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Marketing decisions using a SWOT-AHP approach

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Abstract

In marketing, one of the most fundamental things when creating a strategy is the decision-making process. This is one of the most complex procedures based on personal views when prioritizing the given factors before concluding for the best approach. When many factors are included, due to their qualitative nature it is often difficult to evaluate them and their importance in the process because of lack in quantitative weights. The SWOT analysis is one of the most used approaches in the marketing field when making strategic decision. Due to its simple and effective way to collect information about the four main elements (strengths, weaknesses, opportunities and threats), it is easy to perceive the position of the company. However, the lack of quantitative data in this analysis makes the results potentially non-consistent. The purpose of this dissertation is to discuss how the SWOT analysis can be improved when is also supported by the AHP model which generates quantitative weights and is prioritizing the strengths, weaknesses, opportunities and threats in the SWOT analysis. This type of combined approach can indicate that the consideration given to some of the factors is more important than others, meaning that when making decisions based on these findings the results can be drastically different and more efficient.

Keywords: SWOT; AHP; decision-making; marketing; analysis;

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Introduction

For every company, it is necessary to choose the right marketing mix which is crucial for how the company will take their place on the market and how their performance will evolve through the implementation of resource planning for achieving the marketing objective. This suggests that marketing strategy development and creating a goal is important for long-term decision-making framework. With this framework companies will be able to select marketing strategy opportunities that will provide them with the opportunity to achieve their goals and be future-oriented. This method combined with the mathematical model for decision making, Analytical Hierarchy Process (AHP), can grant an opportunity to find the best suited marketing strategy which will help the decision-makers to identify the most effective and efficient strategy with the best sales revenue result with the minimum time for experiment run. The AHP model has been used in many applications in literature as a method to provide the opportunity for comparing available choices, such as: examining buyer behavior, selecting an appropriate channel for marketing and selection of product development resources. (Al-Dawalibi, Al-Dali, & Alkhayyal, 2020)

The AHP has a great potential to provide directions when making different marketing decisions especially in the field of marketing strategies. By using this method, the managers can receive additional information regarding conceptual and methodological issues needed for future development. The model can be applied to any type of situations that can be represented with a hierarchical model with minimum two levels, one that will represent the objectives, also known as criteria for evaluation and the second as activities, or the actual products, courses of actions and etc. When applied to different marketing tactics for decision-making, it provides for the managers a consistent guideline for resource allocation, potential products, market and distribution channels. The benefits AHP grants can be applied at any level of the company including portfolio analysis, specific market segments and distribution channels. In this dissertation we will observe simple examples of how this process can be applied for decision-making based on a SWOT analysis, however it can be also considered for more advanced and specific cases such as time dependent judgements and constructions of nonlinear hierarchies. (Wind & Saaty, 1980)

Before the company designs the strategy, managers need to assess the company's position on the marketplace. They need to focus on evaluating what are the activities and

choices the company makes which result in success and which activities can be a threat for losing competitive advantage. To complete the strategic process, the decision-makers need to have a complete analysis of the strategies evaluated and the one that is most convenient for the company. In strategic planning, the most important technique is to find information regarding the strengths, weaknesses, opportunities and threats that the company might face in the future, also known as SWOT analysis. In respect to the information found, the company needs to create strategies that align with the vision and mission. For this process to be implemented successfully it is important for the company first to review its mission, vision, and goal. In this step of the strategic planning the company must first understand it options. Based on this, the company can proceed with the analysis and realize its strengths and opportunities and take advantage of them, as also, to create defense for the threats and decrease its weaknesses. In many situations, the SWOT analysis is used only to obtain description of the actual situation of the company in the marketplace. However, when making this analysis, the company cannot be sure which strategy is the right decision and will have to make a choice. Usually the companies are finishing the strategic process here, without making a more profound analysis of each alternative provided. However, this might result in a mistake, and, analyzing the alternative could give a better description of how each strategy proposed can benefit the company and to which level. In this step is proposed to use the AHP model, first to compare and evaluate each alternative, which result will make solving the decision problem easily overcome. (Osuna & Aranda, 2007)

In this dissertation we will observe how the AHP model can be used to make marketing decision based on an already created SWOT analysis for a company. Further the AHP model will be described in detail, what it is, what is the process and how it can be applied. Throughout the paper we will observe what is SWOT analysis and how it is created. After having an idea of these two analyses we will observe how these two can be implemented together and what will be the results through different examples.

1. Marketing

In today's environment changes are happening with fast rate, making it risky to remain constant with one strategy. These changes are asking for new, better strategy for obtaining better opportunities in the future. Some of the most famous changes that need to be addressed are:

➤ Globalization

➤ Technological advances

➤ Deregulation (Kotler, Marketing, Management, Millenium Edition, 2002)

For a company to address and take advantage of these changes, the managers and decision-makers of the company need to ask these questions before deciding on a strategy to implement:

- What are the tasks of marketing?
- What are the major concepts and tools of marketing?
- What orientations do companies exhibit in the marketplace?
- How are companies and marketers responding to the new challenges? (Kotler, Marketing, Management, Millenium Edition, 2002)

The changes mentioned before are the root for endless opportunities. When considering marketing as a tool to address these changes, the main factors are to identify and meet customer needs. Marketing according to Kotler can be defined shortly as "meeting needs profitably", demonstrating a way to shift a social need in a profitable business opportunity. Marketing can be defined using 2 types of definition, social and managerial. The social definition describes marketing as a social process in which individuals or groups obtain what they need and want through creating, offering, and exchanging products and services of value with others. Managerial definition describes it as "the art of selling products." The main point behind marketing is to know the customer so well that you can offer it a product or service that fits the needs and wants of the customer and sells itself. According to Kotler, he defines marketing management as a process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals (Kotler, Marketing, Management, Millenium Edition, 2002)

Marketing mix represents a model based on product, price, place, and promotion and it is defined as a set of marketing tools that the firm uses to pursue its marketing objectives in the target market. (Kotler, Marketing Management, 2000).

Strategies are used as a value-creation process. A strategy identifies the market in which the company is engaged, defines the value competitors are exchanging and defines the way in which value is created. The main factors for defining strategic analysis are:

1. Identifying target customers – the main aspect in strategic analysis, it involves the identifying customers and separating them in segments, selecting a segment to target and deciding on a strategy for reaching that segment.

2. Creating customer value – creating a value proposition that express the benefits and costs of the company's offer for the targeted segment.

3. Creating company value – creating value exchange that will enable the company to reach its goal and create value.

4. Creating collaborator value – identifying channels that will benefit the company for creating market value for the customers and achieve its goal. (Chernev, 2014)

These aspects are providing the main marketing principle for creating value, that the offer is considered to be successful if it is able to create superior value for the target customer that will benefit the company and its collaborators. Marketing tactics are describing the method in which the offer presented with the strategy is defined with the design of the offer. The main factors of the tactics are described with the marketing mix variables:

1. Product / service – the functional characteristics of an offer.

2. Brand – a way to identify the company's offer and to differentiate from the competition.

3. Price – the monetary value of the offer.

4. Incentives – provide solutions for strengthening the value by adding benefits and/or reducing cost.

5. Communication – informing customer of the offer's existence and its key benefits.

6. Distribution – describes the channels through which the offer is delivered to customers. (Chernev, 2014)

Marketing is considered the business aspect that deals the most with customers. When defining it, the most used description is that marketing describes the process of engaging

with customers and at the same time managing a profitable customer relationship. The main goal of marketing is to attract new customers and promise them a superior value that will provide them satisfaction. Everyone has had first-hand contact with marketing, especially with its traditional form which are the plenty products in shops and the various advertisements seen on TV or delivered in the mailbox frequently. However, with the technology advancement, in the recent years marketing has taken a more digital approach, and started transferring its advertisings through websites, blogs smartphone applications, online videos and social media. This approach, apart from being used to deliver a message, it is also considered useful by its ability to reach the customers directly, personally, and interactively. We can see marketing everywhere we go, school, home, work, because marketers are doing their best to help their company by making it more engaged with its target customer. However, behind all these efforts there is a huge network of people that need to decide on the right message, technologies and strategies that will be used for taking the customer's attention that will result in purchase. We see marketing everywhere, but what is actually marketing? Mostly is considered to be only about selling a product and/or service or making an advertisement. However, these two forms are only the beginning and this opinion is considered to be outdated. Marketing should be understood more as a way to satisfy customer's needs. For the marketer to provide an efficient way to engage customer, he or she needs to understand their needs and provide a superior value. According to Peter Drucker, 'The aim of marketing is to make selling unnecessary. Marketing is considered as a process, both social and managerial that provides to individuals and companies to achieve what they want, by developing value for others. Marketing is about deciding which strategy and processes will capture value for customers in order to build strong relationship between the company and the customer. (Kotler, Armstrong, Harris, & He, 2020)

For a marketing strategy to be successfully implemented, capabilities such as understanding, developing and seizing customer value. For these types of strategies to obtain positive results and be effective, the companies implementing them should be focused on changing the customer's needs. In order to implement the right activities marketers need to prioritize the strategic planning in three main areas: (1) managing the business as an investment portfolio, (2) evaluate the company's strength and growth rate on the market, and (3) decide on a strategy. For the marketers to implement their effort, a marketing plan is needed to be implemented in two levels, strategical and tactical. A marketing plan on a strategic level is presenting the value proposition based on the market

opportunities. Moreover, the plan on tactical level is giving detailed information regarding the marketing tactics, product features, promotion, pricing, sales channels, and services. However, before the decision-making process for implementing the right marketing plan, the ideas need to be prioritized based on their importance with the four main activities that every company needs to do: (1) Defining company's mission, (2) Establish business strategy units, (3) Assign resources to every strategic business unit, and (4) Evaluate growth opportunities. (Kotler & Keller, Marketing Management, 2012)

The constant evolution of the competitive market requires from companies to develop constantly dynamic strategies to maintain and improve their market position. When fighting for a market position, companies usually use three key strategies: stealing share from competitors, market-growth, and creating new markets. To gain and maintain the market position, a company needs to create its core competencies that will provide competitive advantage. When deciding over strategies and core competencies for gaining and maintaining market position, the most used framework is SWOT. This framework is simple and flexible for evaluating the company's condition. It analyzes four factors divided in two groups, internal factors and external factors. The internal factors are the company's strengths and weaknesses, while the external factors are the threats and opportunities the market presents where the company operates. These factors are organized in 2 x 2 matrix that demonstrates which factors are favorable and which not for the company. (Chernev, 2014)

Marketing management is a process that develops creative strategies and plans for guiding marketing activities. The development of a right marketing strategy calls for a long process of decision-making with discipline and flexibility. The decision-making process is long because the company need to stick with the chosen strategy for a long period and constantly improve it. Additionally, the managers need to create strategies for a wide range of products and/or services. (Kotler & Keller, Marketing Management, 2012)

2. AHP Model

The analytical hierarchy process (AHP) model is a technique for organizing and analyzing complex decisions, based on mathematics and psychology. (Man Li, Rita Yi; Kwong, Wing Chau; Fanjie Zeng, Frankie, 2019)

The Analytical Hierarchy Process introduced by Thomas L. Saaty in 1970 is known as a mathematical research model which helps decision-makers to decompose a problem in a hierarchical structure with quantitative and qualitative elements. However, the AHP model can be of specific use because of its trait to order the elements in a hierarchy based on their priority. When making a decision, especially in an uncertain situation, the AHP model is proved to be practical because of its ability to provide quantitative judgements in a logical manner. In practice the use of this model can be seen in many different management areas. In the field of marketing there are many models and analytical methods that could help with the decision-making process and strategical planning. However, as an analytical tool it is also successfully applied also in accounting because of the capability to resolve complex problems. In a nutshell, the AHP model is qualified to be used in this field based on the fact that this approach is well coordinated with the way decision-makers base their judgements for making a decision on knowledge and experience. (Dixon-Ogbechi, Haran, & Aiyeku)

The decision-making process requires an objective consideration of the factors involved and because of this it is considered to be complicated and difficult to visualize. (Lee, Seungbum; Ross, Stephen D., 2012)

The AHP model is a measurement that is using many criteria in order to help resolve complicated problems in the decision-making process. The model works in that way that it structures the problem by analyzing and measuring the importance of the decision-making factors. According to this model, the decision-making process requires consideration of different factors that are involved in the process, on which the decision relies. These factors are often intangible, qualitative, subjective, and non-quantifiable, which makes it difficult to give them a priority or to quantify them. In Saaty's AHP model, the main advantage is that it can convert these types of factors into numerical values and evaluate their value in pairs thorough comparisons. The pairwise comparison grants to compute the relative importance value, also called weight by using the eigenvalue method for the factors taken into consideration in the decision-making process. The structure of the model is based on one decision said to be the most important which is placed at the

top of the hierarchy, therefore the goal is to decompose the decision in multiple secondary areas, also called criteria, that will provide information in achieving the decision. (Lee, Seungmub; Walsh, Patrick, 2010)

The assumptions for the model is that the problem arising in the decision-making process is decomposable in simpler aspects that will contribute in achieving the overall goal of the process. These aspects are considered to be the criteria and they can be decomposed even further, creating a sub-criterion. (Lee, Seungbum; Ross, Stephen D., 2012)

The AHP model does not offer one "accurate" decision, but it serves as an additional help to the decision makers to find the best solution to achieve their goal based on their understanding of the problem. The model provides a thorough framework for quantifying all the factors and relating them to the target in mind and also to provide alternative solutions. (Saaty, Thomas L., 2008)

In order to create the AHP model there are several significant steps that need to be followed:

Step 1: Defining the decision-making problem and structuring it in a hierarchy;

Step 2: Pairwise comparison of the criteria in each level of the hierarchy;

Step 3: Estimation of the priority vector of the elements in each level of the hierarchy;

Step 4: Testing the consistency for the entire hierarchy;

Step 5: Synthetization;

Each of these steps is significant for the process. The first step allows us to decompose our problem in multiple criteria based on their priority to reach the final goal. The main goal is always at the top of the hierarchy, below are the criteria and sub-criteria of the intermediate level and last are the decision alternatives. After we decompose the problem, we continue with the pairwise comparison. In this step it is important to compare all the elements in each level regarding to their importance for the decision-making process. Saaty in 1980 has introduced the nine-point scale which organizes the individuality, experience, and knowledge. After obtaining the pairwise comparison, the elements of each level in the hierarchy need to be evaluated in order to estimate their priority for reaching the top goal. To reach this evaluation the elements of each column need to be divided by the sum of the said column, after the eigenvalue can be acquired by adding the elements in each resulting row and then the given sum needs to be divided with the number of elements in the row. With this calculation we compute the priority vector for

the matrix. The final step is to check the consistency of the results. This is a test performed in order to control if there were any judgments made that were deviating from reaching the final goal. This test is based on the whole hierarchy, not just for each level separately. The consistency ration (CR) for the hierarchy needs to be less than 0.10, which is the maximum accepted value. In this case the judgements that were made while prioritizing the criteria are valid, whereas if the consistency ratio is above 0.10 the data needs to be reevaluated and improved, meaning that some judgments were disproportionately affecting the final outcome. To compute the CR, the first thing to be obtained is the weighted sum vector, usually denoted as *eigenvector u, v*. Let *v* be the eigenvector of the comparison matrix A, so that

$$Av = \lambda_{max} v$$

Equation 1

Then *u* is the normalized version i.e.,

$$\frac{v}{\sum v_i}$$

Equation 2

In addition, the weighted sum of the vector is divided with the reciprocal priority in order to get the *eigenvector u.* The CI for the matrix with size *n* is calculated with the following equation:

$$CI = (\lambda_{max} - n)/(n - 1)$$

Equation 3

The consistency ratio (CR) is needed for understanding if the evaluations are consistent. This is the final step when evaluating the priorities of the matrix. CR is the result when dividing the CI with the random index (RI) for the matrix evaluated. RI can be obtained from the Monte Carlo's Consistency Index shown in Table 3, based on the size of the matrix. To calculate the final solution of the consistency ratio we use the following formula:

$$CR = CI/RI$$

Equation 4

2.1. Implementation of the AHP model

The model is implemented in three steps:

      1) Computing the vector of criteria weights;

2) Computing the matrix of option scores;

3) Ranking the options.

In the first step of the model the decision makers need to create a pairwise comparison matrix. The matrix **A** is a m x m real matrix where m is the number of the criteria that needs to be evaluated.

Once the model is created, the decision-makers will evaluate the criteria by comparing them one with another, in pairs. It provides with a full ranking based on pairwise comparison with a measure of consistency. The model is divided in criteria and alternatives. In the framework the criteria and the alternatives are evaluated in pairs against each other. The comparison is organized in a matrix and the entries in the matrix are reflecting the answer to the following question: how much the row is "preferred" to the column? The number of comparisons made equals the number of distinct pairs and is given by following formula: *{n(n-1)}/2*. The matrix can be expressed like this:

$$A = \begin{bmatrix} a11 & a12 & \cdots & a1n \\ a21 & a22 & \cdots & a2n \\ \vdots & \vdots & \ddots & \vdots \\ an1 & an2 & \cdots & ann \end{bmatrix}$$

Equation 5

Where *aij* is the importance for I to *J, aij=1/aji* and *aij = 1* if *i = j*. The pairwise comparison gives the eigenvector that shows the relative weights in the hierarchy. (Seungbum Lee, 2012)

The final step for completing the model is to calculate the numerical priorities for all the criteria and alternatives that were given. The table below has been validated for its effectiveness in many theoretical comparisons. When creating the pairs for comparison we use the scale in order to easily give a numerical value to a criteria and alternative based on their importance, for example if an element on the left side of the matrix is more important than the element on the top we could insert a value from 1 to 9 from the table based on its importance. (Saaty, Thomas L.; Kearns, Kevin P., 1985)

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	**Definition**	**Explanation**
1	Equal Importance	Two elements contribute equally to the objective

3	Moderate Importance	Experience and judgement moderately favor one element
5	Strong Importance	Experience and judgement strongly favor one element
7	Very Strong Importance	One element is very strongly favored over the other one and its dominance is demonstrated in practice
9	Extreme Importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6 and 8 can be used to express intermediate value. Intensities of 1.1, 1.2, 1.3, etc. can be used for elements that are very close to importance.		

Table 1: The Fundamental Scale for Pairwise Comparisons

2.2. Consistency Index

During the pairwise comparison, some measures may deviate from consistency. This deviation may cause further wrong decision. Because of this the decision maker needs to re-examine the inputs in the matrix. The AHP model offers a technique to check if the given priority is consistent by calculating the consistency index. The consistency index (CI) is

$$CI = (\lambda_{max} - n)/(n - 1)$$

Equation 6

where n is the number of elements that are compared, and the value denoted by λ_{max} is the dominant eigenvalue of the matrix. When the CI is divided by the random consistency number for the matrix, we obtain the consistency ratio (CR). If the value of the CR is less than 10% it means that there is low (in)consistency in the matrix and the results are acceptable; if, on the contrary, high values are obtained, it means that there is a problem with the values of the criteria and criteria/judgements should be reevaluated. The alternative option can be due to poor understanding of the factors, and this requires that the decision maker should make new assessments with different criteria or changing the value of the existing ones. (Saaty, Thomas L.; Kearns, Keniv P., 1986)

N	1	2	3	4	5	6	7	8
Random Index	-	-	0.58	0.90	1.12	1.24	1.32	1.41

Table 2: Monte Carlo's Consistency Index

2.3.Practical example

The theory of the AHP model is quite straightforward. Thanks to its creator the AHP model can be seen as a well explained mathematical model with wide use. However, in order to truly understand its purpose, the process should also be explained through examples. In the literature one can often find many examples explaining the model, or variation of the model, however not all of them bring in light the whole purpose of the model in order to better understand it. The most famous example is the Tom, Dick and Harry, in which Thomas Saaty has used the AHP model to choose a company leader. We will now examine in details this example, focusing on the steps needed to perform an accurate AHP decision process. There are several candidates with competing criteria, and the model is practiced in order to help the decision-making process of the board of directors to be more effective and rational. (Saaty, Thomas L., 2006); (Analytic hierarchy process – leader example, 2020)

2.3.1. Decision scenario

A company for industrialized equipment based its success on maintaining the strength of the product lines and generating a constant flow of new products. However, the company's CEO is retiring and there is need of a new leader that will continue the success of the company. The board of directors needs to make a decision for selecting a new company CEO out of three candidates. The main criteria that needs to be considered are: experience, education, charisma, and age. In the table bellow we can see the background of the three candidates:

	TOM	DICK	HARRY
AGE	50 years	60 years	30 years
EXPERIENCE	10 years in the company; 16 years in different industry;	30 years in the company;	5 years in the company; 4 years with CPA firm;

	Currently VP Sales, Marketing and Customer Service	8 years in different company but same industry; Currently Executive VP	Currently VP of Finance
EDUCATION	BS in Marketing; Online MBA	BA and MA	BS in Economics; MBA; Licensed CPA
LEADERSHIP QUALITIES	Active and inspirational leader; Beloved by everyone he worked with	Leads by example and knowledge; Respected by the whole company	Leads quietly from his office; Respected for his knowledge in finance.

Table 3: Background summaries of candidates

After having seen the background of the candidates we can demonstrate them in a basic decision hierarchy for the AHP model:
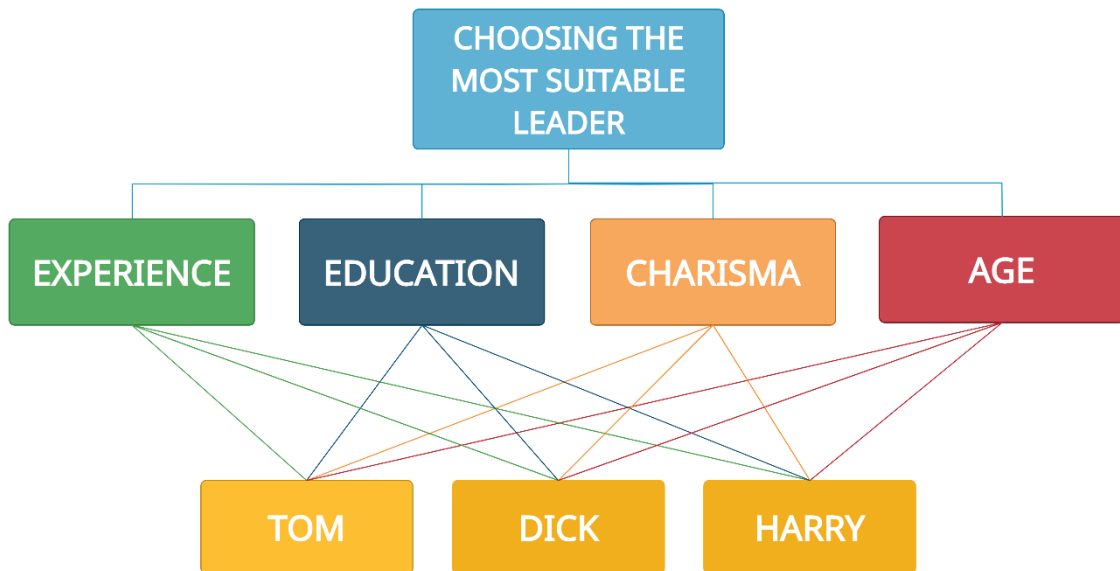
Figure 1: Decision hierarchy

The data demonstrated in Figure 1, will help the decision makes to continue with the AHP model. They need to determine priorities for each given criterion in respect to the importance for achieving the overall goal. After having created the priorities, they need

to combine them in order to create one priority for each candidate. The candidate that will result with the highest priority will be the most suitable. An alternative result should be to take into consideration the priorities of each candidate that will determine the relative strength with respect to the goal.

2.3.2. Pairwise comparison

Because there are three alternatives (the candidates for the position), it is needed to make a comparison between each one of them, the decision maker (the Board) for the comparison will make three pairwise comparisons for each criteria: Tom vs. Dick, Tom vs. Harry, and Dick vs. Harry. Afterwards for each comparison, the Board will have to make a decision for which member is the weakest when compared to the other regarding the criteria by which they are compared and assign a weight for them. For assigning the weights, the decision maker will use the AHP fundamental scale. This being a one-time decision, and not a repetitive one, the model is worked from the bottom up, evaluating the alternatives with respect to criteria firs, and after the criteria in respect to the goal, where in a case where the decision is a repetitive this is done from the top down. (Analytic hierarchy process – leader example, 2020)

2.3.3. Alternatives vs. criteria

Experience

For the board to evaluate the strength that each candidate has in order to achieve the final goal based on their experience. Even though the information provided for each candidate is enough, there is no simple and objective way to measure experience. The Board's opinion about experience is that the leader needs to possess skills, knowledge, and judgment, usually known to be main characteristics possessed by executives that will provide implementation of plan with major changes to a successful business. Additionally, based on the fact that the company is very complex, the prospective leader needs to have direct experience inside and also experience from outside that can benefit in seeing the bigger picture. (Analytic hierarchy process – leader example, 2020)

TOM	DICK	HARRY
10 years in the company; 16 years in different industry;	30 years in the company; 8 years in different company but same industry; Currently Executive VP	5 years in the company; 4 years with CPA firm; Currently VP of Finance

Currently VP Sales, Marketing and Customer Service		

Table 4: Summary of experience for each candidate

The following step in the AHP model is to make a pairwise comparison of the candidates based only on their experience. With this step the Board will be able to decide which candidate is stronger or weaker from the other one with respect to experience, by giving a weight from 1 to 9, based on the Fundamental Scale for Pairwise Comparisons. (Analytic hierarchy process – leader example, 2020)

Tom	1	Dick	4	Dick's experience inside the company is a big advantage, but outside of the company is lacking. Tom's experience is greater outside, but also his experience as a whole is much narrower than Dick's. <u>Dick's experience is more than moderately preferred to Tom's. Weight 4.</u>
Tom	4	Harry	1	Harry is less experienced than Tom, but both have good specialization. Tom has a better knowledge of the company and a greater experience outside of it. <u>Tom's experience is somewhat more than moderately preferred to Harry's. Weight: 4</u>
Dick	9	Harry	1	Harry is relatively new to the company. Dick on the other hand an experienced senior. Even though Harry has an experience outside the company, it is not as significant as Dick's knowledge of our company. Dick's experience is extremely preferred to Harry's. Weight: 9

Table 5: Alternatives compared with respect to Experience

The following step is to insert the weights given above in Table 5, inside a matrix, which is a unique method to AHP. For each comparison the weight is inserted in the right box:

	TOM	DICK	HARRY
TOM	1	¼	4
DICK	4	1	9

HARRY	**¼**	**1/9**	**1**

Table 6: Experience Matrix

The matrix is processed mathematically, which makes the AHP model to determine the priorities for each candidate. The priorities represent the measurement of the strengths for each candidate. From mathematical point of view, they are used to compute the value of the matrix's eigenvector. They can be calculated in diverse ways, through spreadsheet programs, by hand or by specialized program such as R Studio. In the table below are represented the weights and their inconsistency factor computed by specialized AHP software, used for processing the data. (Analytic hierarchy process – leader example, 2020)

	TOM	DICK	HARRY	PRIORITY
TOM	1	¼	4	0.217
DICK	4	1	9	0.717
HARRY	¼	1/9	1	0.066

Table 7: Experience Matrix with Priorities

Sum of priorities = 1.000; Inconsistency = 0.035

Education

After the evaluation of the experience, the Board next has to evaluate each candidate's education background. According to the Board, the leader must have obtained good educational background, with preference to recent MBA or engineering degree. The founder of a company is a person who created a successful organization relying only on his personal insight, without even finishing high school. However, the future is becoming more complex with many necessities, so the Board wishes to install someone on that position with appropriate education. They believe that this type of background is important because the employees are seeking this in their leader. Their respect to the old CEO was never doubted, but however they always expressed frustration by his lack of appreciation for today's tools of business, engineering, and manufacturing. Person's education is mainly evaluated by their academic degrees, however in this particular case

that is not useful. AHP is able to develop an accurate measurement suited for the decision at hand. (Analytic hierarchy process – leader example, 2020)

TOM	DICK	HARRY
BS, Marietta College, 26 years ago. MBA, University of Phoenix, last year.	BS, Duke University, 39 years ago. Teaches courses in industry best practices.	BS, Princeton, 10 years ago. MBA, Pittsburgh, 5 years ago. Licensed CPA.

Table 8:Summary of education for each candidate

The step that follows is identical to the Experience procedure. The Board makes a pairwise comparison for the candidates in respect to education to evaluate their strength and give a weight. (Analytic hierarchy process – leader example, 2020)

TOM	3	DICK	1	Tom has more recent degrees than Dick. His recent MBA will help in implementing the plan. Dick has a fine education, but it doesn't relate to the task. Tom's education is moderately preferred to Dick's. Weight 3.
TOM	1	HARRY	5	Harry's education is preferred than Tom's. Harry went to better schools, possesses recent BS, and CPA qualifications. Tom's MBA is newer, but Harry's is also recent. Harry's education is strongly preferred to Tom's. Weight: 5
DICK	1	HARRY	7	Harry's possesses BS and MBA which makes his education stronger than Dick's who has only BS. Harry's degrees are recent and more applicable to the 21st century needs. Harry's education is very strongly preferred to Dick's. Weight: 7

Table 9: Alternatives compared with respect to Education

The Board than interpret its judgment into the AHP matrix below. From there we can acknowledge from Tom's row in the matrix, shows that his education is three times better than Dick's, but only one fifth from Harry's. Similar thing can be seen also for the other candidates, while Harry's education strongly dominates that of both the other men.

Afterwards the priorities are derived with AHP software. (Analytic hierarchy process – leader example, 2020)

	TOM	DICK	HARRY
TOM	1	3	1/5
DICK	1/3	1	1/7
HARRY	5	7	1

Table 10: Education Matrix

	TOM	DICK	HARRY	PRIORITY
TOM	1	3	1/5	0.188
DICK	1/3	1	1/7	0.081
HARRY	5	7	1	0.731

Table 11: Education Matrix with Priorities

Sum of priorities = 1.000; Inconsistency = 0.062

From Table 11 we can see that from the Board's judgement, Harry has the strongest education from all candidates. He dominates Tom's by factor of almost 4 (0.731÷0.188=3.95) and Dick's by a factor of 9 (0.731÷0.081=9.02).

Charisma

After evaluating the education and experience, the Board must make a pairwise comparison for the charisma each candidate possesses. According to them the next leader needs to reduce the employees' resistance to change. The leader will be put in a position where often he will need to handle influence by using his charm and appeal, instead of logic and authority alone. The charisma is an important characteristic for implementing the future changes. (Analytic hierarchy process – leader example, 2020)

TOM	5	DICK	1	Tom's charisma is a very strong quality of his, however Dick's laid-back nature puts him in a second place. <u>Tom's charisma is strongly preferred to Dick's. Weight 5.</u>
TOM	9	HARRY	1	When compared Tom's strong inspirational leadership to Harry's thoughtfulness presentation of issues, instead of passionate leadership, Tom's charisma is extremely preferred to Harry's. Weight: 9

DICK	4	HARRY	1	Dick has gained his confidence and respect of people with his long tenure in the company. However, he has an easygoing personality. Harry is not yet in possession of good charisma. <u>Dick's charisma is somewhat strongly preferred to Harry's. Weight: 4</u>

Table 12: Alternatives compared with respect to Charisma

	TOM	DICK	HARRY
TOM	1	5	9
DICK	1/5	1	4
HARRY	1/9	1/4	1

Table 13: Charisma Matrix

The result of the AHP software for the charisma is the following:

	TOM	DICK	HARRY	PRIORITY
TOM	1	5	9	0.743
DICK	1/5	1	4	0.194
HARRY	1/9	1/4	1	0.063

Table 14:Charisma Matrix with Priorities

Sum of priorities = 1.000; Inconsistency = 0.069

Charisma is something that is not easily measurable, being a subjective term. There is no fixed scale on how to measure it, and even though AHP is giving us the possibility to do so, the measures can vary if the candidates change or even if the Board changes. This measures that AHP provides are only for this case. (Analytic hierarchy process – leader example, 2020)

Age

The age is something that is quite easy to measure, however in this particular case is not just the number in which the Board is interested in. Due to employment discrimination by age, the decision factors must be precise and justified. The Board is making the age as one criterion to measure because the new leader will have to leave his position in five years. That means the perfect candidate should be near retirement age after those five years, this way he can retire or remain as a consulting capacity in the

company. However, if he is younger, after the 5 years pass, he will not be able to stay in the company and based on his success he might or might not be able to find employment in another place. There is also the possibility for him to side with a competitor beside the non-compete agreements. Many people that work with the legacy products are over age 55, but those who are associated with the new products are in their 20s and 30s. The position at hand, seeks from the leader to be able to relate with both groups and be accepted from both as their leader. Tom, Dick, and Harry are now 50, 60, and 30 years old respectively. (Analytic hierarchy process – leader example, 2020)

TOM	1	DICK	3	Dick is now 60, which will make him 65 when he steps down from the position and he will be ready to retire. However, Tom will be 55 and have another 10 years until retirement. The possibilities for him will be to retire early or find another senior position in the industry. Dick's age is moderately preferred to Tom's. Weight 3.
TOM	5	HARRY	1	At 55, Tom might retire early or find another senior position, but Harry will be 35 with no other place in the company, and we'll probably lose him. Harry also does not get along very well with senor workers. Tom's age is strongly preferred. Weight: 5
DICK	9	HARRY	1	When the leader will need to step down, Dick will be of retirement age, but Harry will be 35 with no place to go in the company. Dick's age is extremely preferred. Weight: 9

Table 15:Alternatives compared with respect to Age

The judgements processed with the AHP software are as follows:

	TOM	DICK	HARRY	PRIORITIES
TOM	1	1/3	5	0.265
DICK	3	1	9	0.672
HARRY	1/5	1/9	1	0.063

Table 16:Age Matrix with Priorities

Sum of priorities = 1.000; Inconsistency = 0.028

The candidates presented the Alternatives of the AHP model, and now that they have been evaluated with regard to meeting the Criteria, the next step is to evaluate the Criteria with regarding to meeting the importance to reach the overall goal. This is also done with a pairwise comparisons. (Analytic hierarchy process – leader example, 2020)

EXPERIENCE	4	EDUCATION	1	The education is an important factor because the founder lacked in it. On the other hand, experience is important because the future plan is a complex task and cannot be implemented without it. <u>Experience is somewhat strongly more important than education. Weight: 4.</u>
EXPERIENCE	3	CHARISMA	1	When logic, knowledge and facts are not enough is when charisma is needed. Experience is what gives ability to implement the plan. <u>Experience is moderately more important than charisma. Weight: 3.</u>
EXPERIENCE	7	AGE	1	Age is important because the leader will step down, also, he must get along with both young and old employees. Experience is an important requirement in order to get the job done. <u>Experience is very strongly more important than age. Weight: 7.</u>
EDUCATION	1	CHARISMA	3	Charisma is what supports the leader to lead. Education gives him respect. Plus, it gives us something we want in our leader. <u>Charisma is moderately more important than education. Weight: 3.</u>
EDUCATION	3	AGE	1	The importance of age was described in the cells above. Education is needed because we want the company to be run

				more thoughtfully than in the past, and also the employees seek it in their leader. <u>Education is moderately more important than age. Weight: 3.</u>
AGE	**1**	**CHARISMA**	**5**	The importance of age was described in the cells above. Charisma is needed because the leader will use it to lead: words and logic are not enough in every situation. <u>Charisma is strongly more important than age. Weight: 5.</u>

Table 17:Criteria compared with respect to reaching the goal

The comparison of the four criteria needs a larger matrix for the AHP model, however it is processed in the same way.

	Experience	Education	Charisma	Age	Priorities
Experience	1	4	3	7	0.547
Education	¼	1	1/3	3	0.127
Charisma	1/3	3	1	5	0.270
Age	1/7	1/3	1/5	1	0.056

Table 18: Criteria Matrix with Priorities

Sum of priorities = 1.000; Inconsistency = 0.044

From the table above we can see that Experience has the highest ranking and is twice more important for reaching the goal. The second place is taken by Charisma, being twice more important than Education, which on other hand is twice more important than Age. (Analytic hierarchy process – leader example, 2020)

Synthesizing final priorities

After finishing the prioritization of the Criteria with respect to the main goal, and the Alternatives with respect to the Criteria, we can go further with calculating and prioritizing the Alternatives with respect to the Goal, which will give us the answer to which candidate is the best for the role as a leader. This step is a matter of multiplying and adding that is carried out through the whole hierarchy. Each priority if every Alternative for reaching the goal is the sum of:

- His priority with respect to Experience, multiplied by Experience's priority with respect to the Goal, and

- His priority with respect to Education, multiplied by Education's priority with respect to the Goal, and

- His priority with respect to Charisma, multiplied by Charisma's priority with respect to the Goal, and

- His priority with respect to Age, multiplied by Age's priority with respect to the Goal

In the table below we can see the calculations for each candidate with respect to criteria:

CRITERION	PRIORITY VS. GOAL	ALTERNATIVE	A		B		C
EXPERIENCE	0.547	TOM	0.217	X	0.547	=	0.119
		DICK	0.717	X	0.547	=	0.392
		HARRY	0.066	X	0.547	=	0.036
TOTAL:			1.000				0.547
EDUCATION	0.127	TOM	0.188	X	0.127	=	0.024
		DICK	0.081	X	0.127	=	0.010
		HARRY	0.713	X	0.127	=	0.093
TOTAL:			1.000				0.127
CHARISMA	0.270	TOM	0.743	X	0.270	=	0.201
		DICK	0.194	X	0.270	=	0.052
		HARRY	0.063	X	0.270	=	0.017
TOTAL:			1.000				0.270
AGE	0.056	TOM	0.256	X	0.056	=	0.015
		DICK	0.672	X	0.056	=	0.038
		HARRY	0.063	X	0.056	=	0.004
TOTAL:			1.000				0.056

Table 19: Calculations of candidates with respect to criteria

The Column A of the table displays the Alternatives corresponding to each criterion. Column B is the Criteria corresponding to the Goal, and Column C shows the result of the two other columns, demonstrating the main priority of the Alternative corresponding to the goal.

Let's take Dick as an example for his priority with respect to the goal is Looking only at Tom, we can see that his priority with respect to the Goal is 0.492, calculated as follows:

- Dick's priority related to Experience is 0.717 * 0.547 = 0.392, plus
- Dick's priority related to Education is 0.081 * 0.127 = 0.010, plus
- Dick's priority related to Charisma is 0.194 * 0.270 = 0.052, plus
- Dick's priority related to Age is 0.672 * 0.056 = 0.038,
- For a total of 0.392 + 0.010 + 0.052 + 0.038 = 0.492

Now let's see the priorities for all of the Candidates:

	PRIORITY WITH RESPECT TO:				
CANDIDATE	Experience	Education	Charisma	Age	Goal
Tom	0.119	0.024	0.201	0.015	0.358
Dick	0.392	0.010	0.052	0.038	0.492
Harry	0.036	0.093	0.017	0.004	0.149
TOTALS:	0.547	0.127	0.270	0.056	1.000

Table 20: AHP calculations

Making the decision

Taking into consideration what the Board chose as decision criteria and their judgement of the importance for each candidate respectively to the criteria, Dick is the best choice for reaching the goal. His priority of 0.492, is the most suitable candidate. Tom has a priority of 0.358, which makes him second, and Harry, with 0.149, is last.

AHP model makes easy for the decision makers to keep track of their thinking and to explain every step they took for making the decision. In case they want to control their decision, they are always able to return to the process and change it if needed. Also, they have the possibility to present the details to outside consultants, the candidates and shareholders, or anyone else that might show concerns regarding the decision. (Analytic hierarchy process – leader example, 2020)

Before we have seen the Tom, Dick and Harry example together with the Board's comments regarding the position opened. The weights that were given, even though are given based on the Board's opinions, need to be calculated and controlled with a software for checking the consistency of the decisions. In Appendix A is the calculation of the example above using the R Studio Software, following the steps from before.

3. SWOT Analysis

Nowadays companies are engaging in strategic planning more frequently and effectively. Strategic planning is known for its benefits in supporting companies to become more productive by guiding the allocation of resources for achieving the goals of the company. Strategic planning is the key for implementing strategic management. Strategic management is the process of creating, implementing, and evaluating decisions that will help the organization to achieve its goals. Implementing this tool, the company can take a better control over the future changes by influencing and shaping them. The strategic management process consists of different tools for increasing the chances of creating a good strategy with competitive advantage. The process begins with creating the Vision of the company. Vision is the description of where the company wants to be in the future. After the organizations sets its vision, the following step is the mission. Mission is defining what the company wants to achieve in the long run as also what should be avoided. The process is finished with creating the goals. They represent what the company wants to achieve. After the company decides on the topics described below, the next step is to make and external and internal analysis. This analysis is mainly known as the SWOT analysis which helps the company to identify the various opportunities and strengths they have, and the critical threats and weaknesses they might face. The internal part consists of the identification of the strengths and weaknesses, while the external part considers the threats and opportunities in the competitive environment. The SWOT analysis is beneficial for the company because it explains how the resources and capabilities can be arranged in order to achieve competitive advantage as also which might be source of such advantage. Based on SWOT Analysis, companies can adapt an appropriate strategy. The strategic choice that the company is willing to make is associated with the vision, mission, and goals, also including the internal and external analysis. This way, through the strategic choice is how the company will implement the theory of obtaining a competitive advantage. The following step is the implementation of strategy. The strategy chosen is said to be implemented when the company embraces the organizational policies and practices according to the decided strategy. After this process is fulfilled, the final result is obtainment of competitive advantage. (Gurel & Tat, SWOT Analysis: A theoretical Review, 2017)

SWOT Analysis is one of the main strategic analysis that is widely used in the field of marketing and management. This analysis gives an opportunity to examine possible combinations of internal and external factors of the environment in order to create ideas for future strategic choices and decisions. The SWOT is useful when its full potential is used after the implementation, but regardless it has many limitations to create a sufficient conclusion or to identify some more complex strategies. (Borislav Borissov, 2015)

Figure 2: SWOT matrix

The name of the analysis comes directly from the main factors that are analyzed in the market, Strengths, Weaknesses, Opportunities and Threats. The matrix shown in Figure 2, created with the analysis is an effective way to create strategic decisions based on the data combined with the four main factors of the analysis. This way the marketer can determine the external and internal factors that influence and involve the understanding of the company's position in the market. The combination of the main elements of the matrix are the most important source for information which helps in further developing the marketing strategies. To better understand the importance and consistency of these four elements there has been developed a generic methodology:

• What are the main goals of the analysis;

• What is the internal potential;

- Defining the strengths;

- Defining the weaknesses;

- What is the external potential;

- Detecting the opportunities;

- Detecting the threats;

- Combining two by two every factor with each other. (Verboncu & Condurache, 2016)

The SWOT analysis has been mentioned and discussed in theory and practice by many authors and cannot be attributed to only one. Regardless its popularity in many fields for making strategic decisions it is very limited in comprehension of the capabilities and challenges of every actor on the market. (Vlados & Chatzinikolau, 2019)

The SWOT analysis can be defined as the culmination to a thorough and cultivated analysis of the market situation in which a company, region or country develops. When creating the matrix, as a base a goal is set under the circumstances observed on the market with the following hypothesis:

1. Adopting an analysis that will show the important benefits which contribute to knowledge, creativity, add new competencies, gives better orientation in the environment and to help form decisions;

2. Give efficient objectives and principles in the area of application;

3. Being able to be used in an expanded scope than the initial application of the analysis in order to bring more understanding for the initial methodology.

This hypothesis will help to reduce distortion of information and the risk of applying an incorrect analysis. (Caprarescu, Gheorghita; Stancu, Daniela Georgiana; Aron, Georgina, 2013)

3.1.SWOT analysis structure

The four areas involved in the SWOT analysis, discussed above are divided into two dimensions: external and internal factors. The strengths and the weaknesses take part of the internal factors with attribution to the company, whilst the threats and the opportunities belong to the external factors and attribute to the environment. For the company to acknowledge its strong and weak aspects, the components should be examined inside its environment, while the opportunity and threats are examined outside its environment. From its structure, we can see that the SWOT Analysis is a strategic planning tool that provides information for the company to be able to match its resources

and capabilities to the competitive environment in which operates. The strengths and opportunities are favorable to the company because they are helping it its goals, while on other hand, the threats and weaknesses are the factors which are harming the process of achieving the goals. This are the factors that the company should avoid or minimize. The SWOT Analysis serves to the manager as a tool for balancing the organizations strengths and weaknesses considering the environmental opportunities and threats. (Gurel & Tat, SWOT Analysis: A theoretical Review, 2017)

3.2.Elements of the SWOT Analysis

As mentioned before the SWOT Analysis is divided in four main parts divided in two different dimensions, however it was not described what does elements should include. We will start with the internal factors, which include what managers should look in the company environment for them to improve the competitive advantage of the company, and after what are the components which are opposing as threats or opportunities in the external environment and how they are able to affect the competitive advantage of the company, positively and negatively.

I. Internal Factors:

1. Organizational Strengths: Strength is defined as a positive and a creative characteristic that gives value to something and makes it more advantageous when compared to others. At organizational level, strength is seen in the abilities that a company has in order to gain advantage over its competitors. It can also be described as a situation or an attribute that makes the company more efficient and effective when compared to its competitors. When comparing a company to its competitors, it can be defined as strong, weak, or equal. This can be seen as after evaluating criteria such as financial structure, production and technical capacity, market situation, management effectiveness and research and development potential. Strength can also be a resource or skill that gives the company advantage relative to its competitor and the needs of the market that is served. Organizational strengths are contained in the competencies the company uses to achieve its goals. The strength is something needed for the company to further use the opportunities that the external environment offers. Also, they are used in overcoming the threats of the external environment.

2. Organizational Weakness: Weakness is defined as something that is missing but is necessary in order to do something. It is the contrary of the strength. At an organizational level, it refers to characteristics and capacities that the company

possesses that are weaker when compared to its competitors. It gives light to the activities in which the company lacks efficiency and effectiveness. A weakness is something that the company lack or is not able to do when compared to the other players on the market, which puts the company at a disadvantage. It represents the limitation a company has regarding its resources, skills, and capabilities, that are considered to be essential for a company to give effective performance. The same criteria seen before, as to weather a company is strong, is actually what can also make the company weak. A lack in financial resources, marketing skills, management capabilities or facilities can be potential weaknesses that may lead the company to inefficiency and ineffectiveness. If the company acknowledges its weaknesses on time, it can solve future problems that may cause limitations and difficulties in long-term strategies.

II.   External Factors:

1. External Opportunities: Opportunity is a situation that can be a driving force for an activity to take place. When seen form the company's point of view, an opportunity is something that can take form in a convenient time or a situation that happens in the environment and that helps the company to achieve its goals. Opportunities are those that would make the company generate positive results. In other words, they are seen as conditions in the market that help the organization to take advantage of its strengths in order to overcome weaknesses and neutralize threats.

2. External Threats: A threat represents a disadvantageous situation that has the potential to jeopardize the realization of a given activity. From organizational context, a threat is a component that makes the achievement of goals difficult or impossible. It is a result of a changes in a situation in the environment where the company represents that can prevent it from maintaining its existence or make it lose its advantage relative to the competition. Every factor in the environment that may block or delay organizational efficiency and effectiveness is a threat. (Gurel & Tat, SWOT Analysis: A theoretical Review, 2017)

3.3.Advantages and disadvantages of SWOT analysis

The SWOT analysis is mostly described as a simple tool for organizing information in preliminary research. Considering its wide use there are many advantages in creating this analysis before making strategic decision, however its limitation to consistently perceive every capability brings out some disadvantages. The main use of the SWOT is the fact that it can be used as a method of evaluation. It is quite useful to understand the environment and the position of a company on the market and the strategic planning and

development. From theoretical point of view this is taken as an advantage considering that the marketer can gain a deeper knowledge of the market position in which the company is and create strategic decisions for further development based upon it. However, on the other hand, this can also be seen as a disadvantage since the analysis does not give quantifying weights on the factors and strategic alternatives. This is significant because many assume that the factors analyzed with the SWOT are independent of each other, an assumption which in many cases does not hold. In addition, SWOT does not include the quantitative data of the factors observed, but only the qualitative. The decision-making process is complicated and includes a number of criteria, interdependencies and prioritization, meaning that sometimes SWOT can be insufficient in order to make a decision that will help achieve the main strategic goal. (Oreski, Dijana, 2012)

3.4. SWOT Analysis practical example

To consider and explain this methodology more in detail I will use a practical example based on a case study done in 2013 by Mehmood, Hassannezhad and Abbas. We will consider data from the leader of the italian market for communication Italian Telecom, by using his major functions on mobile NFC based on qualitative analysis with additional study of Telecom Company in Turin. The data collected is based on company documents regarding the mobile NFC and interviews with managers and experts. The result of this data will determine the four major factors of the SWOT analysis: strengths, weaknesses, opportunities, and threats. (Mehmood, Hassannezhad, & Abbas, 2013) The SWOT matrix will be shown in the table below.
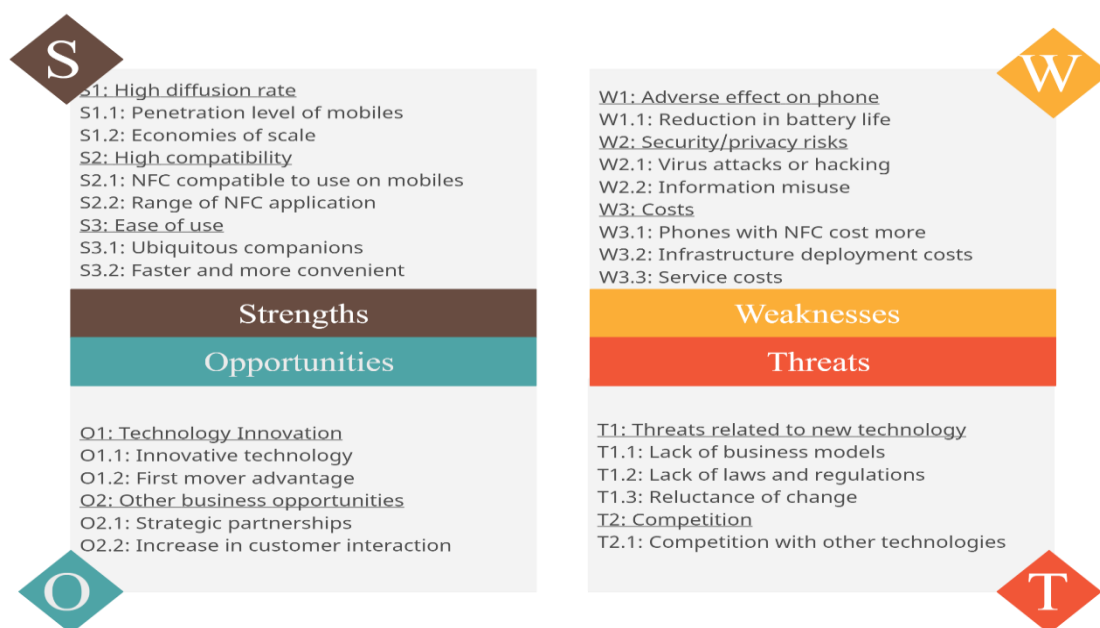
Figure 3: SWOT matrix Telecom Italia

From the SWOT analysis, a survey was made based in which experts needed to evaluate each factor. They needed to answer questions and specify the more efficient factors, and to establish their importance. (Mehmood, Hassannezhad, & Abbas, 2013)

From the results obtained of the SWOT analysis, the strength and opportunities factors, according to the experts are more important than weaknesses and threats. This can be seen that there are many positive options for developing NFC plans in the future. Another thing that can be seen from the results is that the internal factors are dominating the external factors. When taking into consideration this approach to a telecommunication company, there might be limitation, so when developing the future decisions, managers need to be cautious. The benefit is in using surveys for the experts in the field, which can provide richer data. Nonetheless, there are still contradictory opinions whether NFC will reach mass market. The high level in which mobile phones are compatible with the NFC features, including the innovative factors is what makes this future prospect attractive to customers. However, this being in technology-based field, competitive markets remain to be a huge threat, and also the lack of standards. This limitation might be overcome in the near future, as many companies are investing in technology and demo projects. Though NFC apart from the contactless payment offers many applications and services that connect different industries to create partnerships and mutual beneficial situations. The weaknesses such as security and privacy can be easily overcome with the future investment in research of this technology, giving the managers an opportunity to use the strengths to capitalize on opportunities that are offered with the NFC. (Mehmood, Hassannezhad, & Abbas, 2013)

4. Application of SWOT and AHP Model

In the chapter before we have seen the SWOT matrix, and its important features and uses. However, when creating a SWOT analysis the decision-makers can often find many inconsistencies. And in order to resolve this, using the AHP model can be of great help to analyze better the necessary factors. The eigenvector that is calculated when making the pairwise comparison in the AHP, gives the possibility to measure the value of the SWOT factors and elements, by giving them quantitative aspect for better strategic planning and decision-making. (Görener, 2016)

The model in the field of marketing is mainly used to explain how some problems can be decomposed and solved, by using it also with different marketing applications and analysis. Based on which marketing applications are used the model can be of use for making judgements and evaluating them based on the previous knowledge base. (Davies M. , Adaptive AHP: a review of marketing applications with extensions, 2001)

As it was said before, because of the lack of quantitative data in the SWOT analysis, in many cases a mathematical model is included. This way for every qualitative factor can be given a quantitative weight respectively. Saaty's Analytical Hierarchy Model approach can be seen as a way to improve the information found in the SWOT analysis. This model's ability to quantify the data's importance of the elements in the different SWOT group can help improve its usability. The SWOT analysis is seen as simple, effective and fast way to collect qualitative data of the market, combined with the AHP model, the collected data in strengths, weaknesses, opportunities and threats can be prioritized with numerical values. This type of combination provides a measure of quantitative importance for all the factors in the SWOT analysis. (Lee, Seungbum; Walsh, Patrick, 2010)

Before we have seen how the process of analyzing data and markets work with the two most famous methods separately. But what will happen if these two methods are put together? Here I would like to explain how a hybrid approach of these two methods can benefit when analyzing data and prioritizing criteria for the decision-making process. It was seen that even though SWOT analysis is famous and widely used, it has some disadvantages, one of them being the lack of quantitative values for the factors. This disadvantage in the hybrid approach can be overcome with using the AHP model, mainly known for the ability to give quantitative value and priority to qualitative data. In many theoretic articles and case studies can be found that this hybrid method is known for its

efficiency and simplicity to analyze and combine the quantitative and qualitative factors observed. When making a SWOT analysis many uncertainties are seen, which makes it difficult to make future predictions and create well defined decisions. However, the AHP model when inserted, the uncertainties met can be managed. The main factors strengths, weaknesses, opportunities and threats, can be limited to one defined number, which gives the option to overlap and systemize them in order to avoid negligence and repetition. However, this is not a defined way, and they can also be seen without limitation, for which with the AHP model they can be grouped in different levels of hierarchy and observed with the pairwise comparison. Once the criteria are prioritized the decision maker can continue with the consistency ratio in order to control if the observed values have been prioritized correctly or there is need for additional or new observations. Even though the AHP model is not able to give direct information about the uncertainty derived priorities, still it gives us numerical values and prioritized SWOT factors which are useful when defining strategy. The benefit derives from the fact that now the internal and external features described in the main factors are all in a numerical scale that can be easily compared. For example, this statement can be seen if we have weakness that has larger quantitative value than benefits, it is obvious that the focus of the strategy should be put on how to eliminate the said weakness. In other situations, there might be the same value for two factors, which does not mean immediate removal, but should be compared also to the other factors observed. This type of hybrid method is useful for every strategic process because the SWOT analysis is giving the basic framework for which decisions should be made and the AHP model helps to analyze that framework in analytic way. This way can be improved the usability of SWOT by quantifying the importance of the factors with the AHP model. This gives an opportunity to better understand and prioritize the main factors as a group and to decide alternative strategies. For example, if there is a threat that needs to be analyzed further, or if there are weaknesses that the company might face when striking with the competition. This method with the conducted comparisons and the quantitative information about the given situation can be suitable for many future strategic planning and decision-making processes. It provides a framework that can be a useful tool for communication and education as improves it the information base for the above-mentioned processes. (Oreski, Dijana, 2012)

4.1. Advantages in using the SWOT-AHP Model

Using the hybrid model of the SWOT and AHP analysis has been proven useful for the decision-making process. One advantage of using this process lies in the possibility

to make a quantitative testing of every SWOT factor observed and how they are preferred by the decision maker. In addition, the advantages that brings the AHP model, such as the pair-wise comparison, can be of value in the SWOT. The comparison added to the SWOT analysis gives the opportunity to compare the factors in SWOT by analyzing their eigenvalues, as it is normally done in the AHP model. This has been proven to be a good base to start testing the current or future situations on the market in order to make a decision or to start creating an alternative strategy. The quantitative results provided by the comparisons can give the decision-maker enough information whether new strategies need to be conducted and how the priorities of the factors are defined. Moreover, this hybrid method can also be used to compare more strategic options, which is beneficial in a way that the decision-maker can find out which suits best for the SWOT factors. For example, when testing more strategies, an alternative strategy needs to be added to the lowest level of the AHP hierarchy and afterwards to be compared with every SWOT factor. The results provided has a quantitative value that will show the priority of each option. (Oreski, Dijana, 2012)

The proof of these advantages lies behind the fact that in order to remain a successful player on the market, an organization has to know its internal and external factors better than everything. The SWOT analysis being the main method for conducting this type of knowledge has a difficulty in quantifying its factors, but this is overcoming with the AHP model provided in addition. (Lee, Seungbum; Walsh, Patrick, 2010).

4.2.Creating the SWOT-AHP method

As the name says the SWOT-AHP method is constructed in a few steps and always starting with the basic SWOT analysis. First is needed to conduct a SWOT analysis in which all relevant internal and external factors will be included. After the SWOT matrix is created the decision-maker can proceed with the application of the AHP model. The next step brings the comparison of the factors. As seen in the AHP model, everything is based on the pairwise comparisons. In this step, pairwise comparisons need to be made for every SWOT factor separately. This will give us the answer of the main questions observed at the beginning, which of the two factors is more important: strengths, weaknesses, opportunities or threats. The input received of the calculated eigenvalues of the factors will reflect of the decision-maker perception of their importance. After the comparison between SWOT factors is achieved, it is time to do a pair-wise comparison between the SWOT groups. This is done by selecting one priority for each group, that

will be used as its representative, and after they are compared in order to calculate their relative priority as done in the step before. The priorities selected are used in order to calculate the global priorities of all other independent factors that are within them. First the local factors that were defined in the second step of the hybrid method need to be multiplied with their value of the scaling factors in the SWOT groups. The result of the global priorities needs to be 1 after summing up all the factors. The last step of the process is to create the strategy based on the results. After conducting the necessary comparison, the result is in a numerical value of the factors. This contributes to the strategic planning process by giving information if new targets need to be set or if the strategies that have been defined in the implementation plan are already based and taking into consideration the most important factors. (Oreski, Dijana, 2012)

One point of view in integrating this combination of analysis could be to use a direct evaluation of the efficiency rate of the strategies considered for achieving the objective. This could be important because when comparing the strategies and their results, it is essential to know how the strategy could be implemented successfully for achieving the objective over how the value of each factor required to be fulfilled. This way the AHP model could give us the result of how the strategy will give result in respect to the main goal, rather than how it behaves in respect to the other factors. (Osuna & Aranda, 2007)

4.2.1. The SWOT-AHP hierarchy

The model SWOT-AHP of Osuna and Aranda is structured in four levels with the following description:

Level 1: The main objective that needs to be achieved with the decision.

Level 2: Represents the four factors that are defining the SWOT Analysis – Strengths, Weaknesses, Opportunities, and Threats.

Level 3: Factors that are included in the level 2 in each group.

Level 4: Strategies that are considered and evaluated.
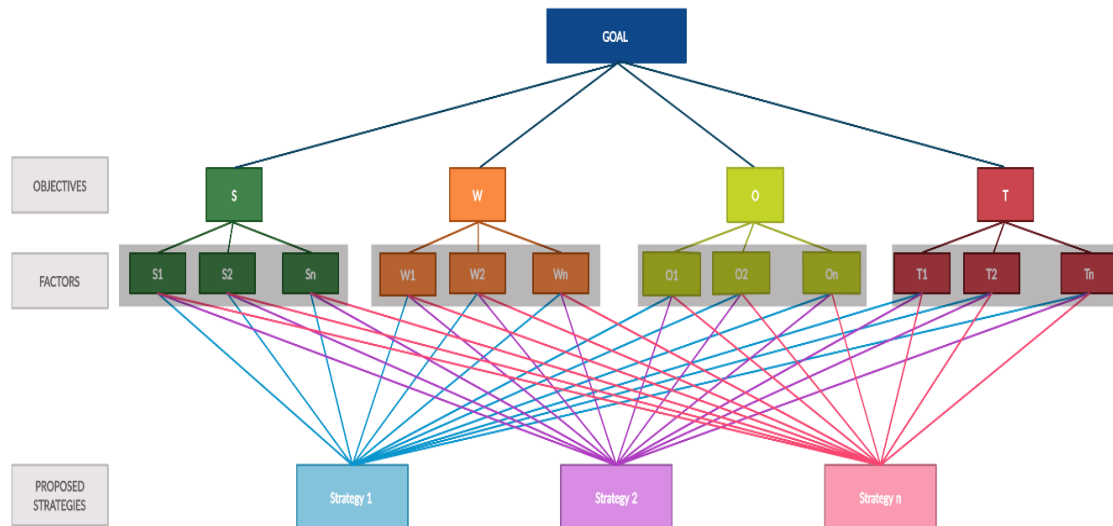
Figure 4: SWOT-AHP hierarchy

In the figure above, the lines are representing the relationships the level have between them and the symbols which are representing the weights of the relationships and the degree of efficiency for each factor accordingly. The symbols have the following meaning:

- *(w_S, w_W, w_O, w_T)* – represents the group of factors given by SWOT
- *(w_{S1}, w_{S2}, ..., w_{Sn})* – represent the importance of the Strength factors withing the S group.
- *(w_{W1}, w_{W2}, ..., w_{Wn}), (w_{O1}, w_{O2}, ..., w_{On}) and (w_{T1}, w_{T2}, ..., w_{Tn})* – have the same representation as the group above, only withing their own group: W-weaknesses; O-opportunities; T-threats.

For the *Strategy j (j=1,2, 3,..., n)* we have the following representation of how the efficiency of the strategy is taking advantage of each factor respectively :

- *$U_{Si, j}$*: Represents the advantage taken of the strength factor *Si (i = 1, 2, ..., n_s)*
- *$U_{Wi,j}$*: Represents the decrease of the effect that the weakness factor provides *Wi (i = 1, 2, ..., n_w)*
- *$U_{Oi,j}$*: Represents the advantage taken of the opportunity factor *Oi (i = 1, 2, ..., n_o)*
- *$U_{Ti,j}$*: Represents how the efficiency of the strategy faces the threat factor *Ti (i = 1, 2, ..., n_t)*

V_j is the main value of the Strategy j, meaning that for the value we have the following equation:

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$$V_j = w_S \sum_{i=1}^{i=ns} w_{Si} U_{Si,j} + w_W \sum_{i=1}^{i=nw} w_{Wi} U_{Wi,j} + w_O \sum_{i=1}^{i=no} w_{Oi} U_{Oi,j} + w_T \sum_{i=1}^{i=nt} w_{Ti} U_{Ti,j}$$

Equation 7

The result is the Strategy j that has the highest value of V_j. (Osuna & Aranda, 2007)

4.3.Practical example of the SWOT-AHP method

This methodology will be performed on a Turkish company for cooker hoods. The company is involved in exporting products in more than 50 countries. The AHP model will be based on the SWOT matrix in three different parts: (1) Goal that needs to be achieved, (2) SWOT groups, (3) Factors within each SWOT groups also known as sub-criteria. Below is the visual representation of the hierarchical structure of the SWOT matrix. (Gorener, Toker, & Ulucay, 2012)
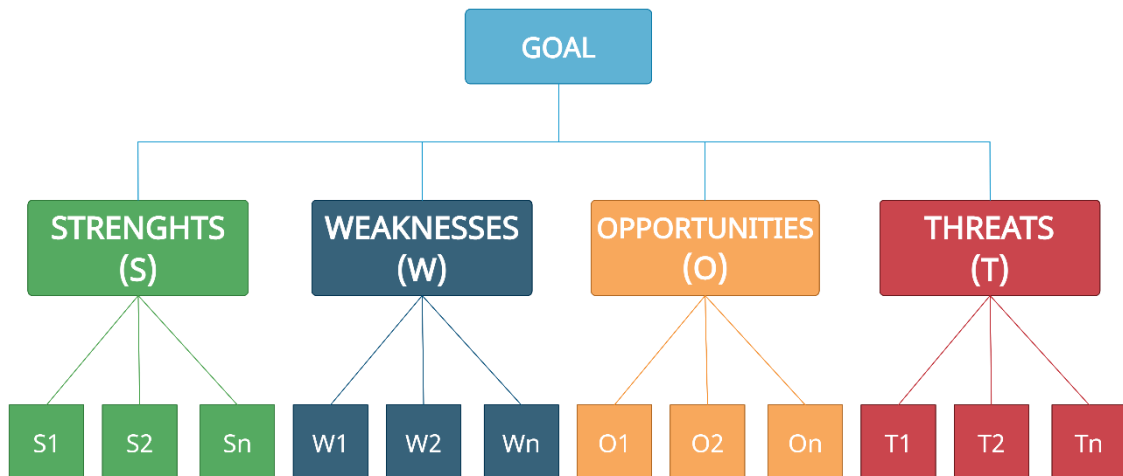
Figure 5: Hierarchical structure of SWOT matrix

In order to develop the SWOT-AHP strategic model, first is necessary to map out the three phases: building a task; modifying the factors; and building an evaluation model. (Gorener, Toker, & Ulucay, 2012)
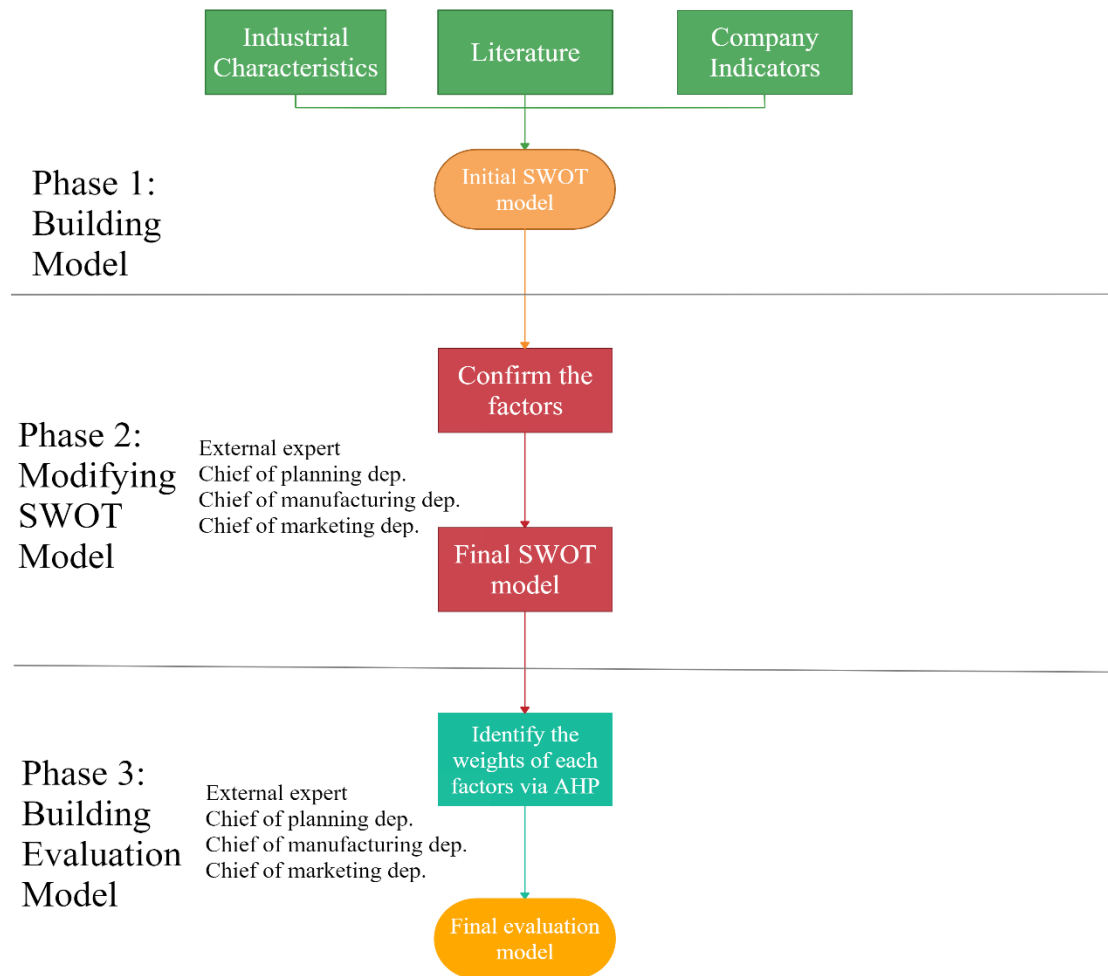
Figure 6: Phases of the methodology

Figure 7: SWOT matrix Manufacturing Company

For applying the AHP on a SWOT matrix, first a pair-wise comparison of each factor in every SWOT group is made, by using the 1-9 scale by Saaty introduced in 1980. Then the SWOT elements are compared considering every SWOT group.

SWOT Groups	S	W	O	T	Importance Degrees
Strengths (S)	1.000	3.000	1.000	3.000	0.366
Weaknesses (W)	0.333	1.000	0.250	2.000	0.143
Opportunities (O)	1.000	4.000	1.000	2.000	0.371
Threats (T)	0.333	0.500	0.500	1.000	0.119
CR = 0.06					

Table 21:Pairwise comparison of SWOT factors

Strengths	S1	S2	S3	S4	S5	Importance degree
S1: Capable for innovation	1.000	0.500	0.200	0.500	0.167	0.055
S2: Large scope of resources and skills	2.000	1.000	0.167	0.200	0.167	0.061
S3: High product quality	5.000	6.000	1.000	3.000	2.000	0.403
S4: Expertise in management and staff	2.000	5.000	0.333	1.000	0.200	0.142
S5: Authenticity on the market share	6.000	6.000	0.500	4.000	1.000	0.339
CR = 0.07						

Table 22: Comparison matrix of Strengths group

Weaknesses	W1	W2	W3	W4	W5	W6	W7	Importance degree
W1: Low manufacturing system performance	1.000	3.000	0.200	0.200	0.500	0.250	0.500	0.053
W2: Strict organizational structure	0.333	1.000	0.167	0.167	0.500	0.200	0.500	0.034
W3: Energy cost	5.000	6.000	1.000	1.000	6.000	2.000	7.000	0.305
W4: Labor cost	5.000	6.000	1.000	1.000	6.000	2.000	7.000	0.305
W5: High costs for logistics	2.000	2.000	0.167	0.167	1.000	0.200	0.500	0.055
W6: Lack in well-known brands	4.000	5.000	0.500	0.500	5.000	1.000	7.000	0.184
W7: Lack in accuracy for forecasting	2.000	2.000	0.143	0.143	2.000	0.143	1.000	0.063
CR = 0.06								

Table 23: Comparison matrix of Weakness group

Opportunities	O1	O2	O3	Importance degree
O1: Rise of living standards and modern buildings	1.000	2.000	3.000	0.539
O2: Globalization and low trade barriers	0.500	1.000	2.000	0.297
O3: New foreign markets	0.333	0.500	1.000	0.163
CR = 0.08				

Table 24: Comparison matrix of Opportunities group

Threats	T1	T2	T3	T4	T5	T6	T7	Importance degree
T1: Macroeconomic instability in Turkey	1.000	0.333	2.000	0.200	0.333	0.500	0.500	0.076
T2: Competition	3.00	1.00	1.00	2.00	4.00	3.00	1.00	0.237
T3: Political instability	0.500	1.000	1.000	1.000	0.500	1.000	0.333	0.098
T4: Changing international market mechanisms	1.000	0.500	1.000	1.000	3.000	1.000	0.500	0.122
T5: Enhancing environmental pressure	3.000	0.250	2.000	0.333	1.000	0.250	0.250	0.092
T6: Different request from international customers	2.000	0.333	1.000	1.000	5.000	1.000	0.333	0.146
T7: Low income per unit	2.000	1.000	3.000	2.000	2.000	3.000	1.000	0.229
CR = 0.08								

Table 25: Comparison matrix of Threats group

Below we can see the final results of the priority scores for the SWOT factors:

SWOT Group	Group Priority	SWOT factors	Factor priority	Overall priority of factor
Strengths	0.366	S1: Capable for innovation	0.055	0.020
		S2: Large scope of resources and skills	0.061	0.022
		S3: High product quality	0.403	0.147
		S4: Expertise in management and staff	0.142	0.052

		S5: Authenticity on the market share	0.339	0.124
Weaknesses	0.143	W1: Low manufacturing system performance	0.053	0.007
		W2: Strict organizational structure	0.034	0.005
		W3: Energy cost	0.305	0.044
		W4: Labor cost	0.305	0.044
		W5: High costs for logistics	0.055	0.008
		W6: Lack in well-known brands	0.184	0.026
		W7: Lack in accuracy for forecasting	0.063	0.009
Opportunities	0.371	O1: Rise of living standards and modern buildings	0.539	0.200
		O2: Globalization and low trade barriers	0.297	0.110
		O3: New foreign markets	0.163	0.060
Threats	0.119	T1: Macroeconomic instability in Turkey	0.076	0.009
		T2: Competition	0.237	0.028
		T3: Political instability	0.098	0.012
		T4: Changing international market mechanisms	0.122	0.015
		T5: Enhancing environmental pressure	0.092	0.011
		T6: Different request from international customers	0.146	0.017
		T7: Low income per unit	0.229	0.027

Table 26: Overall Priorities scores

4.3.1. Conclusion practical example

The AHP analysis is showing that the rise in the living standards and modern buildings is the most important issue for a company that manufactures cooker hoods regarding its internal and external factors. From the overall result it can be concluded that the highest priority of the factors has Opportunities – 37.1%, following with Strengths – 36.6%, Weaknesses – 14.3% and Threats 11.9%. When considering the factors of the SWOT matrix separately, the most important factor is "Rise of living standards and modern buildings" from the Opportunities group with 20% priority. Other factors that should also be considered are High product quality – 14.7%, Authenticity of the market – 12.4% (from Strengths). Energy costs – 4.4%, Labor costs – 4.4% (from Weaknesses), Globalization and low trade barriers

– 11% (from Opportunities), Competition - 2.9% and Different request from international customers – 1.7% (from Threats). (Gorener, Toker, & Ulucay, 2012)

4.4. Tom, Dick and Harry example

In the AHP model chapter, we have seen the Tom, Dick, and Harry and how the Board had made a decision using the AHP model. The practical example was about a company that had its CEO retiring and the Board of Directors needed to find a new leader. The company based its success on the strength of the product line and the constant flow of new product, so the new leader will need to continue this success by improving it and implementing a new plan. The Board had three candidates in mind, Tom, Dick and Harry and the evaluation criteria they needed to make was based on four criteria, experience, education, charisma, and age. In Table 3 of the same chapter, is demonstrated the background of each candidate. For the AHP model, the candidates (alternatives) were compared to each other and afterwards each criterion was compared to the goal. After prioritizing the alternatives and the criteria, the Board continued to prioritize each alternative with respect to the goal, which gives the result of which candidate is best for the role. Further in this chapter we will see how this example can be transformed in the SWOT analysis.

To make this analysis consistent with the Board's goal and the AHP model result, we will start analyzing each candidate first, applying their background for each criteria in strengths, weaknesses, opportunities and threats, based on the Boards opinion for each criteria and what should the following leader possess or not possess.

To recap here is the Boards opinion for each criterion:

EDUCATION	A leader should be in possession of various skills, knowledge and judgment that will provide him with the capacity to implement the new plan for major changes and success in the business. Because of the complexity of the company the future leader should have experience on the company and outside of the company in order to have the ability to see the bigger picture.
EXPERIENCE	The leader needs to be in possession of good educational background, a recent MBA is preferred of and engineering degree. The future leader should have an appropriate education.

CHARISMA	The leader should be able to lead the employees towards change. He needs to be able to handle situations in which he will use his charm and appeal instead of logic and authority alone. This criterion is important for implementing future changes.
AGE	This criterion is particular due to the threat of discrimination. However, the Board's opinion is based on the fact that the new leader should be in the age range that will be able to leave this position after five years. Meaning that the new leader should be near the age of retirement because after the five years as a CEO, he will not be able to continue to work in the company, and might not be able to find employment in other place. On other side, if the candidate is younger, he might side with a competitor. The new leader should also be able to connect with people from 20 to 60 years old.

Table 27: Boards opinion for each criterion

However, in order the Board to be able to proceed with the SWOT analysis, they need more information regarding the candidates for the position. The Board, after the initial research on background regarding the age, charisma, experience and education for each candidate, proceeded to do a more profound background research that will provide better information, and consider their threats and weaknesses that might jeopardize the company and the position as a leader.

4.4.1. Tom

From the background given in Table 3, we know that Tom is 50 years old, has a tenure in the company, additional 16 years in another industry and currently has a high position in the company. Apart from his experience he holds a bachelor's degree and MBA. He is considered to be a leader and loved by everyone he worked with. From the more profound research the Board has also found out, that Tom, even though is loved by everyone in the company, due to his high experience and knowledge has developed a higher ego, making him not desirable in some communication, or sometimes he might even give the wrong first impression. The Board has also realized that Tom throughout his years has developed a habit to take free days frequently due to personal reasons, even though sometimes they were not justified. This might mean that he will purposely choose

to miss working days and even important seminars or meetings. However, even though this can be talked through and improved, the company has found out that Tom has tight connection with the current CEO of the main competitor and that they spend their weekends together almost constantly. This is considered a threat since he might spill company secrets to the competitor, making the company use its competitive advantage. Apart from that the Board has also found out that Tom lacks in his knowledge of software and technology and has a low initiative in learning them. The technology however is an important factor in every company, due to its fast evolution, making this a threat towards Tom keeping up with it. On the other hand, Tom has also tight connections with distributors in other different industries. Since the company has been thinking in expanding its assortment, this might be good opportunity to expand the distribution channel in the future. Apart from that Tom has been active in the field of charities and supporting sport events, which can bring good brand image in the future. His information regarding each criterion will be spread in the SWOT matrix, based on how the Board feels for each criterion.

S

S1: 10 years' experience in the company
S2: High educational background
S3: Loved by everyone with whom he worked
S4: 50 years old

W

W1: Lack of initiative in learning new software and technologies
W2: Frequently taking free days that are not justified
W3: High ego

Strengths

Opportunities

Weaknesses

Threats

O1: 16 years' experience in another industry
O2: Connections with distributors in diverse industries.
O3: Involved in charities and supporting sport events.

T1: Personal connection with competitor's CEO
T2: Changing technologies are important to keep up with;

O

T

Figure 8: Tom's SWOT matrix

4.4.2. Dick

Dick is 60 years old with extreme experience in the company and a satisfactory experience in the same industry, but another company. He is in possession of both BA and MA and has high respect from his employees due to his leading by example and

knowledge. When making a thorough research on Dick, the Board has found out that occasionally he lacks the attention to detail, even though he has a great knowledge and is considered as a leader, he makes mistakes that often go unnoticed such as in grammar and spelling on documents and mail. Even though with his current position this might not be crucial, however with taking the CEO position of the company these errors might give a wrong impression to stakeholders and shareholders. Due to his advanced age and extreme experience, Dick has also been well known in the competitor companies. The Board has found out that Dick not long ago was offered a high position in a company of the same industry that would benefit greatly from his experience and knowledge for increasing its competitive advantage. Moreover as the technology advances, the company has started to implement many marketing strategies throughout blogging and the use of social media, however Dick has demonstrated a lack of knowledge and interest in learning, and due to his advanced age he believes that this are all children toys for the new age. This will mean that he will not be able to adapt easily on the new trends. Moreover, Dick has also been well known to coach new employees, who were very satisfied by his coaching. He has always been pushing towards making a coaching program once a year for employees, for achieving high moral and efficiency, that will provide the company to develop further. This program even though has not been implemented; the Board has agreed that it will benefit everyone if it takes place in the new strategic plan with the new leader.

S		W	
S1: 60 years old S2: 30 years' experience in the company S3: High educational background S4: Leading by example and knowledge		W1: Lack of knowledge in social media and blogging W2: Keen on making small errors W3: Low attention to detail	

Strengths

Opportunities

Weaknesses

Threats

O		T	
O1: 8 years' experience in different company but same industry O2: Good coach O3: Making a coaching program for new and existing employees		T1: Offered position in a competitive company. T2: Low adaptation on new technologies.	

Figure 9: Dick's SWOT matrix

4.4.3. Harry

Harry is younger than the other candidates and less experienced. He has five years' experience in the company and another four years outside of the company. His education is very preferable due to the recent BS and MBA, and the additional license in CPA. However, he is quite and only leading from his office, and is respected by his knowledge of finance. Harry has also been known as a person that lacks focus on some independent work due to his lack of experience and that he has difficulty in following and leading different tasks. Because he is young, he has the necessary knowledge in the use of social media and the learning capacity and eagerness to learn new software. He has also graduated as a valedictorian in his master program and has a potential to continue in doctorate studies. This will benefit greatly the company, due to the lack of education and ambition from the last CEO, this way Harry can also encourage other employees to improve themselves and their efficiency in the company. During his last meeting with the Board, Harry has also provided ideas of how to include the company better in the market environment by starting to involve in charity and university internship for high achieving students. This will provide a better brand name and obtaining hard-working students with remarkable background as new employees that will develop and improve the company's efficiency and implement new stronger strategic and marketing plans in the future. However, Harry has been using a lot of social media and often he has been posting photos and videos of evenings with friends. Even though he has a high educational background and is good at his job, that kind of use of social media could jeopardize the company's image. The company has a strict policy for the CEO position that, during the time of CEO leadership, the assigned CEO should restrain of publishing content on personal social media that will not benefit the overall image of the company. Years ago, an old CEO has made public photos of a night with friends that were not suited for a person that is leading one of the most famous companies in the industry, making the company lose millions in profits of the year, because shareholders, business partners and business customers did not believe that the company is working seriously and can provide them further improving and development.

S1: High knowledge and understanding of social media and technologies
S2: Able to encourage and support employees to improve their knowledge.
S3: Recent high educational background

W1: 30 years old
W2: 5 years' experience in the company
W3: Quite and leads from the office.
W4: Lacks focus on independent work.

Strengths

Opportunities

Weaknesses

Threats

O1: 4 years' experience in CPA firm.
O2: High knowledge in finance
O3: Ideas for improving the company image.

T1: Difficulty in following and leading different tasks.
T2: Not careful use of social media.

Figure 10: Harry's SWOT matrix

4.4.4. Tom, Dick, and Harry SWOT-AHP

Even though before we have considered the Tom, Dick, and Harry example with the AHP model, from the SWOT analysis demonstrated before we have found out additional information regarding the three candidates for the position. In the primary analysis of AHP, Dick has been chosen to be the best option for the leading position, followed by Tom, and Harry being the least desirable option. Now we will analyze the SWOT factors given above for each candidate to see if we can confirm the primary finding, or if there can be an alternative that can be considered based on the additional information given from the profound research on each candidate.

As we have seen from the manufacturing company in the example before, after the SWOT analysis has been conducted, the following step is to make pair-wise comparisons for the factors of SWOT with each other and after each factor of every SWOT group: strengths, weaknesses, opportunities and threats. The analysis will be done separately for each candidate and after we will consider which candidate has the best potential to become the next leader in the company based on the SWOT-AHP evaluation. The calculations step by step, using R studio can be found in Appendix C at the end of this paper.

Tom

SWOT Groups	S	W	O	T	Priority
Strengths (S)	1	4	1	4	0.414
Weaknesses (W)	¼	1	1/3	3	0.156
Opportunities (O)	1	3	1	2	0.331
Threats (T)	¼	1/3	½	1	0.098
CR = 0.15					

Table 28: Tom's pairwise comparison of SWOT factors

Strengths	S1	S2	S3	S4	Priority
S1: 10 years' experience in the company	1	4	3	7	0.548
S2: High educational background	¼	1	1/3	3	0.127
S3: Loved by everyone with whom he worked	1/3	3	1	5	0.270
S4: 50 years old	1/7	1/3	1/5	1	0.056
CR = 0.04					

Table 29: Tom's pairwise comparison of Strengths

Weaknesses	W1	W2	W3	Priority
W1: Lack of initiative in learning new software and technologies	1	2	3	0.540
W2: Frequently taking free days that are not justified	½	1	2	0.297
W3: High ego	1/3	1/2	1	0.163
CR = 0.008				

Table 30: Tom's pairwise comparison of Weaknesses

Opportunities	O1	O2	O3	Priority
O1: 16 years' experience in another industry	1	3	3	0.593
O2: Connections with distributors in diverse industries.	1/3	1	2	0.249
O3: Involved in charities and supporting sport events.	1/3	1/2	1	0.157
CR = 0.04				

Table 31: Tom's pairwise comparison of Opportunities

Threats	T1	T2	Priority
T1: Personal connection with competitor's CEO	1	4	0.8
T2: Changing technologies are important to keep up with	1/4	1	0.2
CR = 0.00			

Table 32: Tom's pairwise comparison of Threats

SWOT Group	Group Priority	SWOT factors	Factor priority	Overall priority of factor
Strengths	0.414	S1: 10 years' experience in the company	0.548	0.227
		S2: High educational background	0.127	0.052
		S3: Loved by everyone with whom he worked	0.270	0.112
		S4: 50 years old	0.056	0.023
Weaknesses	0.156	W1: Lack of initiative in learning new software and technologies	0.540	0.084
		W2: Frequently taking free days that are not justified	0.297	0.046
		W3: High ego	0.163	0.025
Opportunities	0.331	O1: 16 years' experience in another industry	0.593	0.196
		O2: Connections with distributors in diverse industries.	0.249	0.082
		O3: Involved in charities and supporting sport events.	0.157	0.052
Threats	0.098	T1: Personal connection with competitor's CEO	0.8	0.078
		T2: Changing technologies are important to keep up with	0.2	0.019

Table 33: Tom's Overall Priorities Scores

From the SWOT-AHP analysis for Tom we can see that the highest priority from the factors has Strengths – 41.4%, followed by Opportunities – 33.1%, Weaknesses – 15.6%

and Threats – 9.8%. From the analysis we can also see that the most important factor is "10 years' experience in the company" from the Strengths group with overall priority 22.7%. Following is the factor "16 years' experience in another industry" from the Opportunities group with priority 19.6%. Significantly lower priorities have the factors in Weaknesses and Threats. From Weaknesses the highest priority has the factor "Lack of initiative in learning new software and technologies" – 8.4%, and "Personal connection with competitor's CEO" – 7.8% from Threats.

Dick

SWOT Groups	S	W	O	T	Priority
Strengths (S)	1	3	1	2	0.334
Weaknesses (W)	1/3	1	¼	2	0.138
Opportunities (O)	1	4	1	4	0.420
Threats (T)	1/2	1/2	1/4	1	0.108
CR = 0.05					

Table 34: Dick's pairwise comparison of SWOT factors

Strengths	S1	S2	S3	S4	Priority
S1: 30 years' experience in the company	1	4	3	7	0.548
S2: High educational background	¼	1	1/3	3	0.127
S3: Leading by example and knowledge	1/3	3	1	5	0.270
S4: 60 years old	1/7	1/3	1/5	1	0.056
CR = 0.04					

Table 35: Dick's pairwise comparison of Strengths

Weaknesses	W1	W2	W3	Priority
W1: Lack of knowledge in social media and blogging	1	2	2	0.50
W2: Keen on making small errors	1/2	1	1	0.25
W3: Low attention to detail	1/2	1	1	0.25
CR = 0.00				

Table 36: Dick's pairwise comparison of Weaknesses

Opportunities	O1	O2	O3	Priority
O1: 8 years' experience in different company but same industry	1	4	5	0.683

O2: Good coach			1/4	1	2	0.120
O3: Making a coaching program for new and existing employees.			1/5	1/2	1	0.117
CR = 0.021						

Table 37: Dick's pairwise comparison of Opportunities

Threats	T1	T2	Priority
T1: Offered position in a competitive company.	1	6	0.857
T2: Low adaptation on new technologies.	1/6	1	0.143
CR = 0.00			

Table 38: Dick's pairwise comparison of Threats

SWOT Group	Group Priority	SWOT factors	Factor priority	Overall priority of factor
Strengths	0.334	S1: 60 years old	0.548	0.183
		S2: 30 years' experience in the company	0.127	0.042
		S3: High educational background	0.270	0.090
		S4: Leading by example and knowledge	0.056	0.019
Weaknesses	0.138	W1: Lack of knowledge in social media and blogging	0.50	0.069
		W2: Keen on making small errors	0.25	0.0345
		W3: Low attention to detail	0.25	0.0345
Opportunities	0.420	O1: 8 years' experience in different company but same industry	0.683	0.287
		O2: Good coach	0.120	0.050
		O3: Making a coaching program for new and existing employees.	0.117	0.049
Threats	0.108	T1: Offered position in a competitive company.	0.857	0.092
		T2: Low adaptation on new technologies.	0.143	0.015

Table 39: Dick's Overall Priorities Scores

Regarding Dick, we can conclude that the factor with highest priority is Opportunities – 42%, followed by Strengths – 33.4%, Weaknesses – 13.8% and Threats – 10.8%. The

factor with highest overall priority is "8 years' experience in different company but same industry" – 28.7% from the Opportunities, followed by "60 years old" – 18.3% from the Strengths group.

Harry

SWOT Groups	S	W	O	T	Priority
Strengths (S)	1	3	1	3	0.356
Weaknesses (W)	1/3	1	1/2	½	0.118
Opportunities (O)	1	2	1	5	0.391
Threats (T)	1/3	2	1/5	1	0.134
CR = 0.08					

Table 40: Harry's pairwise comparison of SWOT factors

Strengths	S1	S2	S3	Priority
S1: High knowledge and understanding of social media and technologies	1	1	4	0.458
S2: Able to encourage and support employees to improve their knowledge.	1	1	3	0.416
S3: Recent high educational background	1/4	1/3	1	0.126
CR = 0.008				

Table 41: Harry's pairwise comparison of Strengths

Weaknesses	W1	W2	W3	W4	Priority
W1: 30 years old	1	1	1/3	¼	0.119
W2: 5 years' experience in the company	1	1	2	1/3	0.209
W3: Quite and leads from the office.	3	½	1	½	0.210
W4: Lacks focus on independent work.	4	3	2	1	0.461
CR = 0.11					

Table 42:Harry's pairwise comparison of Weaknesses

Opportunities	O1	O2	O3	Priority
O1: 4 years' experience in CPA firm.	1	2	1/2	0.297
O2: High knowledge in finance	½	1	1/3	0.163
O3: Ideas for improving the company image.	2	3	1	0.540
CR = 0.008				

Table 43: Harry's pairwise comparison of Opportunities

Threats	T1	T2	Priority
T1: Difficulty in following and leading different tasks.	1	3	0.75
T2: Not careful use of social media.	1/3	1	0.25
CR = 0.00			

Table 44: Harry's pairwise comparison of Threats

SWOT Group	Group Priority	SWOT factors	Factor priority	Overall priority of factor
Strengths	0.356	S1: High knowledge and understanding of social media and technologies	0.458	0.163
		S2: Able to encourage and support employees to improve their knowledge.	0.416	0.148
		S3: Recent high educational background	0.126	0.045
Weaknesses	0.118	W1: 30 years old	0.119	0.014
		W2: 5 years' experience in the company	0.209	0.025
		W3: Quiet and leads from the office.	0.210	0.025
		W4: Lacks focus on independent work.	0.461	0.054
Opportunities	0.391	O1: 4 years' experience in CPA firm.	0.297	0.116
		O2: High knowledge in finance	0.163	0.064
		O3: Ideas for improving the company image	0.540	0.211
Threats	0.134	T1: Difficulty in following and leading different tasks.	0.75	0.1
		T2: Not careful use of social media.	0.25	0.033

For Harry, the factor group with highest priority is Opportunities – 39.1%, followed by Strengths – 35.6%, Threats – 13.4% and Weaknesses 11.8%. From the factors, "Ideas for improving the company image" from the group Opportunities has the highest overall priority score – 21.1%, followed by "High knowledge and understanding of social media and technologies – 16.3% from Strengths.

From the calculations demonstrated above we can conclude the following ranking of the pairwise comparison of the SWOT matrix:

Candidate	Rank	S	Rank	W	Rank	O	Rank	T
Tom	1	41.4%	1	15.6%	3	33.1%	3	9.87%
Dick	3	33.4%	2	13.8%	1	42%	2	10.8%
Harry	2	35.6%	3	11.8%	2	39.1%	1	13.4%

Table 46: Ranking of candidates based on SWOT priorities

We can conclude that Tom has the highest strengths from all candidates whereas Dick has the highest priority in opportunities. Harry even though has higher strengths than Dick, he also has higher priority than all of them regarding the threats. However, even though they are all similar in the overall priorities we can agree that Dick or Tom might be the better fit for the position based on the priorities given and the factors considered. The weaknesses they possess can be modified and improved, whereas Harry still possesses a higher threat.

5. Case Study: Nike Inc.

Nike is known to be one of the most famous sport-wear company, with shops all around the world and the largest worldwide suppliers for sport equipment among many sports businesses. The company through its products is showing its innovative nature, that gives its competitive advantage over the other brands. There is virtually no person in industrialized countries that has not heard of Nike Inc. Its success is mainly based on their excellent marketing strategy and innovation driven views. This corporation is involved in designing, manufacturing, developing, worldwide selling and marketing footwear, clothes, accessories, and services. Founded by Bill Bowerman and Philip H. Knight in 1962, Nike takes its name from the Greek goddess of victory. The company won over the American market by appearing with low costs and high quality and today is one of the world's leading innovator in sports footwear, clothing, equipment, and accessories. In the

table below we can see Nike's SWOT analysis. (http://www.nikeinc.com, 2016). (Gurel & Tat, SWOT Analysis: A theoretical Review, 2017)

Nike's growth strategy is based on the dedication and implementation of innovation in the company's mission and vision. From the first day of its existence, this company has been focused on finding and investing in new innovative ideas. As an example, we can take the most famous product "Air Jordan" basketball sneakers, which reformed the whole industry of basketball footwear, making every competitor try to create a similar design. With the world's change and direction towards sustainability, Nike does not lack any involvement. Even though it creates its products with over-the-top technology, also it implements materials that are renewable and recyclable. Another memorable innovation is the platform the company created, giving the customer the freedom to design his/her new sneakers on their own. Apart from innovative ideas regarding the shoes design, Nike has also been consistent in its technology innovation. Together with Apple, they had created the sneakers that can track distance, time, calories burnt and give notifications on the customer's iPod. With every technology breakthrough the company has achieved, an opportunity has arisen on the marketplace for future business relationships and innovation. (Flynn, 2015)

The company's mission is to create inspiration and innovation for athlete. The company believes that every person is and athlete. The vision of the company is to continue the innovative thinking for creating sport products that will help athletes to achieve their ability and to develop opportunities that will differentiate Nike from the competitors in order to create value. (Brohi, et al., 2016)

5.1.Nike's market segmentation

People all around the world are becoming more and more conscious for the importance of practicing sports. This has produced the increasement of revenue in the sport industry. In the sport wear market, consumers are investing in different types of athletic footwear, sport apparel, exercise equipment or licensed sport merchandise. Many of those customers are buying their products through online channels on the internet, which is gaining high growth rate, whilst others are still preferring the traditional shopping in stores. (Brohi, et al., 2016)

When creating and deciding on strategy, every company needs to evaluate the first basic steps, before continuing to the strategy creation. The same process is also for the high-achieving companies such as Nike Inc. The first thing the company needs to do is to

find its target market. Nike's target market is, demographically is both female and male, from the age of 15-55 years old. Also, based on the products the company develops, the target market procures athletes and sport enthusiasts. The targeting technique can provide the company opportunities for a variety of sponsorships with professional sport teams, celebrity athletes and college sport teams. The following step is investing in advertisement campaigns based on the target market and sponsorships. The "Just Do It" slogan, has proven to be one of the most successful and greatest advertisement of all time and until today is the main reason for profits. Nike believes that a big investment in advertisement is what will create a competitive advantage and a larger quantity of audience. (Flynn, 2015) I believe we can all agree that until now, Nike has done a good job in marketing strategy, by providing the public with creative campaigns with both young and professional athletes.

With these two being the most important steps in creating the marketing strategy, every company also needs to keep up the novelty that happen in the world. One of the most important is being the constant improvements in the internet and continuous developing and innovating social media. Nike has also seen the possibility these innovations provide for the growth of the business. Nike has always created interesting and big television campaign, however with the introduction of social media, the company has seen the future possibility these platforms have to offer. With every new product launch, the company has learned that the majority of the target market is spending their time on social media. This instead of seeing it as a bump on the road, the company has seen the future opportunities. By investing in digital marketing, the company was able to make communication with both existing and future customers. Additionally, this has given the possibility for the company to reach an even bigger audience all around the world. (Flynn, 2015) The sound of this even though is perfect, the main attribute is that the costs that a company must spend on digital marketing are way less than the costs for a traditional TV campaigns, and still the result is better.

Even though Nike Inc, holds high position in the sport wear industry, the company's objective is to remain leader in the sport market and continue to increase its market share. Also based on the company's vision and mission, the goal includes creating high-quality and innovative products. (Brohi, et al., 2016)

Before analyzing the marketing strategies in which the company should invest for achieving its goal, we will take a look at the marketing mix.

5.2. Marketing mix

Due to the high market position, it is obvious that Nike is in possession of strong marketing mix, which is based on taking advantage over its competitors.

Product

The company offers a wide range of sports apparel. The difference goes from shoes, clothing until accessorize and equipment. The first product in which the company was mainly focused were the sport sneakers. Nike has started from offering running shoes and through time has developed different type of shoes, providing the right footwear for almost every sport. Additionally, it had also created the sub-brand NIKEiD, where customers have the possibility to create their own design on any type of shoes they wish. They can choose texture, pattern, material and colors. Also, there is the option to purchase pre-designed shoes. (Brohi, et al., 2016)

Apart from the shoes, Nike has also invested a lot in creating the right clothing, accessorize and equipment for many sport categories. They offer I wide range of sweat-resistant clothing, that provide better feel throughout the time of exercise, to accessorize and equipment such as phone holders, sweat bands, hats, balls and many more.

Pricing

Nike has a pricing strategy that benefits in the competitive advantage. The pricing is based on the target market, seeing it as a premium segment. Nike controls the cost by using the vertical integration, giving the possibility to participate in different channels or take role in the operational level. However, being a famous brand, many customers are prepared to pay more for obtaining the quality product the company offers. Competitors often use lower prices to obtain competitive advantage, however, Nike is using Cost Based/Value Based Pricing. Wearing expensive clothes is seen as fashion and making a statement, so Nike has implemented them in its target market. Based on this, the target market that needs to be reached have the financial capability to obtain these products. The current customers that are served, have often said that they will not change brand, and are willing to pay the extra cost for the quality of the product and the service they receive. This means that Nike will likely continue to use this strategy in the future. (Brohi, et al., 2016)

Place/Distribution

The products this company offers can be found in multi brand stores and exclusive Nike stores worldwide. There are more than 20.000 stores located in the US, and also the

company sells its products in around 200 countries. In respect to the international market, the company, apart from the exclusive Nike shops, also uses independent distributors, licenses and subsidies to sell its products. Moreover, the company owns manufacturing facilities throughout the world and Asia, as well as customer service and other operational units. Also the company uses outsourcing strategy with China and other developing countries in Asia. (Brohi, et al., 2016)

Promotion

Nike owns a very effective communication mix, making it able to communicate with existing customers and at the same time obtain new customers. The company was able to communicate its brand through every possible channel that exists. From print advertisement that even though they are seen as simple, they provide a strong message, to every possible virtual advertisement. In its promotion, the company often uses celebrities or billboards to make their audience known with the offer. Also, the company is very well known for its sponsorship capabilities in famous sport events, for creating brand awareness. The high revenues that the company has are mainly a result from the brand power created through these promotional tools. (Brohi, et al., 2016)

5.3. SWOT Analysis

The SWOT analysis being one of the most important strategic tool for decision making is essential to be provided before continuing forward with deciding and implementing any strategy. The analysis will help decision-makers to observe what are the most important factors that the company possesses for implementing a right strategy. Even though Nike is one of the most famous brands, and diverse strategies can be implemented easily, since the competitive advantage and the brand image are already established, still decision-makers should observe the factors before acting upon. From the table below, can be seen that the company has much more strengths than weaknesses, whereas the opportunities are equal regarding the threats

S

S1: Globally known sportswear brand with strong reputation for high quality products.
S2: Very competitive with aversion towards competitors. According to Nike's founder, business is like war but without bullets.
S3: Use of contract factories instead of owning them.
S4: High focus on R&D regarding the evolution of an innovative product range.
S5: The manufacturing policy: make a high-quality product at the lowest price. If the price of the product rises due to price hike, then the production process is made cheaper by changing the place of production.
S6: Strong and innovative marketing strategy by sponsoring famous athletes and creating ads that can take part of the pop culture.

Strengths

Opportunities

O1: Being a fashion brand as well as sports brand. Consumers buy the products to make a fashionable statement. This become opportunity because customers would start changing the products more often with the change of fashion, that is before wearing out the product.
O2: Additional accessories such as sunglasses and jewelry create the opening to obtain high profits.
O3: The brand has the opening to overtake emerging markets such as China and India that have a new richer generation of customers.
O4: Nike together with Apple created a sensor for its shoes to track the distance and calories burned during a customer's exercise. As well as bands for the Apple Watches and an application compatible with iOS and Android, to track running distance and burned calories.

W

W1: Even though the company has a wide spectrum of sport products, the income depends on the footwear market share. This makes the company vulnerable if the market share corrodes.
W2: Because of the price sensitivity of the retail sector, many retailers enter the market with a cheaper offer that creates a price competition pressure.
W3: Due to not disclosing information regarding the partnering companies, Nike was charged with the violation of overtime and minimum wage rates in Vietnam, because of having poor working conditions, and for exploiting cheap workforce overseas.
W4: For the production of soccer balls, Nike was reported to be using a child labor in Pakistan and Cambodia.

Weaknesses

Threats

T1: As any other global brand Nike buys and sells products from different countries in different currencies, which makes the costs and margins not stable in long term. This might mean that the manufacturing/selling is with loss.
T2: High competitiveness in the sports footwear market.
T3: The retail sector apart from being price sensitive is also price competitive. Customers are able to find better deals in the store next door for the same or very similar product. That way they are able to buy the cheaper of the two.
T4: The company is in a constant struggle to maintain eco-friendly reputation

T

Figure 11: Nike's SWOT matrix[1]

From the matrix, we can conclude that the company's success factors of Nike are the following:

- Provides customer satisfaction by offering custom products with high quality.
- Understands the needs people, especially athletes have.
- Easy access to the products.
- Offers online shopping.

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[1] http://www.marketingteacher.com/nike-swot/; https://mba-tutorials.com/nike-swot-analysis/

- Successful collaboration with other companies, such as Apple.
- High budget in marketing.
- The company can create new products with minimal risk.
- Outstanding market position.

On the other hand, regarding threats and weaknesses the company has the following issues:

- Negative media reputation.
- Poor environmental and factory conditions.
- Minimum wage workers. (Brohi, et al., 2016)

Additionally, the factors are based on the following market trends:

- Creating word of mouth, by developing advertisement strategy with professional athletes.
- Expansion of target market to maintain competitive advantage.
- Maintain the brand, due to the willingness of customers to pay extra only because of the famous slogan "Just Do It" and because of the quality and style Nike offers.
- Introducing digital sports and e-commerce.
- Nike+ collaboration with Apple.
- Launching innovative products with collaboration of famous athletes, event sponsorships, and innovative advertisements.
- Trying its best to maintain high position on the market with quality products associated with fashion trends, due to the increasing in competition. (Brohi, et al., 2016)

5.4. Strategies to be implemented

From the SWOT analysis and the already established fame, the company is already achieving and maintaining its competitive position. However, the market is in constant changes, and the threats and weaknesses can easily become an issue. For continuing its place on the market, the company, as any other should regularly implement additional and improved strategies. In this dissertation we will observe if the company can implement the following marketing strategies for improving its position and creating value for its customers.

Strategy 1: Expansion in non-served international markets – expanding its production and selling in emerging markets

Strategy 2: Individual marketing – give the possibility to customers to create their own footwear

Strategy 3: Buzz marketing – making contract with influencers to spread information about the products

Strategy 4: Strategic alliances – create connections with diverse sportwear shops

Strategy 5: Social media marketing - expand the use of social media to promote new launches of products and additional special offers. (Brohi, et al., 2016)

5.5.Nike's SWOT-AHP model

For a better understanding of how the SWOT analysis can provide better information regarding the importance of the strategies considered, a SWOT-AHP model will be conducted. The model will be applied in a way that the external and internal factors will be evaluated using the AHP model by Saaty. With this model the factors of the SWOT matrix will be evaluated by a pairwise comparison, first as a group (Strengths, Weaknesses, Opportunities, and Threats), and afterwards with each other from the same group. This model will provide a more quantitative observation of the result. Since the SWOT analysis is mainly giving theoretical overview of the factors influencing the company and its position on the market, the AHP model will provide insights of how much these factors are influencing and which of them are more important than the others. The analysis will be conducted in three steps before deciding upon which strategy is best. The first step is to conduct a pairwise comparison on the overall SWOT matrix, the second one is to conduct a pairwise comparison on every factor with each other in each group. After the pairwise comparison is concluded, the last step is to evaluate how each factor benefits for every strategy offered. The evaluation will be done by using the Fundamental Scale for pairwise comparison. However, in this case the scale will be with limited range, form 1-5 based on the higher importance of the factors. The objective of this case study is to provide a ranking of the factors included in the SWOT analysis. This ranking can give the decision-maker information regarding which factor from which group is more important in respect to the others. From here, the decision-making process will be made easier, because it will be stated clearly from where does the company is facing threats, or which weaknesses it should assess for achieving better competitive advantage. The evaluation of this case study will be done by me. The grading system for the pairwise comparison will be based on my personal opinion, knowledge and the materials provided in this dissertation.

SWOT Groups	S	W	O	T	Priority
Strengths (S) - w_S	1	2	1	3	0.347
Weaknesses (W) – w_W	1/3	1	½	½	0.123
Opportunities (O) – w_O	1/3	1	½	½	0.383
Threats (T) – w_T	1/3	2	¼	1	0.148
CR = 0.03					

Table 47: Nike's pairwise comparison of SWOT factors

Strengths	S1	S2	S3	S4	S5	S6	Priority
S1: Globally known	1	2	1/2	1/4	1/3	1/3	0.082
S2: Very competitive	½	1	4	1/2	¼	½	0.108
S3: Use of contract factories instead of owning	2	¼	1	1/3	1/4	¼	0.070
S4: High focus on R&D	4	2	3	1	2	2	0.288
S5: High quality for the lowest price	3	4	4	1/2	1	3	0.280
S6: Strong and innovative marketing strategy	3	2	4	½	1/3	1	0.170
CR = 0.12							

Table 48:Nike's pairwise comparison of Strengths

Weaknesses	W1	W2	W3	W4	Priority
W1: Income depends on footwear	1	3	1/5	1/7	0.094
W2: Competitors with cheaper prices	1/3	1	1/6	1/8	0.049
W3: Violation of overtime and minimum wage	5	6	1	1	0.393
W4: Use of child labor for ball production	7	8	1	1	0.463
CR = 0.04					

Table 49: Nike's pairwise comparison of Weaknesses

Opportunities	O1	O2	O3	O4	Priority
O1: Fashion brand as well as sport brand	1	2	1/4	2	0.201
O2: Additional accessorize provide higher profit	½	1	¼	3	0.163
O3: Opportunity to overtake emerging markets	4	4	1	3	0.534
O4: Collaboration with Apple	1/2	1/3	1/3	1	0.101

Table 50:Nike's pairwise comparison of Opportunities

Threats	T1	T2	T3	T4	Priority
T1: Not stable costs and margins on long run	1	2	4	3	0.496
T2: Highly competitive sport footwear market	½	1	2	3	0.209
T3: Price competitive retail sector	1/4	½	1	4	0.200
T4: Struggle to maintain eco-friendly	1/3	1/3	¼	1	0.094

CR = 0.008

Table 51: Nike's pairwise comparison of Threats

SWOT Group	Group Priority	SWOT factors	Factor priority	Overall priority of factor
Strengths	0.347	S1: Globally known (w_{S1})	0.082	0.028
		S2: Very competitive (w_{S2})	0.108	0.037
		S3: Use of contract factories instead of owning (w_{S3})	0.070	0.024
		S4: High focus on R&D (w_{S4})	0.288	0.099
		S5: High quality for the lowest price (w_{S5})	0.280	0.097
		S6: Strong and innovative marketing strategy (w_{S6})	0.170	0.059
Weaknesses	0.123	W1: Income depends on footwear (w_{W1})	0.094	0.011
		W2: Competitors with cheaper prices (w_{W2})	0.049	0.006
		W3: Violation of overtime and minimum wage (w_{W3})	0.393	0.048
		W4: Use of child labor for ball production (w_{W4})	0.463	0.057
Opportunities	0.383	O1: Fashion brand as well as sport brand (w_{O1})	0.201	0.077
		O2: Additional accessorize provide higher profit (w_{O2})	0.163	0.062

			0.534	0.204
		O3: Opportunity to overtake emerging markets (w_{O3})	0.534	0.204
		O4: Collaboration with Apple (w_{O4})	0.101	0.038
Threats	0.148	T1: Not stable costs and margins on long run (w_{T1})	0.496	0.073
		T2: Highly competitive sport footwear market (w_{T2})	0.209	0.031
		T3: Price competitive retail sector (w_{T3})	0.200	0.029
		T4: Struggle to maintain eco-friendly (w_{T4})	0.094	0.014

Table 52: Nike's Overall Priorities Scores

From the calculations demonstrated above we can conclude that Nike's opportunities (38.3%) and strengths (34.7%), from the SWOT analysis are holding the highest priority, making them the most important when considering future strategies. When considering every factor separately, we can see that from the strengths group the highest priority has the factor "*High focus on R&D*" – *9.9%,* followed by *"High quality or the lowest price"* – *9.7%;* from the weaknesses is the *Use of child labor for ball production* – *5.7%,* followed by *"Violation of overtime and minimum wage"* – *4.8%;* from opportunities is "*Opportunity to overtake emerging markets*" – *20.4%;* whereas from threats the highest priority has the factor "*Not stable costs and margins on long run*" – *7.3%.*

The AHP model is helping to rank the factors based on the given priority for the decision-making process. The results are showing that Nike Inc. should mainly focus on its strengths and opportunities, as a source to achieve the company's vision. However, even though weaknesses and threats are not possessing high priority in the decision process, they still represent a warning from which might emerge issues. Having these observations in mind, in the tables below will be evaluated how each factor of the four groups has efficiency over the strategies that need to be implemented.

$U_{Si,j}$	Strength-strategy efficiency					
Strategy	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Expansion in non-served international markets	5	5	5	3	5	5

Individual marketing	5	5	4	5	5	5
Buzz marketing	5	5	2	3	5	5
Strategic alliances	5	5	4	5	5	5
Social media marketing	5	3	2	5	5	5

Table 53: Efficiency of strengths-strategy

$U_{Wi,j}$	Weaknesses-strategy efficiency			
Strategy	**W1**	**W2**	**W3**	**W4**
Expansion in non-served international markets	5	5	3	3
Individual marketing	5	2	1	1
Buzz marketing	5	3	2	2
Strategic alliances	5	3	3	2
Social media marketing	5	5	4	4

Table 54: Efficiency of weaknesses-strategy

$U_{Oi,j}$	Opportunities-strategy efficiency			
Strategy	**O1**	**O2**	**O3**	**O4**
Expansion in non-served international markets	5	5	5	5
Individual marketing	5	5	5	2
Buzz marketing	5	5	5	5
Strategic alliances	4	4	5	5
Social media marketing	5	5	4	5

Table 55: Efficiency of opportunities-strategy

$U_{Ti,j}$	Threats-strategy efficiency			
Strategy	**T1**	**T2**	**T3**	**T4**
Expansion in non-served international markets	4	5	5	2
Individual marketing	5	5	5	3
Buzz marketing	5	5	5	3

Strategic alliances	3	5	5	1
Social media marketing	5	5	5	1

Table 56: Efficiency of threats-strategy

For obtaining the global value of each strategy we will use Equation 5, described above. The step by step calculation of each equation can be found in Appendix D.

$$V_j = 0.347 \sum_{i=1}^{i=6} w_{Si} U_{Si,j}$$
$$+ 0.123 \sum_{i=1}^{i=4} w_{Wi} U_{Wi,j} + 0.383 \sum_{i=1}^{i=4} w_{Oi} U_{Oi,j} + 0.148 \sum_{i=1}^{i=4} w_{Ti} U_{Ti,j}$$

Equation 8

Global evaluation of strategies	
Strategy	**Global value**
Expansion in non-served international markets	4.472
Individual marketing	4.391
Buzz marketing	4.369
Strategic alliances	4.352
Social media marketing	4.485

Table 57: Global evaluation of strategies

5.6. Results and decision

The results are made only with one decision maker, and they can give different priorities and global value if evaluated by another person, or group of experts. However, at this point, from the global evaluation of the strategies, the strategy "*Expansion in non-served international markets*" has the highest global value, and immediately after is the "*Individual marketing*". Based on this, Nike should mainly focus its attention on implementing these strategies. However, it can also be seen that the rest of the strategies are perhaps not that different from the first two. This mean that also these strategies can be considered, with less attention at the moment, but they can still provide a positive feedback by implementing them in the future. I agree with the results obtained from the model. From the information provided with the SWOT analysis I believe that these strategies, could easily be implemented in the business and marketing plan of the company and will provide fast positive feedback. Since the values for each strategy are

similar, the company can start the changing process with any one of them. I strongly agree for implementing first the *"Expansion in non-served international markets"*, however even though the individual marketing can provide valuable results, I believe that simultaneously should also be implemented the Social media marketing strategy. This way the company can benefit from the social media platforms to advertise and spread the word of the new changes.

Conclusion

The main focus of this dissertation is to provide information and proof of how the AHP model can be used complementary to the SWOT analysis for achieving better results for choosing the right marketing strategy. Throughout the paper, practical examples were provided for demonstrating how both analysis work separately as well as implemented together. From the example of the manufacturing company in Turkey, the data provided is proving that both analysis when implemented together can better assess the market position in which the company takes place. To prove this point even further, the most famous AHP example for decision making, Tom, Dick, and Harry, has been examined even further. Even though, the case with the Board choosing the right candidate for the leadership position is an excellent example of the use of AHP model, it was analyzed even further, by giving additional data for each candidate and creating a SWOT analysis. Furthermore, an assessment of the SWOT-AHP model is provided from which it was concluded that the primary solution to the case was in fact true, but the results also provide an additional point of view, that instead of Dick, also Tom can be considered to take the position. From this example it can be concluded that the two frameworks might give the same answer together, as those when done separately, but more important, when the hybrid model is provided the solution is more open to discussion. This model is even further developed by additionally providing another evaluation, of which strategy can be best suited when given a SWOT analysis of a company and evaluated by the AHP model.

From the case study proposed we can conclude that Nike has a market share of more than 40% with high competitive advantage, based on the early stages of market positioning, Nike's marketing team and founders have realized that the key to success is to create an offer with advanced products and build a strong brand image. From the SWOT analysis provided it is easy to understand that Nike's strength comes mostly from the popularity of the brand. Also, the company is constantly trying and achieving to provide an offer to its customers that will satisfy their needs. (Flynn, 2015)

In the case study it is demonstrated how the AHP model as a complementary process to the SWOT analysis can provide better decision support, that can be evaluated by every manager or marketer in the company. The benefits this model provides are the flexibility and variety of options than can be achieved from the results. In the case study only one decision-maker was taken into consideration, basing the priorities on personal feeling and knowledge. However, the possibilities from this model can be broaden, for

example just by adding another decision-maker. When applying further research, and more opinions the results can change and become better. The quantitative values given by the AHP are providing a better system for understanding the theoretical results from the SWOT. Using a mathematical process can be more useful in choosing the right strategy than only providing a decision based on a theoretical review form an analysis. When basing a decision only on one approach I believe provides many uncertainties regarding the assessment of the results and their implementation. When applying the AHP model we are providing a more profound analysis to the SWOT. This way, the general factor groups are evaluated separately, to give them priority. From these results the marketer can immediately see which group is dominating and which not, and from this will know were to focus and relocate resources. Moreover, SWOT is providing additional factors in each group, and when also them calculated separately, it can be easily concluded, which factor from which group is more important than the other.

The AHP as a process alone, is difficult to be implemented for resolving marketing problems. However, when this mathematical process is applied complementary to another marketing strategy analysis, the results could provide better decisions and strategy implementation. (Davies M. , Adaptive AHP: a review of marketing applications with extensions, 2001)

The results from the SWOT, when given weighted priorities has created an approach that can support and evaluate the critical decisions. However, this strategy can be used in many different strategy alternatives for an organization. (Gorener, Toker, & Ulucay, 2012)

The combination of these two frameworks is showing that the decision-makers can obtain better results by implementing it more frequently in the future when developing business and marketing plans. Some limitations, such as personal opinions, and poor knowledge of the factors by the decision-makers, do exist, but they can easily be overcome by providing additional data to the model such as interviews and surveys to experts, customers and etc.

Table of figures

Bibliography

(n.d.). Retrieved from https://www3.diism.unisi.it/~mocenni/Note_AHP.pdf

Al-Dawalibi, A., Al-Dali, I. H., & Alkhayyal, B. A. (2020). Best marketing strategy selection using fractional factorial design with analytic hierarchy process. *MethodsX*, 1-3.

Analytic hierarchy process – leader example. (2020). Retrieved from Wikipedia Free Encyclopedia:
https://en.wikipedia.org/wiki/Analytic_hierarchy_process_%E2%80%93_leader _example

Borislav Borissov. (2015). Deficincies in the implementation of SWOT analysis. *Economic Archive*, 1-2.

Brohi, H., khubchandani, R., Prithiani, J., Abbas, Z., Bhutto, A., & Chawla, S. (2016). *Strategic Marketing Plan of Nike.* Institute of Science and Technology (SZABIST). Karachi: SSRN. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2760631

Caprarescu, Gheorghita; Stancu, Daniela Georgiana; Aron, Georgina. (2013). The SWOT Analysis Between Myth and Reality. *Knowledge Horizons*, 38-39.

Chernev, A. (2014). *Strategic Marketing Management* (Eighth ed.). Chicago: Cerebellum Press.

Davies, M. (2001). Adaptive AHP: a review of marketing applications with extensions. *European Journal of Marketing*, 874.

Davies, M. (2001). Adaptive AHP: a review of marketing applications with extensions. *European Journal of Marketing* , 872-893.

Davies, M. A. (1994). Using the AHP in marketing decision-making. *Journal of Marketing Management*.

Dixon-Ogbechi, B. N., Haran, E. M., & Aiyeku, J. F. (n.d.). *Application of the Analytic Hierarchy Process in Determining Relative Importance of Relationship Marketing Variables for Companies in the Nigerian Food and Beverage Industry.*

Farivar, S., Wang, F., & Yuan, Y. (2020). Opinion leadership vs. para-social relationship: Key factors in influencer marketing. *Journal of Retailing and Consumer Services*, 1-2.

Flynn, P. (2015). *Nike Marketing Strategy: A Company to Imitate.* University at Albany, State University of New York. Albany: Scholars Archive. Retrieved from https://scholarsarchive.library.albany.edu/honorscollege_accounting/14/

Görener, A. (2016). A SWOT-AHP Approach for Assessment of Medical Tourism Sector in Turkey. *Alphanumerical Journal*, 159.

Gorener, A., Toker, K., & Ulucay, K. (2012). Application of Combined SWOT and AHP: A Case Study for a Manufacturing Firm. *Procedia*, 5-9.

Gurel, E., & Tat, M. (2017). SWOT Analysis: A theoretical Review. *The Journal of International Social Research, 10*(51), 995-1006.

GÜREL, E., & TAT, M. (2017). SWOT ANALYSIS: A THEORETICAL REVIEW. *The Journal of International Social Research, 10*(51), 1.

Gurel, E., & Tat, M. (2017). SWOT ANALYSUS: A THEORETICAL REVIEW. *The Journal of International Social Research, 10*(51), 999-1000.

Herhausena, D., Miočević, D., Morganc, R. E., & Kleijnene, M. H. (2020). The digital marketing capabilities gap. *Industrial Marketing Management*, 276-277.

Hong, P. V., & Nguyen, T.-T. (2020). Factors affecting marketing strategy of logistics business - Case of Vietnam. *The Asian Journal of Shipping and Logistics*, 212-213.

Hou, Z., Ma, K., Wang, Y., Yu, J., Ji, K., Wang, Y., & Abraham, A. (2020). Attention-based learning of self-media data for marketing intention detection. *Engineering Application of Artificial Intelligence*, 1-2.

Hunt, S. D., & Madhavaram, S. (2019). Adaptive marketing capabilities, dynamic capabilities, and renewal competences: The "outside vs. inside" and "static vs. dynamic" contraversies in strategy. *Industrial Marketing Management*, 129-130.

Kangas, J., Pesonen, M., Kurttila, M., & Kajanus, M. (2001). A'WOT: Integrating the AHP with SWOT analysis . *ISAHP*, 198-198.

Key, T. M., & Czaplewski, A. J. (2017). Upstream social marketing strategy: An integrated marketing communications approach. *Science Direct*, 325-327.

Key, T. M., & Czaplewski, A. J. (2017). Upstream social marketing strategy: An integrated marketing communications approach. *Science Direct*, 328-329.

Kotler, P. (2000). *Marketing Management.* Phoenix: Prentice Hall.

Kotler, P. (2002). *Marketing, Management, Millenium Edition* (10th ed.). New Jersey: Pearson Custom Publishing.

Kotler, P., & Keller, K. L. (2012). *Marketing Management.* New Jersey: Prentice Hall.

Kotler, P., Armstrong, G., Harris, L. C., & He, H. (2020). *Principles of Marketing.* Harlow: Pearson Education Ltd.

Lee, Seungbum; Ross, Stephen D. (2012). Sport sponsorship decision in making a global market: An approach of Analytical Hierarchy Process (AHP). *Sport, Business and Management*, 157-158.

Lee, Seungbum; Walsh, Patrick. (2010). SWOT and AHP hybrid model for sport marketing outsourcing using a case of intercollegiate sport. *Sport Management*, 362.

Lee, Seungmub; Walsh, Patrick. (2010). SWOT and AHP hybrid model for sport marketing outsourcing using a case of intercollegiate sport. *Sport Management Review*, 363.

Man Li, Rita Yi; Kwong, Wing Chau; Fanjie Zeng, Frankie. (2019). Ranking of risks for the existing and new building works. *International Sustainability 10: 2863*, 3.

Mayes, G. R. (n.d.). *Logical Consistency and Contradiction.* Retrieved from California State University : https://www.csus.edu/indiv/m/mayesgr/phl4/handouts/phl4contradiction.htm

Mehmood, F., Hassannezhad, M., & Abbas, T. (2013). Analytical investigation of mobile NFC adaptation with SWOT-AHP approach: A case of Italian Telecom. *Procedia Technology*, 537-540.

Olson, E. M., Olson, K. M., Czaplewski, A. J., & Key, T. M. (2020). Business strategy and the management of digital marketing. *Science Direct*, 1-8.

Oreski, Dijana. (2012). Strategy development by using SWOT - AHP. *TEM Journal, 1*, 284.

Oreski, Dijana. (2012). Strategy development by using SWOT - AHP. *TEM Journal, 1*, 285-287.

Osuna, E. E., & Aranda, A. (2007). COMBINING SWOT AND AHP TECHNIQUES FOR STRATEGIC PLANNING. *ISHAP*, 2-3.

Patel, P. C., Feng, C., & Guedes, M. J. (2021). Marketing capabilities and new venture survival: The role of marketing myopia. *Industrial Marketing Management*, 307-315.

Saaty, Thomas L. (2006). *Fundamentals of Decision Making and Priority Theory.* Pittsburgh, Pennsylvania: RWS Publications.

Saaty, Thomas L. (2008). Relative Measurement and its Generalization in Decision Making: Why Pairwise Comparisons are Central in Mathematics for the Measurement of Intangible Factors – The Analytic Hierarchy/Network Process. *Review of the Royal Academy of Exact, Physical and Natural Sciences, Series A: Mathematics (RACSAM)*, 251-318.

Saaty, Thomas L.; Kearns, Keniv P. (1986). *Analytical Planning: The Organization of Systems.* Headington Hill Hall, Oxford, England: Pergamon Press Ltd.

Saaty, Thomas L.; Kearns, Kevin P. (1985). *Analytical planning: the organization of systems.* Headington Hill Hall, Oxford, England: Pergamon Press Ltd.

Seungbum Lee, S. D. (2012). Sport sponsorship decision making in a global market. An approach of Analytical Hierarchy Process (AHP). *Sport, Business and Management: An international Journal*, 158.

Singh Alok Kumar. (2014). Competitive service quality benchmarking in airline industry using AHP. *Benchmarking: An International Journal*, 774.

T.Rust, R. (2019). The future of marketing. *International Journal of Research in Marketing*, 15-25.

Varadarajan, R. (2020). Customer information resources advantage, marketing strategy and business performance: A market resource based view. *Industrial Marketing Management*, 90-93.

Verboncu, I., & Condurache, A. (2016). Diagnostics vs. SWOT Analysis. *Review of International Comparative Management*, 118-120.

Vlados, C., & Chatzinikolau, D. (2019). Towards a Restructuration of the Conventional SWOT Analysis. *Business and Management Studies*, 76.

Wind, Y., & Saaty, T. L. (1980). Marketing applications of the Analytic Hierarchy Process. *Management Science* , 641-657.

APPENDIX A: TOM, DICK AND HARRY AHP EXAMPLE

Education

> *A <- matrix(c(1,3,1/5,1/3,1,1/7,5,7,1),3,3,byrow=T)*

> *colnames(A)<-c("Tom","Dick","Harry")*

> *rownames(A)<-c("Tom","Dick","Harry")*

> *A*

	Tom	Dick	Harry
Tom	1.0000000	3	0.2000000
Dick	0.3333333	1	0.1428571
Harry	5.0000000	7	1.0000000

> *eigen(A)*

eigen( ) decomposition

$values

[1] 3.0648876+0.0000000i -0.0324438+0.4447702i -0.0324438-0.4447702i

$vectors

	[,1]	[,2]	[,3]
[1,]	0.2482550+0i	-0.12412750+0.21499514i	-0.12412750-0.21499514i
[2,]	0.1066861+0i	-0.05334305-0.09239287i	-0.05334305+0.09239287i
[3,]	0.9628019+0i	0.96280192+0.00000000i	0.96280192+0.00000000i

> *val<-Re(eigen(A)$value[1])*

> *val*

[1] 3.064888

> *vec<-Re(eigen(A)$vectors[,1])*

> *vec*

[1] 0.2482550 0.1066861 0.9628019

> *v<-vec/sum(vec)*

> *v*

[1] 0.18839410 0.08096123 0.73064467

> *CI=(val-3)/2*

> *CI*

[1] 0.03244379

> *CR=CI/0.58*

> *CR*

[1] 0.05593757

For each eigen-value we have the corresponding eigenvector. In order to extract them we are taking out the real part of the values due to the fact that they are complex numbers. We are taking out the first eigen value, since it is the only positive result, and afterwards we are extracting the first column of the eigen vector, that corresponds with eigenvalue [1]. It is needed that the priorities sum to 1, which means that we need to normalize the values of the vector that we have extracted. The normalized priorities are giving us the full ranking of the three alternatives: Tom = 18.8%, Dick = 8.1% and Harry = 73.1%. From this we can see that Harry is strongly preferred in education to the others. We can conclude that this solution is correct by checking the inconsistency which, as mentioned before, the CI needs to be less than 10% for the result to be acceptable. The CI is 0.032444 and this is smaller than 10%, regarding the Monte Carlo table expressed in Table 2 in respect to n = 3, 0.058 × 0.1 ≈ 0.06.

Now we will do the same for the following alternatives:

Experience

> *A <- matrix(c(1,1/4,4,4,1,9,1/4,1/9,1),3,3,byrow=T)*

> *colnames(A)<-c("Tom","Dick","Harry")*

> *rownames(A)<-c("Tom","Dick","Harry")*

> *A*

	Tom	Dick	Harry
Tom	1.00	0.2500000	4
Dick	4.00	1.0000000	9
Harry	0.25	0.1111111	1

> *eigen(A)*

eigen( ) decomposition

$values

[1] 3.0368955+0.0000000i -0.0184478+0.3342268i -0.0184478-0.3342268i

$vectors

	[,1]	[,2]	[,3]
[1,]	0.2887420+0i	-0.14437099+0.25005790i	-0.14437099-0.25005790i

[2,] 0.9534050+0i   0.95340504+0.00000000i   0.95340504+0.00000000i

[3,] 0.0874465+0i -0.04372325-0.07573089i   -0.04372325+0.07573089i

> val<-Re(eigen(A)$value[1])

> val

[1] 3.036896

> vec<-Re(eigen(A)$vectors[,1])

> vec

[1] 0.2887420 0.9534050 0.0874465

> v<-vec/sum(vec)

> v

[1] 0.21716561 0.71706504 0.06576935

> CI=(val-3)/2

> CI

[1] 0.01844777

> CR=CI/0.58

> CR

[1] 0.0318065

The normalized priorities are giving us the full ranking of the three alternatives: Tom = 21.71%, Dick = 71.7% and Harry = 6.57%. From this we can see that Dick is strongly preferred in experience from the others.

Charisma

> A <- matrix(c(1,5,9,1/5,1,4,1/9,1/4,1),3,3,byrow=T)

> colnames(A)<-c("Tom","Dick","Harry")

> rownames(A)<-c("Tom","Dick","Harry")

> A

	Tom	Dick	Harry
Tom	1.0000000	5.00	9
Dick	0.2000000	1.00	4
Harry	0.1111111	0.25	1

> eigen(A)

eigen() decomposition

$values

[1] 3.0712653+0.0000000i -0.0356327+0.4664815i -0.0356327-0.4664815i

$vectors

	[,1]	*[,2]*	*[,3]*
[1,]	*0.96432143+0i*	*0.96432143+0.00000000i*	*0.96432143+0.00000000i*
[2,]	*0.25167938+0i*	*-0.12583969+0.21796074i*	*-0.12583969-0.21796074i*
[3,]	*0.08210762+0i*	*-0.04105381-0.07110729i*	*-0.04105381+0.07110729i*

> val<-Re(eigen(A)$value[1])

> val

[1] 3.071265

> vec<-Re(eigen(A)$vectors[,1])

> vec

[1] 0.96432143 0.25167938 0.08210762

> v<-vec/sum(vec)

> v

[1] 0.74286662 0.19388163 0.06325174

> CI=(val-3)/2

> CI

[1] 0.03563266

> CR=CI/0.58

> CR

[1] 0.06143561

The normalized priorities are giving us the full ranking of the three alternatives: Tom = 74.28%, Dick = 19.3% and Harry = 6.32%. From this we can see that Tom is strongly preferred in charisma from the others. This result is consistent because of the CI being less than 10%, or less than 0.06 equivalent for 3 alternatives.

Age

> A <- matrix(c(1,1/3,5,3,1,9,1/5,1/9,1),3,3,byrow=T)

> colnames(A)<-c("Tom","Dick","Harry")

> rownames(A)<-c("Tom","Dick","Harry")

>A

	Tom	Dick	Harry
Tom	1.0	0.3333333	5
Dick	3.0	1.0000000	9
Harry	0.2	0.1111111	1

> eigen(A)

eigen() decomposition

$values

[1] 3.0290638+0.0000000i -0.0145319+0.2963525i -0.0145319-0.2963525i

$vectors

          [,1]   [,2]   [,3]

[1,] 0.36615947+0i 0.18307973-0.31710340i 0.18307973+0.31710340i

[2,] 0.92649257+0i -0.92649257+0.00000000i -0.92649257+0.00000000i

[3,] 0.08682601+0i 0.04341301+0.07519353i 0.04341301-0.07519353i

> val<-Re(eigen(A)$value[1])

> val

[1] 3.029064

> vec<-Re(eigen(A)$vectors[,1])

> vec

[1] 0.36615947 0.92649257 0.08682601

> v<-vec/sum(vec)

>v

[1] 0.26543334 0.67162545 0.06294121

> CI=(val-3)/2

> CI

[1] 0.01453188

> CR=CI/0.58

> CR

[1] 0.02505497

The normalized priorities are giving us the full ranking of the three alternatives: Tom = 26.54%, Dick = 67.16% and Harry = 6.29%. From this we can see that Tom is strongly

preferred in charisma from the others. This result is consistent because of the CI being less than 10%, or less than 0.06 equivalent for 3 alternatives.

Criteria vs. Goal

> A <- matrix(c(1,4,3,7,1/4,1,1/3,3,1/3,3,1,5,1/7,1/3,1/5,1),4,4,byrow=T)

> colnames(A)<-c("Experience","Education","Charisma","Age")

> rownames(A)<-c("Experience","Education","Charisma","Age")

> A

	Experience	*Education*	*Charisma*	*Age*
Experience	*1.0000000*	*4.0000000*	*3.0000000*	*7*
Education	*0.2500000*	*1.0000000*	*0.3333333*	*3*
Charisma	*0.3333333*	*3.0000000*	*1.0000000*	*5*
Age	*0.1428571*	*0.3333333*	*0.2000000*	*1*

> eigen(A)

eigen() decomposition

$values

[1] 4.1184180+0.0000000i -0.0063777+0.6973568i -0.0063777-0.6973568i

[4] -0.1056626+0.0000000i

$vectors

	[,1]	*[,2]*	*[,3]*
[1,]	*0.87474145+0i*	*0.88440407+0.00000000i*	*0.88440407+0.00000000i*
[2,]	*0.20217197+0i*	*-0.16988300-0.02746596i*	*-0.16988300+0.02746596i*
[3,]	*0.43124480+0i*	*-0.06220061+0.42234339i*	*-0.06220061-0.42234339i*
[4,]	*0.08934103+0i*	*-0.00341581-0.07720302i*	*-0.00341581+0.07720302i*

	[,4]
[1,]	*-0.8940482+0i*
[2,]	*-0.2359569+0i*
[3,]	*0.3609337+0i*
[4,]	*0.1213632+0i*

> val<-Re(eigen(A)$value[1])

> val

[1] 4.118418

> vec<-Re(eigen(A)$vectors[,1])

> vec

[1] 0.87474145 0.20217197 0.43124480 0.08934103

> v<-vec/sum(vec)

> v

[1] 0.54756924 0.12655528 0.26994992 0.05592555

> CI=(val-4)/3

> CI

[1] 0.03947267

> CR=CI/0.9

> CR

[1] 0.04385853

From the result obtained above we can see that the importance of the criteria has the following percentage Experience – 87.4%, Education – 20.21%, Charisma – 43.12%, Age – 8.93%. The consistency index as always should be less than 10%, but in this case, we have 4 criteria and according to the Monte Carlo table it needs to be less than 0.09, which is the case.

APPENDIX B: MANUFACTURING COMPANY EXAMPLE SWOT-AHP MODEL

SWOT Matrix priorities:

> A<-matrix(c(1,3,1,3,0.333,1,0.250,2,1,4,1,2,0.333,0.500,0.500,1),4,4,byrow=T)

> A

```
      [,1]    [,2]    [,3]  [,4]
[1,] 1.000    3.0    1.00    3
[2,] 0.333    1.0    0.25    2
[3,] 1.000    4.0    1.00    2
[4,] 0.333    0.5    0.50    1
```

> eigen(A)

eigen( ) decomposition

$values

[1] 4.17025693+0.0000000i -0.10608398+0.8424093i -0.10608398-0.8424093i

[4] 0.04191103+0.0000000i

$vectors

```
        [,1]                      [,2]                     [,3]              [,4]
[1,] 0.6606493+0i   0.1882964+0.0182831i    0.1882964-0.0182831i    0.90781052+0i
[2,] 0.2585476+0i  -0.2081190+0.3061543i   -0.2081190-0.3061543i   -0.10528990+0i
[3,] 0.6708577+0i   0.8580845+0.0000000i    0.8580845+0.0000000i   -0.40281254+0i
[4,] 0.2159758+0i  -0.1524670-0.2600210i   -0.1524670+0.2600210i   -0.05036034+0i
```

> val<-Re(eigen(A)$value[1])

> val

[1] 4.170257

> vec<-Re(eigen(A)$vectors[,1])

> vec

[1] 0.6606493 0.2585476 0.6708577 0.2159758

> v<-vec/sum(vec)

> v

[1] 0.3658019 0.1431579 0.3714543 0.1195859

> CI=(val-4)/3

> CI

[1] 0.05675231

> CR=CI/0.9

> CR

[1] 0.06305812

Strengths priority matrix

>S<-matrix(c(1, 0.500, 0.200, 0.500, 0.167, 2, 1, 0.167, 0.200, 0.167, 5, 6, 1, 3, 2, 2, 5, 0.333, 1, 0.200, 6, 6, 0.500, 4, 1),5,5,byrow=T)

> S

```
     [,1]   [,2]    [,3]    [,4]    [,5]
[1,]  1    0.5    0.200   0.5    0.167
[2,]  2    1.0    0.167   0.2    0.167
[3,]  5    6.0    1.000   3.0    2.000
[4,]  2    5.0    0.333   1.0    0.200
[5,]  6    6.0    0.500   4.0    1.000
```

> eigen(S)

eigen( ) decomposition

$values

[1] 5.3273885+0.000000i -0.0015571+1.219139i -0.0015571-1.219139i

[4] -0.1621372+0.652323i -0.1621372-0.652323i

$vectors

```
              [,1]                    [,2]                         [,3]
[1,] 0.1000041+0i    0.00350755-0.06921722i       0.00350755+0.06921722i
[2,] 0.1100487+0i   -0.13710169-0.00798184i      -0.13710169+0.00798184i
[3,] 0.7308409+0i    0.15553952-0.59487521i       0.15553952+0.59487521i
[4,] 0.2579973+0i    0.01419800+0.39313431i       0.01419800-0.39313431i
[5,] 0.6141640+0i    0.66596611+0.00000000i       0.66596611+0.00000000i
                        [,4]                    [,5]
[1,] -0.05737213-0.03918293i     -0.05737213+0.03918293i
[2,]  0.01932318+0.03518091i      0.01932318-0.03518091i
[3,]  0.75870135+0.00000000i      0.75870135+0.00000000i
```

[4,] -0.03934427-0.19855148i   -0.03934427+0.19855148i

[5,] -0.29638035+0.53770097i   -0.29638035-0.53770097i

> val<-Re(eigen(S)$value[1])

> val

[1] 5.327389

> vec<-Re(eigen(S)$vectors[,1])

> v<-vec/sum(vec)

> v

[1] 0.05515778 0.06069794 0.40309914 0.14229976 0.33874539

> CI=(val-5)/4

> CI

[1] 0.08184713

> CR=CI/1.12

> CR

[1] 0.07307779

Weaknesses priority matrix

> W<-matrix(c(1, 3, 0.2, 0.2, 0.5, 0.250, 0.5, 0.333, 1, 0.167, 0.167, 0.5, 0.2, 0.5, 5, 6, 1, 1, 6, 2, 7, 5, 6, 1, 1, 6, 2, 7, 2, 2, 0.167, 0.167, 1, 0.2, 0.5, 4, 5, 0.5, 0.5, 0.5, 1, 7, 2, 2, 0.143, 0.143, 2, 0.143, 1),7,7,byrow=T)

> W

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]
[1,]	1.000	3	0.200	0.200	0.5	0.250	0.5
[2,]	0.333	1	0.167	0.167	0.5	0.200	0.5
[3,]	5.000	6	1.000	1.000	6.0	2.000	7.0
[4,]	5.000	6	1.000	1.000	6.0	2.000	7.0
[5,]	2.000	2	0.167	0.167	1.0	0.200	0.5
[6,]	4.000	5	0.500	0.500	0.5	1.000	7.0
[7,]	2.000	2	0.143	0.143	2.0	0.143	1.0

> eigen(W)

eigen( ) decomposition

$values

[1]   7.276328e+00+0.000000e+00i   1.934183e-01+1.584353e+00i   1.934183e-01-1.584353e+00i

[4]   -1.201984e-01+7.025141e-01i   -1.201984e-01-7.025141e-01i   -4.227679e-01+0.000000e+00i

[7] -8.744644e-18+0.000000e+00i

$vectors

	[,1]	[,2]	[,3]
[1,]	-0.1094142+0i	-0.13818980-0.12215617i	-0.13818980+0.12215617i
[2,]	-0.0713742+0i	0.02434034-0.09132079i	0.02434034+0.09132079i
[3,]	-0.6346069+0i	0.57105964+0.00000000i	0.57105964+0.00000000i
[4,]	-0.6346069+0i	0.57105964-0.00000000i	0.57105964+0.00000000i
[5,]	-0.1140898+0i	-0.16006561+0.06671686i	-0.16006561-0.06671686i
[6,]	-0.3835903+0i	0.46439561+0.01301109i	0.46439561-0.01301109i
[7,]	-0.1316227+0i	-0.06502236+0.23387744i	-0.06502236-0.23387744i

	[,4]	[,5]	[,6]	[,7]
[1,]	0.10627261+0.01164277i	0.10627261-0.01164277i	0.06400725+0i	7.845515e-19+0i
[2,]	-0.03659458+0.05587954i	-0.03659458-0.05587954i	-0.04876167+0i	-6.602414e-18+0i
[3,]	-0.35048226-0.20971810i	-0.35048226+0.20971810i	0.56044012+0i	7.071068e-01+0i
[4,]	-0.35048226-0.20971810i	-0.35048226+0.20971810i	0.56044012+0i	-7.071068e-01+0i
[5,]	-0.04036298-0.11483222i	-0.04036298+0.11483222i	-0.08512788+0i	-8.216131e-18+0i
[6,]	0.78683415+0.00000000i	0.78683415+0.00000000i	-0.59667229+0i	1.659030e-16+0i
[7,]	-0.10755202+0.07056107i	-0.10755202-0.07056107i	0.04554705+0i	-2.875578e-17+0i

> val<-Re(eigen(W)$values[1])

> val

[1] 7.276328

```
> vec<-Re(eigen(W)$vectors[,1])

> vec

[1] -0.1094142 -0.0713742 -0.6346069 -0.6346069 -0.1140898 -0.3835903 -0.1316227

> v<-vec/sum(vec)

> v

[1]  0.05262055  0.03432599  0.30520146  0.30520146  0.05486919  0.18448005
0.06330130

> CI=(val-7)/6

> CI

[1] 0.6726829
```

Opportunities priorities matrix

```
> O<-matrix(c(1,2,3,0.5,1,2,0.333,0.5,1),3,3,byrow=T)

> O

      [,1]   [,2]   [,3]

[1,] 1.000    2.0    3

[2,] 0.500    1.0    2

[3,] 0.333    0.5    1

> eigen(O)

eigen() decomposition

$values

[1]  3.0088358+0.0000000i -0.0044179+0.1660298i -0.0044179-0.1660298i

$vectors

              [,1]                    [,2]                    [,3]

[1,] 0.8468221+0i  0.8471220+0.0000000i  0.8471220+0.0000000i

[2,] 0.4660134+0i -0.2334522+0.4029152i -0.2334522-0.4029152i

[3,] 0.2563666+0i -0.1279867-0.2217277i -0.1279867+0.2217277i

> val<-Re(eigen(O)$value[1])

> val

[1] 3.008836

> vec<-Re(eigen(O)$vectors[,1])

> vec
```

[1] 0.8468221 0.4660134 0.2563666

> v<-vec/sum(vec)

> v

[1] 0.5396514 0.2969747 0.1633739

> CI=(val-3)/2

> CI

[1] 0.004417892

> CR=CI/0.58

> CR

[1] 0.007617054

Threats prirorities matrix

>T<-matrix (c(1, 0.333, 2, 0.200, 0.333, 0.500, 0.500, 3, 1, 1, 2, 4, 3, 1, 0.500, 1, 1, 1, 0.500, 1, 0.333, 1, 0.500, 1, 1, 3, 1, 0.500, 3, 0.250, 2, 0.333, 1, 0.250, 0.250, 2, 0.333, 1, 1, 5, 1, 0.333, 2, 1, 3, 2, 2, 3, 1),7,7,byrow=T)

> T

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]
[1,]	1.0	0.333	2	0.200	0.333	0.50	0.500
[2,]	3.0	1.000	1	2.000	4.000	3.00	1.000
[3,]	0.5	1.000	1	1.000	0.500	1.00	0.333
[4,]	1.0	0.500	1	1.000	3.000	1.00	0.500
[5,]	3.0	0.250	2	0.333	1.000	0.25	0.250
[6,]	2.0	0.333	1	1.000	5.000	1.00	0.333
[7,]	2.0	1.000	3	2.000	2.000	3.00	1.000

> eigen(T)

eigen() decomposition

$values

[1] 7.7695250+0.0000000i 0.1706092+2.6108524i 0.1706092-2.6108524i

[4] -0.9186438+0.0000000i -0.1772716+0.6464436i -0.1772716-0.6464436i

[7] 0.1624436+0.0000000i

$vectors

	[,1]	[,2]	[,3]	[,4]

[1,] 0.1862280+0i -0.2119385+0.1350866i   -0.2119385-0.1350866i   -0.17473842+0i

[2,] 0.5771426+0i   0.2454049-0.4082879i   0.2454049+0.4082879i   0.44976959+0i

[3,] 0.2393003+0i -0.2199093-0.2236401i   -0.2199093+0.2236401i   0.02482913+0i

[4,] 0.2978407+0i   0.1761531-0.1002283i   0.1761531+0.1002283i   -0.33480808+0i

[5,] 0.2228813+0i   0.0056084+0.3366440i   0.0056084-0.3366440i   0.21243134+0i

[6,] 0.3547969+0i   0.5276247+0.0000000i   0.5276247+0.0000000i   -0.40388660+0i

[7,] 0.5574001+0i -0.2394458-0.3483930i   -0.2394458+0.3483930i   0.66798908+0i

              [,5]   [,6]   [,7]

[1,] 0.13217452-0.03454137i   0.13217452+0.03454137i   -0.029058887+0i

[2,] 0.08994777-0.53016699i   0.08994777+0.53016699i   -0.398114537+0i

[3,] -0.22385277+0.08778792i   -0.22385277-0.08778792i   -0.005149159+0i

[4,] -0.06494954+0.05986416i   -0.06494954-0.05986416i   0.668113451+0i

[5,] -0.06151026-0.05605630i   -0.06151026+0.05605630i   -0.062992140+0i

[6,] -0.09789978+0.26754325i -0.09789978-0.26754325i -0.383807175+0i

[7,] 0.73379877+0.00000000i   0.73379877+0.00000000i   0.492932391+0i

> val<-Re(eigen(T)$value[1])

> val

[1] 7.769525

> vec<-Re(eigen(T)$vectors[,1])

> vec

[1] 0.1862280 0.5771426 0.2393003 0.2978407 0.2228813 0.3547969 0.5574001

> v<-vec/sum(vec)

> v

[1] 0.07646115 0.23696216 0.09825146 0.12228690 0.09151018 0.14567184
0.22885631

> CI=(val-7)/6

> CI

[1] 0.1282542

> CR=CI/1.32

> CR

[1] 0.09716225

APPENDIX C: TOM, DICK, AND HARRY SWOT-AHP MODEL

Tom's SWOT

```
> T<-matrix(c(1,4,1,4,1/4,1,1/3,3,1,3,1,2,1/4,1/3,1/2,1),4,4,byrow=T)
> T
     [,1]    [,2]     [,3] [,4]
[1,] 1.00 4.0000000 1.0000000   4
[2,] 0.25 1.0000000 0.3333333   3
[3,] 1.00 3.0000000 1.0000000   2
[4,] 0.25 0.3333333 0.5000000   1
> eigen(T)
eigen( ) decomposition
$values
[1]  4.26057880+0.000000i  -0.08862784+1.042877i  -0.08862784-1.042877i
[4] -0.08332313+0.000000i
$vectors
                 [,1]                    [,2]                   [,3]                [,4]
[1,] -0.7374924+0i   0.4315821+0.4534224i   0.4315821-0.4534224i   0.89708356+0i
[2,] -0.2782653+0i  -0.3290429+0.2217600i  -0.3290429-0.2217600i  -0.17540743+0i
[3,] -0.5898251+0i   0.6265570+0.0000000i   0.6265570+0.0000000i  -0.40416783+0i
[4,] -0.1754415+0i  -0.0632703-0.2326403i  -0.0632703+0.2326403i   0.03349155+0i
> val<-Re(eigen(T)$value[1])
> val
[1] 4.260579
> vec<-Re(eigen(T)$vectors[,1])
> vec
[1] -0.7374924 -0.2782653 -0.5898251 -0.1754415
> v<-vec/sum(vec)
> v
[1] 0.41408330 0.15623891 0.33117185 0.09850594
> CI=(val-4)/3
> CI
[1] 0.0868596
> CR=CI/0.9
```

```
> CR
[1] 0.09651067
```

Tom's strengths

```
> TS<-matrix(c(1,4,3,7,1/4,1,1/3,3,1/3,3,1,5,1/7,1/3,1/5,1),4,4,byrow=T)
> TS
           [,1]        [,2]        [,3]    [,4]
[1,] 1.0000000   4.0000000   3.0000000      7
[2,] 0.2500000   1.0000000   0.3333333      3
[3,] 0.3333333   3.0000000   1.0000000      5
[4,] 0.1428571   0.3333333   0.2000000      1
> eigen(TS)
eigen( ) decomposition
$values
[1]  4.1184180+0.0000000i -0.0063777+0.6973568i -0.0063777-0.6973568i
[4] -0.1056626+0.0000000i
$vectors
         [,1]            [,2]               [,3]        [,4]
[1,]  0.87474145+0i   0.88440407+0.00000000i    0.88440407+0.00000000i   -
0.8940482+0i
[2,]  0.20217197+0i  -0.16988300-0.02746596i   -0.16988300+0.02746596i   -
0.2359569+0i
[3,]  0.43124480+0i  -0.06220061+0.42234339i   -0.06220061-0.42234339i
0.3609337+0i
[4,]  0.08934103+0i  -0.00341581-0.07720302i   -0.00341581+0.07720302i
0.1213632+0i
> val<-Re(eigen(TS)$value[1])
> val
[1] 4.118418
> vec<-Re(eigen(TS)$vectors[,1])
> vec
[1] 0.87474145 0.20217197 0.43124480 0.08934103
> v<-vec/sum(vec)
> v
[1] 0.54756924 0.12655528 0.26994992 0.05592555
```

```
> CI=(val-4)/3
> CI
[1] 0.03947267
> CR=CI/0.9
> CR
[1] 0.04385853
```

Tom's Weaknesses

```
> TW<-matrix(c(1,2,3,1/2,1,2,1/3,1/2,1),3,3,byrow=T)
> TW
          [,1]    [,2]  [,3]
[1,] 1.0000000   2.0    3
[2,] 0.5000000   1.0    2
[3,] 0.3333333   0.5    1
> eigen(TW)
eigen() decomposition
$values
[1]  3.0092027+0.000000i -0.0046014+0.166348i -0.0046014-0.166348i
$vectors
               [,1]                  [,2]                    [,3]
[1,] 0.8467969+0i   -0.8467969+0.0000000i  -0.8467969+0.0000000i
[2,] 0.4660103+0i    0.2330052-0.4035768i   0.2330052+0.4035768i
[3,] 0.2564554+0i    0.1282277+0.2220969i   0.1282277-0.2220969i
> val<-Re(eigen(TW)$values[1])
> val
[1] 3.009203
 > vec<-Re(eigen(TW)$vectors[,1])
> vec
[1] 0.8467969 0.4660103 0.2564554
> v<-vec/sum(vec)
> v
[1] 0.5396146 0.2969613 0.1634241
> CI=(val-3)/2
> CI
[1] 0.004601356
```

> CR=CI/0.58

> CR

[1] 0.007933373

Tom's Opportunities

> TO<-matrix(c(1,3,3,1/3,1,2,1/3,1/2,1),3,3,byrow=T)

> TO

```
           [,1] [,2] [,3]
[1,] 1.0000000  3.0   3
[2,] 0.3333333  1.0   2
[3,] 0.3333333  0.5   1
```

> eigen(TO)

eigen() decomposition

$values

[1] 3.0536216+0.0000000i -0.0268108+0.4037588i -0.0268108-0.4037588i

$vectors

```
                [,1]                  [,2]                  [,3]
[1,] 0.8957275+0i   0.8957275+0.0000000i    0.8957275+0.0000000i
[2,] 0.3761820+0i  -0.1880910+0.3257831i   -0.1880910-0.3257831i
[3,] 0.2369798+0i  -0.1184899-0.2052305i   -0.1184899+0.2052305i
```

> val<-Re(eigen(TO)$values[1])

> val

[1] 3.053622

> vec<-Re(eigen(TO)$vectors[,1])

> vec

[1] 0.8957275 0.3761820 0.2369798

> v<-vec/sum(vec)

> v

[1] 0.5936337 0.2493105 0.1570558

> CI=(val-3)/2

> CI

[1] 0.02681079

> CR=CI/0.58

> CR

[1] 0.0462255

```
> TT<-matrix(c(1,4,1/4,1),2,2,byrow=T)
> TT
     [,1] [,2]
[1,] 1.00   4
[2,] 0.25   1
> eigen(TT)
eigen() decomposition
$values
[1] 2.000000e+00 2.220446e-16
$vectors
           [,1]        [,2]
[1,] 0.9701425  -0.9701425
[2,] 0.2425356   0.2425356
> val<-Re(eigen(TT)$values[1])
> val
[1] 2
> vec<-Re(eigen(TT)$vectors[,1])
> vec
[1] 0.9701425 0.2425356
> v<-vec/sum(vec)
> v
[1] 0.8 0.2
> CI=(val-2)/1
> CI
[1] 0
> CR=CI/0.00
> CR
[1] NaN
```

Dick's SWOT

```
> D<-matrix(c(1,3,1,2,1/3,1,1/4,2,1,4,1,4,1/2,1/2,1/4,1),4,4,byrow=T)
> D
           [,1]    [,2]   [,3]   [,4]
[1,] 1.0000000   3.0   1.00     2
```

```
[2,] 0.3333333   1.0   0.25    2
[3,] 1.0000000   4.0   1.00    4
[4,] 0.5000000   0.5   0.25    1
> eigen(D)
eigen( ) decomposition
$values
[1]  4.14312957+0.0000000i -0.03735171+0.7658313i -0.03735171-0.7658313i
[4] -0.06842616+0.0000000i
$vectors
           [,1]                    [,2]                     [,3]                  [,4]
[1,] 0.5919549+0i  -0.6817423+0.0000000i  -0.6817423+0.0000000i  -0.37225814+0i
[2,] 0.2442021+0i   0.2749022-0.1636257i    0.2749022+0.1636257i  -0.20868829+0i
[3,] 0.7436586+0i  -0.2465157-0.5486514i   -0.2465157+0.5486514i   0.90232151+0i
[4,] 0.1921630+0i   0.0645079+0.2587145i    0.0645079-0.2587145i   0.06073685+0i
> val<-Re(eigen(D)$values[1])
> val
[1] 4.14313
> vec<-Re(eigen(D)$vectors[,1])
> vec
[1] 0.5919549 0.2442021 0.7436586 0.1921630
> v<-vec/sum(vec)
> v
[1] 0.3340644 0.1378132 0.4196770 0.1084454
> CI=(val-4)/3
> CI
[1] 0.04770986
> CR=CI/0.90
> CR
[1] 0.05301095
```

Dick's Strengths

```
> DS<-matrix(c(1,4,3,7,1/4,1,1/3,3,1/3,3,1,5,1/7,1/3,1/5,1),4,4,byrow=T)
> DS
              [,1]          [,2]           [,3]    [,4]
[1,] 1.0000000   4.0000000   3.0000000       7
```

```
[2,] 0.2500000   1.0000000   0.3333333     3
[3,] 0.3333333   3.0000000   1.0000000     5
[4,] 0.1428571   0.3333333   0.2000000     1
> eigen(DS)
eigen() decomposition
$values
[1]  4.1184180+0.0000000i -0.0063777+0.6973568i -0.0063777-0.6973568i
[4] -0.1056626+0.0000000i
$vectors
              [,1]                    [,2]                    [,3]            [,4]
[1,]  0.87474145+0i    0.88440407+0.00000000i    0.88440407+0.00000000i    -
0.8940482+0i
[2,]  0.20217197+0i   -0.16988300-0.02746596i   -0.16988300+0.02746596i    -
0.2359569+0i
[3,]  0.43124480+0i   -0.06220061+0.42234339i   -0.06220061-0.42234339i
0.3609337+0i
[4,]  0.08934103+0i   -0.00341581-0.07720302i   -0.00341581+0.07720302i
0.1213632+0i
> val<-Re(eigen(DS)$values[1])
> val
[1] 4.118418
> vec<-Re(eigen(DS)$vectors[,1])
> vec
[1] 0.87474145 0.20217197 0.43124480 0.08934103
> v<-vec/sum(vec)
> v
[1] 0.54756924 0.12655528 0.26994992 0.05592555
> CI=(val-4)/3
> CI
[1] 0.03947267
> CR=CI/0.90
> CR
[1] 0.04385853
```

Dick's Weaknesses

> DW<-matrix(c(1,2,2,1/2,1,1,1/2,1,1),3,3,byrow=T)

> DW

```
   [,1] [,2] [,3]
[1,] 1.0   2   2
[2,] 0.5   1   1
[3,] 0.5   1   1
```

> eigen(DW)

eigen( ) decomposition

$values

[1] 3.000000e+00 -2.220446e-16 0.000000e+00

$vectors

```
        [,1]       [,2]       [,3]
[1,] 0.8164966 -0.9428090  0.0000000
[2,] 0.4082483  0.2357023 -0.7071068
[3,] 0.4082483  0.2357023  0.7071068
```

> val<-Re(eigen(DW)$values[1])

> val

[1] 3

> vec<-Re(eigen(DW)$vectors[,1])

> vec

[1] 0.8164966 0.4082483 0.4082483

> v<-vec/sum(vec)

> v

[1] 0.50 0.25 0.25

> CI=(val-3)/2

> CI

[1] 0

> CR=CI/0.58

> CR

[1] 0

Dick's Opportunities

> DO<-matrix(c(1,4,5,1/4,1,2,1/5,1/2,1),3,3,byrow=T)

> DO

```
      [,1]  [,2] [,3]
[1,] 1.00   4.0   5
[2,] 0.25   1.0   2
[3,] 0.20   0.5   1
> eigen(DO)
eigen() decomposition
$values
[1]  3.0245951+0.0000000i -0.0122975+0.2724682i -0.0122975-0.2724682i
$vectors
              [,1]                    [,2]                    [,3]
[1,] 0.9471383+0i    0.9471383+0.0000000i    0.9471383+0.0000000i
[2,] 0.2769449+0i   -0.1384725+0.2398413i   -0.1384725-0.2398413i
[3,] 0.1619584+0i   -0.0809792-0.1402601i   -0.0809792+0.1402601i
> val<-Re(eigen(DO)$values[1])
> val
[1] 3.024595
> vec<-Re(eigen(DO)$vecctors[,1])
> vec<-Re(eigen(DO)$vectors[,1])
> vec
[1] 0.9471383 0.2769449 0.1619584
> v<-vec/sum(vec)
> v
[1] 0.6833405 0.1998100 0.1168496
> CI=(val-3)/2
> CI
[1] 0.01229753
> CR=CI/0.58
> CR
[1] 0.02120265
```

Dick's Threats

```
> DT<-matrix(c(1,6,1/6,1),2,2,byrow=T)
> DT
           [,1]   [,2]
[1,] 1.0000000     6
```

[2,] 0.1666667   1

> eigen(DT)

eigen( ) decomposition

$values

[1] 2 0

$vectors

*   [,1]   [,2]*

[1,] 0.9863939 -0.9863939

[2,] 0.1643990 0.1643990

> val<-Re(eigen(DT)$values[1])

> val

[1] 2

> vec<-Re(eigen(DT)$vectors[,1])

> vec

[1] 0.9863939 0.1643990

> v<-vec/sum(vec)

> v

[1] 0.8571429 0.1428571

> CI=(val-2)/1

> CI

[1] 0

> CR=CI/0

> CR

[1] NaN

Harry's SWOT

> H<-matrix(c(1,3,1,3,1/3,1,1/2,1/2,1,2,1,5,1/3,2,1/5,1),4,4,byrow=T)

> H

*   [,1] [,2] [,3] [,4]*

[1,] 1.0000000   3   1.0   3.0

[2,] 0.3333333   1   0.5   0.5

[3,] 1.0000000   2   1.0   5.0

[4,] 0.3333333   2   0.2   1.0

> eigen(H)

eigen( ) decomposition

$values

[1] 4.22772392+0.0000000i -0.14599367+0.9798999i -0.14599367-0.9798999i

[4] 0.06426342+0.0000000i

$vectors

	[,1]	[,2]	[,3]	[,4]
[1,]	0.6372773+0i	0.08153996-0.06129485i	0.08153996+0.06129485i	0.91532240+0i
[2,]	0.2116295+0i	-0.14746860-0.23080248i	-0.14746860+0.23080248i	-0.07638124+0i
[3,]	0.7009346+0i	0.89943211+0.00000000i	0.89943211+0.00000000i	-0.38722578+0i
[4,]	0.2403774+0i	-0.16346925+0.28085065i	-0.16346925-0.28085065i	-0.08004372+0i

> val<-Re(eigen(H)$value[1])

> val

[1] 4.227724

> vec<-Re(eigen(H)$vectors[,1])

> vec

[1] 0.6372773 0.2116295 0.7009346 0.2403774

> v<-vec/sum(vec)

> v

[1] 0.3559773 0.1182143 0.3915357 0.1342726

> CI=(val-4)/3

> CI

[1] 0.07590797

> CR=CI/0.90

> CR

[1] 0.08434219

Harry's Strenghts

> HS<-matrix(c(1,1,4,1,1,3,1/4,1/3,1),3,3,byrow=T)

> HS

	[,1]	[,2]	[,3]
[1,]	1.00	1.0000000	4
[2,]	1.00	1.0000000	3

```
[3,] 0.25   0.3333333     1
> eigen(HS)
eigen( ) decomposition
$values
[1]  3.0092027+0.000000i -0.0046014+0.166348i -0.0046014-0.166348i
$vectors
                [,1]                     [,2]                     [,3]
[1,] 0.7252482+0i    0.7252482+0.0000000i    0.7252482+0.0000000i
[2,] 0.6589317+0i   -0.3294659-0.5706516i   -0.3294659+0.5706516i
[3,] 0.1995597+0i   -0.0997799+0.1728238i   -0.0997799-0.1728238i
> val<-Re(eigen(HS)$value[1])
> val
[1] 3.009203
> vec<-Re(eigen(HS)$vectors[,1])
> vec
[1] 0.7252482 0.6589317 0.1995597
> v<-vec/sum(vec)
> v
[1] 0.4579340 0.4160606 0.1260054
> CR=CI/0.58
> CR
[1] 0.007933373
```

Harry's Weaknesses

```
> HW<-matrix(c(1,1,1/3,1/4,1,1,2,1/3,3,1/2,1,1/2,4,3,2,1),4,4,byrow=T)
> HW
    [,1]   [,2]        [,3]              [,4]
[1,]   1   1.0  0.3333333  0.2500000
[2,]   1   1.0  2.0000000  0.3333333
[3,]   3   0.5  1.0000000  0.5000000
[4,]   4   3.0  2.0000000  1.0000000
> eigen(HW)
eigen( ) decomposition
$values
[1]  4.30655511+0.000000i -0.17739359+1.142734i -0.17739359-1.142734i
```

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[4] 0.04823207+0.000000i

$vectors

	[,1]	*[,2]*	*[,3]*	*[,4]*
[1,]	*0.2127139+0i*	*-0.1686078-0.2406392i*	*-0.1686078+0.2406392i*	*-0.13119788+0i*
[2,]	*0.3732605+0i*	*0.6191079+0.0000000i*	*0.6191079+0.0000000i*	*-0.10511584+0i*
[3,]	*0.3737398+0i*	*-0.2354063+0.5317994i*	*-0.2354063-0.5317994i*	*-0.04847396+0i*
[4,]	*0.8220389+0i*	*-0.2685395-0.3464527i*	*-0.2685395+0.3464527i*	*0.98457506+0i*

> val<-Re(eigen(HW)$value[1])

> val

[1] 4.306555

> vec<-Re(eigen(HW)$vectors[,1])

> vec

[1] 0.2127139 0.3732605 0.3737398 0.8220389

> v<-vec/sum(vec)

> v

[1] 0.1193846 0.2094906 0.2097596 0.4613652

> CI=(val-4)/3

> CI

[1] 0.102185

> CR=CI/0.90

> CR

[1] 0.1135389

Harry's Opportunities

> HO<-matrix(c(1,2,1/2,1/2,1,1/3,2,3,1),3,3,byrow = T)

> HO

	[,1]	*[,2]*	*[,3]*
[1,]	*1.0*	*2*	*0.5000000*
[2,]	*0.5*	*1*	*0.3333333*
[3,]	*2.0*	*3*	*1.0000000*

> eigen(HO)

eigen( ) decomposition

$values

[1] 3.0092027+0.000000i -0.0046014+0.166348i -0.0046014-0.166348i

$vectors

```
            [,1]                    [,2]                    [,3]
[1,] 0.4660103+0i    0.2330052-0.4035768i    0.2330052+0.4035768i
[2,] 0.2564554+0i    0.1282277+0.2220969i    0.1282277-0.2220969i
[3,] 0.8467969+0i    -0.8467969+0.0000000i   -0.8467969+0.0000000i
> val<-Re(eigen(HO)$value[1])
> val
[1] 3.009203
> vec<-Re(eigen(HO)$vectors[,1])
> vec
[1] 0.4660103 0.2564554 0.8467969
> v<-vec/sum(vec)
> v
[1] 0.2969613 0.1634241 0.5396146
> CI=(val-3)/2
> CI
[1] 0.004601356
> CR=CI/0.58
> CR
[1] 0.007933373
```

Harry's Threats

```
> HT<-matrix(c(1,3,1/3,1),2,2,byrow=T)
> HT
          [,1] [,2]
[1,] 1.0000000    3
[2,] 0.3333333    1
> eigen(HT)
eigen( ) decomposition
$values
[1] 2 0
$vectors
      [,1]      [,2]
[1,] 0.9486833   -0.9486833
[2,] 0.3162278    0.3162278
> val<-Re(eigen(HT)$value[1])
```

> val

[1] 2

> vec<-Re(eigen(HT)$vectors[,1])

> vec

[1] 0.9486833 0.3162278

> v<-vec/sum(vec)

> v

[1] 0.75 0.25

> CI=(val-2)/1

> CI

[1] 0

> CR=CI/0.00

> CR

[1] NaN

APPENDIX D: NIKE SWOT-AHP MODEL

Nike's SWOT

```
> N<-matrix(c(1,2,1,3,1/3,1,1/2,1/2,1,2,1,4,1/3,2,1/4,1),4,4,byrow=T)
> N
        [,1] [,2]  [,3]  [,4]
[1,] 1.0000000   2  1.00   3.0
[2,] 0.3333333   1  0.50   0.5
[3,] 1.0000000   2  1.00   4.0
[4,] 0.3333333   2  0.25   1.0
> eigen(N)
eigen( ) decomposition
$values
[1]  4.09392995+0.000000i -0.08863961+0.851349i -0.08863961-0.851349i
[4]  0.08334927+0.000000i
$vectors
            [,1]                    [,2]                    [,3]                [,4]
[1,] 0.6290391+0i    0.3586845-0.2001039i   0.3586845+0.2001039i   0.90746228+0i
[2,] 0.2233769+0i   -0.1841659-0.2347250i  -0.1841659+0.2347250i  -0.05089024+0i
[3,] 0.6945732+0i    0.7681790+0.0000000i   0.7681790+0.0000000i  -0.40249381+0i
[4,] 0.2682920+0i   -0.2066557+0.3308856i  -0.2066557-0.3308856i  -0.10918389+0i
> val<-Re(eigen(N)$value[1])
> val
[1] 4.09393
> vec<-Re(eigen(N)$vectors[,1])
> vec
[1] 0.6290391 0.2233769 0.6945732 0.2682920
> v<-vec/sum(vec)
> v
[1] 0.3465243 0.1230536 0.3826257 0.1477964
> CI=(val-4)/3
> CI
```

[1] 0.03130998

> CR=CI/0.90

> CR

[1] 0.03478887

Nike's Strengths

> NS<-matrix(c(1, 2, 1/2, 1/4, 1/3, 1/3, 1/2, 1,4, 1/2, 1/4, 1/2, 2, 1/4, 1, 1/3, 1/4, 1/4, 4, 2, 3, 1, 2, 2, 3, 4, 4, 1/2, 1, 3, 3, 2, 4, 1/2, 1/3, 1), 6, 6, byrow=T)

> NS

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]
[1,]	1.0	2.00	0.5	0.2500000	0.3333333	0.3333333
[2,]	0.5	1.00	4.0	0.5000000	0.2500000	0.5000000
[3,]	2.0	0.25	1.0	0.3333333	0.2500000	0.2500000
[4,]	4.0	2.00	3.0	1.0000000	2.0000000	2.0000000
[5,]	3.0	4.00	4.0	0.5000000	1.0000000	3.0000000
[6,]	3.0	2.00	4.0	0.5000000	0.3333333	1.0000000

> eigen(NS)

eigen( ) decomposition

$values

[1] 6.7452096+0.000000i -0.4149566+1.975174i -0.4149566-1.975174i

[4] 0.1413242+1.029256i 0.1413242-1.029256i -0.1979448+0.000000i

$vectors

	[,1]	[,2]	[,3]
[1,]	0.1778713+0i	0.04210352-0.33745208i	0.04210352+0.33745208i
[2,]	0.2329888+0i	0.38554953+0.30677895i	0.38554953-0.30677895i
[3,]	0.1506120+0i	-0.24861962+0.14118814i	-0.24861962-0.14118814i
[4,]	0.6229004+0i	-0.53349579+0.00000000i	-0.53349579+0.00000000i
[5,]	0.6064531+0i	0.20643101-0.46674828i	0.20643101+0.46674828i
[6,]	0.3682443+0i	0.07417856+0.09621785i	0.07417856-0.09621785i

	[,4]	[,5]	[,6]
[1,]	-0.09516168-0.08324899i	-0.09516168+0.08324899i	-0.04943857+0i
[2,]	0.01374187-0.12722575i	0.01374187+0.12722575i	-0.00924613+0i

[3,] -0.03244438-0.01257329i -0.03244438+0.01257329i -0.09457074+0i

[4,] 0.75830567+0.00000000i 0.75830567+0.00000000i 0.82784552+0i

[5,] 0.12994321+0.54442894i 0.12994321-0.54442894i -0.49237784+0i

[6,] -0.23026450+0.15840000i -0.23026450-0.15840000i 0.24650064+0i

> val<-Re(eigen(NS)$value[1])

> val

[1] 6.74521

> vec<-Re(eigen(NS)$vectors[,1])

> vec

[1] 0.1778713 0.2329888 0.1506120 0.6229004 0.6064531 0.3682443

> v<-vec/sum(vec)

> v

[1] 0.08238329 0.10791164 0.06975782 0.28850406 0.28088627 0.17055692

> CI=(val-6)/5

> CI

[1] 0.1490419

> CR=CI/1.24

> CR

[1] 0.1201951

Nike's Weaknesses

> NW<-matrix(c(1,3,1/5,1/7,1/3,1,1/6,1/8,5,6,1,1,7,8,1,1),4,4,byrow=T)

> NW

*   [,1]   [,2]   [,3]   [,4]*

[1,] 1.0000000   3   0.2000000   0.1428571

[2,] 0.3333333   1   0.1666667   0.1250000

[3,] 5.0000000   6   1.0000000   1.0000000

[4,] 7.0000000   8   1.0000000   1.0000000

> eigen(NW)

eigen( ) decomposition

$values

[1] 4.12495176+0.0000000i -0.04048633+0.7142967i -0.04048633-0.7142967i

[4] -0.04397909+0.0000000i

$vectors

	[,1]	*[,2]*	*[,3]*	*[,4]*
[1,]	*0.15221697+0i*	*-0.06865442+0.21193655i*	*-0.06865442-0.21193655i*	*-0.05390897+0i*
[2,]	*0.08028501+0i*	*-0.08850469-0.06218952i*	*-0.08850469+0.06218952i*	*0.02306094+0i*
[3,]	*0.63790835+0i*	*0.35672226-0.41494063i*	*0.35672226+0.41494063i*	*-0.62215460+0i*
[4,]	*0.75063790+0i*	*0.79952633+0.00000000i*	*0.79952633+0.00000000i*	*0.78069563+0i*

> val<-Re(eigen(NW)$value[1])

> val

[1] 4.124952

> vec<-Re(eigen(NW)$vectors[,1])

> vec

[1] 0.15221697 0.08028501 0.63790835 0.75063790

> v<-vec/sum(vec)

> v

[1] 0.09390033 0.04952660 0.39351596 0.46305710

> CI=(val-4)/3

> CI

[1] 0.04165059

> CR=CI/0.9

> CR

[1] 0.04627843

Nike's Opportunities

> NO<-matrix(c(1,2,1/4,2,1/2,1,1/4,3,4,4,1,3,1/2,1/3,1/3,1),4,4,byrow=T)

> NO

*   [,1]   [,2]   [,3] [,4]*

[1,] 1.0 2.0000000 0.2500000   2

[2,] 0.5 1.0000000 0.2500000   3

[3,] 4.0 4.0000000 1.0000000   3

[4,] 0.5 0.3333333 0.3333333   1

> eigen(NO)

eigen( ) decomposition

$values

[1] 4.2937719+0.000000i -0.0301860+1.116417i -0.0301860-1.116417i

[4] -0.2333998+0.000000i

$vectors

	[,1]	[,2]	[,3]	[,4]
[1,]	*0.3337460+0i*	*0.0925534+0.2964310i*	*0.0925534-0.2964310i*	*-0.4681237+0i*
[2,]	*0.2708873+0i*	*-0.3036304+0.0934694i*	*-0.3036304-0.0934694i*	*0.2994849+0i*
[3,]	*0.8871623+0i*	*0.8743299+0.0000000i*	*0.8743299+0.0000000i*	*0.8235490+0i*
[4,]	*0.1678591+0i*	*-0.0188047-0.1944949i*	*-0.0188047+0.1944949i*	*-0.1137367+0i*

> val<-Re(eigen(NO)$value[1])

> val

[1] 4.293772

> vec<-Re(eigen(NO)$vectors[,1])

> vec

[1] 0.3337460 0.2708873 0.8871623 0.1678591

> v<-vec/sum(vec)

> v

[1] 0.2010937 0.1632190 0.5345463 0.1011410

> CI=(val-4)/3

> CI

[1] 0.09792397

> CR=CI/0.90

> CR

[1] 0.1088044

Nike's Threats

> NT<-matrix(c(1,2,4,3,1/2,1,1/2,3,1/4,1/2,1,4,1/3,1/3,1/4,1),4,4,byrow=T)

```
> NT
          [,1]        [,2]    [,3] [,4]
[1,] 1.0000000  2.0000000  4.00    3
[2,] 0.5000000  1.0000000  0.50    3
[3,] 0.2500000  0.5000000  1.00    4
[4,] 0.3333333  0.3333333  0.25    1
> eigen(NT)
eigen() decomposition
$values
[1]  4.0241204+0.0000000i -0.2109924+0.9851083i -0.2109924-0.9851083i
[4]  0.3978644+0.0000000i
$vectors
           [,1]                 [,2]                 [,3]              [,4]
[1,] 0.8526343+0i  -0.9132255+0.0000000i  -0.9132255+0.0000000i  0.52955309+0i
[2,] 0.3584730+0i   0.1882985-0.0411772i   0.1882985+0.0411772i -0.79274719+0i
[3,] 0.3439355+0i   0.1314753-0.3007518i   0.1314753+0.3007518i  0.30116197+0i
[4,] 0.1619269+0i   0.0678037+0.1285785i   0.0678037-0.1285785i  0.02066125+0i
> val<-Re(eigen(NT)$value[1])
> val
[1] 4.02412
> vec<-Re(eigen(NT)$vectors[,1])
> vec
[1] 0.8526343 0.3584730 0.3439355 0.1619269
> v<-vec/sum(vec)
> v
[1] 0.49659251 0.20878237 0.20031544 0.09430968
> CI=(val-4)/3
> CI
[1] 0.008040133
> CR=CI/0.90
> CR
```

[1] 0.008933481

Global value of strategy-factor efficiency

Strategy 1: Expansion in non-served international markets

$$V_1 = 0.347 \sum_{i=1}^{i=6} (0.082x5) + (0.108x5) + (0.070x5) + (0.288x3) + (0.280x5)$$

$$+ (0.170x5)$$

$$+ 0.123 \sum_{i=1}^{i=4} (0.094x5) + (0.049x5) + (0.393x3) + (0.463x3)$$

$$+ 0.383 \sum_{i=1}^{i=4} (0.201x5) + (0.163x5) + (0.534x5) + (0.101x5)$$

$$+ 0.148 \sum_{i=1}^{i=4} (0.496x4) + (0.209x5) + (0.200x5) + (0.094x2)$$

Strategy 2: Individual marketing

$$V_2 = 0.347 \sum_{i=1}^{i=6} (0.082x5) + (0.108x5) + (0.070x4) + (0.288x5) + (0.280x5)$$

$$+ (0.170x5)$$

$$+ 0.123 \sum_{i=1}^{i=4} (0.094x5) + (0.049x2) + (0.393x1) + (0.463x1)$$

$$+ 0.383 \sum_{i=1}^{i=4} (0.201x5) + (0.163x5) + (0.534x5) + (0.101x2)$$

$$+ 0.148 \sum_{i=1}^{i=4} (0.496x5) + (0.209x5) + (0.200x5) + (0.094x3)$$

Strategy 3: Buzz marketing

$$V_3 = 0.347 \sum_{i=1}^{i=6} (0.082x5) + (0.108x5) + (0.070x2) + (0.288x3) + (0.280x5)$$

$$+ (0.170x5)$$

$$+ 0.123 \sum_{i=1}^{i=4} (0.094x5) + (0.049x3) + (0.393x2) + (0.463x2)$$

$$+ 0.383 \sum_{i=1}^{i=4} (0.201x5) + (0.163x5) + (0.534x5) + (0.101x5)$$

$$+ 0.148 \sum_{i=1}^{i=4} (0.496x5) + (0.209x5) + (0.200x5) + (0.094x3)$$

Strategy 4: Strategic alliances

$$V_4 = 0.347 \sum_{i=1}^{i=6} (0.082x5) + (0.108x5) + (0.070x4) + (0.288x5) + (0.280x5)$$

$$+ (0.170x5)$$

$$+ 0.123 \sum_{i=1}^{i=4} (0.094x5) + (0.049x3) + (0.393x3) + (0.463x2)$$

$$+ 0.383 \sum_{i=1}^{i=4} (0.201x4) + (0.163x4) + (0.534x5) + (0.101x5)$$

$$+ 0.148 \sum_{i=1}^{i=4} (0.496x3) + (0.209x5) + (0.200x5) + (0.094x1)$$

Strategy 5: Social media marketing

$$V_1 = 0.347 \sum_{i=1}^{i=6} (0.082x5) + (0.108x3) + (0.070x2) + (0.288x5) + (0.280x5)$$

$$+ (0.170x5)$$

$$+ 0.123 \sum_{i=1}^{i=4} (0.094x5) + (0.049x5) + (0.393x4) + (0.463x4)$$

$$+ 0.383 \sum_{i=1}^{i=4} (0.201x5) + (0.163x5) + (0.534x4) + (0.101x5)$$

$$+ 0.148 \sum_{i=1}^{i=4} (0.496x5) + (0.209x5) + (0.200x5) + (0.094x1)$$