00	0.50	1.00	0.50
Food sector	0.50	2.00	1.00	1.00	1.00
Textile	0.50	1.00	1.00	1.00	0.33
Construction	1.00	2.00	1.00	3.00	1.00

Table D.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	3.00	3.00	0.50
Entertainment	0.20	1.00	1.00	1.00	0.13
Food sector	0.33	1.00	1.00	2.00	0.25
Textile	0.33	1.00	0.50	1.00	0.13
Construction	2.00	8.00	4.00	7.69	1.00

Table D.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.25	0.33	0.50
Entertainment	1.00	1.00	0.50	0.50	1.00
Food sector	4.00	2.00	1.00	3.00	4.00
Textile	3.00	2.00	0.33	1.00	2.00
Construction	2.00	1.00	0.25	0.50	1.00

Table D. 20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.25	0.33	0.33
Entertainment	2.00	1.00	0.50	0.33	2.00
Food sector	4.00	2.00	1.00	2.00	2.00
Textile	3.00	3.00	0.50	1.00	2.00
Construction	3.00	0.50	0.50	0.50	1.00

Table D.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.20	0.25	0.25
Entertainment	3.00	1.00	1.00	1.00	1.00
Food sector	5.00	1.00	1.00	0.33	0.33
Textile	4.00	1.00	3.00	1.00	2.00
Construction	4.00	1.00	3.00	0.50	1.00

Table D.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	1.00	1.00	0.33
Entertainment	0.20	1.00	0.20	0.33	0.25
Food sector	1.00	5.00	1.00	2.00	2.00
Textile	1.00	3.00	0.50	1.00	1.00
Construction	3.00	4.00	0.50	1.00	1.00

APPENDIX E_ ALL MATRICES OF EXPERT 5

Table E.1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	2.00	5.00	1.00	3.00
annual profit	0.50	1.00	3.00	0.33	2.00
suppliers	0.20	0.33	1.00	0.33	0.50
Sustainability	1.00	3.00	3.00	1.00	2.00
Innovation probability	0.33	0.50	2.00	0.50	1.00

Table E.2: Pair-wise Comparison Matrix for Costs

Costs	operation cost	maintenance cost	Taxes	salaries and wages
Operation cost	1.00	2.00	3.00	3.00
Maintenance cost	0.50	1.00	2.00	2.00
Taxes	0.33	0.50	1.00	1.00
salaries and wages	0.33	0.50	1.00	1.00

Table E.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	3.00	2.00
Salvage value	0.33	1.00	0.50
Franchise	0.50	2.00	1.00

Table E.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	3.00	1.00
Flexibility	0.33	1.00	0.50
Quality	1.00	2.00	1.00

Table E.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	1.00	3.00
Risk management	1.00	1.00	2.00
Increasing capacity	0.33	0.50	1.00

Table E.6: Pair-wise Comparison Matrix for **Innovation Probability**

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	2.00	0.50
uniqueness	0.50	1.00	0.33
Future potential	2.00	3.00	1.00

Table E.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.33	0.25
Entertainment	2.00	1.00	1.00	2.00	1.00
Food sector	3.00	1.00	1.00	2.00	1.00
Textile	3.00	0.50	0.50	1.00	0.50
Construction	4.00	1.00	1.00	2.00	1.00

Table E.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.50	0.50	0.25
Entertainment	3.00	1.00	2.00	3.00	2.00
Food sector	2.00	0.50	1.00	2.00	3.00
Textile	2.00	0.33	0.50	1.00	1.00
Construction	4.00	0.50	0.33	1.00	1.00

Table E.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.25	0.33
Entertainment	2.00	1.00	2.00	1.00	1.00
Food sector	3.00	0.50	1.00	2.00	2.00
Textile	4.00	1.00	0.50	1.00	1.00
Construction	3.00	1.00	0.50	1.00	1.00

Table E.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	2.00	5.00	1.00
Entertainment	0.33	1.00	1.00	2.00	0.33
Food sector	0.50	1.00	1.00	2.00	1.00
Textile	0.20	0.50	0.50	1.00	0.50
Construction	1.00	3.00	1.00	2.00	1.00

Table E.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.33	0.25	0.33
Entertainment	1.00	1.00	0.50	1.00	0.50
Food sector	3.00	2.00	1.00	2.00	1.00
Textile	4.00	1.00	0.50	1.00	2.00
Construction	3.00	2.00	1.00	0.50	1.00

Table E.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	1.00	1.00	1.00
Entertainment	0.33	1.00	0.75	0.50	0.25
Food sector	1.00	1.33	1.00	1.00	1.00
Textile	1.00	2.00	1.00	1.00	1.00
Construction	1.00	4.00	1.00	1.00	1.00

Table E.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	1.00	0.50
Entertainment	0.50	1.00	0.50	0.50	1.00
Food sector	1.00	2.00	1.00	1.00	2.00
Textile	1.00	2.00	1.00	1.00	2.00
Construction	2.00	1.00	0.50	0.50	1.00

Table E.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.50	1.00	2.00
Entertainment	0.50	1.00	0.50	0.75	1.00
Food sector	2.00	2.00	1.00	2.00	3.00
Textile	1.00	1.33	0.50	1.00	3.00
Construction	0.50	1.00	0.33	0.33	1.00

Table E.15: Pair-wise Comparison Matrix for Flexibility viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.50	0.50	1.00
Entertainment	2.00	1.00	1.00	1.00	3.00
Food sector	2.00	1.00	1.00	1.00	2.00
Textile	2.00	1.00	1.00	1.00	2.00
Construction	1.00	0.33	0.50	0.50	1.00

Table E.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.50	0.50	1.00
Entertainment	0.50	1.00	0.33	0.20	1.00
Food sector	2.00	3.00	1.00	1.00	2.00
Textile	2.00	5.00	1.00	1.00	2.00
Construction	1.00	1.00	0.50	0.50	1.00

Table E.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.50	0.50	1.00
Entertainment	1.00	1.00	2.00	2.00	0.50
Food sector	2.00	0.50	1.00	1.00	0.50
Textile	2.00	0.50	1.00	1.00	0.50
Construction	1.00	2.00	2.00	2.00	1.00

Table E.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	2.00	2.00	1.00
Entertainment	1.00	1.00	2.00	3.00	1.00
Food sector	0.50	0.50	1.00	1.00	0.50
Textile	0.50	0.33	1.00	1.00	0.50
Construction	1.00	1.00	2.00	2.00	1.00

Table E.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	1.00	1.00	1.00
Entertainment	0.33	1.00	0.50	0.50	0.30
Food sector	1.00	2.00	1.00	1.00	0.50
Textile	1.00	2.00	1.00	1.00	0.50
Construction	1.00	3.33	2.00	2.00	1.00

Table E.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	1.00	0.50	1.00
Entertainment	2.00	1.00	1.00	0.33	5.00
Food sector	1.00	1.00	1.00	1.00	2.00
Textile	2.00	3.00	1.00	1.00	3.00
Construction	1.00	0.20	0.50	0.33	1.00

Table E.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	4.00	2.00	6.00
Entertainment	0.25	1.00	1.00	1.00	5.00
Food sector	0.25	1.00	1.00	2.00	3.00
Textile	0.50	1.00	0.50	1.00	2.00
Construction	0.17	0.20	0.33	0.50	1.00

Table E.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	1.00	2.00
Entertainment	0.50	1.00	0.33	0.50	3.00
Food sector	1.00	3.00	1.00	1.00	4.00
Textile	1.00	2.00	1.00	1.00	2.00
Construction	0.50	0.33	0.25	0.50	1.00

APPENDIX F_ ALL MATRICES OF EXPERT 6

Table F.1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	0.33	1.00	0.50	1.00
annual profit	3.00	1.00	6.00	1.00	5.00
suppliers	1.00	0.17	1.00	0.25	1.00
Sustainability	2.00	1.00	4.00	1.00	4.00
Innovation probability	1.00	0.20	1.00	0.25	1.00

Table F.2: Pair-wise Comparison Matrix for Costs

Costs	operation cost	maintenance cost	taxes	salaries and wages
Operation cost	1.00	1.00	0.33	1.00
Maintenance cost	1.00	1.00	0.33	1.00
Taxes	3.00	3.00	1.00	2.00
salaries and wages	1.00	1.00	0.50	1.00

Table F.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	2.00	1.00
Salvage value	0.50	1.00	1.00
Franchise	1.00	1.00	1.00

Table F.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	0.20	1.00
Flexibility	5.00	1.00	2.00
Quality	1.00	0.50	1.00

Table F.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	0.33	0.20
Risk management	3.00	1.00	1.00
Increasing capacity	5.00	1.00	1.00

Table F.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	1.00	0.25
uniqueness	1.00	1.00	0.33
Future potential	4.00	3.00	1.00

Table F.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	0.33	0.20
Entertainment	0.50	1.00	0.50	0.33	0.20
Food sector	1.00	2.00	1.00	2.00	0.50
Textile	3.00	3.00	0.50	1.00	0.33
Construction	5.00	5.00	2.00	3.00	1.00

Table F. 8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	1.00	0.25	0.33
Entertainment	0.50	1.00	0.50	0.25	0.17
Food sector	1.00	2.00	1.00	1.00	0.50
Textile	4.00	4.00	1.00	1.00	0.25
Construction	3.00	6.00	2.00	4.00	1.00

Table F.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.13	0.17	0.20	0.25
Entertainment	8.00	1.00	1.00	2.00	3.00
Food sector	6.00	1.00	1.00	0.25	2.00
Textile	5.00	0.50	4.00	1.00	2.00
Construction	4.00	0.33	0.50	0.50	1.00

Table F.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.11	0.14	0.20	0.25
Entertainment	9.00	1.00	1.00	2.00	3.00
Food sector	7.00	1.00	1.00	0.25	2.00
Textile	5.00	0.50	4.00	1.00	3.00
Construction	4.00	0.33	0.50	0.33	1.00

Table F.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	8.00	5.00	3.00	4.00
Entertainment	0.13	1.00	0.20	0.25	0.50
Food sector	0.20	5.00	1.00	0.25	3.00
Textile	0.33	4.00	4.00	1.00	5.00
Construction	0.25	2.00	0.33	0.20	1.00

Table F.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.50	0.33	1.00
Entertainment	2.00	1.00	1.00	2.00	2.00
Food sector	2.00	1.00	1.00	2.00	2.00
Textile	3.00	0.50	0.50	1.00	0.50
Construction	1.00	0.50	0.50	2.00	1.00

Table F.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.50	0.50	1.00
Entertainment	1.00	1.00	2.00	2.00	1.00
Food sector	2.00	0.50	1.00	1.00	2.00
Textile	2.00	0.50	1.00	1.00	0.50
Construction	1.00	1.00	0.50	2.00	1.00

Table F.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	4.00	2.00	2.00
Entertainment	0.50	1.00	2.00	1.00	1.00
Food sector	0.25	0.50	1.00	0.50	2.00
Textile	0.50	1.00	2.00	1.00	1.00
Construction	0.50	1.00	0.50	1.00	1.00

Table F.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.50	0.50	1.00
Entertainment	0.50	1.00	1.00	2.00	1.00
Food sector	2.00	1.00	1.00	2.00	2.00
Textile	2.00	0.50	0.50	1.00	0.50
Construction	1.00	1.00	0.50	2.00	1.00

Table F.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	3.00	3.00	1.00
Entertainment	0.25	1.00	0.25	0.33	0.20
Food sector	0.33	4.00	1.00	1.00	0.33
Textile	0.33	3.00	1.00	1.00	0.33
Construction	1.00	5.00	3.00	3.00	1.00

Table F.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	5.00	4.00	4.00	1.00
Entertainment	0.20	1.00	0.25	0.33	0.20
Food sector	0.25	4.00	1.00	1.00	0.25
Textile	0.25	3.00	1.00	1.00	0.33
Construction	1.00	5.00	4.00	3.00	1.00

Table F.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	3.00	3.00	5.00
Entertainment	0.25	1.00	0.25	0.25	2.00
Food sector	0.33	4.00	1.00	0.50	3.00
Textile	0.33	4.00	2.00	1.00	2.00
Construction	0.20	0.50	0.33	0.50	1.00

Table F.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	4.00	4.00	3.00	5.00
Entertainment	0.25	1.00	1.00	2.00	0.50
Food sector	0.25	1.00	1.00	1.00	0.50
Textile	0.33	0.50	1.00	1.00	0.25
Construction	0.20	2.00	2.00	4.00	1.00

Table F.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	6.00	3.00	4.00	1.00
Entertainment	0.17	1.00	0.25	0.33	0.20
Food sector	0.33	4.00	1.00	2.00	1.00
Textile	0.25	3.00	0.50	1.00	0.50
Construction	1.00	5.00	1.00	2.00	1.00

Table F.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.20	0.20	3.00
Entertainment	0.50	1.00	0.50	0.50	2.00
Food sector	5.00	2.00	1.00	1.00	3.00
Textile	5.00	2.00	1.00	1.00	4.00
Construction	0.33	0.50	0.33	0.25	1.00

Table F.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	2.00	6.00	6.00
Entertainment	0.33	1.00	1.00	4.00	3.00
Food sector	0.50	1.00	1.00	6.00	4.00
Textile	0.17	0.25	0.17	1.00	1.00
Construction	0.17	0.33	0.25	1.00	1.00

APPENDIX G_ ALL MATRICES OF EXPERT 7

Table G.1: Pair-wise Comparison Matrix for Main Criteria

Main criteria	cost	annual profit	suppliers	Sustainability	Innovation probability
cost	1.00	1.00	5.00	2.00	3.00
annual profit	1.00	1.00	4.00	3.00	3.00
suppliers	0.20	0.25	1.00	0.33	0.50
Sustainability	0.50	0.33	3.00	1.00	2.00
Innovation probability	0.33	0.33	2.00	0.50	1.00

Table G.2: Pair-wise Comparison Matrix for Costs

Costs	operation cost	maintenance cost	Taxes	salaries and wages
Operation cost	1.00	1.00	3.00	4.00
Maintenance cost	1.00	1.00	3.00	4.00
Taxes	0.33	0.33	1.00	2.00
salaries and wages	0.25	0.25	0.50	1.00

Table G.3: Pair-wise Comparison Matrix for Profit

Profit	Income and sales	Salvage value	Franchise
Income and sales	1.00	5.00	3.00
Salvage value	0.20	1.00	0.33
Franchise	0.33	3.00	1.00

Table G.4: Pair-wise Comparison Matrix for Suppliers

Suppliers	Delivery	Flexibility	Quality
Delivery	1.00	1.00	0.25
Flexibility	1.00	1.00	0.33
Quality	4.00	3.00	1.00

Table G.5: Pair-wise Comparison Matrix for Sustainability

Sustainability	Control	Risk management	Increasing capacity
Control	1.00	1.00	5.00
Risk management	1.00	1.00	4.00
Increasing capacity	0.20	0.25	1.00

Table G.6: Pair-wise Comparison Matrix for Innovation Probability

Innovation probability	Customer benefit	uniqueness	Future potential
Customer benefit	1.00	3.00	0.25
uniqueness	0.33	1.00	0.14
Future potential	4.00	7.00	1.00

Table G.7: Pair-wise Comparison Matrix for Operation Cost Viewpoint

Operation cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.33	0.50	0.25
Entertainment	1.00	1.00	0.50	0.50	0.50
Food sector	3.00	2.00	1.00	1.00	0.33
Textile	2.00	2.00	1.00	1.00	0.25
Construction	4.00	2.00	3.00	4.00	1.00

Table G.8: Pair-wise Comparison Matrix for Maintenance Cost Viewpoint

Maintenance cost viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.25	0.50
Entertainment	2.00	1.00	2.00	3.00	2.00
Food sector	3.00	0.50	1.00	0.50	1.00
Textile	4.00	0.33	2.00	1.00	2.00
Construction	2.00	0.50	1.00	0.50	1.00

Table G.9: Pair-wise Comparison Matrix for Taxes Viewpoint

Taxes viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.33	0.33	0.33
Entertainment	2.00	1.00	1.00	2.00	1.00
Food sector	3.00	1.00	1.00	1.00	0.50
Textile	3.00	0.50	1.00	1.00	2.00
Construction	3.00	1.00	2.00	0.50	1.00

Table G.10: Pair-wise Comparison Matrix for Salaries and Wages Viewpoint

salaries and wages viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	1.00	3.00	2.00
Entertainment	1.00	1.00	2.00	2.00	2.00
Food sector	1.00	0.50	1.00	3.00	3.00
Textile	0.33	0.50	0.33	1.00	1.00
Construction	0.50	0.50	0.33	1.00	1.00

Table G.11: Pair-wise Comparison Matrix for Income and Sales Viewpoint

Income and sales viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.50	0.17	1.00
Entertainment	0.50	1.00	0.33	0.20	2.00
Food sector	2.00	3.00	1.00	0.33	3.00
Textile	6.00	5.00	3.00	1.00	4.00
Construction	1.00	0.50	0.33	0.25	1.00

Table G.12: Pair-wise Comparison Matrix for Salvage Value Viewpoint

Salvage value viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.25	0.25	0.33
Entertainment	3.00	1.00	0.50	0.33	1.00
Food sector	4.00	2.00	1.00	0.50	2.00
Textile	4.00	3.00	2.00	1.00	2.00
Construction	3.00	1.00	0.50	0.50	1.00

Table G.13: Pair-wise Comparison Matrix for Franchise Viewpoint

Franchise viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.25	0.20	1.00
Entertainment	2.00	1.00	0.33	0.17	2.00
Food sector	4.00	3.00	1.00	0.50	3.00
Textile	5.00	6.00	2.00	1.00	4.00
Construction	1.00	0.50	0.33	0.25	1.00

Table G.14: Pair-wise Comparison Matrix for Delivery Viewpoint

Delivery viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	1.00	0.25	0.50	0.25
Entertainment	1.00	1.00	0.17	1.00	0.20
Food sector	4.00	6.00	1.00	2.00	2.00
Textile	2.00	1.00	0.50	1.00	0.33
Construction	4.00	5.00	0.50	3.00	1.00

Table G.15: Pair-wise Comparison Matrix for Flexibility Viewpoint

Flexibility viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	1.00	0.20	1.00
Entertainment	2.00	1.00	2.00	0.33	2.00
Food sector	1.00	0.50	1.00	0.25	2.00
Textile	5.00	3.00	4.00	1.00	4.00
Construction	1.00	0.50	0.50	0.25	1.00

Table G.16: Pair-wise Comparison Matrix for Quality Viewpoint

Quality viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	2.00	0.25	0.50	0.25
Entertainment	0.50	1.00	0.20	0.33	0.20
Food sector	4.00	5.00	1.00	2.00	3.00
Textile	2.00	3.00	0.50	1.00	1.00
Construction	4.00	5.00	0.33	1.00	1.00

Table G.17: Pair-wise Comparison Matrix for Control Viewpoint

Control viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	3.00	0.33	2.00
Entertainment	3.00	1.00	2.00	0.50	3.00
Food sector	0.33	0.50	1.00	0.20	0.50
Textile	3.00	2.00	5.00	1.00	4.00
Construction	0.50	0.33	2.00	0.25	1.00

Table G.18: Pair-wise Comparison Matrix for Risk Management Viewpoint

Risk management viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.33	0.50	0.25	0.20
Entertainment	3.00	1.00	1.00	0.50	0.33
Food sector	2.00	1.00	1.00	0.50	0.33
Textile	4.00	2.00	2.00	1.00	0.50
Construction	5.00	3.00	3.00	2.00	1.00

Table G.19: Pair-wise Comparison Matrix for Increasing Capacity Viewpoint

Increasing capacity viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	3.00	0.50	0.33	3.00
Entertainment	0.33	1.00	0.25	0.20	2.00
Food sector	2.00	4.00	1.00	0.50	4.00
Textile	3.00	5.00	2.00	1.00	6.00
Construction	0.33	0.50	0.25	0.17	1.00

Table G.20: Pair-wise Comparison Matrix for Customer Benefit Viewpoint

Customer benefit viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.25	0.50	0.50	0.33
Entertainment	4.00	1.00	2.00	4.00	3.00
Food sector	2.00	0.50	1.00	3.00	2.00
Textile	2.00	0.25	0.33	1.00	0.50
Construction	3.00	0.33	0.50	2.00	1.00

Table G.21: Pair-wise Comparison Matrix for Uniqueness Viewpoint

Uniqueness viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	4.00	3.00	3.00
Entertainment	2.00	1.00	5.00	3.00	4.00
Food sector	0.25	0.20	1.00	0.33	0.50
Textile	0.33	0.33	3.00	1.00	2.00
Construction	0.33	0.25	2.00	0.50	1.00

Table G.22: Pair-wise Comparison Matrix for Future Potential Viewpoint

Future potential viewpoint	IT	Entertainment	Food sector	Textile	Construction
IT	1.00	0.50	0.25	0.33	0.20
Entertainment	2.00	1.00	0.20	0.50	0.25
Food sector	4.00	5.00	1.00	2.00	0.50
Textile	3.00	2.00	0.50	1.00	0.33
Construction	5.00	4.00	2.00	3.00	1.00